

Jussi Ilari Kantola · Salman Nazir
Tibor Barath *Editors*

Advances in Human Factors, Business Management and Society

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Advances in Human Factors and Ergonomics 2018

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9th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences

Proceedings of the AHFE 2018 International Conference on Human Factors in Management and Leadership, Business Management and Society and Cross-Cultural Decision Making, held on July 21–25, 2018, in Loews Sapphire Falls Resort at Universal Studios, Orlando, Florida, USA

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Preface

This book provides researchers and practitioners a forum to share research and best practices in the application of human factors to management and leadership. Just as human factors have been applied to hardware, software, and the built environment, there is now a growing interest in the management practices and learning experiences. Principles of behavioral and cognitive science are extremely relevant to the design of instructional content and the effective application of technology to deliver the appropriate managerial and leadership experience. These principles and best practices are important in corporate, higher education, and military environments.

This book also aims to share and transfer not just knowledge, but best leadership and management science practices that are of real value in practical terms, value that can help leaders ensure their organizations stay ahead of the competition through continued innovation, strong competitive advantage, and inspired leadership.

A total of four sections are presented in this book. Each section contains research papers that have been reviewed by members of the International Editorial Board.

- I. Business Development Applications
- II. Human Factors in Organizations and Skill Development
- III. Organizational Complexity and Leadership Style
- IV. Cross-cultural Decision Making

Our sincere thanks and appreciation go to Atsuo Murata for leading the Cross-Cultural Decision Making Conference, and to the board members listed below for their contribution to the high scientific standard maintained in developing this book.

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Business Development Applications



Regional Development Based on Digital Driven Symbiosis

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Abstract. In the fast-moving business environment, the companies want to find location for themselves, where the environment is supporting their businesses, not only in the traditional ways but also by supporting innovation processes of the companies. Because of these new criterions, the countries and regions are forced to rethink new ways to make areas attractive for new companies to settle. In this article is analyzed the development activities on the industry/logistics area of the growth corridor in Finland. The purpose of analysis is to improve the attractiveness for new business as a part of developing digital symbiosis. “Industry 4.0” gives the European framework for building industrial ecosystem.

Keywords: Industry 4.0 · Value network · Digitalization · Transdisciplinary Co-innovation · Co-evolution

1 Introduction

The World Economic Forum report [1] has termed this period of accelerating innovation in science and technology – the transformative change in data and technology capabilities combined with a merging of digital, physical and biological realms and its consequences on society as the Fourth Industrial Revolution. It is not only transforming social networks, scientific research and whole industries; it is also radically reshaping biological and material science innovations. Harnessing these opportunities and proactively managing the risks manifest by the rapid evolution of new science and technologies will inevitably require more creativity and agility in current governance frameworks and financing arrangements.

A crucial role in market evolution is happening by exploring how businesses can use the circular economy to drive arbitrage opportunities across complex, global supply chains [2]. A circular economy is restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value at all times. It questions whether with creativity and innovation we can build a restorative economy.

To be successful on new challenges of Industry 4.0 development, enterprise-university partnerships has to be intense and main objective should be a shared learning [3]. Long-term co-operation creates a background for new co-innovation and co-evolution. The technologies of the Fourth Industrial Revolution have generated enormous excitement about the opportunities they offer as well as concern about governance, regulation and ethics [1]. There are as well exciting possibilities: The

convergence of new technologies is creating unprecedented opportunities in all aspects, from business-to-business commerce to humanitarian intervention. The melding of artificial intelligence (AI) with big data capabilities – not to mention the actual exponential accumulation of data itself – has created a fascinating world of communications, collaboration and interaction, not just between people but also between machines and between people and machines. Through digital transformation, the use of new technologies like big data, open data, cloud, IoT, platforms, artificial intelligence, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities and optimize existing operations to achieve significant business improvement [4]. The collection of scattered data, clustering it for analysis, visualizing it for decision making and using the selected data in new service development on circular economy is most important in creating industrial symbiosis on value network way by using digitalization.

In order to sustain competitive advantage, many companies are changing their business towards circular economy. By doing so, these leaders are expanding their value proposition multidimensional by concurrently creating strong potential through developing more sustainable customer-engaging products, co-innovating sustainable services together with their partners, and collaborating to create integrated new sustainable business technologies [4]. Companies today are facing increasing complexity to execute profitably on continuous sustainable business transition towards circular economy. Responsible leadership is understood as a social-relational and ethical phenomenon, which occurs in social processes of interaction communication [5]. It is a strategic approach for utilizing responsibility as a business and innovation driver to facilitate the transition of industrial business towards circular economy. Responsibility is creating significant impact and opportunities where business, technology and innovation intersect. The transformation towards responsible business takes a long time and that is why it is important to fully understand the strategic concept, identify the key issues and harness the associated opportunities. Competence areas have become more complicated and single human capacity cannot cope with all the needed competence to create new opportunities for businesses. Responsibility business leadership needs democratic innovation culture and co- innovation and co-evolution processes [4].

This article introduces development activities of responsible business leadership and digital driven symbiosis on Finnish growth corridor (region around Helsinki-Tampere highway).

2 Theoretical Background

The new approach is the revised legislative proposal on waste. It covers long-term recycling targets for municipal and packaging waste, measures to limit landfilling, and incentives for Member States to use economic instruments at the national level [6]. It also aims to promote cooperation between industries, with waste from one process becoming secondary materials for others, through a simplified legal framework for by-products and end-of-waste status, creating more certainty for operators in these markets. That leads us for an opportunity to build value networks from the point of side flows of waste. It leads to a business opportunity for industrial symbiosis.

The key notice on sustainability is what extent it will impact a specific business sector and influences on creation of circular economy business and industrial symbiosis. It is an industry-changing paradigm integrating innovation, differentiation and transformation. Tajani [7] has stated, that there will be no sustainability without competitiveness, and there will be no long-lasting competitiveness without sustainability and there will be neither of them without a quantum leap in innovation.

Industry 4.0 describes the organization of production processes based on technology and devices autonomously communicating with each other along the value chain. Industry 4.0 architecture takes account of the increased digitalization of various industries where physical objects are seamlessly integrated into the information network, allowing for decentralized production and real-time adaptation in the future [8]. What is characteristics to Industry 4.0 is that it involves connecting products to each other. Industry 4.0 is closely linked to Cyber-Physical Systems (CPS) [9]. They can be defined as transformative technologies which manage interconnected systems between its physical assets and computational capabilities [10]. To be successful on new challenges of Industry 4.0 development, enterprise-university partnerships has to be intense and main objective should be a shared learning. Long-term co-operation creates a background for new co-innovation and co-evolution. Adapting Industry 4.0 framework as a basis for development activities is expected to provide an opportunity for remarkable competitive advantage for businesses but also for regions [11].

Nidumolu et al. [12] explain widely why sustainability is now the key driver of innovation. The biggest benefit comes from generating and processing big data. Information technology helps make large amounts of data available for different purposes in the public or private sector with minimum effort and costs [13]. Conradie and Choenni [14] have recognized, that the most reliable method how to identify the datasets with big potential is a demand-based approach, which means a close cooperation with potential end users. Every participant in ecosystem has an opportunity to participate on creation of innovations and value, which generally is produced on the boundaries of ecosystem stakeholders [15]. Business ecosystem can be born as group activity or a single company can create it by collaborative activities [16]. Skyttner [17] introduces new systems theory with self-organization and evolution. Jamshid [18] introduces that system thinking is the art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice. Concepts are important to explain chaos. Sanchez and Heene [19] have proposed an open systems model of firms. Improving of organizational competence also requires increasing managers' own cognitive flexibilities to imagine new strategic logics for creating and realizing new kinds of value-creating product offers. Markopoulos and Vanharanta [20] have created the Company Democracy Model. It can be characterized as a multidisciplinary science, as it integrates many management (strategy, leadership, etc.), engineering (process knowledge, innovation), social (human resources, ethos, etc.), financial (marketing, extroversion, etc.) and other disciplines. The co-evolutionary spiral method in the model contributes towards the identification and achievement of the capacity, capability, competence, and maturity needed to turn knowledge into innovation. Industrial symbiosis provides a means to improve competitiveness and build resilient and sustainable economies [21]. Industrial symbiosis helps businesses and organizations to operate in the same way as the natural eco-system where

everything has a place and function, and nothing goes to waste. Whether working at company level, within a region or multiple regions or at national level we apply this systems-based approach. Industrial symbiosis engages diverse organizations in a network to foster eco-innovation and long-term culture change. Creating and sharing knowledge through the network yields mutually profitable transactions for novel sourcing of required inputs and value-added destinations for non-product outputs, as well as improved business and technical processes.

3 Research Questions and Research Approach

The role of circular economy and digitalization as a business driver is growing in bioeconomy and as digital symbiosis in industrial service business. It has to be carefully taken into account in business transition. The opportunities of sustainability and digitalization have not been understood in full context and as new service innovation on digital symbiosis. The main research questions are

- (a) What are the digital fundaments for regional development?
- (b) How Industrie 4.0 framework can support regional development towards digitalization?
- (c) What type of industrial symbiosis business model and implementation process is needed in sustainable growth of business?

This article introduces a concept model for utilizing circular economy and digitalization as a business and innovation driver to facilitate the transition of bioeconomy and industrial co-operative business towards the new service economy on the basis of digital symbiosis. The article gives also new approach for regional development.

4 Circular Economy Framework

The circular economy refers to an industrial economy that is restorative by intention; aims to rely on renewable energy; minimises, tracks, and hopefully eliminates the use of toxic chemicals; and eradicates waste through careful design [2]. The system diagram in Fig. 1 illustrates the continuous flow of technical and biological materials through the value network.

The term goes beyond the mechanics of production and consumption of goods and services, in the areas that it seeks to redefine (examples include rebuilding capital including social and natural, and the shift from consumer to user). The concept of the circular economy is grounded in the study of non-linear, particularly living systems [2]. This ensures enhanced flows of goods and services.

4.1 New Business via Industrial Symbiosis

Changing economic structures, intensifying environmental problems and increasing demand-related requirements all mean that companies need to come up with more resource-intensive solutions. These can be achieved through co-operation between

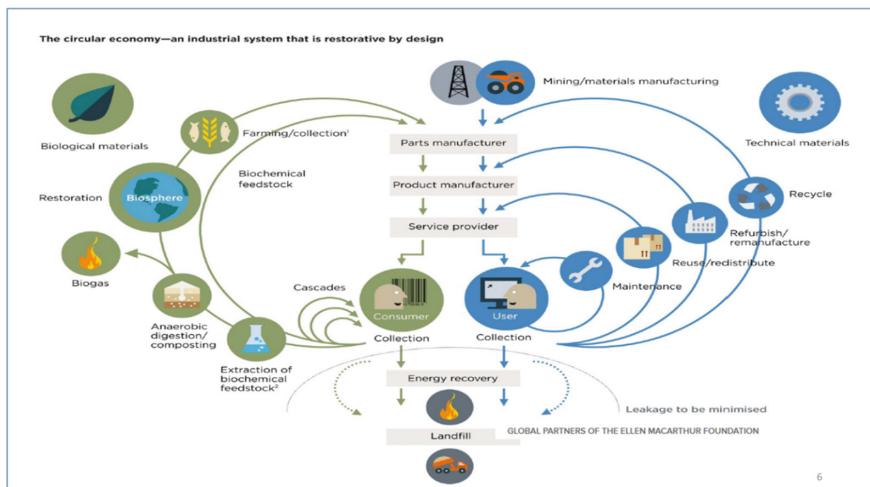


Fig. 1. The circular economy—an industrial system that is restorative by design [2].

companies operating in various sectors, and alongside local authorities and municipalities.

Industrial symbiosis is an industrial ecosystem in which unused or residual resources of one company are used by another. This results in mutual economic, social and environmental benefits. It is a process involving several companies – firms that complement one another provide mutual added value through efficient use of raw materials, technology, services and energy. Joint development of industrial symbiosis provides an efficient way of thinking up, developing and testing product and service innovations. This, in turn, engenders new competencies, on which new business operations can utilize.

Business ecosystems based on industrial symbiosis provide more added value by using fewer natural resources than traditional industrial value chains. This means more efficient energy and water consumption, and reduced waste. In industrial symbiosis, industrial operations, energy production, primary production, waste processing and the services supporting these combine to form an entity that provides products and services for end-user needs, while optimizing resource use [22].

5 Industry 4.0 Framework

The term “Industrie 4.0” was initially coined by the German government. It is *conceptual* in that it sets out a way of understanding an observed phenomenon and *institutional* in that it provides the framework for a range of policy initiatives identified and supported by government and business representatives that drive a research and development programme [8]. In the field of social change there is little awareness of Industry 4.0 outside the group of key stakeholders. Larger firms tend to be more positively disposed whereas unions remain cautious and have reservations. While a

skills gap (as well as a gap in willingness) to adjust to the Digital Single Market exists, the skill requirements to adjust to Industry 4.0 are much greater [8].

The physical world is merging with the virtual world. We are increasingly used to the internet of things, or the internet of everything and increasingly the industrial internet. They all are in the throes of digital transformation. The widespread adoption of information and communication technology (ICT) is increasingly accelerating the blurring of boundaries between the real physical world and the virtual one. The linkage is becoming increasingly Smart [9]. New ITC based technologies make possible 4.0 Industry development and give opportunities to reengineer value chains and create new business models. Internet of Things (IoT) is one of the technological fundaments for 4.0 Industry. Growth of connections brings the new possibilities and solutions for business. Other hand exponential growth brings also new challenges for education, R&D&I and regional development activities. The exponential growth of IoT connections indicates the birth of new business models and new kind of business environments [9]. This “smartness” requires greater connection and collaborations. This is where the ‘explosion’ of platforms and ecosystems is occurring. To attempt to connect the internets of things, services, data, and people need radical redesigns within industries and the participants to connect everything. Presently Industry 4.0 is more industrial driven, but this will change and broaden out [10].

6 Competitiveness of Regions

Digitalization changes everything and is a great opportunity to find out competitive advantage in business. Universities of applied science have a good opportunity and central role in supporting the growth of business on the area of circular economy.

The co-operation between government, enterprise and universities is essential to succeed in co-evolution when building up cumulative competence in creation of solutions for circular economy by benefiting digitalization in it. It is also essential to have a common vision to direct the local operation and funding. Otherwise, the activities can splinter as small pieces and do not form parts of the whole vision.

The development of business environments is understood to be the responsibility of public sector and government. Public sector is however multilayered (e.g. legislative-national- provincial- regional- municipal- areal). There are still other committees and operations, which have the duty to develop business environment. All the layers and activities should be along the same line, support each other and sustainable to get the co-operative environment to function efficiently. In rapidly changing operational environment, it requires clear and commonly understood vision. To describe the elements and layers, by which circular economy thinking has support, it is possible to draw a pyramid, Fig. 2. The layers describe the operations of the public sector, which support and enable effective and digitalized formation of **industrial symbiosis** [3].

Private organizations and companies are actively using new technologies and trying to find the most suitable business environment and locations for them. The task of government, region and town is not to make business but to develop good and fruitful business environments for companies and build infrastructure and provide skilled labour force for industry and society.



Fig. 2. The pyramid of factors affecting Industry 4.0 related renewal.

By identifying the key factors for the Industry 4.0 related renewal, we will find different factors, i.e. “levels” (Fig. 2):

Legislation should new kind of business possible and support business development. Legislation gives “the rules of the game” and this way makes business environments more predictable with less business risks. Industrial areas have developed and profiled themselves based on the **strengths in the local region** (like logistic connections, population, energy, raw materials, knowhow at universities, skilled labour force). It is important to know how **land use** is planned (business/logistic areas) so that companies would be able to create a fruitful business ecosystem, efficient material use (circular economy), and minimize logistic expenses [3]. **Smart specialization** approach combines industrial, educational and innovation policies. **Digital Ecosystem** is as a complex value chain of distributed suppliers specializing in providing either the creative content or the platform for distribution of that content [3]. As a result of the digitalization process, cooperation between companies becomes digital and this leads to the development of a digital ecosystem.

New Innovations are created especially on digital ecosystem interfaces.

In future, in digital ecosystem, companies have more needs for good and attractive business environments in addition to the traditional regional strengths there will be more demands on data availability and the existence of smart platforms. Data has become “the oil” when you analyse the attractiveness of business environments.

Because of the increasing importance of data, the industrial symbiosis cannot any more be evaluated on the basis of the efficiency of material and energy, but modern industrial symbiosis should be evaluated also on the basis of the data flows and data side flows.

Generally, we can have at least two approaches:

- a. data will make it possible to improve the value chains and networks of industrial symbiosis and thus strengthen and make possible the extension of symbiosis.
- b. data will make it possible to find or predict new possibilities or threats (e.g. the change of customer behaviour etc.) which indicates need or possibilities for new innovation in symbiosis or in region.

Based on the arguments above we have a reason to say/claim that regions can increase their attractiveness and development by offering open data and offering its data resources for the use of local companies and industrial symbiosis.

The profitable use of data demands that data has been collected and documented in the right and usable form, so that usability is possible. The legislator will define the ownership of data and the use of the data in the end. It can be seen that the legislation, which is related, will give a huge impact for on regional development and attractiveness of a region.

There are four main approaches to increase the attractiveness:

- a. Collect and publish data for open use.
- b. Open the data sources for limited use (based on the law).
- c. Encourage institutions to publish data that they have collected, but which is not any more important for their business, so called “side flow data”. This “Side flow data” might be useful for regional developers.
- d. Regional authors should encourage local companies to adapt “Industrie 4.0” frameworks, since it will provide connectivity in European digital single markets and give structured model to develop its business and create digital network. That is the reason why “Industrie 4.0” smart platform is critical for the development.

To ensure the development and ability to be renewed in industrial symbiosis, it would be necessary to share all data to the actors in the symbiosis. That would mean the high trust to all that are involved in the symbiosis. Based on the understanding, which is learned and analysed on the basis of data, there is a need to make quick piloting in the “real life” transdisciplinary environment.

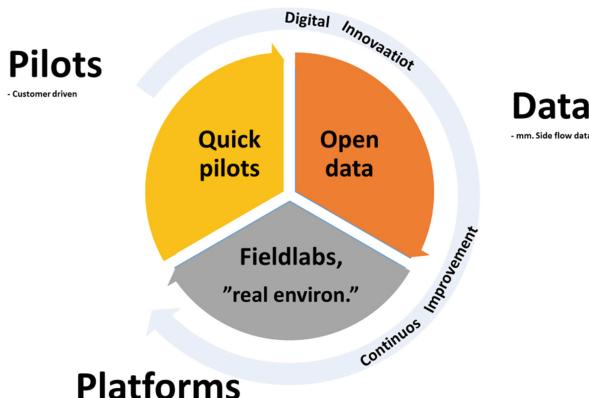


Fig. 3. The birth of innovation in digital ecosystem

The development of regions and industrial symbiosis should be seen as continuous process including data, smart platforms and quick piloting (Fig. 3).

7 Benefiting Digitalization and Big Data Supporting Business Co-evolution

The amount of scattered and structured data around us is increasing dramatically. It is a great business opportunity to benefit that data in business purposes. Circular economy with interrelated bio and mechanical cycle consists of huge amount of data. The data of waste from one partner means material for the other partner. Understanding the value proposition in growing value networks is essential. Management and analysis of data coming from various sources is routed through data-to-service process in business co-evolution of circular economy, Fig. 4.

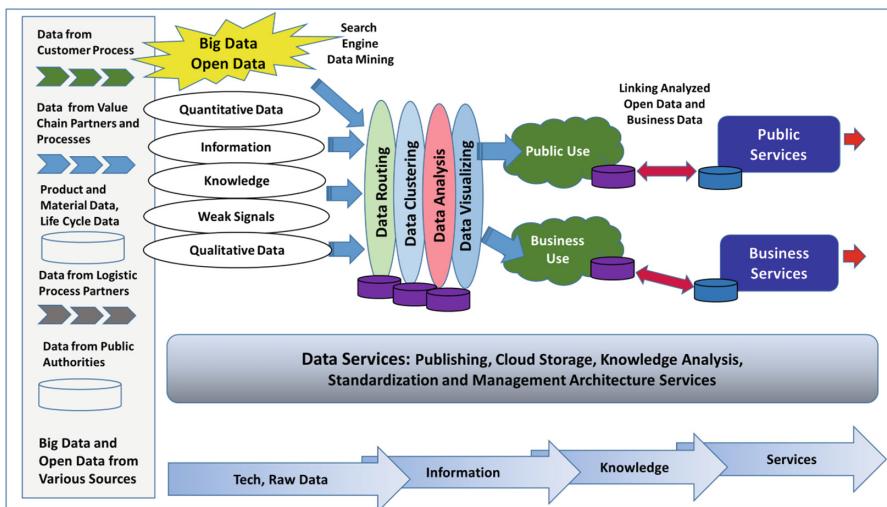


Fig. 4. From data to services process in business co-evolution of circular economy creation and optimization of new operational functions and responsible business co-evolution requires democratic innovation and decision culture. There will be several stakeholders of circular economy on the fields of bio economy and industry participating on decision-making and optimizing functionality of created new services.

In Fig. 5, there is an example of technology-oriented competence and solution creation on the field of circular economy. It is essential to gather data from various sources and different processes. Automation system or sensor network (IoT) is creating data, which is gathered, clustered, analyzed and compare it with the data gathered earlier and then make decisions on how the waste material should be reused, what type of logistics is transferring it and who should reuse and produce that. To support this value network process, it is important to have all type of experts in virtual network optimizing material, logistic and reuse of material. There can also be final customer experts in the same network.

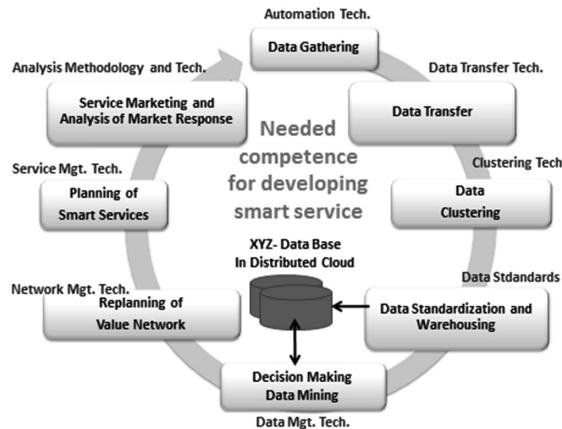


Fig. 5. Relationship of technology and competence in circular economy

8 Discussion and Conclusions

Digital ecosystems and symbiosis should be seen as continuous developing entirety, which will change and renew based on the changes in technology and business environment and thus maintaining their competitiveness. Regional development actions play the key role to support the birth and wellbeing of the symbiosis

Regional development and industrial symbiosis are traditionally supported by many layers. The increasing data and its usability will change and renew the design of industrial symbiosis and develop the attractiveness of regions. Since the availability of data in industrial symbiosis will be critical factor, it is necessary that data will be available for the actors in the symbiosis to create new innovations. Openness of data is important for innovations and renewal of symbiosis.

Availability and usability of data is important (incl, “side flow data”, standards, architecture etc.) for regional development. Industrie 4.0 is a good framework for designing the usability of data. It is also important for the development of region towards European digital single markets.

Digitalization, circular economy and industrial symbiosis are the key drivers, which will change the business environments, a way to act and create innovation. Innovations will need “real life” (transdisciplinary) piloting environments. Both, resource efficiency and digitalization are directing towards service business and environments.

Future attractive business environments are availability of data, smart platforms and “real life” transdisciplinary, piloting environment, these will be important elements also for the competitiveness of industrial symbiosis and the key pillar of regional development.

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Happiness in Fashion

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Abstract. Fashion marketing tactics often fall short due to unpredictable emotional consumer behavior. As a result, positive emotion elicitation towards products is well researched. However, temporary emotional states may have negative implications. Happiness is a stable emotional state, the impact of which as a pre-disposition on purchasing intentions has yet to be thoroughly investigated. In addition, fashion involvement has a known positive impact on purchasing. In this study, the mediating role of happiness as a pre-disposition on the relationship between fashion involvement and purchase intentions is evaluated. A model supported by empirical evidence is presented. Predicated on data gleaned from 849 respondents, Confirmatory Factor Analysis (CFA) followed by Structural Equation Modeling (SEM) were employed. Results confirm that happiness constructs exhibit a multiple mediation effect on the relationship between fashion involvement and purchase intentions. While pursuit of pleasure and pursuit of engagement positively affect fashion involvement, pursuit of meaning negatively affects it.

Keywords: Fashion · Apparel · Marketing · Happiness · Involvement

1 Introduction

The fashion industry is a high value sector in the global economy [1], with the clothing industry one of the most labor-intensive industries in modern economies [2]. The huge impact of the fashion industry on the US manufacturing economy [3] was apparent in a recently released congressional report [4], detailing that in 2015 Americans spent nearly \$380 billion on apparel and footwear. Furthermore, the fashion industry employs over 1.8 million Americans. However, in spite of its impressive impact on the economy, the fashion industry faces significant challenges, such as high competition and imports from Asia [5] and a market characterized by short life-cycles and unpredictable demand [6].

These challenges are forcing fashion companies to invest significant efforts in devising means to quickly attract customers confused by the hyper-abundance of available choices [7]. Surprisingly, only a small number of companies truly understand customer needs [8]. Similarly, most marketers do not fully comprehend customer cognition and behavior [9]. Since it is well recognized that emotions can drive behavior [10], marketing strategies often try to elicit positive consumer emotions to encourage consumption or promote a particular behavior [11]. However, these emotional states are temporary, generating an impulsive purchasing effect [12]. This ultimately produces

an array of potentially negative consequences [13], including guilt, disappointment, and financial hardship [14].

Long and short-term sentiment of happiness are two distinct states [15]. In contrast to temporary bursts of emotion, positive emotions can emerge due to individual affective disposition [16]. Longitudinal studies show that personality traits in adults are stable over long periods of many years or even decades [e.g. 17]. Happiness depends on the stable presence of positive emotions [18], and is one of the most important life purposes driving human action and behavior [19]. However, even though happiness is an important life goal linked to consumer behavior [20], and marketers recognize the consumer quest to increase their happiness, and try to understand the role of happiness in marketing contexts [21], the role of happiness as a pre-disposition for purchasing intentions has yet to be adequately investigated.

Several contributions are made in this study. First, it is noteworthy that the construct of involvement is well researched in marketing and consumer behavior literature [22]. Specifically, involvement of fashion consumers is highly important for both researchers and marketing practitioners [23], and is often used to predict behavior related to apparel products. In this study, a model is presented, in which happiness is factored as a decision-making variable that mediates the relationship between involvement and purchase intentions. Second, happiness is the object of much scholarly attention and is currently a topic of wide ranging empirical research [24]. While many consumers are seeking happiness and gratification through fashion consumption [25], happiness as a generator for fashion consumption has not been researched. Research on happiness is enhanced by contextualizing it in the realm of fashion. Third, brand image is a major focus of academic research [26] as it attracts customers by imbuing the brand with qualities with which they desire to identify [27]. In doing so, it often conveys qualities such as mystery, sensuality, and intimacy [28]. Practical suggestions are thus offered to brand marketers and researchers that a focus on happiness may increase favorable returns. Managerial implications are discussed in the concluding section.

2 Literature Review

The In the study of marketing, emotions are a dominant area of scientific inquiry [29], since the key to more accurate prediction of decision-making and preference-changing of consumers lie in individual emotions [30]. In many studies, the focus is on the influence of emotions on purchase intentions [31]. Specifically, affective emotions play dominant roles as drivers of purchasing decisions [32]. The relationship between emotional state and purchasing is readily apparent in the fashion-clothing context, where emotional anticipation precedes consumer action [33].

However, different emotions are simply responses to different stimuli [34], and many theories in emotion research focus on emotions in the context of dynamic interaction [35]. In contrast to the elicitations of emotions in order to drive purchases [36], happiness is a stable positive emotion [37] – to the extent that there is considerable scientific pessimism regarding the possibility of changing happiness levels [38]. Scholars argue that happiness depends on genetics [39], personality [40], or is based on

an equilibrium set by life events [cf. 41]. A stable emotional state completely differs from emotions such as joy, a pleasant experience, but one that is dynamic and transient [34]. Happiness is the most desirable goal of human life [42], however, in many studies, the focus is on the impact of elevating emotions in the cycle of purchasing [e.g. 43]. Consequently, the impact of individual pre-disposition states of happiness has yet to be adequately investigated. In the literature, it is suggested that happiness is obtained through the pursuit of pleasure, meaning, and engagement [44]. Pleasure refers to individual pursuits of enjoyable experience, positive emotions [45], and their amplification in intensity and duration [46]. Meaning refers to eudaimonic well-being [47] – a sense that one's life is satisfactorily meaningful. Engagement refers to losing oneself in enjoyable activities [48] in which skills are required and challenges are well matched [49]. In this research, the quest for happiness is investigated as a mediator between fashion involvement, a common factor influencing fashion purchase intentions (FPI) [50], and purchasing intentions.

2.1 Fashion Involvement

In Consumer Involvement Theory (CIT) [51], it is suggested that the motivation to act changes with exposure, familiarity, and contact with target stimuli. Two main forces influence purchase intentions: (1) time and energy devoted to making the decision and (2) the degree to which feelings or logic influence a purchase decision [52]. Engagement with a company's products is a way to create customer interaction and participation, which reinforces the connection between the company and the customer [53] and, in turn, increases purchase intentions. In addition to CIT, researchers have also found a positive relationship between fashion involvement and fashion consumption [54]. In line with previous studies, a direct link between fashion involvement and fashion purchase intentions (FPI) can be hypothesized.

H1. Fashion involvement positively influences FPI.

Involvement with fashion is the result of consumer anticipation of happiness since aesthetic desire provides emotional gratification [55]. People enjoy the process of involvement in fashion activity [25]. For instance, Hyun-Mee and Miller [56] found that fashion involvement positively impacts older female life satisfaction, where 'life satisfaction' is often used as a synonym for happiness [57].

In Expectancy Theory (ET) [58], it is suggested that in the decision-making process, people choose an action according to its anticipated reward. This is based on the principle that a basic behavior orientation is the drive to enhance pleasure and avoid pain [59]. In this regard, fashion consumption also draws on hedonistic dispositions [60]. Hedonism refers to the pursuit of sensory pleasure and satisfaction [61] as part of the pursuit of happiness [62]. Importantly, hedonism does not contradict utilitarianism; that is, the usefulness of an action as measured by the amount of happiness it brings [63].

H2. Fashion involvement impacts the pursuit of pleasure.

Happy people tend to spend more money as well as enjoying their surroundings [64]. Some fashion luxury brands have implemented this notion and in addition to beauty and elegance, they attend to the goal of happiness [65].

H3. The pursuit of pleasure positively impacts FPI.**2.2 Pursuit of Engagement**

Please The pursuit of engagement is often achieved by perseverance of effort. In the context of fashion, the most direct motivation for involvement is social reward [66], and individuals often invest considerable effort in that cause. Behavior adjustments based on social acceptance cues are positively correlated to clothing involvement [67]. Level of fashion involvement can relate to sensitivity to the social environment and ability to decode desirable social cues [68] as part of the formation of a social identity. Social identity has a strong influence on individual happiness [69], with fashion clothing serving as a vehicle for establishing it [70].

H4. Fashion involvement impacts the pursuit of engagement.

Happiness derived from the sense of belongingness is by itself a force that drives fashion purchasing intentions. Fashion consumption intentions often stem from social reward satisfactions, which are obtained by displaying financial worth, status, and prestige through clothing [71]. At times, the individual will want to maintain the happiness derived from the sensation of belonging simply by following group dress codes [72], and a continuous effort is important for maintaining happiness [73].

H5. The pursuit of engagement positively impacts FPI.**2.3 Pursuit of Meaning**

Displayed The pursuit of meaning may be achieved through expressions of creativity [74]. Fashion apparel consumers exhibit enormous amounts of creativity [75], deriving from their need for novelty and change (*ibid*). Miller [25] found that pleasure-seeking consumers enjoy the creativity of developing a personal fashion style.

Creative clothing choices and practices support personal identity to the point that individuals can generate a self-transformation through clothing [76]. Fashion marketers agree that fashion represents more than the products it offers, but is a vehicle for individual expression [77]. In the context of self-identity, involvement can influence the incorporation of a product or activity into an individual's self-conceptualization [78].

H6. Fashion involvement impacts the *pursuit of meaning*.

In contrast to the *pursuit of pleasure*, scholars argue that in the *pursuit of meaning*, happiness is not transient, or a collection of shallow sensual pleasures, but an eternal and deep source of meaning [79]. External objects do not provide long lasting happiness [80]. Individuals who seek to maximize meaning through experience require reflection [81], and not consumption. The following is therefore hypothesized:

H7. The *pursuit of meaning* negatively affects FPI.

Based on the above, the three happiness constructs (*pursuit of engagement*, *pursuit of pleasure*, and *pursuit of meaning*) serve as mediators in the link between fashion involvement and fashion purchase intention.

H8. There is a multiple mediation effect of *pursuit of engagement*, *pursuit of pleasure*, and *pursuit of meaning* in the relationship between INV and FPI.

3 Methodology

3.1 Sample

The initial research instrument was comprised of 56 items to test our hypotheses. The online questionnaires were made available to respondents using Google Docs by third-year undergraduate students. In total, 849 respondents filled in the questionnaire (90% response rate). Of the respondents, 54.2% (460) were male and 45.8% (388) female. Respondent ages ranged between 12–17 (0.7%), 18–29 (77.7%), 30–49 (17%), and 50–74 (4.6%). 62.9% had high-school education, 31.9% a BA, and 5.2% postgraduate degrees. 62.5% were unmarried, 35.6% married, and 1.9% divorced.

3.2 Measurement and Analysis

This study measured five constructs: (1) Fashion involvement (INV) (based on O'Cass, [23]); (2) Happiness Pursuit of Meaning (HPM), (3) Happiness Pursuit of Pleasure (HPP), (4) Happiness Pursuit of Engagement (HPE) (2–4) based on Peterson, Park et al. [82]; and (5) Fashion Clothing Purchase Intention (FPI) questions by the author. Five-point scales anchored from “strongly disagree” to “strongly agree” measured the items.

For *Confirmatory Factor Analysis* (CFA) was employed for convergent and discriminant validity [83], followed by Structural Equation Modeling (SEM) to test the model's goodness-of-fit. In accordance with Hu & Bentler [84], a combination approach was used to evaluate the model fit. Specifically, two absolute close-fit indices (SRMR and RMSEA) and two incremental close-fit indices (CFI and TLI) were reported. For CFA and SEM, R v.3.3.3 was employed. Incremental close-fit values $> .9$, values < 0.8 for SRMR [84] and values $<.08$ for RMSEA [85] were considered acceptable.

Cronbach's alpha for internal consistency was determined for establishing subscale reliability. A standard item alpha score of .88 was yielded for *FPI*, .79 for *HPP*, .79 for *HPM*, .70 for *HPE*, and .88 for *INV*.

3.3 CFA

There items of each measure were loaded on a specific latent variable. After several iterations where items were removed to improve validity, there were three items for

FPI, three items for *HPP*, three items for *HPM*, four items for *HPE*, three items for *INV*.

CFA shows good fit to the observed data: CFI = 0.95, TLI = 0.93, RMSEA = 0.06, SRMR = 0.04, 90% confidence interval (CI) for RMSEA (0.059 0.071).

4 Results

The hypothesized model showed a good fit. CFI = 0.93, TLI = 0.91, RMSEA = 0.07, SRMR = 0.07, 90% confidence interval (CI) for RMSEA (0.068 0.080). Figure 1 illustrates the model and results.

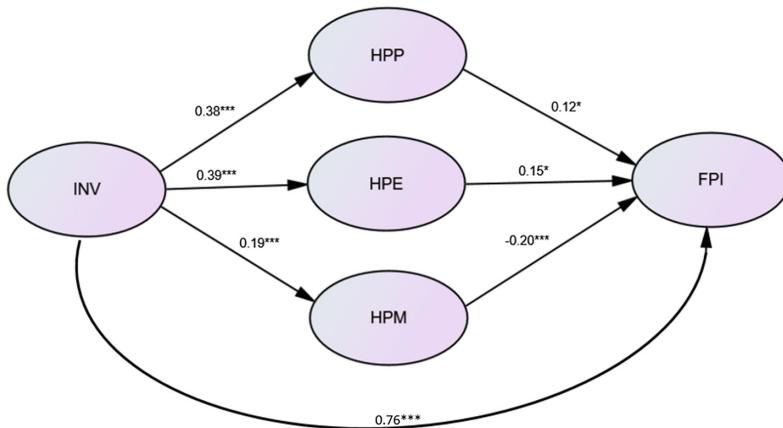


Fig. 1. SEM and coefficients * $p < .05$; *** $p < .001$.

All hypotheses were supported. As illustrated in Fig. 1, fashion involvement positively affects the three constructs of happiness (H2, H4, H6). While *HPP* and *HPE* positively affect *FPI* (H3 and H5 respectively), *HPM* negatively affects *FPI* (H7). The multiple mediation effect of the three happiness constructs, *HPP*, *HPM*, and *HPE*, on the relationship between *INV* and *FPI* (H8) was supported by the data. The Sobel Test for mediation [86] was significant for *HPP* (Sobel $z = 2.3$, $p < .05$), *HPM* (Sobel $z = 3.27$, $p < .01$), and *HPE* (Sobel $z = 2.58$, $p < .01$). The bootstrapped Confidence Interval (CI) for *HPP*'s indirect effect ranges from .004 to .09, for *HPM*'s indirect effect -.06 to -.01, and for *HPE*'s indirect effect .004 to .11 (Bootstrap sample size = 5000).

5 Conclusions and Implications

Fashion involvement is an increasingly significant field in consumer research [87]. In Expectancy Theory, it is argued that performance of actions is based on anticipated reward and the value attached to it [88]. Importantly, researchers in fashion involvement stress the value of social reward [cf. 89]. However, it is only in this study that its

effect on the most common and desired reward of all, happiness, is first investigated. The quest for happiness is not only a reward, but also serves as a driver of consumption. Evidence is thus provided for the important role of happiness as a mediator on the relationship between fashion involvement purchasing intentions.

Through this research, the study of happiness is advanced, a field attracting ever-growing attention in the social science literature [90]. In this work, a link is made between happiness and the fashion industry, providing valuable implications for the study of brand images – one of the most important marketing concepts [91]. Fashion clothing companies pay close attention to their image and not just their products [92]. Brand image typically focuses on status, elegance, quality [93], and aesthetic beauty [94]. Overall, it can be suggested that happiness should receive far greater attention.

Managerial implications can also be extrapolated from the research. First, fashion and marketing professionals may significantly benefit from offering activities that drive involvement with company products. These activities may influence purchase intentions and, at the same time, impact individual affect. Second, marketing practitioners should expand their focus on happiness attachments in relationships to products and brand image. Media exposure and promotional activities targeting happiness may provide significant ROI. In future studies, returns from marketing efforts based on attaching current values to brand (such as intimacy, quality, etc.) should be compared to happiness. In addition, the role of happiness in brand personality, which in turn plays a dominant role in brand attributes, should also continue to be examined [95]. For instance, investigation of the relationship between happiness and Aaker [96] brand personality dimensions- sincerity, excitement, competence, sophistication, and ruggedness as perceived by consumers, is worthwhile. This would shed more light on the dominant role of happiness as a key motivator in the purchasing cycle.

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LeanGame, a Digital Training Tool to Implement Lean Philosophy

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Abstract. One of the most important resource of successfully leaded and managed health care organization is a competent staff. As staff education requires resource investments such personnel's' and educators' time, facilities and thus, typically it have to be funded somehow, money, it would be feasible to try to develop a new, more efficient and more motivating training methodologies and tools, in order to enhance learning outcomes. Health care has large amounts of employees, which gives border condition to tool to be also suitable for large amounts of people. As new digital technologies are available, they offer new ways to execute corporate wide professional training, e.g. serious games. This article presents a new approach to Lean training: a digital LeanGame. It is a digital serious game aimed to introduce basics of Lean Philosophy to health care professionals in hospital environment. Its future users, a group of health care professionals piloted LeanGame in Finnish hospitals in spring 2017. The results of this pilot study show that digital LeanGame can be used in a complementary way to achieve training goals in lean training. This article handles the results of lean game training and discusses of future research and development needs.

Keywords: Digital game-based learning · Serious games · Lean Training health care · Hospital

1 Digital Game-Based Learning

An educational game is “an instructional method requiring the learner to participate in a competitive activity with preset rules” [1]. Serious games are a concept with numerous definitions. In a broad sense, the term refers to games that are used for a purpose other than mere entertainment. Usually they are used as a tool to pass knowledge or information and to enhance skills. Digital serious games can be played using multitude digital technologies such as computers, consoles and mobile devices. The most common platforms for delivering of digital serious games are PC or laptop, followed by video console and online games [2, 3].

The idea of playing games for educational purposes is not a new one. The studies show that they have been an integral part of all societies even in the ancient history. The military has used serious games in educating for a long time. For example, during

the World War II, wargames were used to train the US army. In the last decade, interest towards serious games have grown exponentially and they have become a remarkable business as well [4].

Digital game-based learning has identified as one of the most promising educational approaches for training advanced skills [5]. Different researches show positive learning impacts of digital games. The most common effects are knowledge acquisition and developed problem-solving skills. In addition, games provide growing motivation as one outcome. [2] Unlike traditional teaching methods, the serious games present a learner centered approach. In other words, their user's role is active when the trainee controls the learning process interactively. Learning method is usually problem-based. Method is based on the educational philosophy by John Dewey [25]. Games also provide a real-time feedback for self-assessment and the possibility for the learner to test his/her hypotheses. These same facts are associated with how people learn [6]. Serious games have serious goals. To reach these goals the players' enjoyment is important. An efficient serious game adapts to players needs and interests. Playing a serious game must have the fun-factor to support players' motivation and involvement. [4] According to the Vygotsky's theory of learning, zone of proximal development exists between real and potential levels of development [24]. Scaffolds (e.g. temporary support) have been used in digital games and they provide the necessary support and guidance that learner need to prevent frustration. [23] Scaffolding tools encourage to development problem solving strategies and therefore they facilitate the zone of proximal development [24].

In past few years, an interest towards games designed for training purpose and their use for education have increased [7]. As response to hold the competitive advantage in business and new technical opportunities, many companies have adapted digital serious games as a corporate wide educational method. They are often used for training staff, inducting new workers and increasing internal communication [8].

1.1 Health Games

Health games is a wide concept of different games that aims to improve well-being, e.g. by affecting individual's behavior. Commercially available games have been used for therapeutic purposes since the early 1980s and they were used for children. Today, when the technology has offered possibility to more sophisticated applications, the games are used also for older patients. [9] Commercial games can also be used for pure entertainment, such as Wi fit [3]. Tailor-made games for different health purposes are specifically designed to deliver health related information and to provide a platform where patients can repetitive practice a positive behavior. They involve patient to commit to treatment. [9] A Finnish project "Play for Reward" studied digital games as a part of rehab process of patients with brain injuries [10]. Games for health domain also includes games designed for medical and health care education. Number and genres of games affecting people's health are expected to increase [11].

Health care professionals' continuous education is necessary for e.g. patient safety. Training and educating have to be practiced during their whole career, not during school years only. Nowadays serious games are used in many different professional fields in medical and health care domains and for various training goals [12]. It is

researched, that some commercial games are training the same skills, that are needed in surgical profession e.g. coordination and hand-eye cooperation. These kinds of games have indirect clinical meaning because they promote quality. E.g., there is evidence that by playing certain video games the physician improves surgical skills, makes fewer mistakes and is more efficient in performing laparoscopy [9].

In the review research of serious games, developed for health care professionals, Ricciardi and De Paolis (2014) grouped serious games for eight different group by their application area: surgery, odontology, nursing, cardiology, first aid, dietitian and diabetes, psychology and the others. There is difference in numbers and quality of serious games between different health fields. For example, First aid, triage and mass emergency, is a field that typically requires continuous training and there have been many serious games developed for those needs. [13] Despite of the fact, that those games designed for medical training have growth in numbers, they are still in their infancy compared with the games designed for patients [9].

Educational games for health care professionals are designed to improve their knowledge, skills and performance and to change their attitudes. Nowadays educational games are a growing domain as a health care training platform [12]. There are several literature reviews done from serious games designed for health care professionals. Research aim for Akl et al. (2013) was to study the effect of educational games on health professionals' performance, knowledge, skills, attitude and working satisfaction. Authors found many advantages from educational games. Digital games' competitive nature motivated participants and some of those games had potential to enhance communication between team members. In addition, games helped its players to become more responsible for their own learning. According to this review, there is still need for more research to assess thoroughly the outcomes related to performance and care, as well patient outcomes [14].

Abdulmajed et al. (2015) concentrated their study to mostly on identifying trends and scrutinizing an assessment tools in educational games for health care professionals. Although they did not find evidence on affects for long-term memory, their study showed that there was initial increase in cognitive ability. They stated that educational games are a powerful teaching strategy [15].

1.2 Digital Games for Lean Training

Games are typically used to illustrate the concept of Lean and there is a high number of real games in that specific domain. Manual simulation is a useful method to familiarize to the core themes of Lean, as process thinking and removing waste. However, digital lean games are not so common. [16] Digital game has many advantages versus manual simulations. First, it is a cost-efficient way to train a large amount of people. Digital game does not require any physical presence, so it is not depending on time nor place. Manual simulation takes several hours, whereas digital game can take less than an hour of valuable working time.

As it is apparent, from general searches on the internet, the digital "LeanGame" presented in this article, is not the only one designed to implement Lean thinking. De Carvalho et al. (2014) wrote an article from a digital "The 5S Game". In that game, the players train the 5S method in four different scenarios. De Carvalho et al. studied "The

5S Game's" effectiveness as an educational tool and compared it to the manual Lean game. The results showed that "The 5S Game", as well manual simulation, promoted trainees' motivation and knowledge acquisition. [16, 17] There is also a digital "the Lean Bicycle Factory", done by a Swedish company, which is designed to teach Lean thinking and improve the effectiveness of the process of bicycle production [18].

2 LeanGame

Digital "LeanGame", presented in this article, is designed by Turku University of Applied Sciences' Business Competence and Process Management RDI-group (BCPM) and Turku Game Lab with the Finnish Hospital Districts of Southwest Finland, Satakunta and Vaasa. The game is aimed to introduce basics of Lean Philosophy to health care professionals in hospital environment. Thus, it is a tool to implement Lean in the hospital environment.

The goal of the "LeanGame" is to encourage the health care professionals to see their work and working environment from a different angle. At the same time, the players are being involved to develop their work and tasks, by e.g. cutting of useless, non-valuable work phases i.e. waste. "LeanGame" is placed in hospital and its story is a day in the emergency unit, as a worker. The game is consisted from main story including smaller tasks, the mini games, in game that shows practical implementations of Lean Philosophy in emergency units' everyday work. As an example, the warehouse mini game demonstrates how much ordering and standardizing work place saves time. "LeanGame" is an interactive learning tool where players' choices changes how the story continues. The game also offers a feedback in the end.

2.1 Pilot Study

Since "LeanGame" was developed for real need of early mentioned hospital districts, the need to assess "LeanGame's" results as an educational tool was done by its future users: health care professionals. The assessment was executed through a pilot study in Emergency Medical Service and Radiology Units of The Hospital District of Southwest Finland. The study was conducted in the spring 2017. The participants ($N = 82$) were a group of staff working in Emergency Medical Service and Radiology Units. Response rates were $n = 19$ and $n = 16$ respectively. Hence the total response rate was 42.7% ($n = 35$).

The game link was send to the staff members in the same email as a questionnaire link. The Webropol®-based questionnaire contained 14 questions, both quantitative and qualitative.

The research questions in this study were:

RQ1: How did the participants experienced "LeanGame's" playability?

RQ2: How did the participants experienced digital game as a learning tool versus more traditionally training methods?

RQ3: Did the participants learn about Lean Philosophy?

During the pilot, there was a few technological difficulties, which lead to different arrangement between two different study groups. First, the study plan was to use the computers of the Hospital Districts, but they were partly outdated and not sufficient from their performance enough. Therefore, the pilot was conducted with a separate laptop and a tablet. The participants of Emergency Medical Service started playing with their own devices and they played during their worktime whereas the participants of Radiology Unit had separate playing sessions. All the participants were requested to answer the questionnaire right after their playing experience.

2.2 Results

The study groups consist heterogeneous professions and level of Lean knowledge. The age of respondents ranged between 20–65 years old and 65% of them had participated in some Lean training during last year (Fig. 1). In Radiology Unit 94% of all staff had some previous Lean training, in the Emergency unit that percentage was smaller, 21%. Before the game, almost all respondents (94%) felt that Lean Philosophy is useful in their own work.

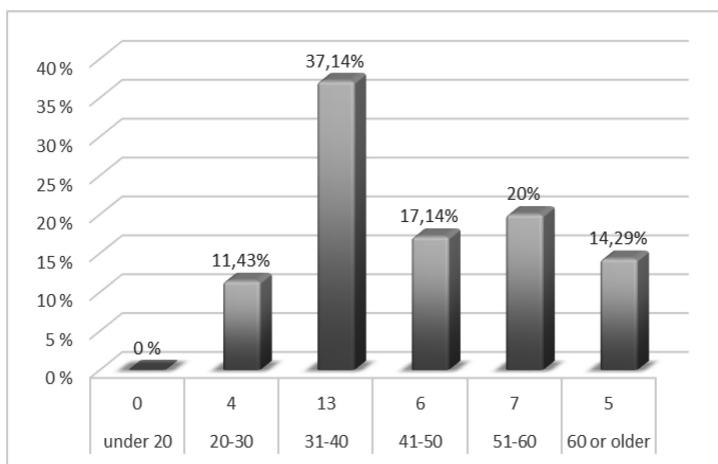


Fig. 1. The age of respondents ranged between 20 and 65 years.

In the qualitative questions, “LeanGame” was described easy and “simple enough” and during the pilot, there was no barriers reported in players technical-skills. According the background questions, 94% of the participants used information technology daily in their work and the rest of them used it at least every week.

The result of **the first research question** of “LeanGame’s” playability was a collection of development ideas for the next version of the game. Ideas were shown as recommendations. The participants made suggestions for the game’s technical and content properties. During the pilot study it became very clear that that not all computers, in the Hospital District, were capable enough to run the “LeanGame”. They did

not have, for example active WEBGL, which is needed in Unity based games. The participants also hoped that the next version of “LeanGame” would work better in Internet explorer® -browser, which is a default browser in the test organization’s computers.

For the “LeanGame” itself, the players made several suggestions. They asked a chance to put the game into a pause. Given the nature of work in the emergency duty, it is clear that worker cannot always play serious games without interruptions, even when game is developed to be quite quick to play. “LeanGame” was developed to be played through in 30–45 min. The participants also asked for instant feedback after every task and mini game. “LeanGame’s” feedback was given mainly in the end. The players were also after more information about the right answers in different tasks and some of them were hoping for discussion sessions about Lean after the game. All players’ feedbacks were collected and analyzed. The results were reported and given as recommendations for the next game version and given to the BCPM-research group and Turku Game Lab. This feedback is used in order to provide information for the decisions made for the development of “LeanGame v. 2.0”.

“LeanGame” was the first digital serious game in the Hospital District of Southwest Finland. Therefore, **the second research** question was about participants’ experience of digital game as an educational tool. Answers were mainly positive. From respondents 51% would like (agree/strongly agree) to take part to an educational session executed with digital games in the future. The same amount of them felt that they learned better with “LeanGame” than by traditional teaching method e.g. lecture. In the qualitative questions one player described “LeanGame” to be more clarifying than lectures or manual “Lean Kata” simulation. The 51% of the respondents would also recommend “LeanGame” to their colleagues (Fig. 2).

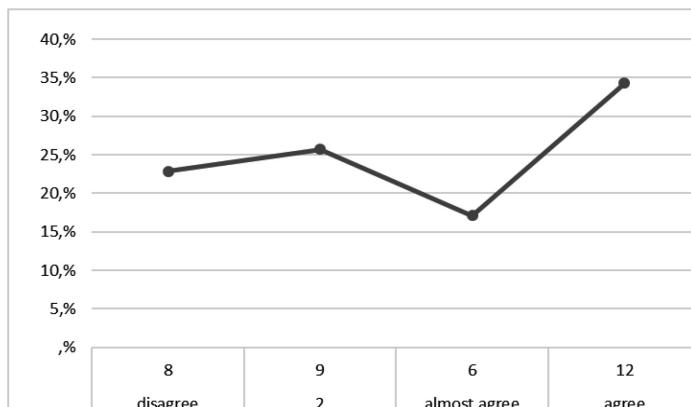


Fig. 2. The answers to the statement “I will recommend LeanGame to my colleagues”.

As an answer to **the third research question** 54% of the respondents agreed (almost agree/agree) with the sentence “LeanGame increases knowledge about Lean Philosophy”. Sixty-one percent of them considered (almost agree/agree) that the game

helped them to implement and use Lean Philosophy and its tools in their everyday work. One respondent, who already had wide knowledge about Lean Philosophy, underlined that the game “did not teach him anything new about Lean”.

In the questionnaire, there were two questions about waste and how participant experienced LeanGame influence about it. 49% of the participants felt (almost agree/agree) that LeanGame helped them to identify waste in their everyday work (Fig. 3), 46% of them felt (almost agree/agree) that the game helped to identify waste in health care processes (Fig. 4). In the questionnaire were four options to answer: 1 = disagree, 2 = slightly agree, 3 = almost agree and 4 = agree. Therefore, the scale was not linear.

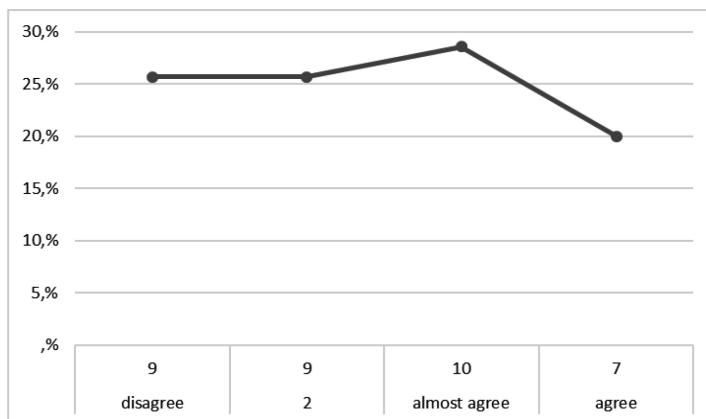


Fig. 3. The answers to the statement “LeanGame helps to identify waste in everyday work”.

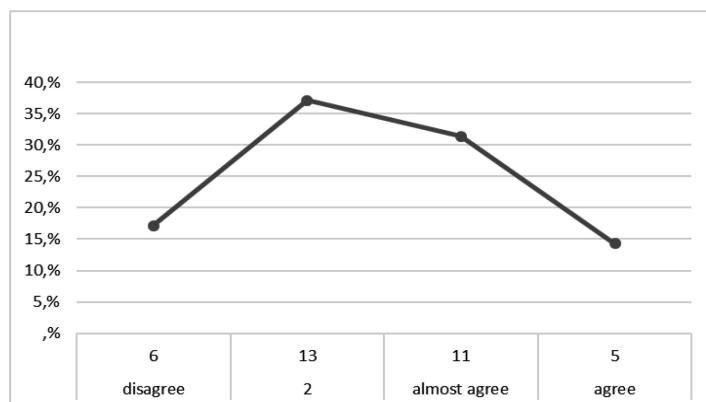


Fig. 4. The answers to the statement “LeanGame helped to identify waste in care process”.

2.3 Discussion

According the studies, assessing digital game-based learning is relatively new topic. Although research on games has been carried out across the globe, there are no distinctive guidelines and best practices in this field [19]. This pilot study was concentrated in participants' instant experiences. Pedagogic influence as well effects on long-term memory were not under scrutiny. It would have been interesting to discuss with the participants after about how much "Lean Game" provoked thoughts and discussions about Lean Philosophy. In addition, it would have been very beneficial to have possibility to study whether the game influenced participants to make changes in their work in practice. Nevertheless, that would have needed a follow-up study and resources lacked this time.

There are several limitations in this study. Arrangements between participants in Emergency Medical Service and Radiology Units were different. Staff working in Emergency Unit played "LeanGame" during their workday and according the results, they often had to stop their playing due to the nature of their work. At the same time, study group working in Radiology Unit had a separate playing session without interruptions. The response rate in Radiology Unit (100%) was significantly better than in the Emergency Unit (28.8%). There also was a similar trend in results between these two groups; the participants in Radiology unit assessed the game slightly more positively compared to the other group. The idea behind playing during worktime was that "LeanGame" would became an educational tool that can be used whenever the employer has time, more than once. However, having spare time is a challenge in the hospital environment.

There was a need for organization's research permission in this study. Permission was needed, because the participants used their working time during it. This pilot study was conducted as a part of student's Master of Health Care thesis and it did not benefit the researchers financially.

2.4 Conclusion

Lean is a quite new concept in Finnish health care system [20]. The District of Southwest Finland has decided to implement Lean Philosophy to all organization levels. Training all employers is critical for that kind of cultural chance [21] as well as need to change management system and leadership approaches in order to achieve as much benefits as planned from change. Lean is a wide concept and impossible to grasp entirely trough games. It has to be remembered that digital game is still a learning platform, or which provides content such as videos, books or any other, even that it is very distinctive one compared to others. Digital or manual, games still involve participants and enable them to test Lean tools in a safe environment.

The "LeanGame's" designers' goal was to create an educational tool, which is easy to use, provokes thoughts and fosters discussion about Lean [22]. According the results in this study, they did succeed. "LeanGame" was found to serve as a complementary way to achieve the basic lean training goals in health care organization. The Hospital District of Southwest Finland has decided to adopt "LeanGame" to be part of its education strategy to be one of the first contact in Lean education.

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Comprehensive Internationalization at HAN University of Applied Sciences. Curriculum, Co-curriculum, and Learning Outcomes

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Abstract. The Netherlands Universities Foundation for International Cooperation (Nuffic) conducted a study [1, 2] into institutional policy on internationalization in 2014 in the Netherlands. This study included most Dutch Higher Education Institutions (HEIs). Of these, 27 (59%) had a central-level plan, eight (17%) were developing such a plan, whilst seven (15%) did not have a separate central-level plan. Only four of the HEIs (9%) in the study did not have a central-level internationalization policy. It can be concluded that the penetration of internationalization in terms of policy is high in the Netherlands. This article is a part of an extensive research project developed at HAN University of Applied Sciences and traces the recent institutional developments within the context of its strategic planning and internationalization policies. In particular, this article deals with the “Curriculum, Co-curriculum, and Learning Outcomes” dimension of the Comprehensive Internationalization CIGE model [3].

Keywords: Comprehensive internationalization · Higher education
Internationalization policies · Internationally connected university

1 Introduction

Based on the definition given by the NAFSA: Association of International Educators (2014), Comprehensive Internationalization represents the strategic and planned integration of three dimensions, namely global, intercultural and international, as part of the ethos and results of higher education [4]. Previously, Knight (2004) stated that internationalization is the key element of the comprehensive approach and Comprehensive Internationalization goes beyond the borders of the curriculum [5]. Comprehensive Internationalization may not exist without internationalization of the curriculum. Since the internationalization of the curriculum gains more attention in universities, it is quite obvious that internationalization at home may be described as a narrow concept [6].

This article is using the Center for Internationalization and Global Engagement’s (CIGE) model as a strategic basis for comprehensive internationalization; this process brings programs, policies, and initiatives into alignment with university strategic plans to become globally oriented and internationally connected [3]. The model contains six

target areas: (1) Articulated Institutional Commitment, (2) Administrative Leadership, Structure, and Staffing, (3) Curriculum, Co-curriculum, and Learning Outcomes, (4) Faculty Policies and Practices (5) Student Mobility, (6) Collaboration and Partnerships; and will help identify implementation strategies that support internationalization at the university level. In particular, this article deals with the “Curriculum, Co-curriculum, and Learning Outcomes “dimension of the CIGE model (Fig. 1).



Fig. 1. CIGE model for comprehensive internationalization

This paper seeks to document how these aspects of internationalization are perceived by HAN University of Applied Sciences faculty and higher management in form of institutional strategic planning and policies. The researcher is planning to encompass a consideration/evaluation of the specific university policies and practices in relation to the theme and the model used as well as an evaluation of institutional responses of University to a range of issues, policies and strategies concerning internationalization.

This paper contributes to knowledge by attempting to develop faculty leadership in the strategic planning of the internationalization process by determining the best practices while creating a process for internationalization to increase the university's global competitiveness. It positions the responses to internationalization of chosen university within the policy context that the university sets.

In a conceptual context, this research is exploring the various tiers of internationalization and tries to equate them to the overall context of institutional strategic planning made by the studied university.

2 Problem Definition and Research Design

This paper traces the chosen university recent development and seeks to account for this in terms of institutional internationalization strategic planning. It seeks to document how different aspects or dimensions of internationalization are perceived by university administrators and faculty. In addition, this paper highlights some of the major issues in connection with institutional responses to the impact of internationalization with respect

to responsibilities that range from being local to international in nature. In particular, the strategic planning is explored, and as the literature shows this aspect is critical in identifying reasons for institutional responses of complex organizations, such as universities.

Following the “Curriculum, Co-curriculum, and Learning Outcomes” dimension of the CIGE model, strategic planning involves key stakeholders that articulate an institution’s commitment to internationalization and provides a roadmap for implementation. Formal assessment mechanisms reinforce this commitment by framing explicit goals and holding the institution accountable for accomplishing them.

As a core purpose of higher education, student learning is a critical element of internationalization. An internationalized curriculum and co-curriculum ensure that all students are exposed to international perspectives and build global competence. Globally focused student learning outcomes articulate specific knowledge and skills to be addressed in courses and programs. The mentioned below steps will be used to structure the research [3]:

- **Step 1: General education requirements.** Courses that focus on foreign language, regional studies and global issues are included in undergraduate general education requirements.
- **Step 2: Internationalized courses in the disciplines.** Courses within each major incorporate international perspectives and highlight global issues in the field.
- **Step 3: Co-curriculum.** Programs and activities address global issues, reinforce international elements of the curriculum, facilitate discussion and interaction among students of different backgrounds and support the integration and success of international students on campus.
- **Step 4: Student learning outcomes.** Internationally focused competencies are included in campus-wide student learning outcome goals and assessments.
- **Step 5: Technology.** Technology is used in innovative ways to enhance global learning, e.g. through joint coursework and interactions with students and faculty abroad.

In line with these recommendations, the researchers chose a combination of interviews, archives, and observations, with main emphasis on the first two. In line with the explorative nature of the study, the goal of the interviews was to see the research topic from the perspective of the interviewee, and to understand why he or she came to have this particular perspective.

Policy and other documentation for the university was collected on site, to supplement the primary and secondary data gathered, when made and recorded. For the international policy context, sources of documentary information were used to scale the international, national and local position on higher education in selected university. Several governments and other websites were used to glean policy and positional information. Sources referenced in research papers were also utilized as resources from online searches through various electronic databases and search engines. The documentation from institution was collected to gain insight into the institution and the strategies and policies in place. Sources of this information included: strategic plans; management and academic structure charts; annual reports; internationalization policy documents; websites etc. These documents were the first types of units of observation.

3 Results and Outcomes

The process of internationalizing teaching and learning can be done using a multitude of instruments such as guest speakers from international companies, guest lecturers from international universities, guest lecturers from local cultural groups, comparative international literature and digital/online learning. Modern technology solutions can represent a good opportunity for all students to benefit by equal access to the internationalization of the curriculum.

The “Internationalization in Action” program, enhanced by the American Council on Education (2013), stress that the internationalization of the curriculums should start with the internationalization of the individual modules or courses that are part of the curriculums [7]. The first step that institutions should take is to internationalize the academic programs that exist already.

According to the Strategical Internationalization Agenda 2016–2020, the Institutional Plan 2016–2020 and the Study Abroad Guide 2016–2017 at Faculty of Economics and Management [8–10], the following points of action regarding the internationalization policy at the HAN University of Applied Sciences were set:

- Each institute has an internationalization vision and plan derived from this agenda.
- Each programme has internationalization included in their final objectives and provides ample space for international exchange and mutual recognition of credits. Where necessary, the curriculum will be adjusted accordingly.
- Teachers professionalize their international and intercultural skills, including mastery of a good level of English or German.
- Offering teaching team training in diversity and inclusiveness.
- Each HAN teacher/researcher has gained international and intercultural experience through a mobility programme.
- The integration of internationalization research is explicitly included in the learning environment of the students, for example by the use of international literature and international cases and cooperation with international partners.
- Each program ensures internationalization and interculturalism in its major curriculum, including learning outcomes securing international and intercultural competencies.
- All courses offer their students the opportunity to be a part of their study, including the major, to do abroad, in cooperation with strategic partners as part of the internationalization of the core curriculum.
- Every continuous learning research has linked an international dimension to one of the research priorities.
- Providing more ICT facilities for internationalization@home, such as virtual mobility, international cooperation at distance and virtual classrooms, including licensing, implementation and maintenance costs.
- Internationalization is explicitly included in HAN ICT policy where development of up-to-date expertise in the use of ICT resources in international education and research cooperation is a priority.
- Improving management information systems, so that international comparisons are more possible (U-Multirank).

- Improvement of clear, transparent and user-friendly processes for outgoing and incoming student mobility, such as digital support MoveOn4 or other systems, to facilitate clear arrangements between contact persons and other institutions.
- Monitoring, evaluation and improvement of processes for the benefit of (international) student experience.

The Faculty of Economics and Management at HAN wishes to further internationalize in order to enhance the quality of its course offer and research and in order to strengthen the employability of its students.

The 2016–2010 Strategic Internationalization Agenda defines as the most important goals the further internationalization of the formal and informal curriculum, the development of lecturers and staff in the field of internationalization and the strengthening of its international network [8]. Furthermore, the faculty aims for growth in the number of students in the English taught courses. The first goal is the focused integration of the international and intercultural aspects in the formal and informal curriculum for all students in the Faculty within their own learning environment [8].

However, internationalized learning outcomes assessment remains relatively under-reported. Based on this under-reported assessment, Jones (2013) considers that there are limited studies that research the accomplishment of the internationalized learning outcomes. Besides, he also states that there is a lack of research regarding the learning outcomes of the internationalized curriculum [11]. The range of the internationalized learning outcomes with the domestic learning outcomes over the years of a study program should be studied in detail in the following years [12]. This is also advisable for the HAN as much deeper information is needed to be collected over a longer period of time to be able to make any conclusions or give advice.

With regard to the formal curriculum, at HAN all courses are required to develop a vision of the internationalization of their curriculum, focused specifically on the professional profile for which they train students. They must do this based on research conducted among alumni and the professional field into the desired international and intercultural competences of their students. This enables them to hone their professional profiles and the course objectives and to define the international and intercultural aspects of the final qualifications. They also have to formulate assessment criteria and have to incorporate these fully in the curriculum and assessment. To make sure internationalization is properly embedded in the final qualifications, each professional field committee must include members who have experience in an international context corresponding to the profession for which students are trained. The faculty wants to strengthen the international orientation in general, while everything is focused on having lecturers, researchers, management and other staff look outwards [8]. Knowledge workshops showcase meetings and courses also give an extra impulse to this cultural change.

HAN believes that mobility in general, both short and term long, can represent a meaningful experience in the internationalization at home process due to the extension into the domestic curriculum. This extension into the domestic curriculum can be done by analyzing the new perspectives gained by the students from their experience of mobility, the new intercultural achievements or finding out what students have learned after such mobility. Those students who benefited from such mobility can share with

others who have not been mobile their impressions, experience and achievements. This is a great method that all students benefit from a mobility experience.

Egron-Polak and Hudson (2014) consider that the combination of lack of engagement by academics and skills deficits represents the major obstacles to internationalization [13]. When mobility is considered just an administrative task instead of a part of the curriculum, the learning outcomes that may result from the mobility will decrease. In consequence, the academics engagement in the internationalization process will drop down.

At HAN, examples of good practices to further internationalize the curriculum are (virtual) student projects within the curriculum with international partner universities, guest speakers with international and intercultural experience in the professional field and foreign guest lecturers from partner universities. The courses offered in Dutch are highly encouraged to benchmark with comparable courses provided abroad. The Dutch- and English-language courses will collaborate in student projects where possible. Furthermore, the Faculty has set a clear language requirement for the Dutch-language courses: graduates must have a command of English at B2 level. Furthermore, every student has the opportunity to go abroad for a one-semester work placement or studies as part of the degree.

The Organization for Economic Co-operation and Development (1996) defines the internationalization of the curriculum as a curriculum with an international content that is developed for foreign and/or domestic students, focused to prepare students to achieve professional and social performances into a multicultural and international context [14]. Beelen (2014) comments on the above definition, considering it as unworkable. Beelen's arguments mention that the definition given by the Organization for Economic Co-operation and Development supports a very narrow perspective regarding the internationalization of the curriculum, since it could provide international content only for those foreign students and this definition does not seem to recognize the intercultural opportunities in a domestic context [15].

In order to make additions the definition given by NAFSA: Association of International Educators, Leask (2015) states that the internationalization of the curriculum represents both incorporation of three dimensions, like international, global and intercultural, and the outcomes from the learning process, such as teaching methods, assessment tasks and support services for the study program [16]. With regard to the internationalization of the informal curriculum, the faculty aims that its students in 2020 will be in a learning environment and a campus where diversity is a matter of course, for his or her own and other cultures. The campuses must have facilities that make both Dutch and foreign students feel at home. Students will be challenged to engage in extracurricular activities to gain knowledge of a broader international context and make contact with students and employees from a different cultural background [17, 18]. Within and outside the campus the faculty wishes to arrange as many meetings and interactions as possible between Dutch and foreign students as well as between foreign students and the local community. The extra-curricular programme will include activities that focus particularly on the diversity of the Dutch society and the student population. Students will even be more actively involved in the creation of the programme. It will give international student associations a bigger role. The faculty

will implement a buddy system because it is an effective way to create bonds between the Dutch students and the foreign exchange students.

In order to internationalize the curriculum at home as any other aspects related to the internationalization process, the academic staff should be able to develop, deliver and assess this process. Many authors, as for example Leask (2015) and Carroll (2015), consider this capability to internationalize the formal curriculum at home as a decisive factor for the success of the implementation of this process [16, 19]. These authors provide also several ideas that should help staff development for internationalization. These ideas mention that the academic staff must focus on internationalizing the existing disciplines and the learning outcomes of those disciplines within the formal home curriculum for all students. This process of internationalizing should be based on proper pedagogy and suitable assessment. The internationalization of the curriculum must be implemented at the level of universities departments and programs of study. Due to this, the academic staff development has to be delivered at those levels. Based on this necessity to implement the internationalization of the curriculum at home or abroad and the support of the academic staff, the institutional policy should create in universities' departments the frame to support this relation.

The faculty considers a team of academics with international knowledge and intercultural skills as an important precondition for the further internationalization of the curriculum [20]. Therefore, the second goal of the 2016–2020 Strategic Internationalization Agenda is to increase the number of lecturers who have worked and studied abroad, so as to anticipate diversity in the classroom and convey the international aspect of the profession being trained for [8].

For this purpose, the faculty will invest in its employees' international skills. By international skills is meant language skills and intercultural competences, but also educational competences, such as developing distance learning or teaching in an international classroom. Furthermore, the faculty commits to additional training of lecturers in the international aspects of their field. The faculty also commits to the mobility of lecturers and researchers and will enforce the exchange of academic staff with partner institutions [20]. The aim is to exchange and develop knowledge and develop international competences among the staff and provide a more in-depth benchmark at module/course level. Lecturers and researchers can also attend international conferences or participate in other ways in an international network specifically for their field.

The faculty wishes to reinforce the international orientation of all staff members. The faculty finds it extremely important that education managers, educationalists and quality assurance staff have an internationally oriented reference framework [20].

For this purpose, the Faculty will offer trainings, workshops and showcase meetings. Managers, course coordinators and members of the curriculum committees will benchmark their course(s) nationally and internationally in terms of internationalization. They can also participate in trainings and conferences. Trainings and courses will also be available for educationalists and quality assurance staff to support them in the internationalization of the curriculum. For colleagues in the support staff there will be intercultural trainings to help them provide the best possible support for students from abroad.

The Faculty realizes that it cannot fulfil its role as a knowledge institution without partners abroad and that international partnerships and alliances are increasingly important. Therefore, the third goal of the 2016–2020 Strategic Internationalization Agenda is to strengthen the relationships with the foreign partner universities by intensifying the joint activities and the relationship management [8]. To that end the international relations department will develop a portfolio for each partner institution with an analysis of the current collaboration, requirements and possibilities for the future and an activity plan. Furthermore, the international relations department will recruit some new partner universities to meet the growing need for student mobility. For that purpose the faculty prefers to approach institutions that are already working with the other HAN faculties or with the foreign partner institutions. Furthermore, the faculty wishes to develop strong long-term relationships with a limited number of partner universities based on the sharing of subject knowledge. International partner institutions can then make a bigger contribution than they are making at present to the internationalization of the course curricula. In order to focus the internationalization activities, the courses will select preferred partners from the existing network of foreign partner universities. Each course will select two to five preferred partner institutions abroad for intensive collaboration in student and lecturer mobility and the sharing of subject knowledge. Other possibilities include virtual mobility, joint modules and curriculum benchmarking. In the research field, they could include joint research, exchanges of data, joint publications and possible joint projects. Germany is expressly included in the selection of preferred partners. The faculty will participate actively in international networks specifically for business schools and specifically in the fields covered by the faculty. Its preference is to join networks in which partner universities also participate.

As a University of Applied Sciences, HAN has a strong professional mandate and therefore the Faculty is constantly looking for strategic alliances with business. Every academic year over two hundred business students undertake a full semester internship abroad. The Faculty does not only facilitate high-quality work placements and graduation assignments abroad, but also collaborates in international case studies, joint research and guest lectureships. In the Strategic Internationalization Agenda, the faculty aims to further invest in the network of international alumni [8].

The Faculty's four English-language bachelor's courses, jointly making up Arnhem Business School, provide education for 1,100 students, including 650 international students. In total, Arnhem Business School hosts 60 different nationalities. The faculty plans to pursue international accreditation to further raise their profile both nationally and internationally.

Arnhem Business School aims for growth in the number of students, ensuring a good mix of nationalities and therefore will invest in student recruitment. Furthermore it will develop transitional routes leading to master's courses at foreign partner institutions. Double degrees will be developed with a number of partner institutions.

Every year over 1,000 HAN students, go abroad for a semester of studies or an internship. However still the vast majority of students do not. HAN clearly realizes that they have to offer learning opportunities within the curriculum and on campus to prepare all students for a globalized professional life. Arnhem Business School is an international learning community that can serve as a catalyst for further internationalization of the

Faculty as a whole. The faculty aims for more structured commitment to the sharing of knowledge and best practices with the Dutch-language courses.

4 Conclusions and Further Research

Far from input and related to the mobility and curriculum, the internationalization of higher education has included in its discourse the internationalization of learning outcomes. The consequence of this emerging topic is that academic staff must lean over the learning outcomes in order to achieve the internationalization of the curriculum. For the internationalization of the higher education in European countries, the internationalization of the curriculum has a key role, according to the European Parliament Study [21]. Despite these favorable considerations, learning outcomes are topics related to processes like teaching and learning, instead of being discussed in relation to the curriculum development. More attention has been paid for learning outcomes achievement and assessment instead of defining those learning outcomes.

Universities must focus on processes like teaching and learning, but also on learning outcomes in order to reach their aims, even if the universities can choose different approaches in the internationalization process of their education. Educational transformation may be enabled by the formulation of learning outcomes and these outcomes must be operationalized in order to use a transformational approach [22].

HAN does recognize the intercultural opportunities in a domestic context and for example organizes various ways for international and local students to meet. However, it has shown that it is not always easy to motivate local students to take advantage of the opportunities offered.

HAN certainly is aware of the importance of internationalizing learning outcomes and structured and purposeful delivery of the international and intercultural dimensions of the curriculum and therefore HAN advises its' courses to use an approach where first the final learning outcomes and the learning outcomes (including intercultural and international perspective) must be defined before content is developed.

Since HAN is a Dutch university of applied sciences we hope to contribute with this article to the research with regard to the countries in which English is not the standard instructional language.

Having in mind that this article is a part of the extensive research project of the International Business Centre of Expertise at the HAN University of Applied Sciences and traces the recent institutional developments within the context of its strategic planning and internationalization policies, final conclusions and interpretations will be drawn at the end of the research project.

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Methods of Ergonomics and Social Technologies Application in Small Business

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Abstract. At present time, the special importance has the technological aspects of small business management in regions that differ by such criteria as level of socio-cultural development; the correlation between state, private and mixed elements of the economy; traditional and innovative activities; geographic, climatic and nationally original characteristics. The social component is also of great importance for the regional small business system, as it provides mobility of labor resources, the emergence of new subjects of innovative activity, support for the level of informal interactions in the region, and the rapid exchange of resources and information. Especially it becomes actual in connection with the implementation of the Digital (Electronic) Economy Development Program in the Russian Federation until 2035. The purpose of the research is to develop scientifically founded mechanisms for the small business management aimed at improving of the labor resources management and regional socio-economic tension reducing.

Keywords: Ergonomics · Labor resources · Region · Small business
Innovation · Socio-economic development

1 Introduction

The regional issues of employment are of great importance for the modern economy both of the Russian Federation and other countries because of the necessity to preserve and rationally use the available regional labor, resource and investment potential.

It should be mentioned that it is impossible to provide an economic growth both in a particular region and in the economy of the whole country without attracting people to active labor activity [1]. An analysis of the current regulating system of the regional socio-economic development has identified an asymmetry leading not only to a balance disruption of relations between business entities but also to a mismatch of their interests. As authors suggest one of the most effective ways of increasing employment is taking measures on small business development.

Despite a large number of studies on various issues of the business functioning, many aspects concerning the development prospects and effective management methods have not been fully studied. Problems related to the justification of the state

support, the formation of institutional conditions at the regional level and the use of effective management methods still remain controversial.

The regional component of the small business functioning has an obvious social aspect as it provides mobility of labor resources, the emergence of new subjects of innovation, support for the level of informal interactions in the region and the rapid exchange of resources and information. The authors have conducted a study proving the effectiveness of social technologies use aimed at increasing employment in the small businesses management.

Social technologies as a special form of management and a kind of social engineering practice are an effective mechanism for integrating the social-managerial theory and practical management activity aimed at changing the social object condition, solving social problems of labor activity and revealing the creative potential of the entrepreneur. Such kind of problems determine the need to develop and implement practical decisions aimed at increasing employment, improving the small businesses management in the regions.

2 Data and Methods

According to the results of the above-mentioned study, the number of economically active population (aged 15–72 years) amounted 2 277 900 people in 2017. There is a decrease of 2,8% compared to the previous year. The level of participation in the labor force in the analyzed period has decreased by 1,7% and amounted to 66,5% (Table 1).

Table 1. Dynamics of the labor force at the age of 15–72 years.

Index	2016	2017
1. Labor force, thousand pers.	2188,1	2277,9
including		
employed	2061,4	2009,7
unemployed	126,7	118,2
2. Level of participation in the labor force, %	68,2	66,5
3. Employment level, %	64,2	62,8
4. Unemployment rate, %	5,8	5,6

The analysis shows that about 94,4% of the labor force was engaged in the economy. The level of employment decreased from 64,2% in 2016 to 62,8% in 2017. People who were actively looking for job (in accordance with the methodology of the International Labor Organization they are classified as unemployed) amounted 118 200 people or 5,6% of the labor force. In 2017 the number of people registered in the state employment services increased by 3,2% in comparison with the previous year and amounted to 102 600 people. The number of people recognized as unemployed in 2017 decreased by 1,9% amounting to 27 300 people (26,6% of the number of applicants). 28% of the unemployed are young people between 18 and 30 years old.

Entrepreneurship as a way of young people self-employment is becoming more and more actual as it gives opportunities for increasing the population income, development of local territories within its social and economic aspects. Young people have very substantial advantages in comparison with the other age groups of the employable population: young people have the longest period of the forthcoming working capacity; better indicators of physical health and endurance; comparatively high general educational level and migration mobility; ability to master new knowledge and skills in a short period of time.

On the other side, young people have a number of disadvantages reducing the competitiveness of young people: lack of sufficient qualification after graduation, idealistic requirements for working conditions and initial wages, lack of self-confidence. The employers, in their turn, do not want to incur financial and organizational costs in order to provide the professional training for young workers, as well as to grant them benefits according to the Labor Code of the Russian Federation or, if we concern the other countries, the legislative acts of the same significance [2, 3].

In order to work out measures of employment level increasing it has been conducted a survey of young people from the higher educational institutions of the Russian Federation, China and Jordan. The participants of the study are more than 15000 students. The survey results have clarified that in the 5-year period today's students intent to work

- in their own business – 29%,
- in the sphere of finance – 15%,
- in education – 10%,
- in state administration – 15%,
- in services – 9%,
- in science – 5%,
- in trade – 13%,
- in construction and industry – about 10%,
- in agriculture – only 4%.

The results also show that young people are interested in the development of their own entrepreneurship. Moreover, the majority of young people (53%) want to live and work in their own region.

It has been also proved that for realizing the labor potential of young people it is expedient to consider small entrepreneurship as an object of socio-managerial technologies, which has a number of specific socio-structural and institutional characteristics based on the complex of qualitative and quantitative parameters of its social state.

A human-oriented approach to management gives an opportunity to analyze the result of technological impact on small entrepreneurship in the context of changing its social potential from the standpoint of two approaches:

- the resource approach where the social potential is defined as the volume of accumulated social resources and their current condition;
- the approach according to which the social potential includes the prospective ability of the system's functioning under the prevailing conditions.

The resource approach suggests the diagnosis of the available condition - the emphasizing and analysis of the socio-structural parameters of small business as a public system's element.

Qualitative characteristics are considered as socially conditioned advantages of small business such as high independence of actions; mobility, the ability for quick and operative decision-making; economy connected with a small volume of products and services, a small number of employees; high susceptibility to innovations; narrow specialization and the ability to occupy specific niches; an adequate reaction to changes in the environment; the possibility of implementing creative ideas and personal abilities; higher turnover of capital; higher level of motivation to achieve success; significant potential of the population groups such as pensioners, students, housewives, disabled people, etc., which are not often employed in large-scale production.

It should be also noted risky features of the Russian small business: a priority orientation on domestic demand, low economic activity restricted by the scale of local markets; great dependence on the current conjuncture of the market and business conditions; a low level of innovation activity due to high risks associated with the implementation and production of innovations; tax "criminalization"; instability; incompetence of managers and workers [4]; still existing elements of the precapitalistic economy.

The study of the qualitative characteristics of a small enterprise as a social group is related to the definition of specific characteristic features as a subject of social and economic activity originating from the essential characteristics of the smallest business, which are given in the table of SWOT analysis (Table 2).

Table 2. SWOT-analysis of a small enterprise as a subject of socio-economic activity.

Strengths	Weaknesses	Opportunities	Threats
Small start-up capital	Part of the regional market	The transition to the big business	A large share of liquidation after the first year of establishment
High efficiency	"Corridor" of Growth	Dynamic development	Growth opportunities
Flexibility	Strong influence of market dynamics	Domination in the regional market	Result replication
Independence	Low level of support or lack of support	Implementation of innovative potential	Fatal influence of external factors

The main subject of entrepreneurial activity is the entrepreneur himself whose hierarchy of life values is primarily determined by the special importance of personal interest in the company economic development, which forms the need for independence and success while the cash income itself is not an objective function. The role of social technologies in the management of small businesses is in the social motivation and orientation of the entrepreneur as a subject of activity.

The basis for the creation of an entrepreneur social portrait is the perception of entrepreneurship as a socio-professional group and the identification of its main typological characteristics. According to numerous studies conducted among small business owners, we can claim that the typical owner of a small enterprise in Russia, China and Jordan is a man between the ages of 25 and 34 (31%).

As concerns professional characteristics, it is expedient to emphasize the ability to make strategic decisions, to manage in effective way, to build a healthy atmosphere in the team. In addition, it is knowledge of the case specifics including aspects related to the technological production process, orientation on the innovations implementing.

Personal-psychological characteristics can be determined by the most universal set of features as innovative and initiative; perseverance; ability to take risks; stress resistance; aiming at the perfection within the focus on efficiency and quality; purposefulness; responsibility; the ability to obtain information, to plan and analyze results; the ability to convey your point of view, to convince; the ability to establish and use contacts; independence and confidence while decision-making [5].

At the regional level, the use of social technologies in the small businesses management makes it possible to achieve greater effect due to the close proximity of the management object and the governing body and mutual immersion in the local entrepreneurial environment. In this regard, it is advisable to develop in each region a "Strategy for Social and Economic Development" (hereinafter referred to as the Strategy) with the use of social and ergonomic technologies.

One of the Strategy's components is the development of the employment sphere, specifically, increasing labor productivity by means of the small business development, the implementation of advanced technologies and technic; districts industrialization; development of local industrial production; the modification of the education system in order to ensure the direct dependence of vocational training and the qualification level on the employment situation in the region; improving the management of the population migration mobility including its interstate aspects.

At the same time, it is important to understand that the implementation of increasing employment policy in the regions should be among the priorities of the activities of regional government bodies and local self-government, as the key role of these social groups in the development of the state and society is becoming more and more obvious [6].

Thereby the main directions of youth participation in the Strategy development are:

- (1) The role of social activity of youth is important. The specificity of strategic planning is always the result of social choice. It is very difficult to achieve that the result of planning will satisfy all social groups. Smoothing of these contradictions is possible with comprehensive implementation of sociological monitoring/
- (2) Youth public organizations are of very importance for the expansion of the youth role in the regional strategies development because such kind of organizations are able to propose solutions beyond traditional ideas. Such decisions can relate to new technologies of development, rules of economic behavior, procedures for coordination of different social groups interests.

- (3) The third important factor in increasing the role of youth in the formation of development strategies, in our view, is the development of a system for training specialists in the sphere of state and municipal management.

It is important that young people, in the overwhelming majority, as studies show, understand and are ready to ensure the global competitiveness of the small Motherland. It is important not only in words but also in practical matters to involve young people in the regional strategies development [7]. At the same time, considering that many territories lack qualified specialists, it is advisable to involve students of higher educational institutions living in these settlements.

3 Results

Studies show that along with world tendencies of the support infrastructure creation for the innovations, science-intensive technologies, education and protection of intellectual property, the most important and prior directions for the regional development in Russia, China and Jordan are the elaboration of effective mechanisms of regulating labor resources self-employment, particularly, the development of small business [8].

The problems of regional development still remain extraordinary: differentiation of territories by average volume of investments per resident, low level of activity municipalities in the field of extra budgetary funding of their development, the lack of sufficient powers of municipal authorities to dispose of investment potential components (land resources, etc.) and relevant organizational structures [9].

World practice demonstrate that high technologies, new means of communication are becoming more widespread in rural areas. In many countries, industrial production also moves to the village. In China, almost half export is being produced in rural areas. This makes it possible to avoid over-population in cities and to create more comfortable living conditions for people [10].

The agriculture in Jordan is closely related to a range of social and economic problems, especially in rural areas. First of all, it is necessary to overcome the natural problems connecting with water shortages, in particular, to implement technologies and innovations maximizing the efficiency of water use, such as drip irrigation, desalination and water treatment, construction of dams, water management systems, etc. Modern tendencies show a great potential for developing the desalination technologies market. Construction of desalination plants in arid regions is carried out practically on absolutely guaranteed “client base”: local farmers, businessmen and urban residents [11, 12].

As in the Russian Federation, the agricultural sectors of Jordan and China are of a high priority. There is an urgent need of overcoming previously mentioned obstacles, increasing investment level and creating new jobs in the sector. In order to support the unemployed people, the Government of Jordan has already established a special fund that provides financial loans only for the unemployed, up to 125 000 JD (equivalent to 125 000 euros) for small business development with a 5% annual interest rate for 8 years and a deferment of the first payment for 1 year [13].

The solution of the employment problems is related to the field of institutional transformations as Russian, Chinese and Jordanian youth avoid working and living in rural areas. Young people prefer to stay unemployed for several years so as not to live away from their families and not to work under unprestigious conditions.

More than 30% of the unemployed are young people of the regions being studied. That is why it is expedient to use the methods of ergonomics and social technologies for revealing and activating the entrepreneurial potential of this category of people.

It is expedient to emphasize the following social functions of small business: small business is a source of middle class formation, provides self-employment and, consequently, unemployment level decrease; reduce social tension in society, which is achieved through the development of a competitive social environment, the principles of social justice characterized by equal access to resources and rights; also small business provides opportunities for self-realization of the “creative class” representatives.

In the conditions of decentralization of the small business management, there is a need for scientific support and rationalization of the regulating forms and methods, control mechanisms, coordination and development used in regional management.

The ergonomics of small business management shows the effective-ness of modern social technologies using, particularly: social technologies of supervision; formation of entrepreneurial culture and traditions; social monitoring and social diagnosis of small business and its institutional environment; social design of small business; technology training and social adaptation of entrepreneurs and workers; information and communication social technologies; technology of social development forecasting; social control of activities and development; formation of an effective business environment; social technology of popularization and formation of a small business representative attractive image.

The study of the ergonomics of youth entrepreneurship makes it possible to identify special features that determine its priority regional orientation: rapid response to changes in the local market conjuncture, high adaptability and mass coverage of economic activity various spheres; close contact with the consumer allowing to take into account the preferences of the population and changes in regional demand; narrow specialization in a certain market segment allowing to use the resources of the region; a small start-up capital that provides the opportunity to collect needed amount with considering the living standard in the region.

4 Conclusion

In modern conditions, small business is a life-supporting system on which social and economic regional stability depends. Inclusion of youth entrepreneurship in the number of state priorities can contribute to eliminating barriers to the newly created enterprises and creating comfortable conditions for the development of entrepreneurial initiative among graduates of educational institutions. The implementation of the principles of ergonomics and social technologies in the small business management at the regional level should be focused on:

- arrangement of actions on popularization of small business idea among youth with participation of mass-media;
- organization of training and retraining programs for teachers and consultants for educational, consulting and other activities in the field of business development;
- grants for organizing their own business in the regional environment for youth;
- stimulation of the creation of associations, clubs, Internet-communities of young entrepreneurs, youth project teams;
- organization of exhibitions of youth projects, selection and subsidizing the most talented young entrepreneurs;
- the implementation of other activities aimed at supporting the subjects of youth entrepreneurship.

At present time, one of the directions of the revival of Russia is providing the sustainability of small and medium-sized enterprises development. The level of their development affects not only the national economy stability but also the life quality of the population. The development of territories in the current crisis-market space is accompanied by the intensification of the negative factors influence hampering the stable functioning and development of business activity in the conditions of the dynamism and uncertainty of the business environment.

Subsequently, this tendency leads to an increase of raw materials and product import substitution and influences in a negative way on the domestic commodity producer. However, many organizational and economic problems both at the macro and micro levels restrain the development of business entities.

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Valorizing the Human Capital Within Organizations: A Competency Based Approach

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Abstract. Changes in the business environment and in the nature of work itself require the implementation of integrated and flexible methodologies in competencies' definition in order to valorize the human capital and achieve organizational targets in a future-oriented perspective. However, extant research suggests that the available approaches to competency definition are more focused on describing past behaviors than on anticipating future requirements. Therefore, this study endeavors to provide a competency-based model that supports the top management in the identification of the competencies employees should possess, highlighting crucial competencies that can translate the strategy and vision of the organization into behaviors, skills, and terms that people can easily understand and implement. The results of our explorative case study led us to identify a set of competencies (digital/analytical/technical/adaptive/combinative/proactive), classified following the Knowledge Skills Attitudes (KSA) model, that collectively lead to a successful definition of future-oriented competencies.

Keywords: Competencies · Competency-based methodology
Strategic change · Human capital · Competency definition · (KSA) model
Participative approach

1 Introduction

Organizations operating in changing business environment face a double challenge: the adaptation and implementation of the new business strategy in the most effective and quick way possible, on one side, and the need to sustain competitive advantage on the long run, on the other side [9]. These two challenges do not involve only business and financial aspects but also the process and people within the organization [9]. Therefore, the identification of core competencies becomes a strategic leverage to face both challenges, and it has a crucial role in translating the strategy and vision of the organization into knowledge, skills, and attitudes (KSAs), terms that can be easily understood and implemented [22, 30]. Furthermore, the growth of competition and technological innovation entails a substantial transformation of the business environment and of the nature of work, shifting from a static perspective to a more flexible and dynamic way of operating [4]. As a consequence, work tasks and skills are subject to

constant change and adaptation [11]. In this situation, the definition of core competencies becomes important to link individual knowledge, skills, and attitudes (KSAs) to the organizational strategy and goals. Therefore, the implementation of competency models supports organizations in identifying patterns of core competencies to better perform a specific job, organization, or sector [25]. However, the changes in business needs and in the nature of work have made the implementation of competency models more complicated than before [1]. In the literature there are several examples of competency models' implementation, nevertheless, most of them are mainly oriented on describing past behaviors rather than pointing out competencies needed in the future [1]. Although this approach is worthy in some specific situation, in a context characterized by change it brings the risk of immobility, providing a set of competency requirements that do not match the strategic orientation and goals of the organization.

Therefore, the aim of this research is to provide insights for the definition and implementation of a competency-based model, highlighting crucial competencies that can translate the strategy and goals into KSAs needed to work in a more effective way in the organization.

2 The Concept of Competency

In the literature, there are several definitions of competency and competence at different levels: individual, group and organization [10, 19, 25]. Indeed, in most of the cases, the definition given depends on the context and the perspective advocated [7]. For some scholars, competency refers mostly to individual characteristics, behaviors and actions (e.g. [17, 28]) while for others it includes team, process, and organizational capabilities (e.g. [1]) [19]. Furthermore, in many studies (e.g. [6, 28]) competencies are defined as the sum of motives, traits, self-concepts, knowledge, skills, and behaviors identified through the comparison between average and superior performance or effective and ineffective performance in an organizational context [19]. However, applying this definition appears as a limitation to the broader understanding of competencies in a context where business is changing fast [24], as in modern organizations. Indeed, focusing on behaviors that have already occurred, provide information about the present or the past [10] with the risk that the identified competencies do not match the future needs of the organization.

Furthermore, previous research shows how competencies are defined from different perspectives [2]. Most of the studies define competency from the individual perspective, considering the individual job as the principal unit of analysis (e.g. [13, 15, 28]). Nevertheless, changes in the business environment and in the organization of work (project orientation, teamwork...) imply a change of perspective, including the team and organizational level in the definition of competencies [1, 14].

Organizational competencies or organizational core competencies are defined in the literature as the product of individual KSAs shared across employees within an organization [4]. Following this definition, individual KSAs, aggregated to the level of the organization, constitute a potential to sustain competitiveness and competitive advantage [30]. Therefore, in contexts characterized by change, it becomes important

for organizations to define the core competencies required to support the strategy and the target of the firm and align them with the individual KSAs in the organization [1].

Hence, competency models help organizations in identifying organization-specific competencies and in the alignment of individual competencies with organizational competencies and strategic targets [21]. In the following paragraph, we describe what are the characteristics that competency models should have to facilitate the translation of the organizational strategy into individual KSAs and how they should be implemented to identify KSAs needed to work effectively in changing organizations.

3 Competency Based Models

Competency models can be defined as tools for the identification of KSAs needed to perform in a specific role; their implementation helps the business to meet the strategic objectives [15]. Nevertheless, Kaplan and Norton [12] point out as the translation of the business strategy into individual KSAs represents a challenge for organizations. This occurs because in most of the cases competencies are defined in a prescriptive way, merely as job descriptions rather than as predictors of future needs [27]. This approach to competencies definition limits the dynamic adaptation of the organization to the business strategy, especially in an environment characterized by change [30]. Indeed, new challenges, changes in products or services, changes in customer preferences have an impact on competency models making them quickly obsolete [21]. Moreover, competency models should be designed to support the strategic orientation of the company, where organizational core competencies represent the foundation of the strategy formulation process [5]. In light of these considerations, competency models should be developed to be interactive and adaptable to the organizational change and strategy [30]. In this situation, organizational learning becomes the key element for the company to ensure the dynamism of the process [5]. Analyzing competency models in light of organizational learning implies a shift of focus from the individual level to organizational level, including in the competency definition not only individual KSAs but also process competencies that combined with individual KSAs will bring positive organizational advantage [1, accelerating also individual, team, and organizational change 29].

In this study we propose a competency model based on the identification of strategic targets the company is going to achieve, challenging the single-job approach that implies identifying KSAs to better perform in a specific task [16]. Indeed, we consider the organization as a whole and we attempt to define some strategic competencies that will influence the achievement of organizational targets in the future. The core element of our analysis is considering together organizational strategic objectives and employees' characteristics in terms of KSAs deploying them through the support of some key actors within the organization. Indeed, despite is not possible to forecast with certainty future needs, executives and top managers can give some specific insights about new developments, business changes and needs [18]. Involving them in the competencies definition is crucial for the reliability of the results [3]. Another crucial element coming from the literature is the definition of the temporal horizon for the competencies identification. The perspective we adopted is a time frame of 5–10 Years

[8]. Our analysis consists of a bottom-up approach [19], we started from the definition of business targets to the identification of organizational core competencies, concluding with the identification of individual KSAs categorized in generic competencies, job-specific competencies, and managerial competencies.

4 Method

Data have been collected in one case company with the aim of identifying competencies that will be needed in the future to work in an effective way in the organization.

The methodology implemented consists of a qualitative analysis. Data have been collected through interviews. The duration of each interview was 30 min on average. 34 people have been interviewed in 4 different departments and all of them are covering high managerial positions (Directors, Presidents, General Managers).

Data have been elaborated and analyzed following the criteria proposed by Smith [26]. The first step has been developing broad descriptions out of the data collected through interviews. The second step was identifying the main focus areas that have been categorized into four groups and that in our case correspond to the business targets and strategic orientation of the company in the next 5–10 Years. The following step was identifying common patterns and connections within the thematic areas. Specifically, we identified within the four main groups the related organizational core competencies from which we deployed the individual KSAs. The last step has been corroborating evidence clustering individual KSAs in generic competencies, technical competencies, and managerial competencies. The results have been discussed with experts within the organization in different sessions to counterproof their robustness and improve their reliability.

5 Results

The results obtained through the analysis consist of a detailed picture of the future orientation of the organization, starting from the business targets to the individual KSAs needed to achieve those targets. Figure 1 describes the process of implementation of the competency model and the main elements emerged from the competency model implementation. Specifically, the four strategic targets identified are:

- Digitalization: what came out from the interviews is that the digitalization process is not only about technology (a basic understanding of technology will still be needed) but is more related to find new agile ways to adapt technology to the business needs, in order to create new business models and to make operations more efficient. From the technical standpoint, the digital transformation will affect the competencies in the engineering sector, indeed the challenge will be combining mechanical and electrical engineering with the digital transformation. Most of the respondents think that one of the priorities of the digitalization process is related to the development of a mindset that enables the digital transformation.

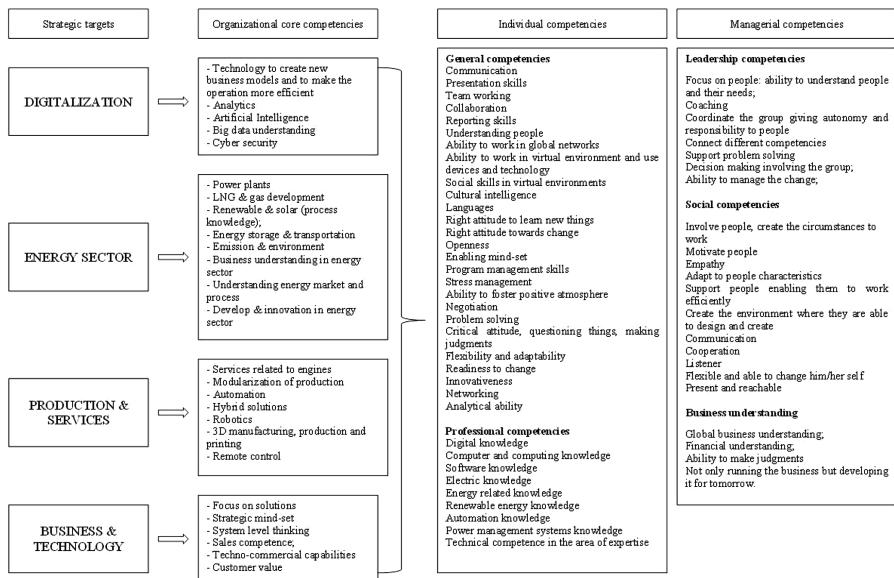


Fig. 1. Implementation of the competency model and main output

- Energy field: a key factor in the energy field in the next years will be the combination of different sorts of energy through big infrastructure projects (e.g. solar and power plants). The company will need to have a deep understanding of the energy process and market, and of the different players in the energy sector, in order to commercialize energy projects and develop the sector finding innovations. Furthermore, the focus will be on the energy storage and gas transportation as well as knowledge related to the environment and emissions.
- Production and services: in the future, there will be an increased need in terms of services related to the products as updating and upgrading products during their life cycle. To enable this long-term support the company will need to have a good product and system understanding. Another crucial aspect is the modularization of the products. In the future, there will be needed competencies related to modularization in order to create products in line with the customer needs, giving a broader choice to the client and increasing the efficiency of the production.
- Business and technology: there will be the need of developing both business understanding and technical capabilities. Indeed, to increase operational efficiency, the company will need to combine business and engineering competencies, developing business mindset in technical people - in order to use and adapt technology to create new business - and providing technical knowledge to business and salespeople, in order to better understand the products and solutions of the company. Moreover, a strategic mindset is required in all business functions, in particular in terms of understanding how to enter new businesses, and ability to make market analysis.

On the basis of these four strategic elements deployed in organizational core competencies we identified the main characteristics that the “employee and the manager of tomorrow” should have to work in the company.

In the next years, there will be required professionals with different characteristics. On one hand, there will be the need of technical professionals in the area of expertise, possessing according to their job: digital knowledge, computer and computing knowledge, electric and electronic knowledge, automation knowledge, or energy-related knowledge. On the other hand, there will be the need of more adaptable and communicational people, able to create new business occasions, bring innovation into the organization.

What emerged from the analysis of the interviews is that general competencies are considered crucial within the organization. Communication among people and team members is considered a key element to maintain a good working climate, some people are better communicators by nature, but all people should learn how to communicate in an efficient way. Furthermore, employees need to be prepared to work in a global network as well as in a virtual environment. Therefore, they need to develop good social skills and social skills in a virtual environment that imply different ways of managing the communication as well as the awareness and understanding of the multicultural context in which the communication takes place.

The work dimension nowadays is the team, therefore the “employee of tomorrow” needs to be a good team player: discussing openly, sharing, information and proposing solutions, developing good and effective reporting skills. The good team player is the one able to work independently, sharing information with the team when needed, and willing to develop him/her self and the colleagues. Furthermore, for the first time in history there will be four different generations simultaneously in the work environment, with their characteristics, background and way of operating. Therefore the “employee of tomorrow” needs to be able to adapt and understand other people characteristics and needs.

Moreover, employees will need to be able to manage their own work, meeting deadlines, prioritizing things while respecting a good quality level. They will need to be meticulous in searching for the right information and ready to exchange information within the company among different departments. The ability to sell their own added value within the team and in the organization is well regarded, as well as the ability to work as part of a system with analytic mindset and understanding the whole logic. Innovativeness is one of the main requirements of the company, together with the ability of analyzing situations optimistically but with a critical eye, conducting analysis at different levels.

Regarding the “manager of tomorrow”, we classified the characteristics he/she should have in three main areas. The first area has been defined *leadership skills*. Indeed, the “manager of tomorrow” will not only be an expert in his/her field but he/she will have the ability to coach and lead the team, promoting a good working climate, focusing on people’s needs, helping them to grow. He/she will coordinate the group giving autonomy and responsibility to people, not controlling them. Moreover the “manager of tomorrow” will be able to connect different competencies, seeing the entire picture and combining factors. He/she should be able to support problem solving and involve the team members in decision-making.

The second area of competencies we identified regards *social skills*. The “manager of tomorrow” will be able to involve people, creating the right circumstances to work and motivating them. Being emphatic and considering people as individuals, adapting his/her style to the people characteristics, will be crucial to enable the employees to work in a good environment and to achieve results. Therefore, the manager should also have good communication skills, adopting new ways of communicating and sharing information, and the ability to listen to people and understand their needs.

Finally, the third area identified is defined as *business competencies*. Indeed, the “manager of tomorrow” must have a strong global business understanding and financial understanding, and the ability of combining factors and making judgments. Not only coordinating the business in the present but developing it for the future.

6 Conclusion

The change in business needs implies a change of perspective also in the approach to the human factor within organizations. Managers and executives have to consider that the new characteristics of business require the re-alignment of organizational and individual competencies [30]. Employees need to be not exclusively highly skilled but adaptable and ready to change, able to learn quickly and communicate effectively [20]. In this scenario, the implementation of competency models facilitates the identification of a set of competencies on the basis of the business strategy. Therefore, in this chapter we pointed out how through the implementation of a competency model tailored on the case organization, it is possible to identify the main characteristics the “employee of tomorrow” and on the “manager of tomorrow” should have on the basis of the future strategic orientation and targets of the company. Moreover, the results obtained through this research can be read through the concept of learning organization. Indeed, an organization able to adapt to new requirements, improving its ability to develop new competencies and support individuals and teams in achieving results is considered a learning organization [23].

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Sales Competition as Education Method – The Case of the European Sales Engineering Team Competition

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Abstract. Sales competitions are an interesting education method to train negotiation and sales skills of students. Different European sales competitions exist on European and national level, where the competitor must sell a standard product to a buyer in a given lapse of time. These competitions do not well correspond to the sales process for technically complex products or services sales engineers are used to. Therefore, the Academic Association of Sales Engineering AASE developed the European Sales Engineering Team Competition ESETC, where international teams of students compete in a 4-step approach including two written and two oral stages. This article presents the genesis of ESETC and compares this innovative team competition with existing European sales competitions.

Keywords: Sales engineer · Curricula · Education · Sales competition ASE

1 Introduction

Sales engineers (SE) sell technical products and services to companies, and their results are crucial for their employers. SE try to establish a long-lasting relation with their professional client by commanding the best solution responding to the customer's needs, and by looking for an financial offer with optimized benefits for both sides. Therefore, SE need technical knowledge and commercial competencies, but also management and soft skills. As business is done globally today, good language skills and the ability to work in multi-cultural international teams is also requested.

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Sales competitions are an established education method used by many Higher Education Institutions (HEI) to train negotiation and sales skills to students. Existing sales competitions, such as the European Sales Competition (ESC), the francophone Le Challenge de la Négociation commerciale or the Finnish national Sales Competition Best Seller, are confronting the student with a buyer by following a given case describing the product or service as well as frame conditions. The aim is to sell this product or service to the buyer and to close the deal in a 10 to 20-min time slot.

The sales process of a technical product or service is much more complex than the cases used in the existing sales competitions. The process includes consulting and the suggestion of a technically and economically feasible solution, the writing of a sometimes complex technical and financial offer by a team as well as one or several negotiation rounds. The existing sales competitions do not at all reflect this complexity. Therefore, the Academic Association of Sales Engineering (AASE) imagined a new sales competition, where international teams of SE students from different HEI represented in the AASE compete in a four-step approach, which is in line with a typical technical sales process.

In this article, a short description of minimum requirements on knowledge, competences and skills required for SE based on AASE recommendations (Sect. 2) is followed by a presentation of the above-mentioned sales competitions in Sect. 3. Section 4 highlights some discrepancies of those with the requests to SE education, which led to the development of the European Sales Engineering Team Competition (ESETC).

The first edition of the ESETC was conducted in early 2017 with 26 students from three European HEI and is detailed in Sect. 5, including experiences gained and feedback from students. The article concludes in Sect. 6 with an outlook on the 2018 edition of ESETC, where more students from more European HEIs and by this more teams are expected to participate.

2 AASE Recommendations for SE Education

The studies of engineering sciences are inherently popular receiving a great interest from professors as well as students. However, developing new and innovative products represents one side of success that must be complemented by suitable promotion and sales actions. Throughout their professional career, engineers are oftentimes responsible for the latter though they are not sufficiently qualified to derive appropriate marketing or sales strategies. Therefore, selling technical products must be learned in the same way the technical foundations for engineering are taught. Consequently, being able to successfully merge these two fields results in higher profitability for the company [1].

SE sell technical products and services to companies. They consult the professional customer and suggest technically and economically feasible solutions with maximum utility for both the customer and their own company. They are best trained to understand the requirements of the industry [2]. They have sole responsibility for the technical, the financial as well as the administrative part of the negotiation and the offer. Therefore, SE need technical skills to understand the concrete needs of their customers and to suggest them the best solution, and sales and negotiation skills to get

the best result for both their customers and their own company to create or continue a long lasting professional relationship.

The Academic Association of Sales Engineering (AASE), created in 2014, is a grouping of about 40 European teachers and deans from 19 Higher Education Institutions graduating SE. AASE members are collaborating in the fields of SE education, research and promotion of the SE profession. In 2017, AASE defined minimum requirements for SE studies based on a system of four pillars [3], Fig. 1.

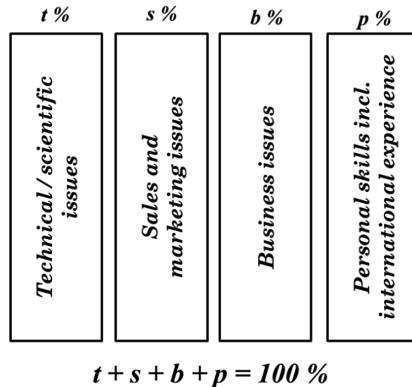


Fig. 1. AASE's pillars of a typical sales engineering education [3]

These minimum requirements are the result of an analysis of 14 Bachelor and 5 Master's Degree programmes from 2 Austrian, 1 Finnish, 1 French and 14 German HEI. Each lecture has been classified in one of the 4 pillars. Then, the share of each pillar has been calculated based on the attributed ECTS credits [4], the resulting minimum shares for Bachelor and Master's Degree programmes shown in Table 1 have been defined as minimum requirements for SE study programmes.

Table 1. Requested minimum shares by AASE per thematic axis for Sales Engineering Bachelor and Master's Degrees [5]

Thematic axis	Bachelor's Degree programmes	Master's Degree programmes
Science & Technology	29.0%	0.0%
Sales & Marketing	15.0%	25.6%
Business & Management	10.5%	20.8%
Personal skills	4.3%	1.1%

The minimum standard for Sales Engineering Bachelor's degrees requests a minimum share of 29.0% of technical and scientific lectures, so that a good technical comprehension of the product or service can be guaranteed. The technical education can focus on one technical domain, e.g. mechanical or electrical engineering, or being a more general technical basic education covering a large band of technical issues. The minimum standard for this pillar for Master's degree programmes is only accepted when the technical skills have been taught in the preceding Bachelor degree to admitted students.

The defined minimum criteria allow ensuring a high-quality SE education covering all identified skills and competences while leaving a high degree of liberty in the programme design to HEI. Effectively, each HEI can individually assign about 40% of lectures in Bachelor's Degree programmes and even more than 50% of lectures in Master Degree programmes to one or more of the four pillars and focus on e.g. one specific domain without deteriorating the general degree quality with regard to AASE requirements.

3 Existing Sales Competition as Learning Method in Europe

Sales competitions are a methodology to improve sales competences in real life imitating role-play situation. In sales competition, competitors have limited time to close the deal in an interactive situation with a buyer. The sales meeting and negotiation setting is predefined within a case generally provided by partner companies. Both, seller and buyer, have their own case description including rules, the objective of the negotiation and a story line. The product, service or solution that the competitor needs to sell is normally actual product or service and does not need customisation. In some cases, different alternative products enable the seller to adapt its argumentation to the buyer's specific requirements. Seller and buyer have had time to familiarize themselves with the case before, in some cases just one hour, in other cases weeks or months before the competition performance.

The origins of sales competitions lead to the USA, where sales competitions have existed quite a while and are performed in various formats and sizes. In Europe, sales competitions have gained popularity during past decade with the raise of the sales education, although French competition already started in 1989.

All aspects of the sales interaction, from small talk to the closing is evaluated by independent judges, who do the evaluation on a pre-set evaluation sheet. The numerical evaluation gives a possibility for comparison of the performances. In some competitions, the buyer gives also evaluation for the likelihood of making the deal.

Sales competitions are done in stages. Although judges have instructions and guidelines for the evaluations, still the latter is a personal interpretation of the sales situation. Therefore comparison of the evaluations from different judges is difficult. In most of the sales competitions, one room will make a unit, where comparisons can be made. Multiple of these units are done simultaneously to make one stage. Most often, at least two stages are performed in a competition, but more can exist. The number of units and stages vary from competition to competition, and some of these stages can be physical interactions or online.

Even if the time of negotiation is different, all described European sales competitions are such that one student is in front of one buyer. The negotiation objects are standard products/services without any option of customisation, the main negotiation options are the seller's skills and a potential discount.

3.1 Best Seller – National Sales Competition (Finland)

The Finnish national sales competition Best Seller [6] started in 2009 as Haaga-Helia University of Applied Science and Turku University of Applied Science created the national sales competition. The competition has two stages, where the competitors have to sell a product, service or solution following a given scenario. The first stage, the semi-finals, have four simultaneous rooms, where six competitors compete against each other. Based on the results of the semi-final stage, the best sellers advance to the final stage to figure out the Best Seller and the winner of the year.

Partner companies supply the sales products and scenarios. Each participant has 20 min per round; a jury of at least three members from industry or academia judges the performance following a standardised evaluation sheet. The 24 competitors come from different Finnish universities, and the competition's official language is Finnish. The national Finnish Sales Competition is organized every year either by Haaga-Helia or Turku University of Applied Science. In 2017, Sales Engineering student Alina Venermo from Turku University of Applied Science won the Best Seller competition.

3.2 Le Challenge de la Négociation Commerciale (France)

The French online sales competition «Le Challenge de la Négociation commerciale» [7] first took place in 1989 as an initiative of some teachers and students engaged in sales training who wanted to create an opportunity for students to test their negotiation skills in a close to reality situation. In 1999, the organisers created the association “Les Négociales” to pursue the challenge. Each participant starts the competition in one of the 40 qualification centres in France, Belgium, Switzerland or Morocco. All competitors run through two stages where they have to sell a (technically simple) product or service following a given scenario. In each stage, multiple groups of generally 10 competitors perform in parallel. Based on the results obtained in their two performances, the most performing sellers run a third stage to determine the finalist of each qualification centre. The best 10 to 15 candidates of each qualification centre get together in Epinal (Eastern France) to figure out the winner of the year. This final event lasts two days, with two cases for all competitors on the first day. The second day, the quarter-final takes place in the morning and the semi-final in the afternoon. The six best candidates from these semi-finals go into the final round held the evening of this same day.

Partner companies supply the scenarios. The product or service is based on a catalogue and a fixed price. In some cases, different alternative product/service solutions are proposed allowing selecting one depending on the customer's needs. The main negotiation option is a discount. The participants, sellers and buyers, have one hour to prepare their performance. Each competitor has 10 min per stage; a jury of at least three professional sellers or academic evaluate the different elements of the performance following a standardised evaluation sheet.

In 2017, more than 5,000 students participated in the qualification rounds, and 550 came together at the finals in Epinal.

3.3 European Sales Competition

Year 2012 network consisting of Turku University of Applied Science and Haaga-Helia University of Applied Science from Finland, Fachhochschule Wiener Neustadt from Austria, Nickel industry park from Poland and Vlerick Business School from Belgium got funding from European Union lifelong learning program to build a European sales competition.

First European Sales Competition was held in Brussels in June 2015, followed by one in Helsinki in June 2016 and in Edinburgh in June 2017. Every year, another university organises the competition, the 2018 ESC is held by Euridis in Paris at the end of May.

Traditionally ESC has had 24 competitors, which come from the registered European universities. Each attending university can nominate 2 competitors, which can be selected based on their previous competition performance or other means. Since the competition is getting more popular and more universities are willing to participate, the format might need to be adjusted.

The competition format is based on National Finnish sales competition and Turku Sales competition and therefore currently has similar two stages, a jury of at least three members, standardised evaluation sheet and cases and products supplied by partner companies. Each participant has 20 min per round for their sales meeting negotiations and each finalist has 1 h to prepare for the final performance.

In 2016, the European Sales Competition Association (ESCA) was formed to govern the competition and ensure a proper continuum of it.

4 Incoherencies with Real B2B Sales Situations

Even if the time of negotiation is different, all described European sales competitions are such that one student is in front of one buyer. The negotiation objects are standard products/services without any option of customisation, the main negotiation options are the seller's skills and a potential discount. These arrangements work for assessing the negotiation skills of the competing sellers and test their resistance to pressure.

Sales Engineers are confronted with more complex situation: They sell technical products or services needing consultancy or customisation, the whole process needs different stages to conclude one affair, and finally, building up a long-lasting relation with the customer is as important as concluding the sales. Sales representatives are in contact with different persons in a buying centre. These persons are fulfilling different roles with different interests. Each interlocutor fears the decision-making phase, as there can be an economic risk, e.g. to spend the money, the technical risk that the product does not work as expected, an individual risk that not all information has been correctly considered, or simply a social risk that the decision is not accepted by the supervisor or the colleagues. Therefore, each member of the buying centre is interested in minimizing the different risks, often leading to the purchase of products they already know and with which they are satisfied. This makes selling technically complex and innovative products and services even more challenging.

Winkelmann [9] describes a typical B2B sales process based on 10 steps from the identification of a customer via the offer, the negotiation until the conclusion of the contract, Fig. 2. Step 5, customisation, includes in technical B2B sales phase of consulting to identify or design the best solution for the client.

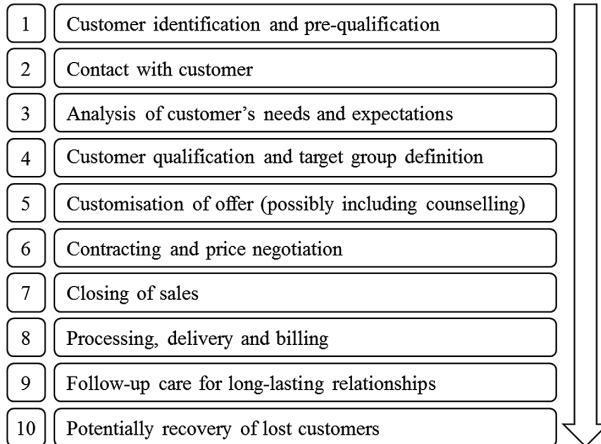


Fig. 2. Scheme of a B2B sales process (according to [9], own translation)

The different Sales Competitions in Europe mainly focus on point 3 ‘Analysis’ and on point 6 with a special focus on price negotiation, all concentrated in a 10 to 20 min time slot. As a standard catalogue product or service is used, individualisation happens by selecting one of several optional products or services when available.

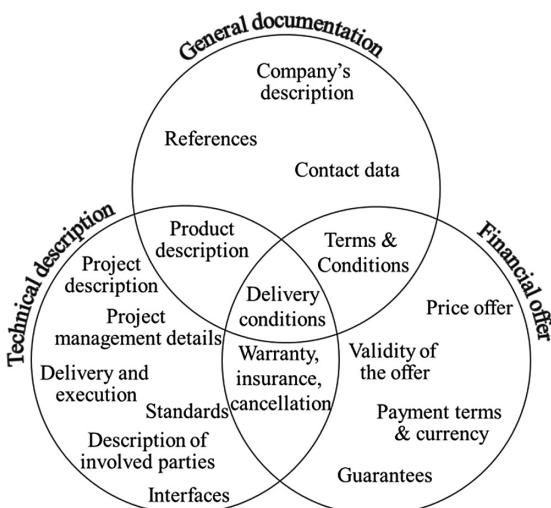


Fig. 3. Typical elements of a technical B2B tender (own figure)

Generally, a B2B tender is complex, based on a written proposal, and completed by one or several negotiation phases. Therefore, one oral negotiation of few minutes does not represent a close to reality situation for sales engineers. The tender mostly contains several documents that can be grouped into the general documentation, the technical description, and finally the financial offer, Fig. 3. This complex dossier is not sufficiently integrated into the existing competitions in Europe.

Creating such a tender is teamwork. Whereas the customer is mainly in contact with the sales engineer, there are many other people involved in the building of a bid: R&D, production, transport, software development, human resources, financial, legal, construction and other departments, partners or sub-contractors get involved depending on the project. Only in specific situations, representatives from other departments accompany the sales engineer to a meeting with the customer. The customer actually sees only the top of the iceberg of all people involved in the tender building. As the tender must be submitted at a given date, the sales engineer manages and coordinates all involved persons to ensure that the work is done in time and with the requested quality. Thus, the sales engineer takes the role of a project manager treating all aspects of a project: budget, planning, human resources, risks, deliverables.

Finally, the sales engineer looks for a long-lasting relationship with its customer, as he wants to continue doing new affairs with him in the future. His objective is hence not to obtain the maximum benefit out of this affair, but to build an offer that satisfies the customer as well as his own company, and therefore he tries to cooperate with his customer, as cooperation is seen as one key factor for successful relationships (e.g. [10, 11]).

5 The European Sales Engineering Team Competition (ESETC)

The before mentioned incoherencies lead to the consideration at AASE that a specific sales competition reflecting a complex B2B technical sales situation would well complete the existing sales competition landscape in Europe. Article authors developed the European Sales Engineering Team Competition ESETC, and piloted it for the first time in 2017. Totally 25 students from Turku University of Applied Science (Finland), Hochschule Karlsruhe (Germany) and ESTA Belfort (France) competed in 5 teams.

The ESETC has a different approach to the existing European sales competitions, as seen in Table 2, to model better technical sales process. In ESETC, the participating international teams search, model and compare market data, integrate their findings into a commercial and technical case and form a creative and flexible offer, which they need to deliver to the buying company by utilizing various sales methods and tools.

In ESETC, each student participates as a part of a team. Teams are created mixing up participants from different universities and countries, introducing various backgrounds and cultures in the cooperation. Students are participating on a voluntary basis; each participating higher education institution sends 5 to 10 competitors. Each team is composed of one Team Leader and 4 to 6 team members. Students are in their 2nd or 3rd year of studies.

The international teams have to go through four stages of negotiations as part of the competition:

- (1) an email bid,
- (2) a physical meeting,
- (3) an improved email bid,
- (4) an online negotiation.

Table 2. Comparison of selected European sales competitions and ESETC

	ESC	Best seller	Négociales	ESETC
Start date	2015	2009	1989	2017
Product	Standard	Standard	Standard	Customized
Negotiation	oral	oral	oral	written & oral
Competitors	solo	solo	solo	International teams
Number of competitors (2017)	24	24	5 000 (550 in finals)	26 (in 5 teams)
Origin of participants	Europe	Finland	France, Belgium, Switzerland, Morocco	Europe
Negotiation cycle(s)	20 min oral negotiation	20 min oral negotiation	10 min oral negotiation	2 written proposals + 2 * 20 min oral negotiations
Stages during qualification	1	1	2–3	0
Stages during finals	1	1	2–4	1
Duration	1 day	1 day	1 day (qualification) + 2 days (finals)	3–4 weeks

The products or services chosen for the ESETC need a customer specific customisation. In 2017, the teams had to sell a fleet of service cars from a given brand to a virtual Finnish company with offices in Finland, France and Germany and with several use cases. The competitors had to search for the best-adapted car models, consider logistics, taxes and other cultural and national differences to form the initial offer.

In the first stage, the teams received the customer's offer request and need to create a solution in the form of technical and financial offer. The case did not clearly state all customer's needs, guiding the teams to contact the customer via email to ask further questions and specifications. The teams could make their first offer without the customer contact and approach the first physical meeting without any more information. The offer request states a deadline for a meeting with the customer. This cycle measures the skills of “reading between the lines” and courtesy when the teams ask for a meeting time.

In the second stage, the team leaders had a 20 min physical appointment with an employee of the customer where the team leader presents the teams solution, confirms the customer's needs, identifies missing information and tries to close the sale. During the meeting, the customer representative requested changes to the bid and asked team leader to send him the improved bid within a very short lapse of time. In the 2017 edition, the met person was representing the purchasing manager and had no decision-making position. Therefore, the sale could not have been closed in this stage. This meeting values the interaction competences of the team leader, his capability to identify the customer's needs, adaptiveness to changes as well as capabilities to handle objections and restrictions. A member of the team leader's HEI is responsible to find suitable person for the buyer's role in this physical negotiation phase. The negotiation is filmed for evaluation purposes. The sales interaction recording is judged by pre-set evaluation sheet by the judges.

In the third stage, the teams improved their original bid to accustom the new information and requests they learned from the meeting. The teams must send their final product presentation with technical and commercial calculations by email to the customer before a given deadline. These presentations and calculations are evaluated for their accuracy by the judges.

In the last stage, the team leader met a representative of the customer via a 20 min online conference and tried to close the deal. The team leader, who is responsible for the negotiation phases, is measured for his/her interpersonal and negotiation skills, but also for the knowledge his offer and the product.

EETC duration is several weeks due to the length of these four cycles. The length of the competition provided time for the international teams to get together, to make product research, to communicate between themselves and to improve their bids – in the very same manner as in real life technical offers. Due to the several stages and long duration of the competition, it is needed to hold most of the competition online. This also enables the competitors to continue with their regular studies in their home universities. Only the physical meetings are held in the team leader's home universities.

All communications between the customer and the participating teams are saved: the emails, the videotaped meetings and the Skype negotiations. All these elements are the basis for the performance evaluation and for judging the winning team, once all four stages passed. All the teams will go through all the stages.

The feedback from the first EETC held in 2017 was very encouraging. Students reported that (1) they appreciated the international teamwork, (2) they learned to handle different cultural specificities, (4) they could utilise the skills and competences learnt during their studies, (5) they boosted their networks and met new friends and (6) they had fun.

6 Outlook for 2018

After the encouraging return from the 2017 participants, the AASE decided to institutionalise the competition and to open it to further higher education institutions represented in the Academic Association of Sales Engineering. The 2018 edition takes place in April/Mai 2018 with estimated 40–50 students from at five different European higher education institutions, and with a new case.

The main negative experience from the 2017th edition was that evaluation of the filmed and the online negotiations was too time consuming for the three judges. The total evaluation effort for each judge was more than 200 min, as each one had to visualize and to evaluate 2 negotiation rounds of 20 min for each of the five teams. Therefore, maintaining this evaluation method was not possible with an increased number of competing teams in view. It has therefore been adapted: The local judge and the buyer directly evaluate the performance during the negotiation that is filmed and evaluated offline by only one additional judge from the competition jury. Concerning the written proposals and the final negotiations, they are evaluated by the competition jury members, three professional sales teachers from three different participating universities, who will attend directly the online competition. In addition, competition becomes rougher as not all competing teams will reach the second round:

7 Conclusion

Technical sales combine the commercial and technical worlds in the form of solution, offers and competences. Technical sales professionals, Sales Engineers, are at the same time problem solvers, change providers, consultants and solution providers. They often sell technical products or services in multiple phase sales situations by utilizing multiple sales methods and tool. During the technical sales process, Sales Engineers can interact with multiple levels of customer organization and can be in contact with multiple persons during the technical sales process. In addition to technical and sales competences, good language skills and ability to work in multi-cultural international teams is also requested.

Sales competitions are an established education method used by many Higher Education Institutions to train negotiation and sales skills to students. Most of the existing sales competitions are confronting the student with a buyer by following a given case describing the product or service within a prewritten case. As described in this article, the Authors developed European Sales Engineering Team Competition (ESETC), to find an sales education method to fit the need of technical sales competences development. In ESETC, the participating international teams search, model and compare market data, integrate their findings into a commercial and technical case and form a creative and flexible offer, which they need to deliver to the buying company by utilizing various sales methods and tools.

The competing teams participated in 4 stage competition during 3 to 4 weeks to learn the complexity to technical sales process, experience cultural specificities with international teamwork and to utilise the skills and competences learnt during their studies. After the successful launch in 2017, European Sales Engineering Team Competition will continue to grow as part of the Academic Association of Sales Engineering (AASE) activities.

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How Does Current Legislation Support the Emergence of Industrial Symbiosis in the EU?

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Abstract. The world is changing. The global growth of population increases the demand for resources, the prices of raw material are rising, and availability will be weaker. We cannot continue the way we are consuming today, because of the globe's limits. Consumers will require more sustainable products and services.

Circular economy can provide a key for the better future, not by limiting the consumption but keeping materials in use as long, as possible. The old linear production-consumption-waste model losses value. The goal of circular economy is to streamline material use in order to keep the value and materials in use better than earlier. This will give positive impact to energy efficiency, low carbon and costs.

One way to implement circular economy is industrial symbiosis, where two or more partners exchanges by-products in a way that benefits each other. Nevertheless, the emergence of industrial symbiosis needs political, financial and societal support.

Keywords: Circular economy · Industrial symbiosis · Legislation

1 Introduction

A circular economy model is opposite to the linear take-make-dispose economic model. The linear model based on resources that are easy to access. The aim of circular economy is utilizing materials and resources in the most efficient and valuable way. This means re-using materials and most importantly, designing products to be repairable, upgraded and reused. The idea is to minimize the use of virgin materials.

Value potential of circular economy is in by-products and in waste, as well as in product maintenance, re-use and re-creation. The primary goal is efficient circulation and preventing the waste. The secondary goal is to utilize by-products and waste as raw material or in energy production. It is estimated that circular economy provide for EU 1,8 trillion euro value potential.

One way to implement circular economy is industrial symbiosis. There are two or several actors in industrial symbiosis who are collaborating to utilize by-products or waste. Actors can save e.g. in waste cost or even make some money by selling their

waste. It is beneficial if these actors have a close connection to keep the supply cost small. Industrial symbiosis can secure companies from the uncertainty of raw material markets and to improve sustainable development. The successful business of circular economy will benefit society by wellbeing and employment and by new innovations and business opportunities.

There are certain challenges in creating industrial symbiosis: how to create sufficient material flow, how to supply cost-effectively, how to separate or extract materials? Industrial symbiosis faces different drivers and challenges e.g. legislation, taxation, land use planning, investments, financial support, data availability, digital services, innovations and new businesses. The essential question is what is a good soil for industrial symbiosis?

2 Research Questions

The research questions are:

1. What industrial symbiosis means in business and economy?
2. What kind of environment in business and in society should be to create industrial symbiosis?
3. What impact industrial symbiosis creates to business, economy and society?
4. How legislation can enable the implementation of industrial symbiosis?

The research method is to follow a project, that addressed with circular economy and industrial symbiosis as well as follow activities by European Commission. The project is called SYMBI (Symbiosis for Regional Sustainable Growth and a Resource Efficient Circular Economy), it supports the regional development policies of industrial symbiosis and circular economy. SYMBI consist of research and supporting activities in seven partner countries: Finland, Italy, Spain, Slovenia, Poland, Greece and Hungary. Project objective is to promote the use of secondary raw material and raise awareness of industrial symbiosis and circular economy.

3 What Industrial Symbiosis Means in Business and Economy?

Finns are forerunners in the context of circular economy and industrial symbiosis. They see the potential early and take actions since then. The Finnish Innovation Fund Sitra wants to make Finland a world leader in the circular economy by 2025. Sitra has been selected as the winner of the public-sector category of The CirculArs Awards in World Economic Forum in Davos. It is expected that circular economy provides for Finland 2–3 billion euro added value potential by 2030 and for Europe up to 1800 billion euro by 2030 [1]. In Finland, the growth of circular economy is expected to happen in a sustainable food system, forest-based loops, technical loops, transport and logistics.

Industrial symbiosis is a way to implement circular economy, but what it really means? Here we have three definitions:

- (1) Chertow's much referred and quite strict definition from 2000 and 2007.
- (2) Updated definition from Lombardi and Laybourn from 2012.
- (3) The Finnish Innovation Fund Sitra's definition from 2013.

Much cited definition of industrial symbiosis is a taxonomy for five different material exchange types [2]:

1. Organization give or sell recovered materials through dealers.
2. Exchange of material occurs inside organization, exchange considering the whole life cycle of products, processes, design and purchasing.
3. Exchange of material occurs among organizations that locating nearby, in the same area.
4. Exchange of material occurs among organizations that are not locating side by side, but are still close enough.
5. Virtually organized exchange of material among organizations across a broader region, this increases opportunities.

In [3] “3–2 heuristic” definition distinguish industrial symbiosis from other types of exchange. The criteria are that at least three different entities must be involved in exchanging at least two different resources and none of them primarily engaged in recycling business. Resource exchange relates to by-product reuse, infrastructure sharing and joint provision of services (e.g. transportation and marketing). Motivation for exchange is cost reduction, increased revenues, long-term resource security, the availability of critical resources and regulatory pressure. Lombardi and Laybourn [4] have updated Chertow's definition of industrial symbiosis. They say that industrial symbiosis engages organizations in a network to foster eco-innovation and long-term cultural change. Knowledge sharing in the network enable mutually profitable actions in exchange of resources and improving business and processes.

The last definition in this article comes from Finland [5]. It says that industrial symbiosis is co-operation between two or more companies utilizing materials, energy, water and by-products. Industrial symbiosis creates value for each partner. Industrial symbiosis connects cross-sectoral companies and changes value chains, that are linking together forming business ecosystems. Industrial symbiosis is a solution to handle company's by-products cost-effectively. There is not necessarily flow of money between companies, but the value may form by cost savings with waste or by purchased materials.

4 What Kind of Environment in Business and in Society Should Be to Create Industrial Symbiosis?

Circular economy drivers and barriers can be divided as hard or soft [6]. Hard one's relate to technical or economic issues and soft one's relate to institutional and regulatory factors or social and cultural factors. Technical capacity is vital, and ICT is a facilitator. Technological challenges are the key barrier; the availability of appropriate solutions, lack of skilled staff, technological innovations and funding. Policies, legislation, regulation, taxes, infrastructure, education and new technologies will have a key

to unlock the potential of circular economy. Society and customers are more and more aware of environmental issues that will affect consumer preferences: customers prefer services rather than products. This awareness can be raised quicker by promoting circular economy related choices and by co-creation with the customer.

European Commission published a report of regulatory barriers to circular economy [7] that summarizes six types of barrier, which relate to (1) lack of definitions, (2) unclear targets in legislation, (3) the definition of hard numerical limits in legislation, (4) the incomplete implementation of legislation, (5) different national implementations of a legislation and (6) legislation that conflict each other by represent conflicting values.

Industrial symbiosis can emerge by two ways: by planning industrial areas or by self-organizing. Planned areas are created by municipalities to support certain kind of industry in the area. Self-organized industrial symbiosis emerges when organizations decide to start exchanging. Land use planning is in an important role in the development of industrial symbiosis in Finland. Land use planning can promote economic community structure and favorable business conditions, the sustainable use of natural resources, availability of services and traffic infrastructure and services. Mattila [8] says that ‘monopoly’ of the municipalities in land use planning can also be a drawback, because there is a need for detailed plans considering wider areas across municipalities and regions.

Industrial symbiosis can form a new relationship between suppliers and buyers and it expands the existing partnership [9]. Industrial symbiosis creates a collaborative supply chain network, which may have collaborative challenges, meaning organizational challenges and operational challenges. Organizations needs help to find suitable partners, so it is important to have organized local meetings. There can be an asymmetric relationship between organizations, meaning that some company have more power than others and they can create a critical mass for the symbiosis and if this company exit from the market, it might ruin the whole symbiosis. Another risk is the evolution of the industrial symbiosis network because it can change collaborations nature. If symbiosis is based on technologies, it is possible that they might become obsolete in the future. When increasing the distance, the number of potential partner increases. More partners mean more by-product exchange and stability. However, an increase in distance means the increasing costs of exchange and environmental impact. Variation of by-product quality, seasonal variation and shortages may be problem for symbiosis. This may cause a need to storage and/or purchasing original raw material. Excess by-products might be handle as waste. Information about the waste streams shows the potential for by-product exchange. There is a need for a platform where companies can share information about their waste streams and seeking for partners. Sharing the information might be challenging because of uncertainties in production.

The SYMBI project has published a report of the comparative analysis study of regional and national policies on industrial symbiosis and circular economy in European countries [10]. It provides a policy overview and recommendations in project partner countries. They have divided European Union countries into three categories in terms of the state of development of industrial symbiosis: low, medium and high-level countries. Low-level countries are Italy, Greece, Hungary, Slovenia and Poland. Medium level country is Spain and high-level country is Finland. The only high-level country within

SYMBI partners, Finland, has conduct circular economy practices in many economy sectors, e.g. energy efficiency in the paper industry, bottle recycling and development of new products in the forestry. In Finland, industrial symbiosis is used for promoting co-operation between companies, supporting regional growth and creating jobs and industrial clusters. In Finland there is a need to develop an internationally competitive industries and efficient use of resources. The awareness of environmental issues raised by the high education level and it increase demand for new solutions. In Finland, land use planning supports the development of industrial symbiosis by giving opportunity to close proximities between companies. Still, there is much to do in the context of industrial symbiosis. Comparative study says that generally industrial symbiosis opportunities may remain unseen and co-operation between different industries is often too weak. There is lack of the demonstration activities and private finance. SYMBI's comparative analysis study summarized enabling and the constraining factors of industrial symbiosis and circular economy development in partner countries. They found that inhibitors relate to lack of time, capital, skills, knowledge of opportunities, demonstration activities, information and supportive platforms for interaction. More inhibitors found among regulation, taxes, weak cross-sectoral co-operation, cheap virgin raw materials, by-product quality and sufficiency. Project SYMBI suggest 5 key policy recommendations: (1) fostering of industrial symbiosis by the use of financial incentives, (2) raising awareness about the benefits of industrial symbiosis and circular economy, (3) specialized planning or improvements in waste management plans and recycling processes, (4) efficient information flows, (5) efficient networking among public sector, private businesses and other stakeholders.

5 What Impact Industrial Symbiosis Creates to Business, Economy and Society?

Circular economy expected to bring economic growth and jobs. For businesses, it means cost reduction, increasing profitability and new business opportunities. For society economic growth and jobs bring welfare and wealth.

In project SYMBI, partners collected data from 48 industrial symbiosis cases [11]. Research of these cases shows types of collaboration among companies in industrial symbiosis. The exchange is mostly happening in energy, by-products and raw materials (83% of the cases). Secondly, collaboration is the collective gathering and removal of waste (52%). There is some collaboration in joint commercial firm facilities (13%), joint use of utilizes and firm functions (13%), multimodal transport (8%), combining the transport of goods and people (4%). What were the needs and objectives in these cases? Companies want to improve resource efficiency (67% of the cases), promote the use of sustainable bioenergy resources (56%), reduce costs (52%), reduce CO₂ emissions (50%), increase profitability (43%), open new markets for secondary raw material (38%). The minor objectives were access to new markets (17%) and sharing risk (4%). What were the success factor of researched cases in the SYMBI project? The most important thing is active participation and commitment (75%), the close

proximity of companies (60%), the diversity of actors (50%), legal and political support (38%). Minor success factors were similar organization culture (29%), low economic risk (23%), the balance of power between partners (23%) and adequate funding (19%).

6 How Legislation Can Enable Implementation of Industrial Symbiosis?

European Commission published the EU Action Plan for the Circular Economy on December 2015 [12]. The objective is to boost the transition towards circular economy. The Action Plan includes objectives and actions for product design, production process, consumption, secondary raw materials and innovations and funding. The actions focused on specific material, which are plastics, food waste, critical raw materials, construction and demolition waste, biomass and bio-based products and fertilizers. A year after the Action Plan, European Commission published the implementation report [13]. Key deliveries reported was legislative proposal on the online sales of goods, legislative proposal on fertilizers, a launch of the innovation deals, eco-design, food waste, waste-to-energy, proposal for amending the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment, the platform to support the financing of circular economy. Other initiatives delivered relate to green public procurement, good practices in waste collection and water reuse.

European Commission published a strategy for plastic on 2018 [14]. Plastic is important material in economy and society. However, plastic can harm the environment, up to 13 million tons of plastic ends up in the oceans every year globally. In Europe, the number is 500 000 tons. The microplastic is a problem for human health in food, drinking water and air. In EU the amount of microplastic is estimated up to 300 000 tons. Plastic production reached 322 million tons globally in 2015 and it provided jobs for 1.5 million people in EU. Every year Europe generates over 25 million tons of plastic waste, which reuse and recycling are very low. Demand for recycled plastics accounts for 6% of plastic demand in Europe. European Plastic Strategy introduces vision for new plastics economy. The idea is that products containing plastics must be designed allow greater durability, reuse and high-quality recycling. All plastic packages in EU market must be reusable or cost-effectively-recyclable by 2030. Key actions are improving the quality of plastics recycling (e.g. design for recyclability, boosting demand for recycled plastics, better separate collection and sorting), curbing plastic waste and littering (e.g. preventing plastic waste in our environment, establishing a clear regulatory framework for plastics with biodegradable properties, the rising problem of microplastic), driving innovation and investment towards circular solutions.

7 Case from Finland: Bright Green Forssa Region

Finland is the forerunner in the context of circular economy and industrial symbiosis. Here we will introduce one Finnish industrial symbiosis model from Forssa region. This model has roots in early 1990's and has been among the first industrial symbiosis in Finland. This case was told by the regional developer on February 2018 [15].

In Finland, land use planning is a tool for municipality to create a fruitful ground for industrial ecosystems that supports circular economy actions. By building plans, municipality can enable (or disable) the development of industrial symbiosis by close connections and required infrastructure between companies. Municipality can attract new companies in the area by other companies, that can share resources and material flows.

Forssa is a small town in southern Finland, with about 20 000 inhabitants. Circular economy and industrial symbiosis emerged in Forssa by regional development activities with local companies in 1990's. Since that, many new innovations have been born and new companies in environmental related businesses. Recycling business involves a lot of logistics, and the location of Forssa nearby three big cities gave many opportunities for companies to develop their business and services. Municipality of Forssa planned the Envitech area for environmental related businesses. Forssa reserved large area for Envitech and gave opportunity for businesses to growth.

In early 90's, Forssa established landfill area by EU regulations and welcome private recycling companies in the area as well. This was far-sighted decision. In the beginning there was no completed building plan for the area, the land was parceled out for new companies and infrastructure was built little by little. During the first decade of 2000, building plan was completed.

Regional developers and companies established The Environment Club in 2006 and the next year they created a strategy for environmental business, exports and education. Forssa region created a business strategy on 2008 which name was Bright green Forssa region. The objective was to produce diverse ecological products and services in all sectors. They awarded local companies by Bright Green certificate of honor. On 2009 Forssa region developers and companies visited Kalundborg, Denmark. They learned that developing of industrial symbioses requires more communication than work itself and that communication is more important than technology by means of success. They underlined in Kalundborg, that if there are competitors at the same table, the output will be only initiatives, not development actions. Nevertheless, in Forssa, it was difficult to adapt the companies different course of actions and the fact that companies were competitors. Argues aroused, the activity fades out little by little and finally the club was closed down in 2011.

There were closed loops in the beginning of 2000 first decade in Envitech area. In 2014, there was Finland's biggest biogas plant. During 1990's there was one innovation per year and during 2000–2010, there were several innovations per year and startup businesses. Why did this happen in the small Forssa region? The success relates the fact that there were drivers such as public-private co-operation, growth seeking executives in the companies and the critical mass from southern Finland. Today, one of the companies has entered China's market and another to Vietnam.

8 Summary and Conclusion

Emerge of industrial symbiosis needs legislative support, financial incentives, knowledge and information flow, partners and by-products, land use planning and infrastructure. The success factors are active participation and commitment, close proximity,

the diversity of partners and political support. At companies' point of view, supportive action is needed for matchmaking.

There are already actions with the legislation at the level of EU, but it is just in the beginning. Objectives set by European Commission will lead actions towards eco-design, consumption, secondary raw material markets, innovation and funding. Actions focused on plastic, food waste, critical raw material, construction waste, biomass, bio-based products and fertilizers. Plastic has huge potential in circular economy because of low reuse and recycling. The vision is that products containing plastic will be designed for greater durability, reuse and effective recycling.

There will be many new opportunities with digitalization. Virtually organized collaboration and exchange can provide wide networks of companies and form new value networks. In the big picture, information about by-products shows opportunities and secures the sufficient flow of material. What if companies must report their by-products and waste at least at regional level? Then regional development actions can focus on build up industrial symbiosis among companies. This could benefit companies themselves but the society and environment as well.

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Role Ambiguity and Trust Repair of Flight Attendants: Emotional Labor of Human Service Employees

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Abstract. This study tests the hypotheses that flight attendants' emotional labor aspects moderate the decreasing propensity of organizational trust in the changing industrial climates where the role ambiguity is likely perceived by the employees. The questionnaire surveys were administered to a total of 827 flight attendants, 414 for a European and 413 for an Asian airline. A 5-point Likert-type scale was employed to assess the aspects of role ambiguity and emotional labor. The results indicate that, first, role ambiguity perceived by the human service employees decreases trust toward the employer. Second, emotional labor aspects moderate or repair the decreasing propensity of trust, when the level of role ambiguity perceived by the employees is low. In the competitive industrial environment, emotional labor aspects practiced by the human contact employees may help the employees harmoniously work with the automated machines and IT in the competitive and stressful workplace.

Keywords: Role conflict · Emotional labor · Affective delivery
Deep acting · Airline · Flight attendant

1 Introduction

Competition in the airline industry has intensified and become more popular than before, since the air travel has become cheaper. As a result, downsizing, cost reduction, layoffs, and early retirement programs have become the recent trends in the airline industry. Increased competition among service providers, along with the overall growth in the service economy, has forced many organizations to pay greater attention on the nature and quality of service provided to customers and clients (Schneider and Bowen 2010; Zeithaml et al. 1990). Organizations, under pressure to make rapid and constant changes, have had to alter employment relationships and the psychological contract that underlie them (Robinson 1996).

Moreover, the current aviation industry is a 24-h a day and 7-days a week operation that produces a variety of challenges for flight attendants, including extended duty periods, highly variable schedules, frequent time zone changes, and increased passenger load (Avers et al. 2009). Thus, flight attendants' workplace today is more complicated and stressful than before.

Furthermore, there have been rapid changes in the airline market. As information technology has advanced, IT and the automated machines have begun substituting the employees' works previously done by human contact employees. Under such an environment and strong pressure of competition, many companies have been obliged to alter their organizational structure and human resource relationships. The traditional contract of long-term job security in return for hard work and loyalty may no longer be valid (Sims 1994), the expected roles of cabin crew members are gradually changing (Okabe 2017), and organizations and employees are now reconsidering the mutual obligations in employment contracts.

Problem Statement

Downsizing and the introduction of early retirement program is a trend of the airline industry. In addition, the roles expected of modern flight attendants are gradually changing from what they were in past decades. Thus, the human service employees might perceive psychological contract violation (PCV), role ambiguity (RA), and role conflict (RC) in the workplace. These conditions affect job satisfaction of the employees as well as the nature and performance of the organization (Kahn et al. 1964).

The concept of emotional labor has resonated with sociologists of work and with researchers in the fields of management, psychology, communications, nursing and health, leisure and hospitality, and many others (Briner 2004). Understanding the consequences of emotional labor is important because both theory and empirical evidence suggest that emotional labor is integral to the daily work experience of many frontline service employees and is closely linked with indicators of employee well-being (Grandey 2000; Hochschild 1983), customer outcomes such as satisfaction and loyalty (Grandey et al. 2005; Hennig-Thurau et al. 2006), and, ultimately, organizational performance (Grandey 2000).

Moreover, the professionals in human service organizations are often required to spend considerable time in intense involvement with other people. Frequently, the interaction with customers is the core commitment and emotionally driven behavior of the employees. The service interaction may create the positive emotional display to the customers, in turn, job satisfaction for the employees themselves. At the same time, the human service behavior consumes human resources around the customers' including psychological, social, and physical problems. The employees engaging "peoples' work" under such circumstances may experience the chronic stress, emotional exhaustion and pose the risk of "burnout".

Finally, though IT system and the automated machines are performing work previously done by human contact employees, the importance of human service employees is unchangeable for many organizations, since they have an important role as an interface linking organizations and customers. The images of airlines, including hospitality offering and tacit knowledge in the form of human service employees (such as flight attendants) have been accumulated over their entire histories, and should be considered as intangible assets of the airlines. It would be regrettable if these were lost because of managerial changes, furthermore, even the most loyal customers may be moving away from companies (Okabe 2017). Consequently, I am concerned that the tasteless and dry service will wide spread.

Purpose of the Research

The purpose of the present research is, first, to investigate and test the hypothesis of the direct relationship between the antecedents (role ambiguity) and the consequences (trust toward the employer) in the human service organization. Second, the present research tests the hypotheses of the moderating effect of emotional labor aspects between role ambiguity and trust toward the employer, i.e., whether emotional labor aspects moderate the decreasing propensity of organizational trust in the changing industrial climates where the role ambiguity (RA) is likely perceived by the human service employees.

2 Literature Review

Human Service Employee. Though the airlines try to downsize and reduce costs, human service employees are indispensable for many organizations, particularly airlines, as they serve as a fundamental type of interface connecting the organization with customers. The importance of customer service employees' emotions, which is also referred to as "emotional labor" has long been part of organizational behavior since Hochschild published *The Managed Heart* in 1983. Hochschild (1983) observed the flight attendants' recruiting, training and work.

Emotional Labor. Emotional labor refers to the process by which workers are expected to manage their feelings in accordance with organizationally defined rules and guidelines (Wharton 2009). According to Hochschild (1983), organizations are increasingly willing to direct and control how employees present themselves to others. Management of emotions practiced by the flight attendants is emotional labor and is commercialized for the commercial purpose of airlines (Hochschild 1983). In other words, the images that employees create for customers and the quality of interactions between employees and customers have become increasingly under the control of management (Morris and Feldman 1996). Consequently, a key component of the work performed by many workers has become the presenting of emotions that are specified and desired by their organizations (Morris and Feldman 1996).

Emotional Display Rules. Emotional display for organizational purposes has been referred to as display rules (Ekman and Friesen 1975). Stimulated by Ekman and Friesen's (1975) notion of social-cultural emotional norms and Hochschild's (1983) ideas of emotional labor, organizational researchers adopted the term display rules to describe the expressive expectations placed on employees as part of the occupational or organizational context (Ashforth and Humphrey 1993; Diefendorff et al. 2011; Rafaeli and Sutton 1987; Van Maanen and Kunda 1989). According to the emotional labor literature, display rules shape employee emotional displays in ways that facilitate the attainment of organizational objectives (Diefendorff et al. 2011). Thus, the employee expresses the positive and appropriate reactions, and suppress negative emotions to customers in the service interactions. In other words, display rules are standards of behavior that indicate not only the emotions that are appropriate in a given situation,

but also how those emotions should be conveyed or publicly expressed (Ekman 1973), and known as integrative display rules (Wharton and Erickson 1993).

Emotional Labor. Emotional labor represents an occupational category, the emotion effort or labor to perform that job, and interpersonal expression (Grandy and Gabriel 2015).

Affective Delivery. Affective delivery refers to an employee's "act of expressing socially desired emotions during service transactions" (Ashforth and Humphrey 1993). Human service employees such as flight attendant are required to show positive emotion, such as friendliness and warmth. Past empirical evidence has indicated that employee affective delivery can influence customer reactions (Tsai and Huang 2002).

Surface Acting. Surface acting is an emotional strategy in which employees modify their facial expressions and behavioral displays without changing their inner feelings (Grandey 2003). Surface acting requires effortful suppression of genuine emotion and expression of the appropriate emotion (Johnson and Spector 2007); thus, engaging in surface acting may entail experiencing emotional dissonance (e.g., Hochchild 1983).

Deep Acting. Deep acting is another emotional strategy in which one tries to really create feelings that must be expressed (Grandy et al. 2015) because it shows that the employee has goodwill toward the organization (Rafaeli et al. 1987). The intent, then, is to seem authentic to the audience.

For most types of service organizations, a market orientation is implemented largely through individual workers (Brown et al. 2002). The benefits include a higher level of customer satisfaction (Brown and Sulzer-Azaroff 1994), better service quality evaluation (Pugh 2001), and improvement in customer willingness to return and recommend (Tsai 2001).

3 Research Hypotheses

Role Theory. Role theory states that when the behaviors expected of an individual and an organization are inconsistent, the employees will experience stress, may lose trust toward the employer, become dissatisfied, and perform less effectively than if the expectations imposed on the employees did not conflict (e.g., Kahn et al. 1964; Rizzo et al. 1970). Since organizations are role-systems (Katz and Kahn 1978) that depend on the interaction of system members, role ambiguity could be expected to have negative consequences on organizational outcomes (Tubre and Collins 2000). I suppose the human service employee may perceive role ambiguity because of the changing industrial climate, therefore, I propose the following direct effect hypotheses:

Hypothesis 1: Role ambiguity (RA) perceived by human service employee is negatively relates to trust toward the employer

Moderating Effects. A moderator variable specifies when and under what conditions a predictor variable influences a dependent variable (Baron and Kenny 1986). A moderator variable may reduce or enhance the direction of the relationship between a predictor

variable and a dependent variable, or it may even change the direction of the relationship between the two variables from positive to negative or vice versa (Lindley and Walker 1993). I propose the following moderating effect hypotheses:

- Hypothesis 2: Affective delivery of human service employees moderates the negative relationship between role ambiguity and trust toward the employer
- Hypothesis 3: Surface acting of human service employees moderates the negative relationship between role ambiguity and trust toward the employer.
- Hypothesis 4: Deep acting of human service employees moderates the negative relationship between role ambiguity and trust toward the employer

4 Methods

Participants and Procedures. The questionnaire surveys were administered to a total of 827 flight attendants, 414 for a European and 413 for an Asian airline. A 5-point Likert-type scale was employed to assess the emotional labor aspects and other variables.

Measures

Role Ambiguity (RA). Role ambiguity was measured by using five items ($\alpha = 0.82$) derived from the scale developed by Rizzo et al. (1970).

Role Conflict (RC). Role conflict was also measured by using five items ($\alpha = 0.87$) derived from the scale developed by Rizzo et al. (1970).

Affective Delivery (an emotional labor aspect). Affective delivery was measured by using three items ($\alpha = 0.82$) derived from the bases of McLellan et al. (1998) and those items were slightly modified to adapt to the work characteristics of flight attendants.

Surface Acting (an emotional labor aspect). Surface acting was measured by using four items ($\alpha = 0.86$) derived from the bases of surface acting identified by Brotheridge and Lee (2003) and those items were slightly modified to adapt to the work characteristics of flight attendants.

Deep Acting (an emotional labor aspect). Deep acting was measured by using three items ($\alpha = 0.87$) derived from the bases of deep acting also identified by Brotheridge and Lee (2003) and those items were slightly modified to adapt to the work characteristics of flight attendants.

Trust Toward the Employer. Trust toward the employer was measured by using two items ($\alpha = 0.90$). One item derived from Williams and Anderson (1991), and another item derived from based of service worker performance used by Brown et al. (2002). These items were slightly modified to adapt to the work characteristics of flight attendants.

Data Analysis. Cronbach's α is the most widely used index of the reliability of a scale (Streiner 2003). The descriptive statistics, Cronbach's α and intercorrelations were calculated (Table 1). Then, hierarchical regression analyses were conducted to test the study hypotheses; the direct effects of the antecedents (RA) on the consequence

Table 1. Descriptive statistics, reliability, and intercorrelations

	Mean	S.D.	α	1	2	3	4	5	6	7	8	9	10
1 Gender ^a	0.76	0.43											
2 Tenure ^b	3.45	1.84		.06*									
3 Age ^c	3.53	1.06		-.01	.82***								
<i>Variables in the Organizational Dynamics Context</i>													
4 Role Conflict	3.52	0.72	.87	-.05	-.08***	-.11***							
5 Role Ambiguity	1.70	0.50	.82	-.04	-.10**	-.12***	.24***						
6 Emotional Exhaustion	3.62	0.86	.88	-.03	-.17***	-.19***	.54***	.29***					
7 Trust	2.99	0.73	.90	.08***	.18***	-.19***	-.17***	-.21***	-.20***				
<i>Variables in the Emotional Labor Context</i>													
8 Affective Delivery	4.49	0.53	.82	-.08***	.01	-.05	-.10**	-.15***	-.04	.01			
9 Surface Acting	4.03	0.67	.86	.07*	-.11**	-.10**	.19***	.01	.21***	-.03	.12***		
10 Deep Acting	3.74	0.85	.87	.05	-.03	-.06	.22***	.07**	.28***	-.02	.12***	.30***	-

Note: *** p < .01, ** p < .05, * p < .10. N = 827.

^a Gender: coded as Male = 0, Female = 1.^b Job tenure: coded as 1 = 0–5 years, 2 = 6–10 years, 3 = 11–15 years, 4 = 16–20 years, 5 = 21–25 years, 6 = 26–30 years, 7 = more than 30 years.^c Age: coded as 1 = less than 20, 2 = 21–30, 3 = 31–40, 4 = 41–50, 5 = 51–60, 6 = more than 60. α : Internal consistency (Cronbach's alpha)

(trust toward the employer) and the moderating effects of RA and emotional labor aspects (affective delivery, surface acting, and deep acting) on the relations between the antecedents and the consequence.

5 Results

The Table 1 presents the descriptive statistics, reliability, and intercorrelations. All the scales demonstrated good internal consistency reliability, where an alpha ranging from 0.79 to 0.83 is considered acceptable (Tavakol and Dennick 2011). Table 2 presents the summary of the hierarchical regression analyses. In the step 1, the control variables, including gender, tenure, age, and the additional independent variables, including role ambiguity, role conflict and emotional exhaustion, are inserted into the regression equation to eliminate alternative explanations. In the step 2, the independent variables of emotional labor aspects (affective delivery, surface acting, and deep acting) are inserted into the regression equation.

Hypothesis 1 proposed that role ambiguity (RA) perceived by human service employee is negatively related to trust toward the employer. As predicted by Hypothesis 1, Table 1 presents that RA is significantly and negatively related to trust toward the employer ($r = -.21, p < .01$). Table 2 presents the summary of hierarchical regression analyses. Table 2 also presents that RA is negatively related to trust ($\beta = -.09, p < 0.01$, both in the step 1 and step 2), supporting Hypothesis 1.

Interaction effects. Hypotheses 2 proposed that affective delivery of human service employees moderates the negative relationship between role ambiguity and trust toward the employer. The moderator hypothesis is supported if the interaction is significant (Baron and Kenny 1986). Table 2 presents that, when the interaction term (RA \times affective delivery) is inserted into the equation in the step 3, the interaction is significant [$F(15, 811) = 58.42, p < .001, \Delta R^2 = .002$], supporting Hypothesis 2.

Figure 1 presents the plotting graphs of the interaction effects of role ambiguity (RA) and affective delivery on trust. The result explains that, when RA is lowly perceived by the employees, though the difference in the level of trust of the two groups (high and low affective delivery groups) is not significant, the high affective delivery group reports a higher level of trust (3.15, $p > 0.10$) than the low affective delivery group (3.06, $p > 0.10$). Conversely, when RA is highly perceived by the employees, though the both two groups report the decreasing propensity of trust, the low affective delivery group significantly report a higher level of trust (2.92, $p < 0.10$) than the high affective delivery group (2.75, $p < 0.10$). This result reveals that, affective delivery moderates the decreasing propensity of trust, when the level of RA is low. On the other hand, when the level of RA is high, affective delivery might not able to moderates the decreasing propensity of trust. Consequently, Hypothesis 2 is partially supported.

Hypotheses 3 proposed that surface acting of human service employees moderates the negative relationship between role ambiguity and trust toward the employer. Table 2 presents that, when the interaction term (RA \times surface acting) is inserted into the equation in the step 4, the interaction is significant [$F(15, 811) = 58.17, p < .001, \Delta R^2 = .001$], supporting Hypothesis 3.

Table 2. Hierarchical regressions analyses

Dependent variable: Trust Toward Employer H2 (RA and affective delivery), H3 (RA and surface acting) & H4 (RA and deep acting)					
Independent variables	(Step 1)	(Step 2)	(Step 3)	(Step 4)	(Step 5)
Language	-.23***	-.23***	-.23***	-.23***	-.23***
Gender	.02	.02	.02	.02	.02
Tenure	.04	.04	.04	.04	.04
Age	.08*	.08*	.09*	.09*	.08*
PCV	-.42***	-.42***	-.42***	-.42***	-.42***
Satisfaction	.41***	.41***	.41***	.41***	.40***
Careerism	.02	.01	.01	.02	.01
Task Performance	-.03	-.04	-.04	-.04	-.04
Role Conflict	-.04	-.04	-.04	-.05	-.04
Role Ambiguity	-.09**	-.09**	.32*	.16	.14
Emotional Exhaustion	-.02	-.03	-.03	-.03	-.03
Step 2 (Emotional Labor)	Surface Acting	.02	.02	.15*	.02
	Deep Acting	.02	.03	.02	.19*
	Affective Delivery	.01	.18**	.01	.01
Step 3 Interaction (1)	RA x Affective Delivery			-.42**	
	F	78.89***	61.98***	58.42***	
	Adjusted R-square	.509	.508	.510	
	Δ R-square		-.001	.002	
Step 4 Interaction (2)	RA x Surface Acting				-.28*
	F				58.17***
	Adjusted R-square				.509
	Δ R-square				.001
Step 5 Interaction (3)	RA x Deep Acting				-.30**
	F				58.37***
	Adjusted R-square				.510
	Δ R-square				.002

Standardized regression coefficients are reported. *** p < .001, ** p < .01, * p < .05.

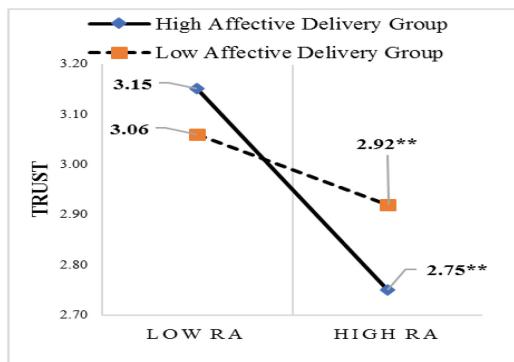


Fig. 1. The interaction effect of role ambiguity and affective delivery on trust (H2)

Figure 2 presents the plotting graphs of the interaction effects of role ambiguity (RA) and surface acting on trust. The result explains that, when RA is lowly perceived by the employees, though the difference in the level of trust for the both two groups (high and low surface acting groups) is not significant, the high surface acting group reports a slightly higher level of trust (3.03, $p > 0.10$) than the low surface acting group (3.01, $p > 0.10$). Conversely, when RA is highly perceived, the low surface acting group significantly reports a higher level of trust (2.87, $p < .10$) than the high surface acting group (2.56, $p < .10$). The result reveals that, surface acting may moderate the decreasing propensity of trust, when the level of RA is low. On the other hand, when the level of RA is high, surface acting might not able to moderate the decreasing propensity of trust. Consequently, Hypothesis 3 is partially supported.

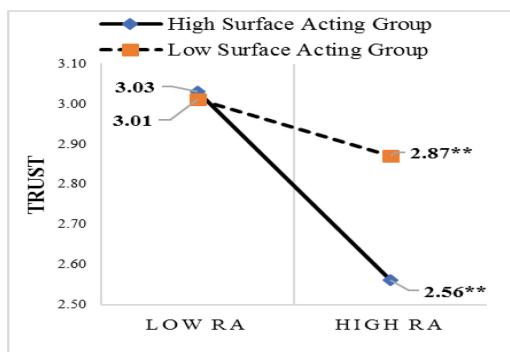


Fig. 2. The interaction effect of role ambiguity and surface acting on trust (H3)

Hypotheses 4 proposed that deep acting of human service employees moderates the negative relationship between role ambiguity and trust toward the employer. Table 2 presents that, when the interaction term (3) (RA x deep acting) is inserted into

the equation in the step 5, the interaction is significant [$F(15, 811) = 58.37, p < .001$, $\Delta R^2 = .002$], supporting Hypothesis 4.

Figure 3 presents the plotting graphs of the interaction effects of role ambiguity (RA) and deep acting on trust. The result explains that, when the low level of RA is perceived by the employees, though the difference in the level of trust of the two groups (high and low deep acting groups) is not significant, the high deep acting group reports slightly higher level of trust (3.08, $p > 0.10$) than the low deep acting group (3.07, $p > 0.10$). Conversely, when RA is highly perceived, the low deep acting group significantly reports a higher level of trust (2.90, $p < .10$) than the high deep acting group (2.75, $p < .10$). The result reveals that, though the interaction effect between RA and deep acting is observed, when the employees perceive the high level of RA, deep acting might not able to moderate and repair the decreasing propensity of trust toward employer. Consequently, Hypothesis 4 is partially supported.

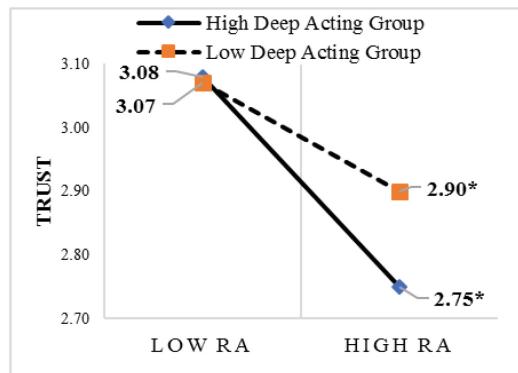


Fig. 3. The interaction effect of role ambiguity and deep acting on trust (H4)

6 Discussion and Implication

The population working in the service industry continues to increase. Human service employees serve an important role between the organization and customers as an interface. Although the topic of trust has long been of interest to organizational scholars, it would be useful to rethink on its nature, antecedents, and consequences.

The competition has intensified in many industries. As a result, downsizing, cost reduction, layoffs, and early retirement programs have become the recent trends. Moreover, IT and the automated machines substitute the employees' works previously done by the employees. Thus, the expected roles of employees are gradually changing, and the employees may perceive role ambiguity as well as role conflict.

The findings of this research indicate, first, that role ambiguity perceived by the human service employees (flight attendants) decrease trust toward the employer. Second, emotional labor aspects moderate or repair the decreasing propensity of trust toward the employer, when the level of role ambiguity perceived by the employees is low. Third, surface acting strategy used by the employees the least moderate the

decreasing propensity of trust, comparing other emotional labor aspects (affective delivery and deep acting), thus the least recommended in the working place with role ambiguity.

In the competitive industrial environment, emotional labor practiced by the human contact employees may help the employees harmoniously work in the stressful workplace. Finally, emotionally competent employees provide an organization with harmony and integrity and can increase the competitiveness of the company because the employees effectively adapt the company's strategy and work efficiently.

7 Limitations and Suggestion for Future Research

In the cross-sectional design, the use of only the self-evaluated responses of emotional labors may be considered the first limitations of this research. Second, the present research exclusively focused on human service employees and limits the generalizability of the findings. The present research also exclusively focused on flight attendant, thus, the duration of contact with customers would be comparatively shorter than the other human contact service employees, for example, in the hospital. It limits the generalizability of the findings.

A suggestion for future research direction would be a research of the interaction effects emotional labor in the different human service organization with different professionals that supposed to required emotional labor. Therefore, the similar topic in the different area in the world and different organizations would be a future research direction.

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Organizational Development-Lean Thinking Through the LeanGame Learning Game

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Abstract. This article presents research where organizational change was carried out in the health care organization in Satakunta's Health Care District. In the district's new strategy, Lean thinking was chosen to support a strategic goal, to increase employee's and patients' satisfaction towards the care they received. This development need has been reported in earlier studies to find enhancement ways for operations. LeanGame is an educational game, which combines two distinct elements: Lean, a philosophy and management system, and interactive game that let players get to familiarize themselves the Lean thinking through the game. The LeanGame is linked to the organization's strategic approach for continuous development implementation. This paper introduces the LeanGame piloting in Health Care District. Article handles development of LeanGame and the LeanGame piloting. Article describes results of piloting, reveals the results of testing the educational game in professional development and gives future research suggestions as well as future development needs for Lean Game.

Keywords: Lean · Educational game · Organizational development
Health care

1 Lean Thinking in Health Care

Lean is a method that has roots in the Japanese automotive industry and in the quality management of its production processes. It is a philosophy, a management system that can be utilized to organize and manage operations. In the 1990s, the operating model has become part of the health care organizations. In its present form, the aim of the operating model in health care is to improve the value creation for the customer and reduce the waste in the process. These goals involve improvement of the quality of the care, reducing waiting time and streamlining patient flow and fluency in services [1, 2].

Lean is a mode of operation that focuses on flow efficiency. Flow efficiency is at its best when a customer/patient gets the service or product whenever he wants, as quickly and easy as possible. Improved efficiency has been achieved by promoting the precision of processes and reducing waste as time, costs and errors [3]. Lean thinking identifies nine distinctive forms of waste; (1) overproduction, (2) waiting, (3) unnecessary transport, (4) incorrect processing, (5) excess inventory, (6) unnecessary

movement, (7) errors, (8) unused employee creativity and (9) environmental waste/resistance to change. Focus should be on the inactivity of the staff's creativity and the resistance to change and to question whether leaders get involved in development and find out from each department the courage to engage in development and new adoption. [4]. Lean is a structured way for operations development and a waste from processes [5]. Waste can be found from e.g. the patient treatment processes and their sub-processes, the flow of information or it can also be seen visually in instruments and stocks. The waste can also mean the time spent waiting for employees as well as the client/patient [6, 7].

Key to the success of change in operations can be considered to be teamwork, successful value analysis and based on successful streamlining of flow efficiency. The introduction of Lean thinking models in the organization needs testing and re-evaluating the existing model's performance [8–10]. Changes in patient treatment processes require that each member of the team commit to action. Team members must be involved in designing a change in functions, processes or operations and commit to further future change. Good communication and systematic planning have great importance when introducing lean thinking [11, 12].

Once change has been made and it has been shown to have positive effect to developed of the unit, the effects of this development is seen to have increased patient satisfaction, working atmosphere and work satisfaction [3, 4, 12]. The introduction of Lean thinking and models needs expertise. It needs training and focus on Lean thinking and its implementations. Studies have shown that staff will be more responsive to future changes when they have enough information about Lean. In addition, the fact that the planning of the operations considers the specific features of each unit and the needs of the whole organization is seen to promote change of action [8, 10, 11]. In some cases, a new approach to Lean thinking can be difficult to approve. Returning to the old model of operation is possible if the implementation of new operations is not encouraged with a positive attitude [12]. In this situation, the role of leaders is important. They need to encourage and support workers as the change progresses. If all of these are handled, the success of the change is more likely, and it will more likely be a permanent change in operation models [11].

2 Organizational Development

Organization development is cooperation. In the hospital environment, co-operation can involve activities between different occupational groups to solve problems and to improve patients'/customers' service and care. Organizational development needs clarified management structures. It also needs that leaders are committed to development personally and have sufficient management skills. Multidisciplinary development activities need strong strategy and leadership for development activities to promote ultimate goal. Development activities should also be led in everyday work. Leadership is especially needed when development activities are integrated to goal-oriented work and the results of development work are implemented in to working practices [13].

3 LeanGame Learning Game Piloting in Satakunta's Central Hospital

In recent years, there has been an interest towards the use of games and in education. At the same time, awareness of their possibilities in education has grown. A good learning game can be considered to be such that its story is interchangeable, even though the progress in the game itself is linked to the subject that is to be studied. The games typically are based on experiential learning and interaction [14]. The possibilities that the virtual world provides, compared to real world situations, can be easily found when allowing mistakes and learning through the trial and error. At the same way, as in simulations, digital learning games can build up so that varied and unexpected situations and problems are occurring, which cannot be met in the real-world situations at the time of education [15, 16], or at least not with safe manners. In game development, it is important to recognize that the game will enable an easy transition of subjects of the learning sessions to be implemented into practice. The game must be inspiring, technically adequate and must be motivating the player to learn. The learning games has been compared to the classroom, in sense of the time usage, and it has been found that a learning games are more effective tool for teaching than the traditional class room lecturing teaching method. In this case, we can also discuss about the cost-effectiveness of teaching [17].

3.1 Lean Game Learning Game Piloting

LeanGame is an interactive Learning Game, so called serious game, designed to introduce players to Lean thinking and philosophy. The hospital districts of Southwest Finland, Satakunta and Vaasa have developed the Leangame Learning Game in co-operation with the students and experts of the Business Competence and Process Management Research Group, Healthcare and Well-being Turku University of Applied Sciences and Turku Game Lab. The LeanGame is used as part of the training of hospital staff's lean training and gives a new interactive way to provide training.

3.2 The Purpose of Research

The aim of this study was to evaluate LeanGame's user experience in the Satakunta's Central Hospital. Main task was to assess the playability of the game and how the learning game is perceived as an educational tool for Lean thinking. Research results are used in the Leangame 2.0 development. Research problems were:

- (1) How did the staff experience the Leangame as education tool to Lean thinking?
- (2) How did the staff experienced that the playing the game has increased their awareness of how they can use lean thinking in their work development?
- (3) How did the staff experience the playability of the Leangame?

3.3 Research Method, Materials and Analysis

In the Satakunta's Central Hospital, the total number of personnel in Department of Emergency, Pediatrics, obstetrics and gynecology was ($N = 550$). The Study was conducted as a web-based questionnaire (Webropol®). The respondents replied after they had played the LeanGame in computer class. The questionnaire consisted of multiple choice questions, open questions and scale questions. The scale that was used in questionnaire was Likert's scale. The key figures of the scale were from one to four, with four agreeing entirely, three almost agreeing, two slightly disagreeing and one completely disagreeing [17]. Structured sections of the survey were analyzed by statistical methods by calculating the frequencies, percent and averages using Excel® statistical programs and Webropol® graphical methods. Open questions were analyzed by analysis of the content. In the analysis of the content, similar answers were sought from the material (themes), after which the preliminary conclusions could be drawn from the summary.

3.4 Research Results

Fifty-seven players answered to questionnaire, which gives the response rate of 11.4%. The players and respondents represented a variety of different professional groups: doctors (16%), nurses (67%) (nurses, midwives) and other professions belonging to the categories (17%), such as administration and the secretaries of the department. The age distribution of the participants is shown in Fig. 1.

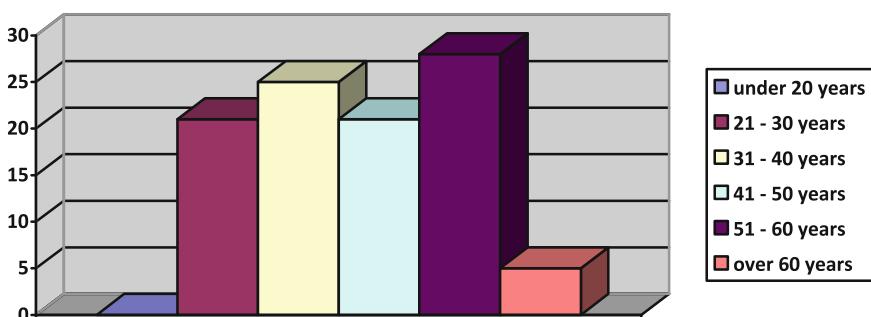


Fig. 1. The age distribution of the participants

As can be expected from the age distribution, over 33.3% had a work experience of 20 years. Every respondent has used the computer at their daily work and most of respondents did not play computer games usually (Fig. 2).

78% of doctors, 55% of nursing staff and 30% of other staff members had not received any earlier lean education or training (Table 1).

The first and second research problem were handling the question of the staff's experience of how the LeanGame introduced them Lean thinking and how the game gave them ideas how they could develop their own work according to Lean philosophy.

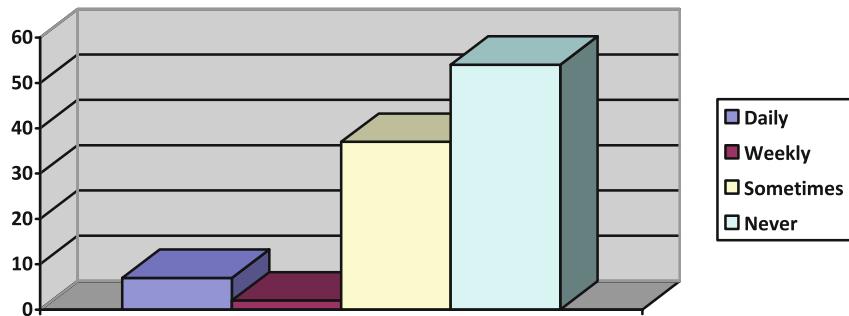


Fig. 2. Answers to the question; How often do you play Computer Games?

Table 1. Answers to the Question; Have you trained in Lean?

Professional	Doctors	Nurses	The Others
Yes	22%	45%	70%
No	78%	55%	30%
What kind of training?	Lecture	Lecture Lean Training	Lean Training

Most of the respondents felt that the game introduced them to Lean thinking and the game helped them use Lean in their own work. However, half of the respondents felt that the game did not give them new ideas how to develop treatment processes (Fig. 3). Alleged claims;

1. The LeanGame helps used Lean in your work.
2. The LeanGame helps to develop treatment processes
3. The LeanGame gives to ideas for work development
4. The LeanGame gives to ideas for treatment development
5. The LeanGame helps to notice waste
6. The LeanGame helps to notice waste in treatment process.

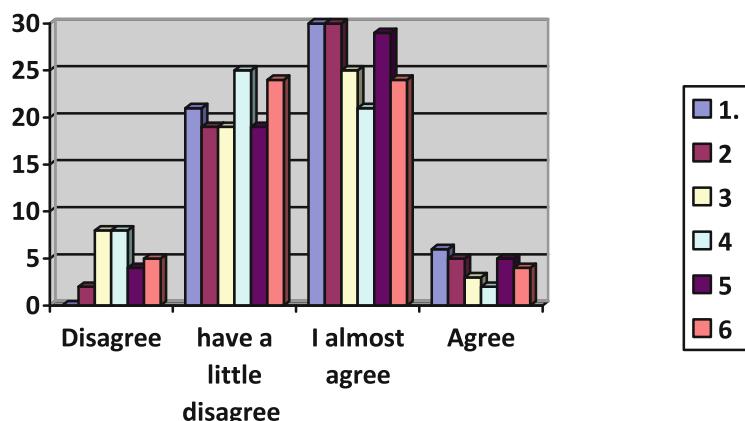


Fig. 3. Can LeanGame used to develop work?

When analyzing this, according to respondents' profession, it can be noticed that 59% of nurses, 43% of doctors, and 60% of the third group felt that the game did not give them ideas for work development. Similarly, considering how the game helped respondents to notice waste in their job, the answers in the different professional groups was as followed; nurses 40%, doctors 56% and the third group 30% (Scale 1 = Agree, 2 = I almost agree, 3 = Have a little disagree and 4 = Disagree). The answers are given in Table 2.

Table 2. Comparison of professional groups

	Scale	Nurses	Doctors	The others
LeanGame help to develop of work	1	8%	0%	30%
	2	55%	67%	30%
	3	37%	33%	40%
	4	0%	0%	0%
LeanGame help to develop of treatment	1	7%	0%	20%
	2	49%	67%	60%
	3	41%	22%	20%
	4	3%	11%	0%
LeanGame gives ideas	1	0%	0%	10%
	2	41%	57%	30%
	3	43%	43%	40%
	4	16%	0%	20%
LeanGame help to recognize the waste at work	1	10%	0%	10%
	2	50%	44%	60%
	3	29%	56%	30%
	4	11%	0%	0%
LeanGame help to recognize the waste at treatment process	1	7%	10%	10%
	2	45%	50%	30%
	3	37%	30%	50%
	4	11%	10%	10%

The third research problem was to find answer how the players felt LeanGame as a learning game and how they would want to develop the game. The game had a positive acceptance. More than half of the respondents would like to take part to the lessons with playing through the learning game in future. Most players would recommend learning game to their colleagues. The game was proven to be clear, easy to use, and comfortable to learn. The players wished that the game would be more challenging and that it would have practical problems and issues to solve. Interactivity of the game was asked to be improved. Respondents stated that the feedback from the game to player was not clear enough. The feedback was wished to be developed to be clearer and that feedback would be given right after each game section instead of one feedback after accomplishment of whole game.

On the final question, respondents had the opportunity to write open feedback about their own thoughts and opinions. Statements was e.g. that; "Health Care personnel could be more involved in game development", "A wider game which would include possibly a theoretical part for the expert". It was questioned whether the proportion of supervisors and the level of education is enough? Is the realization of Lean thinking possible at all in the units?

3.5 Reflection on LeanGame Pilot Results

The questionnaire's response rate stayed relatively low, which means that the results of the pilot cannot be thoroughly generalized. However, the response rate was 11.7%, which is typically enough, for good results and sample group was quite large for a case study, it might be stated that a few answers can be found with relatively good reliability.

- (1) The game needs to be more challenging and involve precise practical problems. The solutions to the problems must be based on Lean thinking.
- (2) Further development of the game should involve more nursing staff. As typically in lean thinking experts and professional who carry operational work as everyday work, know what kind of challenges they need to tackle and how the develop of their own work and care processes should go in daily work.
- (3) Interactivity of the game needs to be improved. Game should provide feedback right after each learning issue/section.

Improvements should also be made in order to improve playing experience:

- (1) One round of the game takes about 30 min. It is a long time to use for playing during the middle of the day, if game is supposed to be playable in open time slots of everyday work. Short, independent games, focusing to one issue at time were preferred.
- (2) LeanGame version 1.0 cannot be paused. Ability to pause the game and continue from the game at the same point was highly expected.

3.6 Future Research Suggestions?

This pilot is the first in this organization and it would be useful to conduct comparative research when a new version of the LeanGame game becomes available. This research would give answers; How has the LeanGame developed? Is the game's interactivity improved from the first version? New research would give answers also, how the organization has developed? What is the current state of Lean in the organization? Have the practices changed? Also, very interesting research point of view would be possibility to make comparative study between 1-h lecture from lean principles and LeanGame.

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Correlations Between Holistic Awareness of Time and Innovativeness

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Abstract. Time and innovativeness are crucial for organizations and human beings and are very hard to master. Without time management, this imperative resource is wasted or at least utilized poorly. Without innovativeness, there will be no new innovations, inventions, approaches or change to better. Even that these are commonly recognized to be very important, these issues are often still neglected. Time and innovativeness are quite similar also other ways. Both phenomena should be understood from a wider perspective in order to maximize their utilization. Both need to be approached from both personal and organizational point of views as well as understood human factor in both. Both phenomena can be utilized better by conscious awareness towards them and linkages between them should be understood. This paper presents research which shows that time and innovativeness development needs are behaving similarly. The correlation between these two phenomena was found and different development personalities are introduced as a conclusion. Future research aspects and recommendations are also discussed in this paper.

Keywords: Proactive innovativeness · Time management · HRM development Learning organization

1 Time Personality

“Success in knowledge economy comes to those who know themselves, their strengths, their values and how they best perform” [1]. Drucker’s article is concentrating to personal skills in leadership domain and it is clearly shown that it emphasizes highly self-consciousness. “Effective executives do not start with their tasks, they start with their time” [2] shows that the time is always an imperative driver. This driver is a unique resource that cannot be stored, is perishable, irreplaceable and has no substitute. It’s not affected by demand it and no price or marginal utility can be found from time. Hardest part for leadership domain is that we are always lacking it. [1, 3] Therefore the journey of developing to be an effective leader is to learn how to manage oneself and above all learn how to manage own time usage. Measurement of chronological time

duration, speed and numerical order with clocks [4], is not even near to managing it and even farer from understanding it. Conscious awareness towards own time personality and recognition how person experiences the time are should be clear before understanding and managing time can even be discussed [5].

Time's two faces can be separated to subjective time and objective. [6] Objective time is also named to chronological time and it is a domain where business and management is done. Subjective time is domain leadership and human actions are done [5] Cf. for Czarniawska [7] for the history of Chronos (chronological) and Kairos (human time). Two ancient Greeks gods for time have given their names to these two faces of time. As chronological, objective, time can easily be synchronized with clocks or other specific measurement devices, subjective, Kairos time is relativistic and the speed of it is dependent on many different factors. Personal ways to utilize and sequence time, feeling, [6], cultural background [8], situation, time pressure [9], sleep deprivation [9, 10], personal traits [11] and planning personality [12] are all domains which are biasing experienced time to differ from objective time [5].

At some point of life, most of us have experienced a loss of time tracking i.e. have felt the timelessness [13]. This why we have the expression “time flies”. An extreme phenomenon is called as flow, i.e. the complete focus and motivation. [14] And as opposite, everybody has experienced feeling that time stops when s/he has done something unpleasant or boring. The satisfying situation makes feelings towards time positive [6]. The hectic life or work situation may cause people the willingness to compress every moment of the day with very intensive activities, cut everything, what feels time waste at that time, and try to get only the essence of things to their mind. [3] Compressive mindset, if it is up kept too long, might end up to situation where person is “implying that rational reduction of information, emotions, and alternatives is necessary to reach organizational and individual goals.” This leads to a situation where quality, creativity, open-mindedness, innovativeness, and empathy are reduced. [15] This compression of time is crucially against Drucker’s [2] suggestion, where people “have to feel that we have all the time in the world”. Studies show that if the balance is not found between personal life and work, the organization may start to lose their workers. Balance between personal and work life has been found to be the most or the second most important attribute of the job [16]. Self-development possibilities are also factors that make time as positive thing [6]. It’s also found that when a person does not receive enough time for rest and sleep, it may lower his or her self-control and it may rise unethical behavior [10]. Sleep-deprivation is shown to harm execution of time-pressured activities [9]. Personal traits are also key issues in time personality and it’s biases towards objective time [5]. Traits that are found are perfectionist, preemptive, people pleaser and procrastinator [11]. Harm will rise especially if person has insufficient delegating skills [17] and too optimistic future orientation [12]. Tendency for long-term vision reduces biases when compared to short-term visioning [6].

Before mastering concept of time or managing time, it must be recognized that time cannot be either accepted or denied. Each person should have found own systematic ways how to become aware of one’s own time experience, time personality and its use. Own thoughts and ideas towards time should be expressed and comparisons and analyzes of one’s own thinking regarding time should be done with other methods and thinking processes [18]. I.e. consolidating it to bigger sections [1] and parts of own life.

Time usage, on the other hand, cannot be mastered, if boss, system (organization), peers, or followers are using all time available [17]. Time usage should be also divided by locations or work style [20], by with whom time is spent [3, 19] or how big portions work is done [21]. Despite which division system will be utilized, it still should be kept in mind that time is a limiting factor in all activity - not tasks themselves.

2 Innovativeness

“Innovation”, in its wider and general meaning, can be defined to the processes where new ideas are implemented within an organization. Thus, innovation can be seen an establishment of new concepts, procedures or technologies. By nature, innovation processes are typically non-linear and require tools, which are flexible and adaptive. In an innovative, evolutionary process, it is a question about changing ideas into technological, social, and institutional assumptions that blend in with normal practice, processes or products [22]. Much concern has been expressed about physical infrastructure related to research and development (R&D) activities at organizations and correlations between physical resources allocated to R&D activities and their successful outcomes. Recently more and more attention has been paid to other factors, so-called innovation drivers. These drivers are thought to act as an innovative stimulant for any R&D system. The mental facilities are also taken account in the system as at least as crucial elements as the physical ones. E.g., a right kind of state of mind, together with a positive attitude towards innovativeness and personal time management skills can be such essential elements [23].

Nonaka and Konno discuss about “ba” as a shared space or platform where different elements of innovative activity - physical, mental, virtual and any combination of them - can form an innovative outcome [24]. From the innovation management point of view, both the composition and coordination of such platforms creates a critical framework for any innovative project. Therefore, it can be said that resource allocation or attention to physical infrastructure alone does not guarantee the positive outcome.

At least part of all innovative activities is innovating human systems and the mental models. Human beings are the very basic building material of any organization. These mental models should be formed by using a bottom-up philosophy, which means that organization culture and management philosophy permits and encourages idea generation among employees. Freedom to bring some experiments into effect without a fear is also needed. [25] Nevertheless a top-down philosophy is also needed for goal-oriented steering and controlling of the system. Using just bottom-up philosophy might lead to anarchy and uncontrollable chaos in the innovative process and top-down philosophy alone might suppress innovativeness and restrain motivation in general. In most creative activities, the question is about creating favorable circumstances in general, and for a situation at hand in specific [23].

Latour approaches the innovativeness and innovative networks especially from the artifact’s perspective and questions the relevance of dividing the elements into human and non-human items [26]. In his Actor-Network Theory (ANT), he equalizes all the elements, players and systems within any innovative network, and takes account all the items as critical ones, which can ruin or save the result or outcome, making no division

into human or other-than-human factors. However, the consciousness of these different elements or factors related to both physical and mental facilities in any innovative activity might help a lot to tackle the possible setbacks looming while some innovative solutions are needed.

3 Research Setting and Approach

This research is done in order to point out correlations between holistic awareness of time and innovativeness. Starting point for this research is in research is in Reunanen's Windahl's and Vanharanta's earlier study where innovativeness and time management was first compared [33]. As in earlier study, the main approach and mindset for this research is applying Evolute based applications called Chronos and Kairos [30] and Pursoid [31]. These approaches are utilizing ontology engineering, the precision of meaning, and usage of soft-computing methods and fuzzy logic in order to find out what is and how to cope with uncertainty and imprecision in human knowledge inputs [32]. Chronos and Kairos are designed to reveal individuals' conscious awareness towards time [5] and Pursoid is developed in order to have the possibility to analyze conscious awareness concerning individual innovation capabilities and competences. [31] Both application statements are developed so that they will give a comparable overview of respondent's current situation and feelings and target situation and desirable feeling. Remarkable of these applications is that respondent's answers to statements so that they could choose any analogic answering scale for these two (current and target) situations. Scales for answers are for example never, sometimes, usually and always but such as in Likert scale there are no steps and respondent can answer freely i.e. analogically at any point of the scale. This method is called VAS-meter (Visual Analogue Scale), and it is specially developed to describe subjective issues [34].

Chronos and Kairos is constructed so that it includes different ($n = 24$) features and categories ($n = 9$) under these six main points. These categories are divided into two main classifications: (1) managing time and (2) experiencing time. These features and categories are consisting 168 statements to be answered. Pursoid consists ($n = 36$) individual features called competences, which are grouped into different ($n = 9$) sub-groups and two main groups: (1) personal competences and (2) social competences. These competences consist of 170 statements.

All answers to statements were handled as decimal number variables valued between 0 and 1. Fuzzy logics were used in order to form respondent's linguistic answers to numbers. Fuzzy logic is used in order to process linguistic data in computational, numerical ways. Fuzzy sets are ways to represent vagueness in linguistics [27]. Fuzzy logic is used in the applications to handle the imprecise information, which is the nature of information in the human decision-making processes. There is also natural fuzziness in the evaluation processes of individuals [28]. Fuzzy logic controllers usually consist of four modules: fuzzification, interface, rule-base and defuzzification [29].

In order to find out whether there are correlations between innovativeness and time, this research's Proposition 1 is: Persons have similar development needs in time

management and innovativeness management and Proposition 2 is: People can be divided to different development personalities according to time management and innovativeness management.

4 Research Data

Research data collection was executed in 2014–2015 and consisted of 108 individual respondents answering both research applications. Respondents were students from Turku University of Applied Sciences. Students were mostly from engineering and business degree programs and represented full-time students and part-time (working adult) students. Age variety was 18–52 and arithmetic average settled to 25.6 years when 2 of respondents didn't want to reveal their ages. Both genders were presented. From 108 respondents 19 answered female and 28 answered male and 61 respondents did not answer to this question. Respondents' work experience varied from 0 years (19 respondent) to over 20 years (8 respondents). Average settled for 5.6 years and a major part of respondents (55 individuals) had 1–5 years working experience. The second largest group had been working between 6–10 years (21 respondents). Respondents' nationality was mostly Finnish. From 108 respondents there were Czech, French, German and South Korean one per each, Austrian, Chinese, Spanish two from each and rest were Finns.

Respondents answered to 168 statements in Chronos and Kairos in a way to reveal their creative tension i.e. proactive vision. This was done so that respondents answered to their current status (their present feeling towards statement) and future status (target feeling, how they would like to feel towards statement in future). I.e. every respondent answered two times to every statement. All respondents answered similar way also to 170 statements in Pursoid tool. This way all respondents had answered to 2 times for 168 + 170 statements when they had accomplished both research tools. This gives 73.008 different individual variables to research data mass. Creation of data mass is shown in Eq. 1 below here, where x is a number of variables and n is number of respondents.

$$x = 2 \cdot n \cdot (168 + 170) \quad (1)$$

Creative tension, the main handled variable in this research, is the difference between target status and current status and therefore points out respondent's direction and amount of the need for the development in different domains. The creative tension was calculated by subtracting current status variable from target status variable. All statistical analysis was made in Excel.

4.1 Data Analysis

Statistical analysis started so that all input data was exported from Evolute tool to excel files. This was done according to have the possibility to compare results from different respondents and to ease analysis whether the respondents could be grouped into different groups. Compared to earlier research (cf. Reunanen, Windahl, Vanharanta) [33],

which already gave insights and research data that innovativeness and time management should be compared. First thing was to calculate creative tension from all answers to all respondents. Figure 1 is illustrating results of calculation of the creative tension from C&K tool's inputs. The second column from the left indicates respondents' ID number, which is used for identification of single respondent (only part of respondents is shown). Respondents cannot be identified further than their answers to the demographic question, so anonymity is guaranteed to respondents. Top row is showing the statements (only part of statements is shown) and respondents' answers are shown in the crossings of statements and respondents.

	I start planning my work	I am late for meeting s.	I will postpone e next meeting if	I get feelings about my job	I work overtime	I work overtime because I have much tasks to do	I can fit my everyday life in to normal working hours.	I fill my days with very intensive activities	I keep myself very busy	I will complete my schedule when tasks are offered,	I will complete s my schedule e when tasks are offered,	Time I use to work	I schedule my free time to reserve d for family and/or friends,	My work takes so much time that I have to use my schedule with family and/or friends, (Selttim et al., 2017)								
Application/Person ID	I start planning my work	I am late for meeting s.	I will postpone e next meeting if	I get feelings about my job	I work overtime	I work overtime because I have much tasks to do	I can fit my everyday life in to normal working hours.	I fill my days with very intensive activities	I keep myself very busy	I will complete my schedule when tasks are offered,	I will complete s my schedule e when tasks are offered,	Time I use to work	I schedule my free time to reserve d for family and/or friends,	My work takes so much time that I have to use my schedule with family and/or friends, (Selttim et al., 2017)								
Chronos & 1700	0,05	-0,15	0,00	0,04	0	-0,11	0,1	0,08	0	0,1	0,07	-0,1	0,16	-0,09	0,1	-0,14	-0,02	0,01	0,05			
Chronos & 1705	0	0,21	0	0,03	0	0,02	-0,11	0,01	0,03	0	0,3	-0,18	0,34	-0,31	0,16	-0,35	-0,63	0,33	0,01	0,34		
Chronos & 1707	0,01	-0,02	0,01	0	0,16	0,27	-0,19	-0,05	0	0	0,16	0	0,27	0,01	-0,17	0	-0,01	-0,19	0	0,01	0,18	
Chronos & 1708	0,3	-0,01	0	0,19	0,29	0,12	-0,01	0	0	0	-0,01	-0,18	0,04	-0,01	-0,01	-0,16	0,14	-0,02	0,01	0	0,17	
Chronos & 1710	0,1	0,08	-0,07	-0,11	0,06	0,04	-0,18	0,16	-0,08	-0,03	0,15	0,11	0,13	0,1	-0,3	-0,14	-0,3	-0,33	0,02	0,16	0,28	
Chronos & 1711	0	0,01	0	0,03	0,01	0	0	0	0	0,04	0,04	0,04	0	0	0,01	0	0,01	0	0,04	0	0,01	
Chronos & 1715	0,36	-0,15	0,01	0,03	0,08	-0,01	0,2	-0,01	0	0,04	0,04	0,04	0	0	0,05	0	0,08	0,04	-0,01	-0,15	0,18	
Chronos & 1716	0,35	0,24	-0,21	0,28	0,32	0,03	-0,03	-0,24	-0,29	0,29	0,19	0,09	0,08	0,27	-0,2	0,23	0,01	0	0,01	-0,32	0,12	
Chronos & 1717	0,01	0,21	-0,13	0,04	0,19	-0,08	0,22	-0,02	-0,23	0,29	-0,03	0,05	0,06	-0,02	0,03	0,01	0,01	0,01	0,03	0,01	0,01	
Chronos & 1737	-0,29	0,08	-0,11	0,11	0,14	0,12	-0,15	0,18	-0,17	0,3	0,09	-0,18	0,15	-0,11	-0,22	0,16	-0,17	-0,31	-0,39	0,21	0,19	
Chronos & 1738	-0,34	0	0	0	0	0	-0,01	0,01	-0,01	-0,24	0,63	0,82	-0,72	0,66	0,03	0,39	-0,38	0,36	-0,37	0,99	0,01	0
Chronos & 1774	0,24	-0,02	0,04	0,25	0,14	-0,01	0,01	-0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	
Chronos & 2101	0,36	0,02	-0,06	0,14	0,18	0,13	-0,15	-0,05	-0,09	0,02	-0,01	0,17	0,22	0,08	-0,27	0,01	-0,31	0	0	0	0	
Chronos & 2102	0,35	0	0	0	0	0,13	0,05	-0,17	0,03	0	0,01	0,03	-0,17	0,01	0,01	-0,15	0,19	0,21	-0,02	0	0	0,28
Chronos & 2105	0,01	-0,01	0	0	-0,03	0,03	-0,48	0,23	-0,45	0,03	-0,01	0	-0,01	0	-0,01	-0,41	0,02	-0,65	-0,73	0	0	0,53
Chronos & 2106	-0,51	0,04	-0,12	0,02	0,08	0,23	-0,17	0,38	-0,18	-0,21	0,24	-0,18	0,16	0,13	-0,29	0,07	-0,17	-0,34	-0,04	-0,02	0,33	
Chronos & 2107	0,31	0,3	-0,3	-0,04	0,3	0,31	-0,34	0,28	-0,26	-0,26	0,29	0,33	0,32	0,37	-0,34	0,34	0,66	-0,31	0,32	-0,32	0,33	

Fig. 1. Results of Creative tension from Chronos and Kairos

Figure 1 is also showing the next step of data analysis. All answers are categorized into five different levels. Since all answers were quantified from linguistic answers to numbers between -1 and 1 grouping was done so that first group was done as shown in Table 1. In the table, T is marking respondents' quantified answer from the C&K application and I answer from Pursoid application. Groups are not identical. As seen first and second group's scale is different in C&K answers from in Pursoid answers. The reason for this is when groups were made very many answers in Pursoid data mass is concentrated to a narrow area. From this will be discussed later more.

Table 1. Groups for answers

Group number	Scale in C&K answers	Scale in Pursoid answers
1	$0,5 \leq T \leq 1$	$0,4 \leq I \leq 1$
2	$0 < T < 0,5$	$0 < I < 0,4$
3	$T = 0$	$I = 0$
4	$0 > T > -0,5$	$0 > I > -0,5$
5	$-0,5 \geq T \geq -1$	$-0,5 \geq I \geq -1$

This grouping gives the possibility to group respondents to different groups. As simplified: when respondents have answered so that creative tension results over 0,5 or

under -0.5 it means that respondent has strong will to change that domain. If respondents answer is between 0 and 0.5 or -0.5 s/he would like to change that domain but not as strongly as in previous cases. If respondent's creative tension is 0 it means that, s/he is satisfied to current status. Since groups were formed clearer in C&K Time management application. This was taken to be the driver. Respondents were grouped into five different groups according to their results from creative tension in time management. The first group consists respondents ($n = 19$) whose creative tension was over 0.5 in 20 more statements. Second group ($n = 22$) are respondents whose creative tension was 0.5 in 10 to 19 answers. The third group ($n = 16$) was conducted from respondents who had over 0.5 creative tension in 5 to 10 answers. Fourth group ($n = 33$) had creative tension over 0.5 in 1 to 4 answers and last group ($n = 18$) who had 0 answers' creative tension over 0.5. Figure 2 shows how respondents were grouped according to their creative tension in the C&K application. As seen from Fig. 2, respondents' answers in Pursoid tools is set adjacent to their answers in the C&K.

ID	Chorons & Kairos					Pursoid							
	0 ≤ T ≤ 1	0 < T < 0.5	0 ≥ T > -0.5	0.5 ≥ T ≥ -1	T = 0	Check	ID	0.4 ≤ T ≤ 1	0 < T < 0.4	0 > T > -0.5	-0.5 ≥ T ≥ -1	T = 0	Check
2794	38	46	34	44	6	168	2794	6	138	3	16	170	
2136	39	50	42	23	6	168	2136	19	110	19	0	14	170
2943	38	49	61	17	6	168	2943	29	123	7	1	10	170
2840	34	52	42	26	12	168	2840	108	6	2	18	170	
2120	33	49	40	38	8	168	2120	108	121	8	3	3	170
2816	30	64	43	23	8	168	2816	25	121	9	3	2	170
2137	29	58	46	28	7	168	2137	9	82	28	0	51	170
2854	29	62	37	38	2	168	2854	42	107	13	4	4	170
2837	27	57	53	18	13	168	2837	46	108	5	3	8	170
2186	26	67	39	21	15	168	2186	12	119	15	0	24	170
2937	25	60	54	21	8	168	2937	16	141	10	0	3	170
2835	24	63	52	20	9	168	2835	55	79	18	5	13	170
2935	22	60	60	19	7	168	2935	11	129	20	4	6	170
1738	21	53	45	20	29	168	1738	6	106	22	1	35	170
2134	21	60	58	14	15	168	2134	36	113	18	0	3	170
2795	20	67	53	20	8	168	2795	7	142	12	2	7	170
2831	20	66	56	18	6	168	2831	1	84	19	5	21	170
2844	20	72	69	22	6	168	2844	40	101	22	1	6	170
2921	20	57	50	13	28	168	2921	13	110	11	0	36	170
2125	19	64	48	18	18	168	2125	0	97	23	0	50	170
2796	19	64	61	15	9	168	2796	3	121	28	3	15	170
2825	19	74	65	10	0	168	2825	22	125	22	1	0	170
2936	18	67	57	12	14	168	2936	1	127	15	0	27	170
2124	17	72	41	11	27	168	2124	15	104	21	1	29	170
2819	17	65	54	20	12	168	2819	20	109	13	3	25	170
2838	15	65	61	14	13	168	2838	21	129	15	0	5	170
2843	14	68	68	68	68	168	2843	22	140	14	10	42	170

Fig. 2. Grouping the respondents

Figure 2 is showing the example of categorization of respondents' answers. The first column is ID and after that is categorized rows of creative tension results. Coloring was used in order to ease to see the results to researchers. Figure 2 is quite nicely showing that in group 1 most of the respondents had also very high results on answer group 5 in C&K (lessen something very strongly) and answer group 1 in Pursoid.

After grouping the respondents every groups' averages (arithmetic means) was calculated for each answer groups. This was done in order to find out the distribution of answers in each group. Average handled here is average of how many answers of each respondent group is settled under certain answer group. Percentage of each answer groups was done simply by dividing average number by a number of total statements, which were 168 in C&K and 170 in Pursoid application. Table 2 is showing the distribution of answers to answer groups (AG) and their share as a percentage of all answers for each respondent groups (RG) from C&K data.

Table 3 is showing the distribution of answers to answer groups (AG) and their share as a percentage of all answers for each respondent groups (RG) from Pursoid data.

Table 2. Distribution of answers in different respondent groups from C&K data

	RG 1		RG 2		RG 3		RG 4		RG 5	
	Mean	%								
AG 1	26,9	16,0	13,6	8,1	6,7	4,0	2,3	1,4	0,0	0,0
AG 2	58,5	34,8	69,6	41,5	72,1	42,9	77,2	45,9	79,5	47,3
AG 3	11,1	6,6	12,0	7,2	21,0	12,5	17,8	10,6	23,2	13,8
AG4	48,1	28,6	61,1	36,4	60,1	35,8	67,8	40,4	65,1	38,8
AG5	23,4	13,9	11,5	6,9	8,1	4,8	2,8	1,7	0,2	0,1
Total	168,0	100,0	168,0	100,0	168,0	100,0	168,0	100,0	168,0	100,0

Also, the comparisons between averages of answer groups from whole sample group would give useful information to research. This is provided in Table 4. Column at far right is the difference between averages as an absolute value.

Table 3. Distribution of answers in different respondent groups from Pursoid data

	RG 1		RG 2		RG 3		RG 4		RG 5	
	Mean	%								
AG 1	26,0	15,3	10,4	6,1	6,0	3,5	4,2	2,5	1,0	0,6
AG 2	113,2	66,6	123,2	72,5	125,6	73,9	127,9	75,2	117,6	69,2
AG 3	14,7	8,7	14,9	8,7	18,8	11,0	16,2	9,6	24,8	14,6
AG4	14,2	8,3	20,5	12,1	19,4	11,4	21,5	12,6	26,4	15,6
AG5	1,9	1,1	1,0	0,6	0,3	0,2	0,2	0,1	0,2	0,1
Total	170,0	100,0	170,0	100,0	170,0	100,0	170,0	100,0	170,0	100,0

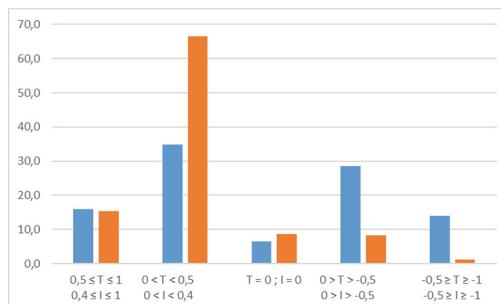
Table 4 reveals that there are no significant differences between answer groups 1 and 3. Largest differences are in answer groups 2 and 4. Also the significant difference is that in Pursoid there is a very limited number of answer group 5's answers. These differences can be explained by the difference how C&K and Pursoid tools are designed. The amount of statements of issues, which typically are lessened in development, is different in C&K from Pursoid.

Table 4. Averages of answer groups from whole sample group

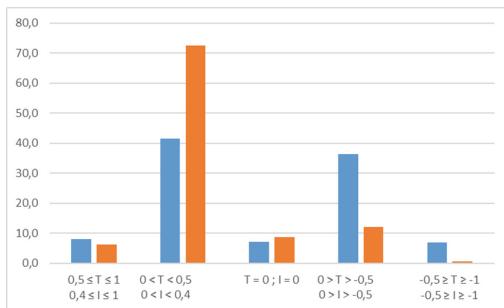
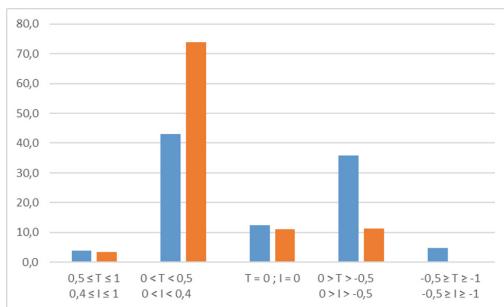
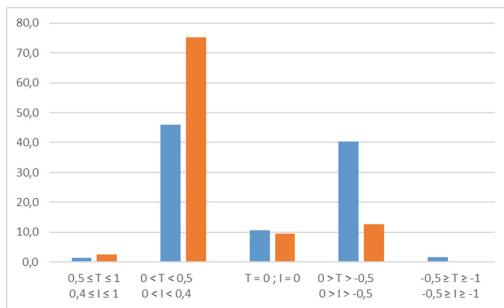
	C&K %	Pursoid %	$ \Delta $
AG 1	5,9	5,6	0,3
AG 2	42,48	71,48	29
AG 3	10,14	10,52	0,38
AG4	36	12	24
AG5	5,48	0,42	5,06
Total	100	100,0	

4.2 Comparison of Results

It also seems to be the trend in other respondent groups so that number respondents' answers are concentrating on same answer groups in both applications. Figures 3, 4, 5, 6 and 7 show the results of different respondents' how their answers are divided to different creative tension answer groups. Left pillar in all figures is showing the percentage of answers of creative tension in time management (the C&K application) and the right pillar is showing creative tension in innovativeness. The x-axis in figures Figs. 3, 4, 5, 6 and 7 is answer groups introduced in Table 1 and Y-axis is percentage compared to all answers.

**Fig. 3.** Division of answers in respondent group 1

As seen from the figures Figs. 3, 4, 5, 6 and 7 it is quite clear that creative tension between time management. In almost all cases, the answer distribution was similar between C&K data and Pursoid data. When analyzing the figures Figs. 3, 4, 5, 6 and 7 and Tables 2, 3 and 4 it is clearly seen that in every case and as whole the number of answers is behaving similarly between C&K and Pursoid data mass.

**Fig. 4.** Division of answers in respondent group 2**Fig. 5.** Division of answers in respondent group 3**Fig. 6.** Division of answers in respondent group 4

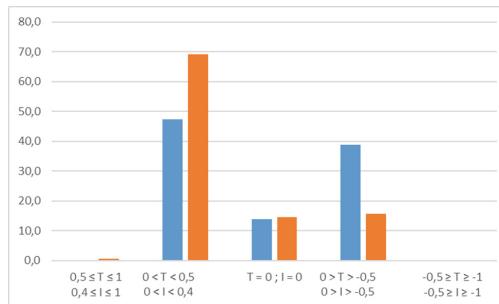


Fig. 7. Division of answers in respondent group 5

5 Conclusions

Time and innovativeness are not easy to master and but still are crucial for nowadays managers and workers. Both seem to be situational form their nature and quite clearly, there is some kind of connection between time and innovativeness in people's mind and feelings. As they, both need intentional development in order to proceed in way of mastery it seems that they cannot be separated in this development.

It seems that there is a lot of correlation between time and innovativeness. When respondents were grouped it revealed that the positive development needs in time management also was very directly showing that these same respondents also were in strong need of positive development needs for innovativeness. It was the same situation as well in case of negative development (lessening something) and in the case when no development need was found. This correlation was shown in all groups quite clearly. For these results, it can be assumed that this research proves that there is a correlation between time personality and innovativeness personality.

All graphs and comparisons are giving the same results. Respondents' development needs are behaving similarly in the holistic development of time and innovativeness management development. The correlation is clear, both research applications are done so that improbable correlations should be avoided, and respondents have answered to both tools in less than one-week time window i.e. they have had quite a similar situation in life. This gives us a result that Proposition 1 was correct: Persons have similar development needs in time management and innovativeness management.

Proposition 2 was also correct: People can be divided into different development personalities according to time management and innovativeness management. In this research, respondent groups are represented by respondent groups. Respondent group 1 can be named to "passionate developers". They have strong need to either add or lessen something in both time and innovativeness management and they feel it very strongly. Respondent groups 2 and 3 are very similar, and it is hard to find anything that differs them distinctively from each other. Therefore, this group could be merged and named to "developers". They have a need for development, but their passion is not as extreme as in the first group. Respondent groups 4 and 5 are very similar to each other also. As in case of groups 2 and 3, groups 4 and 5 cannot be divided very clearly from the results.

Therefore, these groups could also be merged and named to “no rush developers”. They also have some needs for development, but they have no extreme passion and their creative tensions are quite low in both directions. Therefore, we can conclude that there are at least three distinctive groups of development personalities when scrutinizing it from time and innovativeness management point-of-view.

In order to strengthen these main conclusions next research questions could be: Which statements are mostly correlating between Chronos, Kairos and Pursoid applications? Are these statements same with same respondent groups or do they differ? Which is leading which? Does enhanced time management skills automatically enhance innovativeness or vice versa? In order to find out more detailed information, to make more deep conclusions, more thorough statistical analysis should be made.

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Review of Industry 4.0 in the Light of Sociotechnical System Theory and Competence-Based View: A Future Research Agenda for the Evolute Approach

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Abstract. This paper reviews the concept of Industry 4.0 related challenges and basic requirements for successful implementation of it. It proposed that sociotechnical system theory (STS) and competence-based view (CBV) are best approaches towards implementation of industry 4.0 in the organizations. STS theory leads to such systems, which are more acceptable to end users and deliver better value. While competence-based view prepares those users to interact efficiently with new systems. To support competence-based view for industry 4.0 we argue that competence models of the Evolute approach need to be revised and updated, as well as, there is need for new competence models for emerging new job profiles. The combination of these three approaches will result into successful implementation of new industry 4.0 systems in the organizations.

Keywords: Industry 4.0 · Sociotechnical system · Theory · Evolute Competence-based view · Competence models · Digitalization IoT

1 Introduction

The digital revolution has been unfolding for decades and its impact on business and society has been visibly accelerating since the start of the new century. But from past one decade, the exponential evolution of modern technologies like Industrial Internet of Things (IIoT), cloud computing, advanced algorithms, artificial intelligence, hyper-connectivity, self-learning systems, automation, big data and analytics are leading us to ever smarter systems, machines, products and factories [1]. Based on this trend, the term “Industry 4.0” (also well-known as fourth industrial revolution) emerged, which refers to “the digitization/digitalization of the manufacturing sector, with implanted sensors in virtually all product components and manufacturing equipment, ubiquitous cyber-physical systems, and analysis of all related data [2]. Unlike past industrial revolutions, it is supported by a fusion of technologies, which is blurring the lines between the physical, digital, and biological spheres [3]. As per its current velocity of occurring, it is much more disruptive as compared to past technologies. On one hand, it will make firms much more efficient and productive with new technological capabilities and on the other hand, it will pose new challenges for organizations and people [1, 3].

It requires new skills, knowledge and competencies to manage these technologies as well as require more flexible working environment in the organizations [4].

The main objective of this paper is to discuss the Industry 4.0 with respect to its basic concepts, history, and challenges. We have chosen two approaches to discuss industry 4.0, which are sociotechnical system (STS) theory and competence-based view (CBV). The reason behind these choices is to approach industry 4.0 from social aspect. Sociotechnical system theory accounts for social factors while implementing new technologies [5–7]. It discusses changes in working practices and social issues during the design and implementation of new technologies. It considers both technical and social issues in quest of promoting change in the organizations [3, 8]. Moreover, we argue that competence-based view strengthens the social part of STS theory, especially in this fourth industrial age, where more flexible work environment is required in the organizations [9]. Finally, we discuss the Evolute system approach and Co-Evolute methodology to further support the social part of STS theory. Co-Evolute methodology helps organizations in analyzing and improving human resources and organizational processes by providing competence analysis [10–12]. Most of the Evolute tools were developed before the start of new industrial age, therefore, the last objective of this paper is to provide a future research agenda for Evolute approach.

2 Industry 4.0

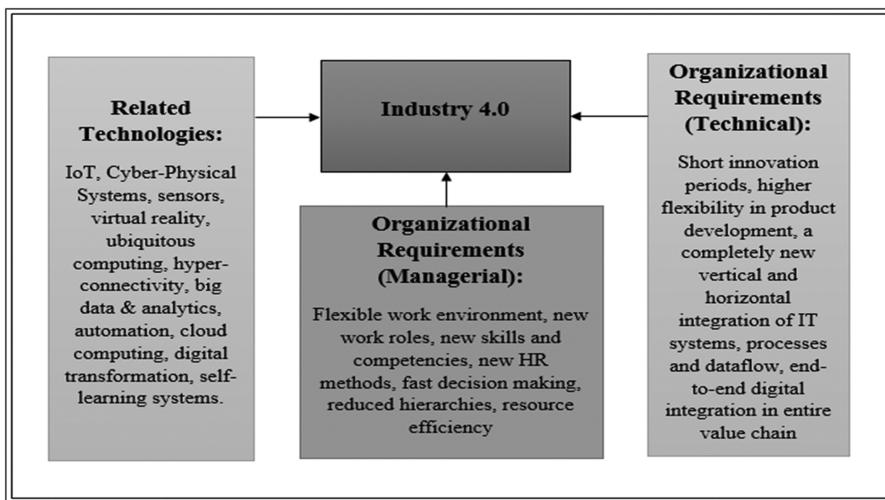
In recent years, Industry 4.0 has been introduced as a popular term to describe the trend towards digitization and automation of the manufacturing environment [9]. Nowadays, the visionary idea of Industry 4.0 or other synonyms like smart manufacturing, smart production or Industrial Internet of Things (IIoT), have been increasingly promoted by different actors to describe the trend towards digitization, automation and the increasing use of ICT in the manufacturing environment [13]. German government coined this term “Industry 4.0” to refer their initiative towards hi-tech strategy for 2020 [13]. It is also known as fourth industrial revolution, following the earlier three revolutions of mechanization (due to invention of steam engine), mass production (electricity energy replacing the steam engine) and automation/computerization/digitization (usage of information technology and electronics) [13]. The core idea of all these paradigms was to improve production operations to enhance organizational profitability. First industrial revolution improved productivity by introducing steam engines, second enabled mass production through usage of electricity energy, third enhanced the production efficiency by using IT and electronics [1], while this fourth industrial revolution is enabling organizations in mass customization by using advanced, smart and hyper-connected technologies [1]. In following, Table 1 summarizes all these four paradigms:

The fourth industrial revolution or Industry 4.0 is emerging due to exponential evolution of modern technologies, which includes Internet of Things (IoT), cloud computing, advanced algorithms, artificial intelligence, hyper-connectivity, self-learning systems, automation, big data and analytics [14, 15]. These disruptive technologies are the basic building blocks of this fourth industrial revolution [16, 17], while digitalization or digital transformation is basic requirement for organizations to advance in this fourth industrial age [13]. These technologies possess such capabilities that can

Table 1. Industrial revolutions [1, 13]

	1 st Revolution	2 nd Revolution	3 rd Revolution	4 th Revolution
Names	Mechanization	Mass production	Computerization automation	Robotization
Time period	Late 18 th to Early 19 th century	Late 19 th to Mid-20 th century	2 nd half of 20 th century	Early 21 st century
Mode of production	Steam engine and mechanical production	Electricity and division of labor	Electronics and information technology	ICT technologies
Production structure	Industrial cities	Industrial region	Global production networks	Global value chains

exponentially enhance the productivity of firms by offering new functionality, higher reliability, greater efficiency, and optimization possibilities that pose both opportunities and challenges for people and organizations [13]. In following, Fig. 1 [1, 13] provides an overall picture of industry 4.0 enabling technologies and organizational requirements in terms of technical and managerial issues for its successful implementation.

**Fig. 1.** Overview of industry 4.0

According to Lasi et al. [13], to comply with this fourth industrial age, organizations need to change themselves according to industry 4.0 requirements. It includes short development and innovation periods, a change from a seller's into a buyer's market viewpoint, higher flexibility in product development, decentralization to cope

with the specified conditions, faster decision-making measures, reduced organizational hierarchies and resource efficiency [9]. Explaining it further, Oesterreich et al. [9] argue that there will be wide spread of increasing mechanization, automation, digitalization, networking and miniaturization, which will enhance organizational manufacturing and operational capabilities. Lasi et al. [13] also explains key features required for the implementation of industry 4.0. It includes integration of IT systems, processes and data flows between different stakeholders like customers, suppliers and external partners (also known as horizontal integration), end-to-end digital integration of engineering through the entire value chain to enable highly customized products and integration of IT systems, processes and data flows within the company from product development to manufacturing, logistics and sales for cross functional collaboration (also known as vertical integration) [16, 18–20].

To implement industry 4.0 concept successfully in any organization, the system designers must consider both technical and social challenges. Most of the recent studies have focused on technical part of industry 4.0 [7, 19], which raises the need for managerial research in this field. Therefore, we have limited the scope of this paper to discuss only managerial aspects of industry 4.0. In next section, we discuss sociotechnical system theory for the implementation of industry 4.0.

3 Sociotechnical System Theory

Sociotechnical systems thinking emerged out of work steered at the UK Tavistock Institute into the introduction of coal mining machinery, which identified the interconnected nature of technological and social characteristics of the workplace [20, 21]. The introduction of new machinery into coalmines without analysis of the associated changes in working practices stressed the need for consideration of social issues during the design and implementation of new technologies [4]. The term sociotechnical system is applied to describe systems that involve a multifarious interaction between humans, machines and the environmental characteristics of organizational systems [20]. The STS theory considers both technical and social factors when seeking to promote change within an organization, whether it is related to the introduction of new technology or an organizational change program [4, 20]. Organizations are complex systems, which involve many interdependent factors. Therefore, to design change in one part of the system without considering how this can affect, or require change, in the other parts of the system will limit its effectiveness [5]. That is why, organizations need to adopt holistic approach when designing a new system in organization, especially, they must consider social and technical aspects of it to enhance its efficiency and effectiveness. There is wide recognition that considering the social and technical interactions has practical significance in organizational development predominantly when seeking to promote change [22], that makes STS theory a comprehensive and holistic approach for such purposes.

In the early stage of STS theory, it was used to analyze existing systems to reveal dysfunctions between what people in the social system were trying to accomplish and what the technical system aided [5]. Such analysis helped in improving effectiveness of sociotechnical systems. As per such systems cannot be designed without the

commitment of people, who will be users of it, so it led user-participative methods for new system designs [23]. Such objectives led to a series of methodological developments like HUFIT project, ORDIT project [5], ETHICS [5] and Multiview [5]. In past decade, STS theory is widely spread across many disciplines [24]. On one hand, this widespread shows the success of STS theory while on the other hand, it caused loss of conceptual foundations of it [5]. Looking at future challenges for STS theory, organizations and work environments are changing fast [3, 5]. The new technologies are much more disruptive as compare to past, which require exponential changes in all industrial areas [25]. So STS theory must consider such issues to contribute in the changing nature of work systems in future. [5] Table 2 summarizes the overview of STS theory in historical prospect.

Table 2. Overview of STS theory [5]

Overview of STS theory	
Early Mid 19 s	<ul style="list-style-type: none"> • Creation of STS Theory by Trist & Bamforth
Late 19 s	<ul style="list-style-type: none"> • Analysis of existing systems • User-participative methods for new systems design • Methodological developments • STS theory as design approach • Projects like HUSAT, ORDIT, ETHICS & Multiview
Present (21 st Century)	<ul style="list-style-type: none"> • Wide spread of STS in many disciplines like Ergonomics, Psychology, Human-Computer Interaction, Sociology, Management and Organizational Theory • Due to this widespread, STS theory is losing its roots in terms of its basics principles and conceptual foundations
Future (New industrial age)	<p>STS should address:</p> <ul style="list-style-type: none"> • Changing characteristics of organizations, growing use of IT, network of suppliers rather simple work processes, development of work systems which is now extended across a number of organizations • Trans-organizational work systems • Emerging forms of new technologies e.g. social media services

If we look at each industrial revolution as described in Table 1, each paradigm has its own new technology, which steered new ways of working and interaction between technology and humans [24]. The classic “factory system of manufacturing” was introduced during first industrial paradigm, second industrial revolution brought division of labor and third revolution transferred the responsibilities of manual worker to one of control worker [25]. Similarly, this fourth-industrial revolution is also introducing new ways of work e.g. decoupling of work and place, decoupling of work and employment and decoupling of work and time, which is leading towards flexible work environment and requires new skills and competencies [26]. It is very clear that stakeholders at all levels will need to change their approach towards how they work, but at the moment, new research is very essential to understand the full sociotechnical

impact of fourth industrial revolution on how people can work effectively and what competencies they require in this digital environment [26, 27]. In the next section, we discuss the competence-based view to discuss industry 4.0.

4 Competence Based View

Due to ever-changing advanced technologies, organizations are facing turbulent and changing environment, which raises the need for flexibility in work organization and job design to stay competitive [26, 27]. In human resource management, it has replaced the traditional job based approach with competency-based systems [26]. According to Campion et al. [28], in competency based approach, organizations aim to identify the competencies that are critical to job performance, and allocate tasks to employees based on the competencies they have, rather than on the position they hold in the organization (as is the case for traditional HRM systems). Therefore, competence based HRM focuses on employee's competencies instead of job and its requirements [29, 30]. It allows more flexible organization of work than the traditional job based approach [26, 28]. According to the resource-based view, competency management is an important tool for maintaining organizational competitiveness [31]. By defining those competencies that are needed to successfully implement the organizational strategy, organizations create resources that, in turn, contribute to sustained competitive advantage [32].

To cope with challenges related to industry 4.0, organizations need to adopt competence-based view, which will help organizations to identify critical competencies to develop their workforce to meet present and future market needs [31]. Competencies can be defined as “an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or a situation” [32]. These competencies can be categorized in four main classes. Firstly, technical competencies comprise all job-related knowledge and skills. Secondly, methodological competencies include all skills and abilities for general problem solving and decision-making. Thirdly, social competencies encompass all skills and abilities as well as the attitude to cooperate and communicate with others. Finally, personal competencies include an individual’s social values, motivations, and attitudes [33].

Figure 2 provides overview of how competence-based view can contribute towards development of new competence models for emerging new work roles and new job profiles. It also shows the role of Evolute system approach, i.e. based on competence-based view; we can develop new competence models in Evolute system, which will help in successful implementation of Industry 4.0.

A very critical step for competency identification & development is to identify that what kind of new work roles of existing jobs are emerging due to industry 4.0. For example, new work roles of system designers, who are designing new industry 4.0 systems for the organizations, new work roles of HR managers, who now have to deal with big data and analytics for different HR practices and so on [1]. Similarly, new job profiles are also emerging in the organizations, which require different and higher levels of competencies [11, 12], e.g. data scientists and electro-mechanical engineers [10–12]. Therefore, to address the challenges related to competency development of

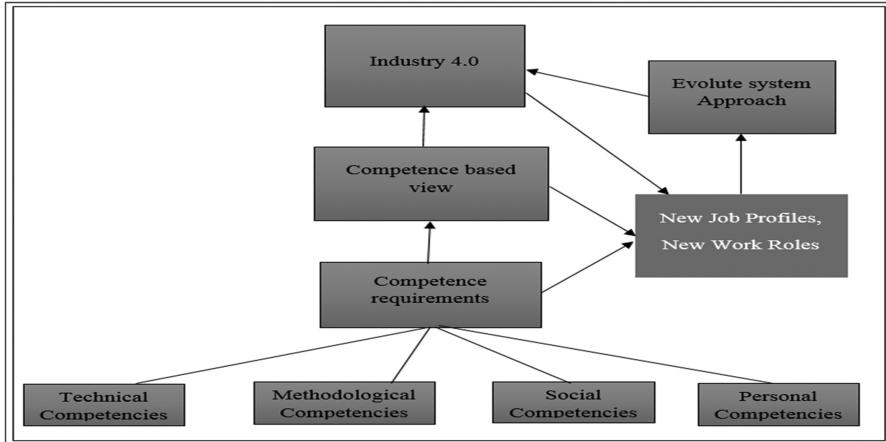


Fig. 2. Research framework from CBV prospect

these new work roles and new job profiles, organizations need to use competence models like Evolute system approach. In next section, we discuss Evolute approach and future research agenda for it.

5 Evolute Approach

The Evolute approach can be proved as very important competence model tool, which will not only help organizations in competency development of employees but also in developing/analyzing different processes. Previously, it has been used for competency identification, competency development and talent identification [12]. It is based on the emerging co-Evolute methodology and brain-based metaphors, which enable one to visualize in the form of different graphs and examine the current reality and personal vision of individuals/employees and business processes [10, 12]. The idea of co-Evolute methodology is based on the concept that organizations aim to support employees' personal growth, vision and development in order to improve their own core competencies [10]. This strategy helps both organization and employees, in evolution towards excellence that is why, it is called co-Evolute system or co-evolutionary methodology [10].

The Evolute system is a platform that supports building and using co-evolutionary applications [10]. It utilizes fuzzy logic to capture the subjective, abstract and vague nature of individual's current occupational competencies [34]. Fuzzy logic also facilitates approximate reasoning for analyzing and modelling different levels of creative tension according to the occupational competencies and based on individuals' perception of their current reality and vision [34]. According to Senge [34], creative tension is the difference between personal vision and current reality. It motivates individuals and organizations to develop their-selves to achieve their future vision. Currently, the Evolute system consist of thirty-seven tools, which are designed for

different work roles, cultures and processes. For example, tool Astroid is designed to analyze the competencies of sales personnel, Bicorn and Serpentine for safety culture, Cochleoid for competencies of buyers, Conchoid for competencies of maintenance personnel, Cycloid for competencies of project managers and so on [35].

In this new industrial age, Evolute system can play a vital role in competency identification and development for emerging new work roles and job profiles. Most of the existing competence models in the Evolute system were developed in the first decade of current century. A lot has been changed since the introduction of Industry 4.0 era, which raises the need of reviewing and updating the existing competence models of Evolute system as well as developing the new competence models. We propose following research agenda for Evolute system approach to support the Industry 4.0:

- Comprehensive review of existing competence models and update them according to need of industry 4.0.
- Identification of new work roles of existing job profiles and update the related competence models of Evolute system accordingly e.g. Tool CYCLOID evaluates project managers, which was developed in 2006 [36]. There has been many changes in the field of project management e.g. more usage of project management tool box (digital tools) [37], which raises the need of competency upgradation of project managers [16, 17]. So such updates are required to enhance the effectiveness of such tools.
- Identification of new job profiles and competence model development for them, for example, competence model for system engineers need to be developed in the Evolute system as system engineers are the one, who develop industry 4.0 related systems for organizations. Similarly, new job profiles which are driving this revolution are technical experts (control engineers, computer scientists), data analysts (creating business intelligence from integrating the large data sets) and knowledge workers [21], which raises the need of competence model development for it.
- Identification of new cultures of organizations and development of competence models for it e.g. there is need of “digital culture” application in Evolute system as its one of the fastest emerging culture in the organizations due to digitalization phenomenon, which is leading towards industry 4.0.

6 Discussion

In this study, firstly, we examined the concept of Industry 4.0 with respect to its definition, related technologies and current challenges. We found that new technologies of this industrial age are much more disruptive as compare to past three industrial revolutions, which can exponentially enhance the productivity of firms by offering new functionality, higher reliability, greater efficiency, and optimization possibilities that pose both opportunities and challenges for people and organizations [3]. It raises the need of big organizational change in all aspects i.e. organizational structures, culture, horizontal and vertical integration, organizational and personnel competences, management styles, human resource practices and so on. We limited the scope of this study by focusing only on social and managerial aspects of industry 4.0.

Secondly, we reviewed sociotechnical system theory in historical aspect. We summarized past work on STS theory, current status of it and future issues that STS theory should address. Based on this review, we highlighted the need of understanding sociotechnical impact of industry 4.0 in the organizations. We conclude that, organizations must consider sociotechnical impact of new technological systems in their organizations as it is widely acknowledged that adopting a sociotechnical approach to system development leads to systems that are more acceptable to end users and deliver better value to stakeholders [1, 13].

Thirdly, we argue that, personnel competencies are the most critical success factor to implement and operate the industry 4.0 systems in the organization, whether it's, technical requirements, managerial issues, or other challenges related to it, organizations must need specific competencies in their experts/human capital, who are dealing with these issues. To meet those competency requirements, this research paper proposes that organizations need to adopt competence-based view to analyze their human capital strengths/weaknesses and to develop them accordingly.

Lastly, we argue that, for the purpose of competency analysis and personnel competency development, organizations can use Evolute system approach, which provides different competence models for such purposes. As Industry 4.0 is relatively new phenomenon, therefore, Evolute approach should review its existing competence models in the light of fourth-industrial age's requirements and develop new competence models for experts such as system engineers, technical experts, data analysts and other emerging job profiles.

7 Conclusion

The present study provides a significant contribution to the literature of industry 4.0, STS theory, CBV and Evolute approach. It offers useful insights for organizations that they must consider social factors and competency requirements for designing, implementing and maintaining Industry 4.0 systems. The research model (Fig. 2) that we have presented can be an important stepping-stone for the HR & Evolute scholars/practitioners for the contribution towards competency development according to the needs of industry 4.0. Moreover, the study reported in this article was the first to explore future research agenda for Evolute approach to enhance the organizational compatibility with industry 4.0 through personnel development. We hope that this study will inspire further theory building and future research on how organizations can manage their industry 4.0 systems in terms of social factors (through STS theory), competence development (through CBV) and competence model development (through Evolute system).

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Economic Development of Kenya, Tourism Industry Impact

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Abstract. Tourism in general is a hugely important source of export earnings (it is treated as a service export, even though it is consumed in the country in which it is provided) and a dynamic sector of the world economy. Earnings from tourism (receipts) reached \$852 billion even in recession battered 2009 (World Bank). Between 2000 and 2015, the number of international tourists grew from 675 million to 1.2 billion (World Bank). Growth was led by tourist arrivals in developing and emerging economies, which far outpaced growth in tourism to advanced economies, although the latter still lead in absolute numbers. It is, therefore, no mystery why the main focus with regard to economic development of Kenya - classified as developing country, was put on the tourism industry, the merits of which are essentially in terms of increased foreign exchange receipts, balance of payments, government revenues, employment, and increased economic activity in general.

1 Introduction

A country in sub – Saharan Africa, famous for its unique indigenous culture, nature – based attractions, beautiful landscapes and pleasant weather conditions, is the iconic home of safari, immortalized by legendary personalities such as Ernest Hemingway and Karen Blixen. At first glance, the country is primitively associated with being popular destination in major tourist generating countries such as Europe and North America. It also enjoys a reputation as an exporter of intensive flavored, aromatic and one of the most sought – after coffee in the world. However, taking a closer look on Kenya's economic affairs, one can see that this is the largest economy in Eastern Africa and one of the ten most competitive ones in sub – Saharan Africa (Gavan 2014). What is the recipe of the success for this developing country? According to Kenya's Independent Travel Guide, even though the country was built on agriculture, today one of the largest parts of the Kenya economy is tourism market.

2 Review of Literature on Economic Development of Kenya

The economic development of Kenya is an issue, raised by many scholars and economists. Among them, the names of the below mentioned should be distinguished. Diis, tested modernization theory¹ in Kenya's economic development. He concluded that the country adopted modernization initiatives for development such as democracy, the decentralization of the government, Constituency Development Fund and development of vision 2030 - national long-term development policy that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. It was proved by the author that Kenya did devise development goals properly, however their implementation is the major problem, which includes corruption, economic inequality and security. Moreover, the country should seek advice and assistance from the international community in order to develop strategies and mechanism that causes the implementation of these policies (Diis 2016) Due to the fact, that after independence Kenya has been constantly opening itself for the international cooperation, it is important to understand whether or not this activity contributes to economic prosperity of the country. With this in mind, the work of Kiganda, Obange and Mukras served as a relevant research element. To explain that trade openness does promotes economic growth in the case of Kenya, the researchers modeled their study on Adam Smith's absolute advantage theory. The results indicated significant positive effect and unidirectional causality between trade openness and economic growth in Kenya, with coefficient of 0,98 implying that 1% increase in trade openness increases economic growth by 0,98% respectively. The study concluded that in the long run trade openness promotes growth in Kenya. In view of this, the study recommends that the government of Kenya continues, pursuing trade openness policies to increase trade volumes to enhance economic growth (Kiganda, Obange & Mukras, p. 121) Another key element in Kenya's economic development is, by all means, the security sector. Regionally, the country is surrounded by a host of violent conflicts witnessed in Sudan, in the North and Great Lakes region to the West and Somalia to the East. While internally, Kenya continues to grapple with peace and security challenges that hinder economic development and growth, and disproportionately affect areas that are already poor and marginalized. The key challenges are: violent, extremism (terrorism and radicalisation), conflicts over natural resources (over extractives and land); and political conflicts (elections, ethnicity and devolution) affecting integration of cultures and communities. Provided that, Kenya faces a number of security challenges both internally and externally, the study of Moitui examined the relationship between Security Sector Reform (SSR), and human development and economic growth in Kenya. Whereas, SSR is in this context taken as the enhancement of the effectiveness and accountability. During this process pre-modern or traditional societies evolve into the contemporary Western societies that we

¹ Social scientists, primarily of white European descent, formulated modernization theory during the mid-twentieth century. Reflecting on a few hundred years of history in North America and Western Europe, and taking a positive view of the changes observed during that time, they developed a theory that explains that modernization is a process that involves industrialization, urbanization, rationalization, bureaucracy, mass consumption, and the adoption of democracy.

know today. (Crossman 2018) <https://www.thoughtco.com/modernization-theory-3026419> of the security sector in the execution of its mandate both of to the state and its people. This represents a remarkable break from the tradition, where SSR is usually tackled in the political realms, especially as a key human right issue. By showing that a link exists between SSR and macroeconomic conditions of a country as well as the general wellness of the citizens, the study illuminates SSR as a major factor in socioeconomic well-being of a country. Basing on the chi - square statistical test of association, the study demonstrates that Kenya had experienced positive economic growth attributable to the enactment of the Security Sector Reform. The findings of the study point to a situation where In 1960 Kenya's European population represented lesse leadership of a country ought to factor in SSR in the socioeconomic architecture of a country and just as a governance issue (Moitui 2017).

3 Review of Relevant Theories of Development

So far, Valle and Yobesia investigated the economic contribution of tourism in Kenya, using Social Accounting Matrix (SAM) model. Their results indicate that the private services sector in general and tourism in particular is an important economic activity with potential to play an even bigger role in spurring output, incomes, and creating employment. In the course of the research, 6 they point out that as in many other developing countries, tourism is one of the key drivers of Kenya's socio - economic development. The enhancement of the tourism sector's backward linkages with the extractive sectors, equipping manpower with skills required for better employment positions, increasing the share of local ownership in the service sector, and the diversification of tourism attractions would be helpful policies to leverage tourism's potential. (Valle and Yobesia 2009) In turn, Njoya and Seetaram examined whether the tourism development can be the engine for poverty reduction in Kenya. In order to do so, they applied a dynamic, microsimulation computable general equilibrium model, finding out that tourism has effect on poverty gap and poverty severity significant for both rural and urban areas with higher impact in the urban areas. Explicitly, tourism expansion enables poorer households to move closer to the poverty line. However, one of the main policy implications that emerge from these findings is that tourism development strategies need to give due consideration to agricultural production. Results indicate that there is a significant pull of labor from agriculture to sectors with higher linkages to the tourism industry. Fostering collaborations and reducing competition between the two sectors has the potential of benefitting both. Tourism can stimulate the development of new agriculture based services, such as tours of agricultural production and processing facilities. Strengthening linkages between the agricultural sector and the tourism sector, may dissipate the negative impact on the agricultural sector (Njoya and Seetaram 2017). New synergies between these two competing sectors can take the form of favoring locally sourcing of food needed from an increasing demand in the tourism sectors, over import as suggested by Belisle. This will create opportunities in the agricultural sector through the expansion of its market. While reducing the leakage rate from the tourism sector (Belisle 1983 as cited in Njoya and Seetaram 2017). A great contribution to existing works, with regard to tourism

impact on economic development in Kenya, belongs to Akama, who despite of prevailing postulates of tourism impact on economy, performed critical evaluation of it. Particularly, he provided the analysis of concerning existing structural deficiencies and socioeconomic factors which impact on the efficacy of tourism as a tool for long-term sustainable development in Kenya. According to his findings, main objectives of the new tourism strategy should include: enhancement of equitable distribution of the tourism revenues; increasing local participation in tourism decision making; reduction of the high leakage rates; increasing the multiplier effects of tourism; and minimisation of the social and environmental impacts of tourism (Akama 2000). Review of the relevant theories makes it obvious, that for Kenya's economic development, tourism does matter. With this in mind, we would like to pursue the subject by admitting the potential of diaspora tourism in Kenya, which cannot be easily disaggregated from other forms of tourism, but it is worth thinking about its distinctive features and its potential values. It should be mentioned, that subject has been already looked into by Newland and Taylor, who highlighted the role diaspora communities can play in making the tourism increasingly attractive and 7 effective avenue for development efforts. However, there is still a gap in the research when it comes to Kenya. According to International Diaspora Engagement Alliance, tourism comes in many forms, including family visits, heritage or "roots" tourism to medical tourism, business travel, and "birthright" tours. But regardless of the purpose of their travels, diaspora members are generally more likely to infuse money into the local economy when traveling to their country of heritage than most international tourists. Recent emigrants are familiar with the culture and may not need international agents to charge them higher rates in order to feel comfortable and at home. As a result, diaspora tourists are less likely to limit themselves to foreign-owned tourist enclaves that import their supplies and export their profits. Generally, diaspora tourists are more willing to stay in locally owned or smaller accommodations (including with friends and relatives), eat in local restaurants, and buy locally produced goods than other international travelers. Diasporas can help open markets for new tourist destinations in their countries of heritage. As diaspora tourists travel to less-visited regions to see friends and family or participate in various cultural events they will promote the creation of new restaurants, attractions, and general services for tourists outside of the major cities. The pioneering tourists themselves might choose to invest in businesses in the region after making connections on their visits. They will likely influence others to visit through word of mouth and may become involved with local community projects. Newland and Taylor put forward six different ways that governments and NGOs can promote diaspora tourism, including:

1. Creating programs dedicated specifically to diaspora tourism
2. Offering educational and cultural exchange programs
3. Subsidizing heritage and sporting events
4. Developing a strong internet presence
5. Making entries into countries of origin easier and less expensive In view of that, further research should be explicitly devoted to the aspect of diaspora tourism development in Kenya.

4 Overview of Economic History

In order to outline the evolution of Kenyan economy, the studies of Nulty, Ochieng, Kreinberg, Sen and Cira were addressed. This is due to the fact, that their papers explored policy decisions spanning from independence in 1964 to the present day that have dictated the development experience of Kenya. While the development experiences of each country is uniquely dictated by available natural resources, political relations, and social issues, organizations like the World Bank and the International Monetary Fund have made equal access a more vivid reality for many countries.⁸ The development experience of Kenya – its achievements and hindrances – has been the product of lingering colonial policies, domestic growth initiatives and international investment. Historians, as Ochieng argue, that even though Kenya gained independence, it didn't do much to break away from colonial policies. Instead it was classified as neo - colonial, while employing dominant number of European personnel in the political and commercial sector² (Ochieng 1992 as cited in Nulty 2012). This is in turn, led to growing competition between Kenyans and both white settlers and their fellow Africans, followed by further tribalization of the nation. Another feature of Kenyan economy after independence was development of foreign relations with the west, India and China - driven by foreign aid, the opportunity for overseas markets and tourism opportunities. Whereas, Kenyan leadership opted not to privatize any standing industries, providing the opportunity for foreign investment, essentially followed by foreign control of the economy. Summarizing, Kenya's development initiatives mirrored the plans instituted in other developing nations; vast amounts of foreign capital, supremacy of agriculture, restricted development of industry along with a grave dependence on the exportation of primary products and the importation of capital and consumer manufactured goods (Nulty 2012) While the Kenyan government continued to invite and encourage foreign investment, they simultaneously endeavored to enhance the vitality of Kenyan-based firms. As a part of an "Africanization" policy, the Trade Licensing Act of 1967 prevent noncitizens from trading a specified list of products in all non-urban areas and in 1970 this policy was extended to include the trading of commodities as well. Once again, in 1975, the act was amended to require all manufactured goods produced by foreign-based firms to be distributed exclusively by the Kenya National Trading Corporation, placing exclusive control in the hands of Kenyans. In a further venture to better the economic prowess of Kenyans, the government created programs to extend credit to citizens. Initiatives were organized through the Agriculture Finance Corporation, the Kenya National Trading Corporation, the National Housing Corporation and the Commercial Development Corporation to support small business projects and to buy and overhaul hefty farms (Ochieng 1992). Economist Amartya Sen, in his essay "The Ends and Means of Development", argues that there are five instrumental freedoms that must be achieved before a country can be considered developed. Sen's instrumental freedoms include: political freedoms, economic facilities, social opportunities, transparency guarantees and protective security.

² In 1960 Kenya's European population represented less than 1% of the populous, however they managed to account for 40% of the wage-bill (Nulty, 2012).

Barring economic facilities for the moment, he is essentially suggesting that a country's citizens must have the right to vote, the protection of civil liberties, a right to education, available healthcare, legitimate elections, government's devoid of corruption and legitimate police forces (Sen 1999). Similar to Amartya Sen's idea of instrumental freedoms is the globally enacted Basic Human Needs [BHN] approach used to prioritize investments in human-interest initiatives; with the success of the initiatives ensuring a country's economic progress. Operating within this approach, the Kenyan government prioritized human environment concerns in the late 1990s that were potentially prohibiting development and came up with issues surrounding water, sanitation, air pollution and land degradation. It also put an emphasis on the education and healthcare. Current situation: a diagnosis, relating to theoretical part.

Having shed light on the most relevant aspects of Kenya's economic history with regard to economic development, we would like to pursue the topic by presenting the current state of country's economy in figures.

Starting from GDP, it's value achieved 70 529 014 778 of current US dollars in 2016 (World Bank). The annual growth of GDP presents the positive dynamics of this indicator. Explicitly, in 2008 it equaled 0.2%, particularly shocking value comparing to 6.9% in 2007 (World Bank). Obviously, the significant decline was the consequence of the financial crisis in 2007–2008. However, in the years to follow, the indicator was growing steadily to achieve 5.8% in 2016, which is a robust progress due to the fact, that in the two biggest economies of Africa – South.

Africa and Nigeria (Africa Ranking 2017), GDP growth was recorded at 0.3% and -1.5% respectively (World Bank).

When it comes to GDP per capita - ultimate indicator of country's economic development, it's value was 1455, 4 of current US dollars, obviously lower than Nigeria's and South Africa's -2178 and 5273, 6 US dollars accordingly. In turn, the annual growth of the indicator showed a positive trend after the crisis in 2009, achieving the value of 3.2% in 2016. Again, it illustrated remarkable development, comparing to Nigeria and South Africa with the growth at level -4.1% and -1.3% in the order given (World Bank).

Moving forward with analysis of relevant macroeconomic indicators, which describe current state of the economy, the inflation, interest and exchange rates should be looked into as well. According to Kenya National Bureau of Statistics, the inflation was reduced to 5.3% in April 2016 from 7.1% in April 2015 due to lower food prices and reduced motoring expenses caused by low fuel prices (Kenya National Bureau of Statistics, as cited in Kenya Economic Outlook 2016). Furthermore, The Economist Intelligence Unit forecasts inflation to average 5.1% between 2017 and 2020 due to a prudent monetary policy and efficiency gains arising from regulatory reform and investment in infrastructure. The EIU notes that drought remains a potential risk to inflation and demand pressures will prevent a rapid decline in inflation (The Economist Intelligence Unit, as cited in Kenya Economic Outlook 2016).

When it comes to interest rate in Kenya, Central Bank of Kenya summarizes, that lending rates in Kenya increased from 15.5% in February 2015 to 17.9% in February 2016 while deposit rates increased from 6.7% to 7.5% in the same period perhaps due to a move by Kenyan banks to maintain their interest spreads following the increase in the base lending rate by CBK by 300 basis points to 11.5% in July 2015 (Central Bank of Kenya, as cited in Kenya Economic Outlook).

The World Bank attributes the high interest spreads in Kenya due to lack of competitiveness in the banking sector and the high cost of financial intermediation. The World Bank notes that large banks in Kenya have the power to maintain wide interest spreads at the expense of borrowers and depositors. Regarding the exchange rates, the Kenyan shilling (KES) depreciated by 8% against the USD, by 4% against the British pound (GBP) and by 14% against the Euro (EUR) between April 2015 and April 2016 according to the KNBS (International Monetary Fund, as cited in Kenya Economic Outlook 2016). The International Monetary Fund (IMF) attributes the weakening of the KES to reduction in foreign currency denominated capital inflows, declining of tourism receipts and interventions by the CBK to smooth the foreign exchange market. Despite the KES depreciation, the EIU notes that KES is resilient compared to other emerging market currencies due to the country's stringent monetary tightening and also due to the country's low level of dependence on hydrocarbons and minerals exports (Economist Intelligence Unit, as cited in Kenya Economic Outlook 2016).

As an illustration of current sectoral perspectives in Kenya, the below distribution of them will be presented in a graph (Fig. 1) (Table 1).

Main sectors of Kenyan economy in 2016

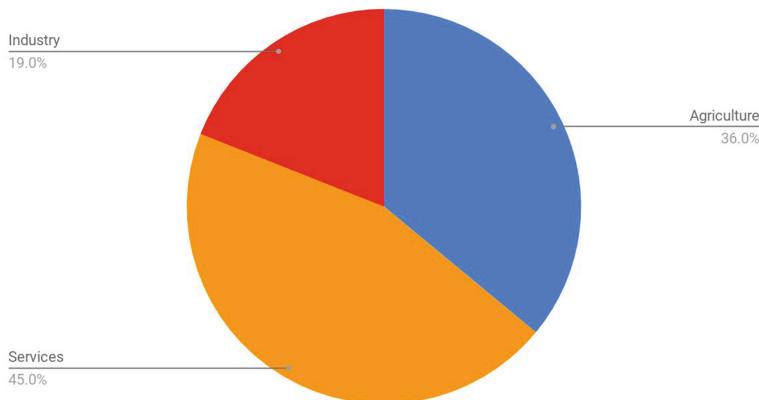


Fig. 1. Distribution of main sectors of Kenyan economy in 2016.

Table 1. Sectoral perspectives of Kenyan economy.

Industry	Characteristic
Construction and infrastructure	Continued development of infrastructure at a rapid rate, largely due to implementation of Vision 2030 projects. A key factor to the immense improvements in Kenya's construction business is the involvement of Chinese workers, which, in spite of caused tension in local community, seem to be relentlessly efficient
Youth empowerment	The Government revamped the National Youth Service (NYS) as a vehicle for recruiting young men and women to the national service. The programme is essential in preparing the youth for the job market and other income generating activities. The Government has allocated KES 21.2 billion towards Gender and Youth Empowerment Programmes through NYS. Small and Micro Enterprises (SMEs) are a key source of employment
Devolution	The National Government has supported devolution as stipulated in the Constitution and the Public Finance Management (PFM) Act 2012 since FY2013/14. Parliament has approved allocations to County Governments amounting to KES 280.3 billion as the equitable share of revenue raised nationally
Education	Kenya is showing a strong commitment to strengthen its education. The Government spent a total of KES 324 billion in the fiscal year 2015/16 compared to the KES 308 billion in the fiscal year 2014/15 according to the National Treasury. Kenya has 49 universities, which range from public to private. Most students that were educated in public secondary schools end up at public universities. Those that study at private schools end up at private institutions, or as is recently the trend, study abroad
Energy and Resource	Kenya's Government has set forth its Vision 2030 program that aims to turn Kenya into a "newly industrialised, middle-income" country. The energy sector has been recognised as one of the three major pillars that must be improved on to help reach this goal
Information and Communication Technology	Kenya has seen tangible growth in the ICT sector. Key indicators of this as reported by the Communications Authority of Kenya (CAK) are that mobile phone subscription penetration has risen from 79% in FY 2014/15 to 86% in FY 2013/14 while internet subscriptions have risen from 14 million in FY 2013/14 to 24.9 million in FY 2014/15, while data speeds rose by over 67% in the period. Kenya is well-known around the world for being a pioneer in the field of mobile money, aka M-Pesa, and has continued to show growth in this field, while constantly improving technology and increasing access, with a 2.8% increase in

(continued)

Table 1. (*continued*)

Industry	Characteristic
	mobile banking. There was also a 25% increase in internet connectivity within the country over the last 3 years, with fiber optics accounting for close to 97% of all ground internet connections. This has boosted Kenya's connectivity within itself, and to the rest of the world
Agriculture	The agriculture industry in Kenya is by far its most prominent, important and dominant industry. As of 2015, the industry accounts for over 25% of the country's GDP, 20% of employment, 75% of the labour force, and over 50% of revenue from exports
Manufacturing	While Kenya is the most industrially developed country in the East Africa region, manufacturing only accounts for 14% of GDP, according to the World Bank. This can be put down to the fact that most of Kenya's exports such as tea and coffee require little or no processing
Transport and Logistics	The World Bank has called Kenya "a country of contrasts" when it comes to logistics and transport. The public-sector side is lagging behind, with no form of Government provided public transport within cities, and many other public commodities sub-par. The private sector, on the other hand, is thriving, well-organised, and competitive. The public sector's performance could however improve especially since the Government has allocated a total of KES 117.6 billion for air and sea transport reforms and KES 30 billion for low volume seal roads
Tourism	Inflows from the Tourism sector decreased to KES 84.6 billion in 2015 from KES 87.1 billion in 2014. International visitor arrivals declined by 12.6% to 1.1 million in 2015. The Government is constantly working on reviving the sector. In particular, it asserted its commitment to improving security in the country, and to strengthening tourist experience by packaging tourism sector incentives and revamping the tourism communication strategy

Note. Data, included in the table retrieved from: <https://www2.deloitte.com/content/dam/Deloitte/ke/Documents/tax/Economic%20Outlook%202016%20KE.pdf>

5 Conclusions

Even though, Kenya's economy was built on agriculture - contributing in 36% to country's GDP (World Bank), tourism represents a cheaper alternative for the diversification of the economy, particularly considering the country's competitive advantage in terms of environmental attraction suitable for nature tourism together with an abundance of labor. Furthermore, at independence in 1963, Kenya depended mainly on its exports of agricultural products such as coffee and tea for foreign exchange.

However, with the decline in world market prices of these primary products, the country has turned to tourism as an alternative. The tourism currently contributes to 10% of Kenya's GDP, which is significantly lower than 13.6% in 2006 (World Bank). The decline was attributed to security issues and negative publicity occasioned by restrictive travel advisories in Kenya's key source markets (World Travel & Tourism Council). In view of that, Kenya should elaborate on the relevant patterns of sector's development, primarily through potentially beneficial diaspora tourism. Notably, it will contribute to country's economic development through employment of local workers and the multiplier effects that their earnings generate in their communities; foreign exchange earnings to support the national balance of payments; and a reinforced relationship with members of the diaspora, including – importantly – the second and subsequent generations. Summarizing the economic development of Kenya in general, it should be stated that it's limitations and progress stands at crossroads. Foreign investment and trade policies have provided windows of opportunity which foreign countries and corporations alike have used to unduly influence Kenyan politics and repatriate large sums of money. While these investments and corporate presence have provided job opportunities, one really wonders whether the value of 15 tax incentives is consistently equal to the economic growth provided to the economy. Furthermore, policies that focus on growth as opposed to development have done little to aid Kenya's development initiatives; they only serve to bring short-term profits and not long-term sustainability.

The remnants of colonial policy, maintained by the post-independence government did little to change the limiting and profit-based systems the British had instated during their occupation. The decision to maintain the status quo was certainly a debilitating factor of development, especially considering the government struggled to appropriately fill jobs vacated by Europeans all the while maintaining the standing system. Beyond issues surrounding foreign investment and trade, is the idea that social development stands as the gate between Kenya and economic development. Issues of social development have seemingly been swept to the side, and left to the devices of Non-Governmental Organizations, to allow politicians to discuss issues, which satisfy the needs of their influential constituents and not the common Kenyan. An overhaul of social structures needs to be implemented in tandem with a modification of foreign trade and investment policies. While it is impossible to alter previous policies and permanently erase their effects, Kenya is still a young country that has the capability of redefining itself generation by generation to better serve the needs of its evolving population.

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The Role of the Startup Competition and Entrepreneurial Ecosystem in the Integration of Entrepreneurship Education Within the Algerian Universities

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Abstract. The integration of entrepreneurship education has changed the role of the university by creating a bridge between university and industry. The public university is facing now the internationalization environment, especially with the privatization of the higher education sector. Moreover, enhancing innovation and the entrepreneurial culture became the barrier entry for this public university. Unfortunately, this academic organization has to face new challenge instead to develop their position. The entrepreneurial ecosystem is a great opportunity to adopt a competitive behavior in the regional, national and international innovation system. In addressing this research gap, this paper provides a case study of Algerian public universities. The authors use a qualitative interview with facilitators implicated in the entrepreneurial ecosystem. Those had organized and animated the startup competition within the Algerian universities. Thus, the paper offers insights into how the university enables actors to address the challenge of internal factors and external factors to use the best pedagogical practices in teaching entrepreneurship and enhancing innovation culture.

Keywords: Algerian university · Entrepreneurship education
Startup competition · Entrepreneurial ecosystem · Innovation culture

1 Introduction

The Algerian higher education system had introduced since 2004 new reforms [1]. These reforms included a different area in the modernization of education and training systems. Firstly, it aimed to achieve the adoption of the three-cycle system (Bachelor Master Doctorate). Secondly, it tried to achieve the adaptation of curriculum program to the market need and the introduction of Quality Assurance. Thirdly, these reforms had enhanced the employability, personal and professional development of graduates

throughout their careers by improving cooperation between employers, students and higher education institutions.

However, the Algerian Minister of higher education considers that these reforms could be achieved mainly through the development of programs and the insertion of internal structure that help increase innovation, entrepreneurial skills and research of graduates. These reforms give to the Algerian universities the opportunity to explore and develop their role in the national innovation system [2].

However, the higher education system is facing now new problems in the achievement of all these reforms. In this context, the government creates new structure dedicated to the promotion of innovation and entrepreneurial spirit within the Algerian universities. These institutional implications push the university to invest in the field of entrepreneurship education and the commercialization of their innovation.

Our contribution aims to illustrate the role of the Startup competition and entrepreneurial ecosystem in the integration of entrepreneurship education within the Algerian universities. This paper offers insights into how the university enables actors to address the challenge of internal factors and external factors to use the best pedagogical practices in teaching entrepreneurship and enhancing innovation culture. The authors use a qualitative interview with facilitators implicated in the entrepreneurial ecosystem. Those had organized and animated the startup competition within the Algerian universities.

2 Creating an Entrepreneurial Ecosystem to Foster Entrepreneurship Education

From the literature review, there is no a consensus on the definition of an entrepreneurial ecosystem. However, it can be defined as a group of interdependent actors and factors such companies, including Start-ups that share similar goals and work in a network or organization to promote innovation and productive entrepreneurship within a particular territory. This concept refers also to the social and economic environment affecting the local and regional entrepreneurship.

The entrepreneurial ecosystem was first developed in the 1980s and 1990s as a new field in entrepreneurship research based on the role of social, cultural, and economic forces in the entrepreneurship process [3]. This environment composed of entrepreneurial leaders and policymakers whom created a community and developed a culture have an impact on the entrepreneurship process, from the intention of nascent entrepreneurs to start a firm to their ability to find venture capital and to launch a new firm.

The idea behind is to explain the influence of the regional economic and social factors over this process in a systemic entrepreneurship research approaches. Thus, Moore [4] conceded the basic functioning of the entrepreneurial ecosystem depending on the interaction of all stakeholders related to entrepreneurship. Consequently, this entrepreneurial ecosystem is a great accelerator of startups. In the field of entrepreneurship education, the entrepreneurial ecosystem is one of the most important keys that foster innovation behaviors, entrepreneurial intention and contributes to enhance entrepreneurial spirit Fig. 1.

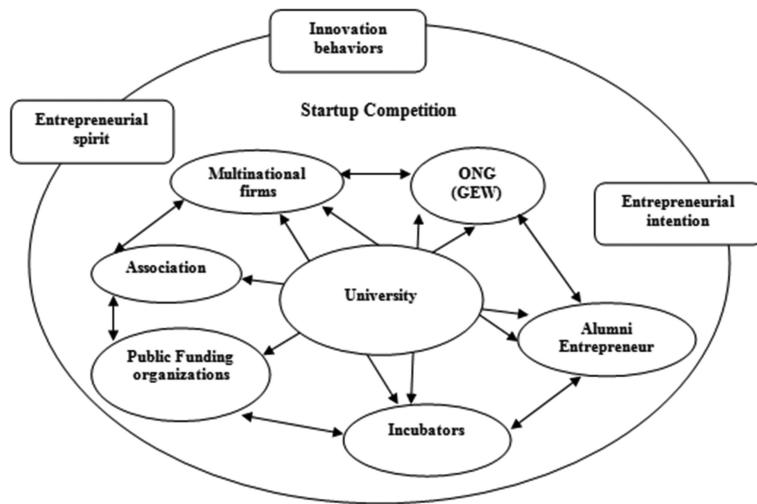


Fig. 1. Startup competition in centre of the Entrepreneurial Ecosystem

In the case of the Algerian university, the integration of entrepreneurship education was the impulsion of the government to promote entrepreneurship and innovation within university [5, 6]. While the entrepreneurial ecosystem is fostering the startups, the startup competitions facilitate the integration of entrepreneurship within the university.

This two, concept played an important role in the integration of entrepreneurship education within the Algerian universities. One of the specific actions of the entrepreneurial ecosystem in Algeria was to support web entrepreneurship through the Startup competition. Every year, the GEW (Global Entrepreneurship Week) in co-ordination with Algerian universities and others public and private actors organized the startup competition named Webdays competition. Based on business plan competition, the Webdays events specific to the web and telecommunication sector are actually the most used in teaching entrepreneurship within the Algerian universities Fig. 2.

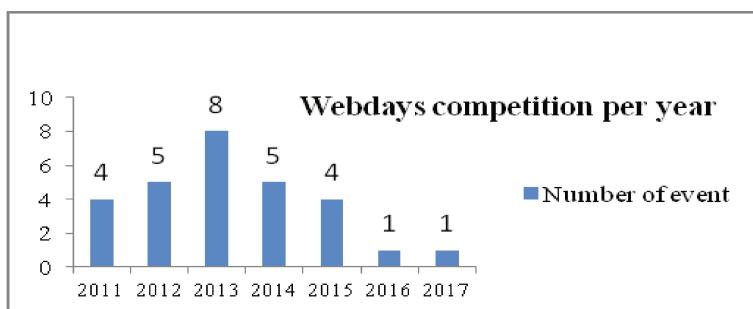


Fig. 2. Webdays competition based on business plan within the Algerian universities.
Source : [6]

3 The Integration of Entrepreneurship Education Within Universities

The relation between entrepreneurship and university had been developed as a result of a collaborative work with the partners of the higher education system. Then, the university will be more responsible to diffuse knowledge in the greater way and in the appropriate need of industrial partners. University must assure the transfer of technology to their users with low cost and create a competitive dynamic in the local, regional and national innovation system.

Entrepreneurship changed the vision, the culture and the value of the university by making the university in the middle of the knowledge market. It became more important in producing and commercialization of knowledge, in the other way it became a seller of services to the knowledge industry [7].

Moreover, the entrepreneurial university is based both on commercialisation “custom made further education courses, consultancy services and extension activities” and commoditization “patents, licensing or student owned start-ups” [8]. The university must ensure their responsibility in building a bridge to the industrial users of innovation.

Indeed, the emergence of the entrepreneurial university was explained as a response to the increasing importance of the knowledge in national and regional innovation systems, and the recognition that the university is an effective and creative inventor and transfer agent of both knowledge and technology [9, p. 314].

The literature defined the entrepreneurial universities were allowing new resources of funds like patents; research funded by contracts and entry into a partnership with private enterprises [10]. This ability to find new resource fund is the first essential factors in the integration of the entrepreneurial vision within the university. The entrepreneurial university can be defined as the university which involved the creation of new business ventures by university professors, technicians, or students [11].

As a second mission of the entrepreneurial university, the university must push their internal actors to discover the entrepreneurial adventure by creating new business ventures and contribute to the development of innovation in a competitive behaviour. Etzkowitz [12] affirmed this mission by considering the entrepreneurial university as a natural incubator, providing support structures for teachers and students to initiate new ventures: intellectual, commercial and conjoint. In this context, this university had the ability to innovate, recognize and create opportunities, work in teams, take risks and respond to the challenges [13]. Moreover, Clark [14] consider that the entrepreneurial universities are those who seek to innovate in how it goes to business, to work out a substantial shift in organizational character, to become stand-up universities that are significant actors in their own terms.

Nearly of all these characteristics, the entrepreneurial universities are those who generate technology advances. And facilitates the technology diffusion process through intermediaries such as technology transfer offices (TTOs) as well as the creation of incubators or science parks producing support R&D for existing companies or to help jump-start new firms [15]. This university capitalised their technology transfer in a formal effort from research by bringing research outcomes to fruition as commercial

ventures [16]. Studies on the entrepreneurial university, however, usually focus on the mechanisms for the development of products, patents and academic spin-offs [17] and characterised the relationship between the university and their business partnership as more closer [18].

Across of all these definitions, we adopt the definition given by Röpke [19], who concluded that the entrepreneurial university was the meaning of three things: *the university itself, the members of the university–faculty and the interaction of the university with the environment*.

According to Röpke [19] definition, the introduction of entrepreneurship is developed by the interaction between the university and their environment. Therefore, the university had to learn from their environment and explore all opportunities. At the same, time the success of this relationship is conditioned by the ability of the university to achieve three important outcomes: Teaching, Research and entrepreneurial activity.

Eventually, teaching entrepreneurship becomes more important since the first course was given in 1947 at Harvard University by Professor Myles Mace. This experience was generalized increasingly in all the United States University and Colleges. It might be argued that the introduction of entrepreneurship education was an individual initiative from the member of the university. This professor brings a new idea to the academic field which is teaching entrepreneurship. Besides this opportunity, other actors were implicated in the development of entrepreneurship education for example *Center for entrepreneurship*.

From this American experience, the university learns to integrate the culture of innovation and creativity. It appears that the primary origin of the integration process entrepreneurship was the awareness of entrepreneurial spirit. This awareness aimed to develop student's entrepreneurial intention, create a new student entrepreneur generation [6].

Furthermore, research based on entrepreneurship education argues the importance of the entrepreneurial intention in the awareness the entrepreneurial spirit [20–30].

In addition, the entrepreneurial intention is considered as a great tool to measure the impact of entrepreneurship education on and to evaluate the useful pedagogical practice in enhancing the entrepreneurial spirit (Fayolle et Gailly, 2009; Fayolle et Klandt, 2006; Fayolle, 2004; Verzat, 2011). In the case of the Algerian university, the integration of entrepreneurship education was the impulsion of the government to promote entrepreneurship and innovation within university [5, 6].

This integration as we define is an internal process based on the internal actor's roles and the ability of the university to enables them with the help of external actors to address the challenge of entrepreneurship and innovation culture Fig. 3.

Our research has explored three cases. The research involved a review of previous literature, the collection of in-depth case material through interviews with the teachers of entrepreneurship implicated in the university's integration process during 2016 and the first half of 2017. The three cases were selected on the basis that those teachers were involved in the following actions:

- (1) Awareness the entrepreneurial spirit;
- (2) Choosing the best entrepreneurial pedagogical practice;
- (3) Developing the entrepreneurial skills.

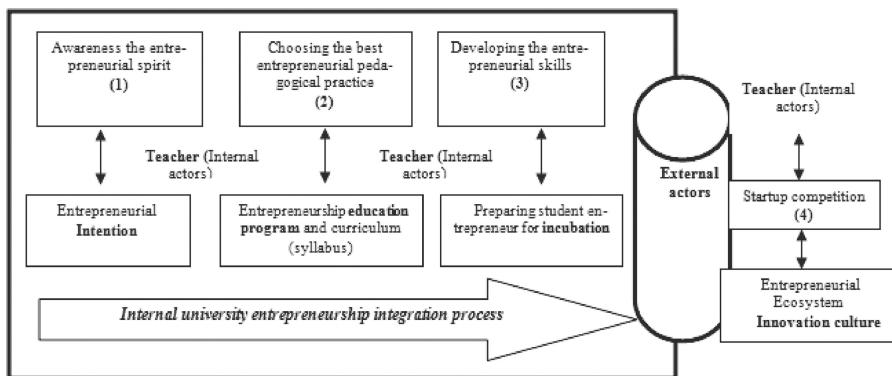


Fig. 3. Conceptual framework of the study. Source: Adapted from [6]

- (4) Participating and organization of the startup competition within an entrepreneurial ecosystem.

The sample is regionally diverse as the universities are located in three different regions of Algeria. Therefore, the interviews were loosely structured on the four actions of the conceptual framework of a study and the literature review. Due to the confidentiality, the actual names of universities and the exact locations will not be given in the paper. The three cases are named Case 1, Case 2 and Case 3.

4 Three Cases Studies

Given the first objective of the paper, these three cases studies will present the internal entrepreneurship integration process of the Algerian university. The cases studies are presented below in order to describe three different universities and to understand the integration process.

Case 1: The aim of the teachers is to enhance student entrepreneurial spirit: “.....I believe in my students they can improve their entrepreneurial abilities. Our first mission is to give them the opportunity to enhance their entrepreneurial intention among entrepreneurial program. Then, we aim to help them in the adventure of launching a new startup.” Teachers affirm that since they were implicated their student became more interested to discover entrepreneurship and they asked for more information. Thus, for this first case, the implications of teachers were initiated by the faculty: “...In our university, entrepreneurship as a program was the initiative of the faculty. In the beginning, the administration implicated teacher in the elaboration of the entrepreneurship education syllabus. The first mission was to discover the subject of entrepreneurship that is new and ambiguous. We organized many seminars and open day on entrepreneurship; we invited some entrepreneurs and expert of the field.”

The integration process had been begun by allowing the teachers to propose and elaborate entrepreneurship program. The faculty in collaboration with teacher organized seminars and open day on entrepreneurship. These events were animated conjunctly with practitioner and entrepreneurs. Their interpretation of the entrepreneurship integration process for those teachers was essentially based on stimulation of the entrepreneurial spirit: “*...For stimulating entrepreneurial spirit, we organize every month, an open day. The entrepreneurship house located at university play the role of facilitator it gives information for all students present at the event. We aim to share more knowledge about the field of entrepreneurship within the academic community.*”

Thiers experience was an excellent opportunity to share their knowledge with their own student and to learn from the external actors (entrepreneurs and expert involved). This case illustrates that the faculty is an important internal actor who gives to the teacher a great implication in the facilitation of the entrepreneurship integration process.

Case 2: The aim of the teachers is to enhance student entrepreneurial spirit and to work deeply with the entrepreneurship house: “*Teaching entrepreneurship is a new field and students are interested....I think we need more facilities and tools to attend the higher number of students. The enrollment's student statistic delivered by the entrepreneurship house show that events on entrepreneurship attract more students every New Year.*” Teachers are more implicated, and they tried to improve the internal integration process by offering their own suggestions in order to devolve and facilitate the interaction between the entrepreneurship house and their students: “*.....Statistics provided by the Entrepreneurship House show that the number of students enrolled in education increases annually and we should be proud of this fabulous evolution. We succeed to enhance a maximum of our student comparatively with other Algerian universities. We are more implicated in business plan competition and the national startup competition, and we had made our network.*”

In this second case, teachers are more involved and motivated. They use new pedagogical practice, e.g. startup competition and business plan competition. Also, those teachers are part of a network, and they capitalized a large experience in enhancing entrepreneurial spirit. This network is an indicator of integration process made by the internal actors.

Case 3: The teachers are facilitators one of them is a member of an international youth entrepreneurship association: “*Before teaching entrepreneurship we should develop the student entrepreneurial intention then implicate them to discover the entrepreneur ability. Student must be able to decide creating new enterprise.*”

Teachers offer their experience by animating conference and open day to discuss the subject of the entrepreneur as a job. For this case, teachers were involved in the four actions of the conceptual framework of the study: “*We promote the entrepreneurial spirit by keeping awareness during all the year. We believe strongly in the effect of the actions of awareness on the student entrepreneurial intention. Our methodology is based on two approaches. The first is the experimental method; we give to our student the opportunity to learn in a real experience (competition). The second is the learning by doing method, they learn by making errors, and we correct for them we bring entrepreneur, and they were excited to discover the real life of an entrepreneur.*”

In this third case, teachers choose their approaches, and they are part of the integration process. Teachers make their experience in order to enhance their students. As facilitators, they learn from a real experience to bring the external actors (entrepreneurs) into the classroom.

5 Discussion of Finding

In achieving the objective of this paper, which is to discover how the university enables actors to facilitate the process of integration of entrepreneurship culture among university. We have observed that the teachers are the main important actors in this integration process. They are involved; and they believe in their work. Even some of them don't initiate offering entrepreneurship courses; they contribute truly.

Despite these observations, the teacher is the most important actor who can facilitate the internal process in collaboration with faculty and the others external, actors. Certainly, the entrepreneurial education *can be defined as “something” that facilitates access to entrepreneurial practices. It concerns the “what to do?” And how to make it happen by being personally involved*” [35, p. 26].

According to the three cases, the third case is a good example of the role of the teacher in the integration process. As we saw, the teacher can bring their experience and make a bridge with the other partners of the university. In addition, the use of the startup competition is one of the most important pedagogical practices that contribute to facilitating the integration of entrepreneurship education within the Algerian university.

6 Conclusion

This paper has been concerned with the interpretations and meaning that teachers are involved in the internal integration process of entrepreneurship within the university. Evaluating their impact is the first step in our conceptual framework. Limited by time and the availability of teachers, ours cases study were done with a focus on the role of the teacher in the internal integration process. In order to select them, we make sure that they were implicated at a minimum in one of the four following actions:

- (1) Awareness the entrepreneurial spirit;
- (2) Choosing the best entrepreneurial pedagogical practice;
- (3) Developing the entrepreneurial skills.
- (4) Participating and organization of the startup competition within an entrepreneurial ecosystem.

Essentially, we were proudly grateful for their contribution. Through our analysis of the three cases, we have identified two ways of the internal entrepreneurial integration process: teacher as part of awareness teaching and teacher as facilitator.

Thus, we conclude that the teachers who successes are those who make their own network. Bring their experience and knowledge into the university system. However, the lessons we draw from the case studies enable us to discover the role of the teacher in the internal integration process, and we should develop further research to evaluate

the effect of each way of the internal integration process in a quantitative survey research projects.

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Innovation and Growth: Evidence from Mexico and Brazil

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Abstract. Using Granger causality test, the study finds the presence of unidirectional and bidirectional causalities between innovation and per capita economic growth. These results vary depending upon the types of innovation indicators that we use in the empirical investigation process. Most importantly, the study finds that all these innovation indicators are considerably linked with per capita economic growth. Both countries should recognize the differences in innovation and per capita economic growth in order to create policies regarding development.

Keywords: Innovation · Economic growth · Mexico · Brazil

1 Introduction

Beneki [1]; Wong [20]; Verspagen [18]; Segerstrom [17] Innovation leads an extensive and long-standing support to economic growth). This study is based on Maradana [13], and uses six different indicators of innovation and examines their relation to long-run economic growth:

- (1) Patents-residents
- (2) Patents-non-residents
- (3) Research and development expenditure
- (4) Researchers in research and development activities
- (5) High-technology exports
- (6) Scientific and technical journal articles

Latin America lags in term of economic growth and innovation; “Despite the recent, rapid economic growth experienced by several Latin American countries during the commodity boom, the fall in commodity export prices, including oil, coal, other minerals and agricultural products, has underscored the many competitiveness challenges required for new growth sectors to emerge. Improvements could be made in many areas, and the skills and innovation gap ranks high on the list. Other areas for improvement include education, on-the-job training, scientific and technological investments by both government and business, and enhancing the innovation

environment” (World Economic Forum, 2008). Some other regions, such as Eastern Europe or Asia have experienced a recent economic growth, especially in the East Asian region (Hu, 2015); some authors attribute this growth to the process of turning imitation to innovation (Hobday, 1995; Mathews, 1995).

Brazil and Mexico occupy distinctive positions in the structure of the capitalist world economy. Gereffi [9] suggests that both countries bear little resemblance to the classic model of a “peripheral” country. They are too industrialized, having many of the modern industries typically found only at the center of the world economy, they supply themselves with too large a share of the finished goods consumed domestically; their exports are too diversified and include too many manufactured items; and they have developed unusually strong states with sophisticated administrative apparatuses capable of promoting and protecting local interests. But neither do Brazil and Mexico possess the characteristics commonly associated with “developed” or “core” nations.

2 Framework

Schumpeter’s distinction between invention, innovation, and diffusion is still a useful theoretical starting point. For example, an invention suggests some sort of creativity that has been exploited for technological progress, while innovation and diffusion hint at the economic, social and organizational incentives and impediments to the incorporation of technological advances into economic products and processes Dosi [7].

Scientific and technological knowledge and the ability to innovate are elements that contribute to increase the productivity and the standard of living of nations. International experience shows that developing countries rely increasingly on their ability to generate, absorb and transfer knowledge because that way goods and services with a higher added value enrich their development capabilities and position the nation in a global environment that is increasingly interconnected and competitive [2].

The government’s role in economic development is decisive; Guisan [10] appoints that R + D are important for economic development and quality of life, both in Humanities and Social Sciences (H + S) and in Natural Sciences and Engineering (NSE).

In the Latin American region, some countries have not achieved a global integration, for example, Mexico’s exports dependency on the United States market and the relative importance of such exports in Mexico’s overall economic performance makes it highly susceptible to U.S. economy fluctuations [19].

2.1 An Outline of Innovation in the Latin American Countries

Today, Latin America regions face important challenges to foster sustained economic growth, reduce poverty and improve the living standards of their population. In this context, promoting progress of innovation in the regions becomes a key priority [16].

The Latin American economic integration process has been developed throughout the twentieth century making use of the following strategies: regional economic research, financing agencies, and trade agreements. It is important to note that research on regional economic issues and financing agencies are mainly funded by the United States; And, that even though most of the countries are part of a trade agreement, the intraregional trade is not significant in any case [15].

According to Olavarrieta and Villena [16] Latin America lags behind the more advanced economies in terms of innovative activities. This is not only at the output level: patent applications, high-technology exports (percentage of manufactured exports) and scientific and technical journal articles, including business research; but also at the input level: R&D expenditure (as percentage of the GDP) and researchers in R&D (per million people). Hence, it is not expected that this scenario will dramatically change at least in the short run.

Previous works have addressed innovation-growth issues in two ways: The Regional disparities of innovation activities and economic growth in countries and the causality between both issues. See Maradana [13].

The six variables of innovation we use are:

PAR: Number of patents filed by residents measured per thousand of population;

PAN: Number of patents filed by non-residents measured per thousand of population;

RDE: Research and development expenditure measured as a percentage of real GDP;

RRD: Researchers in research and development activities measured per thousand population;

HTE: High-technology exports measured as percentage of real domestic product; and

STJ: Scientific and technical journals articles measured per thousand population.

Table 1 shows the definition of the variables. Tables 2 and 3 provide a general status of innovation indicators in the Latin American countries. The status of innovation regarding each indicator (PAR, PAN, RDE, RRD, HTE, and STJ) in the Latin American countries are examined in 3 different time periods from 1996 to 2015. These 3 periods are P1: 1996–2007, P2: 2007–2013 and P3: 1996–2013.

Table 1. Definition of variables

Variable code	Variable definition
GDP	Per capita economic growth expansion of a country's economy, expressed in per capita gross domestic product
PAR	Patents filed by residents: expressed in numbers per thousand population
PAN	Patents filed by non-residents: expressed in numbers per thousand population
RDE	Research and development activities: expressed as a percentage of real gross domestic product
RRD	Research and development expenditure expressed as a percentage of real gross domestic product
HTE	High-technology exports: expressed as percentage of real gross domestic product
STJ	Scientific and technical journal articles: expressed in numbers per thousand population

Variables above are defined in the World Development Indicators of World Bank.

Table 2. Trend of innovation (per thousand population) in Brazil and Mexico

Countries	PAR			PAN			RDE		
	P1	P2	P3	P1	P2	P3	P1	P2	P3
Brazil	0.006	0.006	0.006	0.022	0.020	0.022	1.005	1.146	1.070
Mexico	0.010	0.009	0.010	0.038	0.034	0.037	0.349	0.431	0.380

PAR is the number of patents filed by residents, PAN is the number of patents filed by non-residents, and RDE is research and development expenditure. P1. Is 1996–2007, P2 is 2007–2013, P3 is 1996–2013

Table 3. Trend of innovation (per thousand population) in Latin American countries.

Countries	RRD			HTE			STJ		
	P1	P2	P3	P1	P2	P3	P1	P2	P3
Brazil	0.004	0.003	0.004	0.001	0.000	0.000	0.013	0.012	0.012
Mexico	0.007	0.006	0.006	0.001	0.000	0.001	0.022	0.019	0.021

RRD is research and development activities, HTE are high-technology exports, and STJ is scientific and technical journal articles. P1. Is 1996–2007, P2 is 2007–2013, P3 is 1996–2013

2.2 Methods of Study

We empirically test the relationship between innovation and per capita economic growth. Specifically, the causality between innovation and per capita economic growth can be addressed in four different ways: supply-leading hypothesis of innovation-growth nexus, demand-following hypothesis of innovation-growth nexus, feedback hypothesis of innovation-growth nexus, and neutrality hypothesis of innovation-growth nexus.

We intend to test the following hypotheses:

H_{1A}° : Innovation activities do not Granger-cause per capita economic growth.

H_{1A}^1 : Innovation activities Granger-cause per capita economic growth.

H_{1B}° : Per capita economic growth does not Granger-cause innovation activities.

H_{1B}^1 : Per capita economic growth Granger-causes innovation activities.

This study considers the economies of Brazil and Mexico. We use the GDP as a reference for our variables. The empirical investigation considers annual data over the period 1996 to 2015 which was obtained from the *World Development Indicators* of the World Bank (Table 4).

Table 4. Descriptive statistics of the variables

Countries	Variables					
	PAR	PAN	RCE	RRD	HTE	BTJ
Brazil	0.021/0.001	0.006/0.001	1.070/0.086	0.004/0.001	0.001/0.000	0.012/0.001
Mexico	0.010/0.001	0.036/0.003	0.388/0.069	0.006/0.001	0.001/0.000	0.021/0.002

PAR is the number of patents filed by residents, PAN is the number of patents filed by non-residents, and RDE is research and development expenditure, RRD is research and development activities, HTE is high-technology exports, and STJ is scientific and technical journal articles, and GDP is per capita economic growth. Values reported here are natural logs of the variables.

Model 1: For individual country analysis

$$\Delta GDP_t = \alpha_1 + \sum_{k=1}^p \beta_{1k} \Delta GDP_{t-k} + \sum_{k=1}^q \lambda_{1k} \Delta INN_{t-k} + \delta_1 ECT_{t-1} + \varepsilon_{1t}$$

The testable hypotheses are:

$$H_0 = \lambda_{1K} = 0; \text{ and } \delta_1 = 0 \quad \text{for } k = 1, 2, \dots, q$$

$$H_A \neq \lambda_{1K} = 0; \text{ and } \delta_1 \neq 0 \quad \text{for } k = 1, 2, \dots, q$$

$$\Delta INN_t = \alpha_2 + \sum_{k=1}^p \beta_{2k} \Delta INN_{t-k} + \sum_{k=1}^q \lambda_{2k} \Delta GDP_{t-k} + \delta_1 ECT_{t-1} + \varepsilon_{2t}$$

The testable hypotheses are:

$$H_0 = \lambda_{2K} = 0; \text{ and } \delta_2 = 0 \quad \text{for } k = 1, 2, \dots, q$$

$$H_A \neq \lambda_{2K} = 0; \text{ and } \delta_2 \neq 0 \quad \text{for } k = 1, 2, \dots, q$$

Where ECT is the error correction term, which is derived from the long-run co-integration equation; p and q are the lag lengths for the estimation; Δ is the first difference operator; and ε_{1t} and ε_{2t} are the independent and normally distributed random error with a zero mean and a finite heterogeneous variance.

Model 2: For panel data analysis

$$\Delta GDP_{it} = \alpha_3 + \sum_{k=1}^p \beta_{3ik} \Delta GDP_{it-k} + \sum_{k=1}^q \lambda_{3ik} \Delta INN_{it-k} + \delta_3 i ECT_{it-1} + \varepsilon_{3it}$$

The testable hypotheses are:

$$H_0 = \lambda_{3ik} = 0; \text{ and } \delta_{3i} = 0 \quad \text{for } k = 1, 2, \dots, q$$

$$H_A \neq \lambda_{3ik} = 0; \text{ and } \delta_{3i} \neq 0 \quad \text{for } k = 1, 2, \dots, q$$

$$\Delta INN_{it} = \alpha_4 + \sum_{k=1}^p \beta_{4ik} \Delta GDP_{It-k} + \sum_{k=1}^q \lambda_{4ik} \Delta INN_{it-k} + \delta_4 i ECT_{it-1} + \varepsilon_{4it}$$

The testable hypotheses are:

$$H_0 = \lambda_{4ik} = 0; \text{ and } \delta_{4i} = 0 \quad \text{for } k = 1, 2, \dots, q$$

$$H_A \neq \lambda_{4ik} = 0; \text{ and } \delta_{4i} \neq 0 \quad \text{for } k = 1, 2, \dots, q$$

Where $i = 1, 2, \dots, N$ represents a country in the panel, $t = 1, 2, \dots$, and T represents the year in the panel.

The Augmented Dickey Fuller (ADF) unit root test (Dickey and Fuller 1981) is used for individual country analysis, while the ADF-fisher Chi-square panel unit root test is used for the panel setting. On the other hand, Johansen co-integration test is used for individual country analysis while Fisher/Maddala co-integration test is used in the panel setting (Table 5).

2.3 Results and Discussion

Case 1: Between patents-residents (PAR) and per capita economic growth (GDP)
 In Brazil, we find unidirectional causality from per capita economic growth to innovation (PAR<=GDP). For countries like Colombia, Costa Rica, Ecuador, Mexico, Panama, Paraguay and Uruguay we find bidirectional causality between innovation and per capita economic growth (PAR<=>GDP). While in Argentina, Chile, Guatemala and Peru, per capita economic growth does not Granger-cause innovation (PAR<#>GDP)

Table 5. Results of unit root test

Countries	PAR	PAN	RDE	RRD	HTE	STJ	GDP
	LD/FD	LD/FD	LD/FD	LD/FD	LD/FD	LD/FD	LD/FD
Brazil	-20.553***/-7.297***	-20.540***/-8.481***	1.474/-3.439 ***	-20.681 ***/-6.067***	-0.897/-2.971***	-20.593***/-8.1912598***	-6.841***
Mexico	-38.383***/-3.208***	-3.222***/-38.381***	2.195/-3.000***	-37.975***/-3.146***	-4.360***/-3.792***	-38.412***/-3.2413276***	-6.322***

PAR is the number of patents filed by residents, PAN is the number of patents filed by non-residents, and RDE is research and development expenditure, RRD is research and development activities, HTE is high-technology exports, and STJ is scientific and technical journal articles, and GDP is per capita economic growth. The investigation is done at three levels: 1) no trend and intercept, 2) with intercept, and 3) with both intercept and trend. The results are more or less uniform; however, the reported statistics in the table present the ADF statistics at no trend and no intercept.

*Statistical significance at 1% level; **statistical significance at 5% level; ***statistical significance at 100% level.

Table 6. Results of Johansen-Juselius Co-integration Test (Max Test)

Countries	Cointegration with GDP					
	PAR	PAN	RDE	RRD	HTE	STJ
Brazil	6.358/0.000	17.056*/0.067	22.284*/ 5.316*	9.649/0.019	7.460/2.585	10.906/.142
Mexico	27.770*/ 9.7163*	38.617959*/ 10.084*	14.744*/ 8.167*	12.800/9.637*	17.374*/ 8.996*	7.447046*/ 9.959

Note: We observe statistical significance at 5% level * Indicates the statistical significance of the co-integrating vector and confirms the presence of co-integration between innovation and per capita economic growth.

Table 7. Results of Johansen-Juselius Co-integration Test (Trace Test)

Countries	Cointegration with GDP					
	PAR	PAN	RDE	RRD	HTE	STJ
Brazil	6.358/0.000	17.124*/ 0.067	27.600*/ 5.316*	9.668/0.019	10.044/2.585	11.048/ .142
Mexico	37.486**/ 9.7163	48.703*/ 10.085*	22.911*/ 8.166*	22.438*/ 9.637*	26.370*/ 8.996*	47.406*/ 9.959*

Case 2: Between patents-non-residents (PAN) and per capita economic growth (GDP)

For countries like Argentina, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Paraguay, Peru and Uruguay we find bidirectional causality between innovation and per capita economic growth (PAN<=>GDP). Chile shows a unidirectional causality from per capita economic growth to innovation (GDP=>PAN). In countries like Brazil and Colombia we find per capita economic growth does not Granger-cause innovation (GDP<#>PAN)

Case 3: Between R&D expenditure (RDE) and per capita economic growth (GDP)

Brazil shows a unidirectional causality from innovation to per capita economic growth (RDE=>GDP), whereas in Chile we find the unidirectional causality from per capita economic growth to innovation (GDP=>RDE). Additionally, in Colombia we find the existence of bidirectional causality between innovation and per capita economic growth (RDE<=>GDP), while in the rest of the countries per capita economic growth does not Granger-cause innovation (RDE<#>GDP).

Case 4: Between researcher in R&D activities (RRD) and per capita economic growth (GDP)

In Brazil we find per capita economic growth Granger-causes innovation ($RRD \leqslant GDP$). For countries like Colombia, Costa Rica, Ecuador, Mexico, Panama, Paraguay, Peru and Uruguay there is a bidirectional causality between innovation and per capita economic growth ($RRD \leftrightarrow GDP$), while in the context of Argentina, Chile, Guatemala and Peru, per capita economic growth does not granger-cause innovation ($RRD \nless \# GDP$).

Case 5: Between high-technology exports (HTE) and per capita economic growth (GDP)

Colombia shows a presence of unidirectional causality from innovation to per capita economic growth ($HTE \Rightarrow GDP$), whereas for Paraguay we find the presence of unidirectional causality from per capita economic growth to innovation ($GDP \Rightarrow HTE$). Moreover for countries like Brazil, Chile, Ecuador, Guatemala, Peru and Uruguay there is a bidirectional causality between innovation and per capita economic growth ($HTE \leftrightarrow GDP$), while in the context of Argentina, Costa Rica, Mexico and Panama, per capita economic growth does not Granger-cause innovation ($HTE \nless \# GDP$).

Case 6: Between scientific and technical journals articles (STJ) and per capita economic growth (GDP)

For Brazil we find the presence of unidirectional causality from per capita economic growth to innovation ($GDP \Rightarrow STJ$), whereas for countries like Argentina, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Paraguay, Peru and Uruguay we find bidirectional causality between innovation and per capita economic growth ($STJ \leftrightarrow GDP$), while in the context of Guatemala, we find that per capita economic growth does not Granger cause innovation ($STJ \nless \# GDP$) (Tables 10 and 11).

Table 8. Summary of co-integration test results

Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Brazil (0)	Brazil (1)	Brazil (2)	Brazil (0)	Brazil (0)	Brazil (0)
Mexico (2)	Mexico (2)	Mexico (2)	Mexico (1)	Mexico (2)	Mexico (2)

Case 1: co-integration between PAR and GDP; case 2: co-integration between PAN and GDP; case 3: co-integration between RDE and GDP; case 4 co-integration between RRD and GDP; case 4: co-integration between HTE and GDP; case 6: co-integration between STJ and GDP. PAR is number of patents by residents, PAN is number of patents by non-residents, and RDE is research and development expenditure, RRD is research and development activities, HTE is high-technology exports, and STJ is scientific and technical journal articles, and GDP is per capita economic growth. 0 stands for absence of co-integration between innovation (PAR/PAN/RDE/RRD/HTE/STJ) and per capita economic growth, 1 stands for presence of co-integrating vector between innovation (PAR/PAN/RDE/RRD/HTE/STJ) and per capita economic growth. Parentheses indicate the number of co-integrating vectors (s). Results are derived on the basis of the Tables 6 and 7 results.

Table 9. Results of test from error correction model

Countries	Ganger causality test between					
	PAR and GDP		PAN and GDP		RDE and GDP	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Brazil	0.84/4.31	-0.07/-2.28*	1.10/5.61	NA/NA	0.36/2.97	-3.41**/-1.92
Mexico	0.05/0.24	-1.97/-3.64***	0.05/0.27	-2.02*/-2.24*	0.74/3.97	0.97/-0.54

The short-run causality is detected through the Wald statistics, while long-run causality is detected through the statistical significance of error correction term. For both terms (PAR /PAN /RDE) innovation is the dependent variable.

*Indicates the statistical significance at 5% level; ** indicates the statistical significance at 10% level.

Table 10. Results of test from error correction model

Countries	Ganger causality test between					
	RRD and GDP		HTE and GDP		STJ and GDP	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Brazil	1.07/5.47	-0.85/-2.98**	1.34/6.82*	-2.51**/-3.44***	1.34/6.86*	0.60/-3.19**
Mexico	0.05/0.23	-1.98*/-3.90***	1.17/5.99	NA/NA	0.05/0.25	-2.05*/-2.21*

The short-run causality is detected through the Wald statistics, while long-run causality is detected through the statistical significance of error correction term. For both terms (PAR /PAN /RDE) innovation is the dependent variable.

*Indicates the statistical significance at 5% level; ** indicates the statistical significance at 10% level.

Table 11. Summary of Granger Casualty test

Countries	Nature of Granger Causality between					
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
	PAR and GDP	PAN and GDP	RDE ad GDP	RRD and GDP	HTE and GDP	STJ and GDP
Brazil	DFH	NEH	SLH	DFH	FBH	DFH
Mexico	FBH	FBH	NEH	FBH NEH	NEH	FBH

Case 1: co-integration between PAR and GDP; case 2: co-integration between PAN and GDP; case 3: co-integration between RDE and GDP; case 4 co-integration between RRD and GDP; case 4: co-integration between HTE and GDP; case 6: co-integration between STJ and GDP. PAR is number of patents by residents, PAN is number of patents by non-residents, and RDE is research and development expenditure, RRD is research and development activities, HTE is high-technology exports, and STJ is scientific and technical journal articles, and GDP is per capita economic growth. SLH indicates the unidirectional causality from innovation to economic growth, DFH indicates the unidirectional causality from economic growth to innovation, FBH indicates the bidirectional causality between innovation and economic growth, and NEH indicates no causal flows between innovation and economic growth. Results are derived on the basis of Tables 8 and 9 results.

3 Conclusion

This study analyzed the Granger causal nexus between innovation and per capita economic growth for Brazil and Mexico using time series data from 1996 to 2015. Policy makers and academics interested in this matter should know that the implications drawn from research on per capita economic growth that disregard the dynamic interrelation of the two variables will be imperfect. It is the conjoined bidirectional relationship between innovation and per capita economic growth the foundation of our research and the premise for future research.

In order to achieve innovation, it is necessary to implement regular evaluations regarding policy design and financing needs; imitate practices that in other countries are increasingly implemented to promote innovations; the governmental agencies responsible for the funding of S&T (Science and Technology) and innovation projects should develop monitoring and assessment systems based on qualitative and quantitative information and indicators; support programs as well as the expected outputs and outcomes should be highlighted at the outset.

Since enterprises also foster and develop innovations, it is important for the government to promote effective loans among them. In order to create interest and facilitate loans, governments need to:

1. Promote low interest loans
2. Reduce bureaucracy and times
3. Constant evaluation of loans

Government also has an important role in attracting capital from foreign firms. Attracting foreign investors could be a difficult task since politics, economics and society are involved.

A country with a bad political environment or a bad economic situation would not attract the sufficient FDI (foreign direct investment); and, a society that is not well-educated will lack of opportunities. In addition, governments must evaluate the results in order to reduce the risk of wasting money and have no impact on innovation. Many governments provide incentives to attract more enterprises, such as tax holidays, suppression of trade union activity, and an accelerated depreciation allowances.

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Towards Sustainability in European Agricultural Firms

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Abstract. European agricultural activity plays an important role in European and world food security through the agricultural production, supply and international trade. The main aim of this paper was analyses the agricultural sustainability of the twenty-nine Member States of the European Union in terms of economics, environmental, social and political activity. Information and data comes from FADN database from the European Commission. The methodology includes the min-max approach and multivariate methods, namely, Component Principal Analysis and Cluster analysis. The results confirm three groups of European countries, namely, the North and Central countries; the New Member States and the Mediterranean counties. The results also confirm that European agriculture firms and respective countries had a medium sustainability. The main conclusion highlines confirms the importance of the sustainability as a tool to better adjust agricultural policies among the European Member States.

Keywords: European · Member states · Economics · Environmental Political · Social · Sustainability

1 Introduction

Agricultural activity plays an important role in the 29 Member States of the European Union (EU) in terms of economics, environmental, social and political activity. This sector provides not only agricultural goods and services to feed the local population but have direct and indirect impacts on European and world economic sector by the exports and imports, as well as, in other sectors by the multiplier effect, namely, on the agroindustry's. But the agricultural activity has, at the same time, impacts at the social level for the local population on European countries and at a worldwide level, namely, by the creation of direct and indirect jobs and the maintenance of population living in rural areas. At the environmental level the contribute of the agriculture cannot be neglected in preservation of the habitats and biodiversity that allow the development of of-farms activities with add values for livelihoods and the creation of jobs.

More specifically, this paper aims to:

- (a) To analyze the total sustainability of the farms from European Member States as a way to promote innovation and social change among all the European agricultural firms;
- (b) To analyze the competitiveness of EU MS farms;
- (c) To analyze the social sustainability of EU MS farms;
- (d) To analyze the environmental sustainability of EU MS farms;
- (e) To analyze the political sustainability of EU MS farms;
- (f) To compare the results of total sustainability of farms among countries in order to better define CAP policies and support from EU.

This paper making a threefold contribution in the literature:

- (1) This paper gives insights to stakeholders and to public decision-makers about the way forward in the promotion of the rural development and also promoting the agricultural sustainability.
- (2) Introduce at the first time another new and very increasing, important and innovator indicator of sustainability, namely, the political dimension, as a new concept of sustainability in the literature.
- (3) Gives insights to the scientific community to more accurate measures for sustainability of farms and for sectorial activities with the necessary adjust in order to promote the agricultural and sectorial sustainability.

2 Literature Review

The economic indicators from firms in general and agricultural firms are common since the neoclassical theory. On the other hand, sustainability indicators are also common in life sciences and environmental sciences [2]. But evaluation of European sustainability firms was never analyzed. The seminar work from [1] assessing the farm relative sustainability on Lithuanian agricultural firms. Based on that work economic, social and environmental indicators was constructed. But the political indicators of firms wasn't never used. According to Dos Santos (2013) agricultural European firms are high subsidized.

Based on FADN database [3] data and [1] we construct the social, economic, social and introduce a new political indicator of sustainability according to the Tables 1, 2, 3 and 4.

Table 1. Economic indicators of the agricultural activity

Variable	Indicator
X ₁	Labour productivity: farm gross value added per 1 annual work unit (EUR/AWU)
X ₂	Capital productivity: Cash-flow (at constant prices) to capital
X ₃	Land productivity: farm gross value added (at constant price) per 1 ha of UAA (EUR/ha)
X ₄	Solvency: ratio farm total assets to total liabilities
X ₅	Farm income: family Farm income per 1 family work unit (EUR/FWU)
X ₆	Fixed capital formation: investment in long term assets per 1 ha of UAA (EUR/ha)
X ₇	Farm diversification: ratio of revenue from the other gainful activities to total revenue (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.

Source: Vitunskiene and Dabkiene, (2016) adjusted.

Table 2. Social indicators of the agricultural activity

Variable	Indicator
W ₁	Family work: ratio of hours worked by family members to total hours worked on farm (%)
W ₂	Jobs on farm: total annual hours worked converted into full-time equivalents (FTE)
W ₃	Innovation and cycle agricultural life: Net Investment/UAA (%)
W ₄	Family Farm Income/FWU
W ₅	Job creation (Total AWU/UAA) (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.

Source: Vitunskiene and Dabkiene, (2016) adjusted.

Table 3. Environmental indicators of the agricultural activity

Variable	Indicator
Z ₁	Use of chemical fertilizers: amount of chemical fertilizers per ha of UAA (Kg/ha UAA)
Z ₂	Energy intensity: ratio of cost of electricity, equipment, heating, transport fuel and oil to farm gross value added
Z ₃	Meadows and pastures: share of meadows and pastures (per cent of UAA)
Z ₄	Livestock density: livestock units per 1 hectare of UAA (LSUs/ha)
Z ₅	Environment-friendly: Total agricultural area out of production/UAA (%)

Note: ha- hectare; AWU – Annual work unit; UAA – Utilized agricultural area; % - per cent.

Source: Vitunskiene and Dabkiene, (2016) adjusted.

Table 4. Political indicators of the agricultural activity

Variable	Indicator
P ₁	Total dependency of farms from subsidies: Total subsidies/Farm net income (%)
P ₂	Dependency of crops subsidies: /subsidies on crops/Farm net income (%)
P ₃	Dependency on livestock subsidies: subsidies on livestock/Farm net income (%)
P ₄	Dependency on dairying subsidies: subsidies on dairying/farm net income (%)
P ₅	Dependency on environmental subsidies: subsidies on environmental measures/Farm net income (%)

Source: Authors, 2017.

3 Methodology

Data comes from FADN database [2] but reporting to the year of 2013, because was the last one available. The main methods include multivariate methods, namely Component Principal Analysis was used to estimate weights for the selected indicators to construct sub-indices and then the sub-indices were aggregated into the farm relative sustainability index according to [1] but adjusted to the present goals. After, Cluster analysis was used to form homogeneous groups of European farms of countries, according to the agricultural sustainability indices by [4–7].

Based on FADN database [3], data and [1], were construct the social, economic, social and introduce a new political indicator of sustainability according to the Tables 1, 2, 3 and 4.

4 Results

The main results of the cluster analysis of farms of EU MS outline confirm the existence of three clusters based on economics; social; environmental and political indicators, namely:

Table 5. Clusters of countries of farms sustainability

Cluster	Countries
I	Czech Republic; Estonia; Hungary; Italy; Poland; Portugal; Romania and Slovenia
II	Bulgaria; Cyprus; Greece; Spain; Croatia; Lithuania; Malta, Austria, and Sweden
III	Belgium; Denmark; Germany; France; Ireland; Luxembourg; Latvia; Netherlands; Finland and United Kingdom

Source: Results of authors, 2018.

The results show the existence of three clusters that generically include, respectively: (1) Cluster I include mainly the New Member States (NMS); (2) Cluster II includes mainly the Mediterranean countries; and; (3) Cluster III includes mainly the Central European countries, which have mostly been in the genesis from European Union and are beneficiaries of the policies from the beginning from Common Agricultural Policy (CAP) (Tables 5 and 6).

Table 6. Results of Cluster of farms sustainability indicators

Variable	Economic indicators/cluster		
Cluster	I	II	III
X ₁	117560	111061	398211
X ₂	0,5	0,5	0,3
X ₃	8207	13076	17092
X ₄	321	440	77
X ₅	109780	81794	328271
X ₆	223682	51930	393520
X ₇	8717	13921	14534
Variable	Social indicators/cluster I	Social indicators/cluster II	Social indicators/cluster III
W ₁	537	611	675
W ₂	1574	665	468
W ₃	22554	-61989	216707
W ₄	109781	81795	328272
W ₅	59	106	29
Variable	Environmental indicators/cluster I	Environmental indicators/cluster II	Environmental indicators/cluster III
Z ₁	93232	115492	146775
Z ₂	2,8	2,2	3
Z ₃	45,6	37,5	22,1
Z ₄	0	0	0,2
Z ₅	0,7	0,4	0,5
Variable	Political indicators cluster I	Political indicators/cluster II	Political indicators/cluster III
P ₁	591	384	582
P ₂	9	14	11
P ₃	25	18	52
P ₄	22	0,5	6,2
P ₅	0,8	2,9	7,5

Source: Results of authors, 2018.

The results of economic indicators highline confirm that Central European countries (Cluster III) presents a high value of productivity of labour; capital; financial indicators; income and investment in fixed capital. On the opposite way the farm diversification id high in the Mediterranean countries due the climatic and soil conditions that allows different and unique agricultural systems, namely as occurs with “montado” or cork production with pastures and animal production [4].

About the social indicators of the agricultural activity among the Clusters, the results confirm the important social impacts of all these tree clusters on this indicator, mainly with the high contribute of the agricultural firms from cluster I and cluster III, from the NMS and Central European agricultural firms on jobs creation on farm; innovation and rural development. These results confirm the important contribute of family farms for the preservation of the rural development and sustainability and are according to [8, 9].

About the environmental indicators the results mainly confirm that the Mediterranean agricultural systems are, in general, more environmental friendly with low inputs in fertilizers chemicals; low energy intensity consumption; highest areas on pastures and more extensive livestock systems. These results highline confirm the need of financial support from CAP policies to conduct the maintenance of the environmental European systems and farms and your preservation.

The results of political indicators from the firms of the all the clusters confirm that the dependency of farms from subsidies presents the highest value for the Central European countries, namely the total dependency of farms from subsidies, dairying and environmental financial support measures from CAP.

5 Conclusion

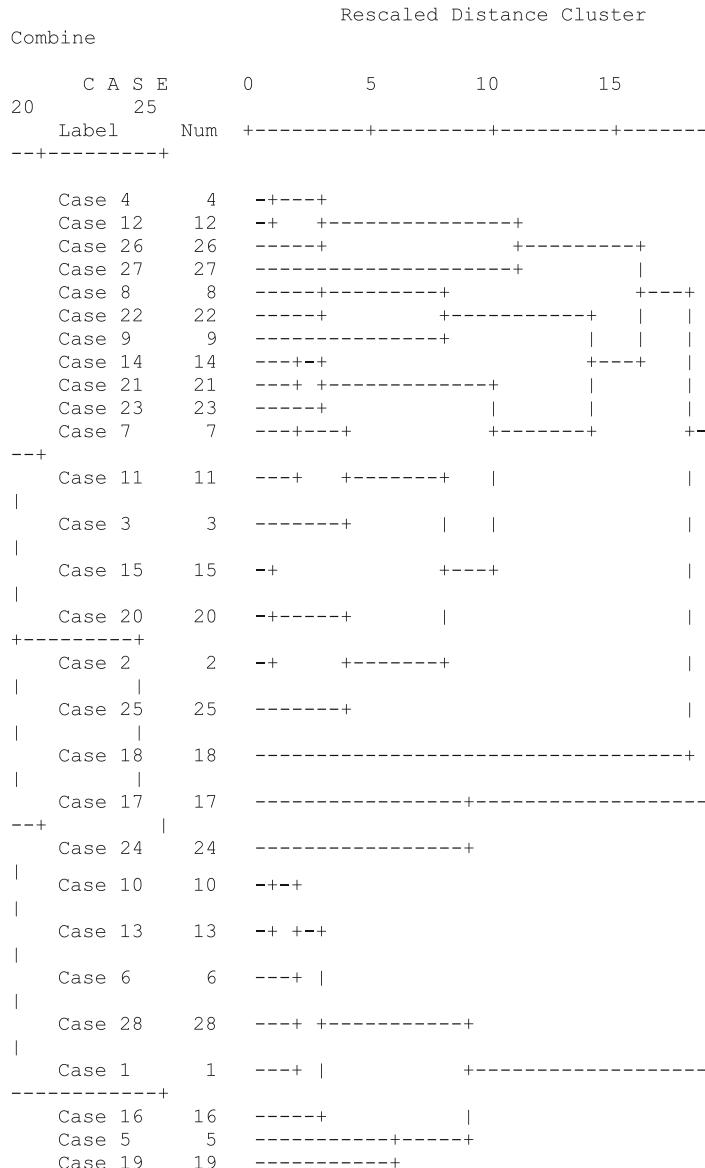
The main results confirm that farms from European Central countries are more competitive with more economic efficiency and have high financial support from CAP measures. On the opposite way, Mediterranean agricultural firms have the highest value and contribute on environmental and rural development and preservation. In general all the European agricultural firms from EU the family farms represent an important contribute for jobs creation and the maintenance of the rural live.

With the exception of crop subsidies, Mediterranean agricultural firms present the lowest values of support from CAP policies. That means the need of more attention from public decision makers about the Mediterranean agricultural farms and countries.

Appendix A

* H I E R A R C H I
 C A L C L U S T E R A N A L Y S I S * * * * * * * * * * *

Dendrogram using Ward Method



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Analysis Econometrics of the Factors that Strengthen the Position of the Small Mining Producer in Chile

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Abstract. The purpose of this research is to identify possible factors that strengthen the position of the small mining producer in the access to new financing mechanisms for exploration activities, and, evaluate the efficiency of the risk capital that National Mining Company (ENAMI) provides to this sector.

For this purpose, a survey applied to small mining producers that have been benefited by ENAMI in the delivery of resources for the recognition of reservations. We analyzed possible factors that according to the literature affect the development of the sector and impact on their access to financial capital. The user satisfaction and the technical efficiency of the promotion program was analyzed. Is achieved determine that there are positive gaps (between attitude and expectations) that could be empowered to improve their current condition (knowledge and associativity). However, there are negative gaps (environment and risk), which can generate a further distancing between the sector and the financial market. The technical efficiency program analysis shows increasing returns for the different offices of promotion. The program is evaluated positively in terms of user satisfaction (from the evaluation of the project until its execution). It is corroborated that small mining, depending on the price of commodities, even though it presents problems of structural character that affect their development, cannot be solved only with improve financing conditions.

Keywords: Small mining · Efficiency of risk capital · Technical efficiency

1 Introduction

Small-scale mining in Chile is an important economic sector, especially comparing to other small business. In productive terms, it reports 1.6% of fine copper per year, equivalent to more than US600 million, establishing itself as an important source of direct and indirect employment in remote areas of the country, particularly in the northern part. In some years it employed over 11% of the total persons working in the

mining sector, with a significant socioeconomic impact, generating productivity stimuli, and improving income of these lesser trained workers, providing a better use of internal resources [1]. This type of mining produce only minerals and its main scope of action is copper and gold, having no skills in processing the material or marketing the products. For this reason, this activity depends on the existence of a purchasing power organism in charge of refining and commercializing their production. This function is carried out by the National Mining Company (*Empresa Nacional de Minería* - ENAMI), a state company that besides productive functions carry out the mining promotion policy that includes financing activities that sustain the long-term development of the sector. Currently, this productive segment faces important challenges in their activities, among them are the low levels of human capital, lack of capital to improve productivity, and, therefore, to improve access to funding sources. Financing is hard for those activities that are critical in the value chain of mining, such as mineral exploration and reserves determination. These highly time consuming and uncertain results activities are the ones that allow small-scale mining to subsist and perform a productive and sustainable work over time.

Small and medium-sized mining are important actors for the harmonious development of the national mining industry, so it is important that State's policies aimed at it consider their own realities and needs, which differ greatly from the large mining industry (COCHILCO, 2013) [2]. In this area, ENAMI works as the main support to finance small-scale mining operations because of their systemic deficiencies and the inadequate way in which the activity functions, without business parameter of efficiency, knowledge of the market and so on. A topic that will be described in this section.

Rivera and Aroca (2014) [3] raise the importance of small-scale mining through the relevance of its operations, as well as the positive socioeconomic impact it generates in the areas where it is developed. From the field of operations, it is important to highlight the easy, but nonetheless risky, access to small reserves of ore or small deposits, that entails shorter implementation times of their operations, and lower infrastructure requirements, even sometimes very precarious one. Its economic importance translates into a contribution to reducing poverty, especially in rural areas or economically backward regions, since it indirectly participates to the export of minerals and the consequent entry of foreign currency into the region. In addition, it generates jobs and basic business skills in the area where it is developed [4], increasing the standard of living of population nearby.

Although the difference between the sectors belonging to small, medium and large mining, lies mainly in their levels of production, we can also point out differences in the level of hours worked and level of sales, which due to their implications in public policy have been ample and comprehensively defined in different public bodies. Anyhow, when we refer to the concept of small mining, it is difficult to exactly combine or choose one criteria to determine in what circumstances we are facing a small mining industry. There are different criteria to classify companies by size, number of workers, sales level, assets value, and so on, which also apply to the sector miner. After the nationalization of copper in Chile in 1971, three segments are characterized in the mining industry in Chile: large-scale mining, composed of those producers that produce more than 75,000 tons of fine copper per year; medium-sized

mining, composed of those that produce less than 75 thousand FMT and they operations do not classify as small-scale mining [5]; and small mining [6].

The present investigation aims to study the Small Mining sector in Chile and its relationship with ENAMI through the analysis and assessment of one of the most important promotion instruments for the sector, such as venture capital, which is used to evidence mining reserves. This instrument of development plays an important role for the advance of the activities and stages of the mining process, representing 60% of the cost structure of the small producer. Regarding the methodology used, it was divided into three stages: (i) know and configure those factors that improve the current position of the small mining producer, trying to improve their access to new financing mechanisms for mining exploration; (ii) examine the efficiency of the instrument to promote the recognition of mining resources and reserves (risk capital). To this end, the user satisfaction of the promotion instrument was measured, carrying out a fieldwork with interviews conducted with a sample of small mining producers located between the II and V region; (iii) measure, through a stochastic frontiers approach, the technical efficiency returns of the reserve recognition instrument for the 13 regional promotion mining offices spread throughout the country.

2 Methodology

Regarding the methodological development, the study was divided into three stages designed at responding to the objectives of the research. Initially, a quantitative study complemented by qualitative elements is realized, identifying the main factors that compromise the development of Small-scale Mining: knowledge, technologies and innovation, environment, risk and associativity.

For the enrichment of the previous analysis, surveys are taken to a sample for convenience to mining producers located in the northern zone of the country (13 mining offices). The variables that would impact the competitiveness of the national small mining sector will be measured. These variables are determinant in their relationship with ENAMI and new potential financing alternatives. Likewise, the satisfaction of the beneficiaries of the instrument to promote the recognition of mineral reserves is assessed, and the evaluation assigned to the instrument is studied from the point of view of the user, who recognize its importance as the currently only mechanism perceived in force of access to risk capital for the sector. The tool chosen for the measurement of variables is a survey, which established based on two dimensions determined by sectorial facts and expert opinion [7]. The survey has two types of questions, the closed type one and another type with a classification scale according to each dimension, with the purpose to recognize, characterize and cluster the profiles of mining producers, to identify possible common necessities. As a result, the general parameters established are production level, the condition of ownership and the level of education.

Finally, the technical efficiency of the instrument to promote the recognition of mining resources and reserves prepared by ENAMI is analyzed, which has been established as a basis for the promotion policy to provide competitiveness to the sector.

For this measurement, the stochastic efficiency frontier model [8] is used, which is applied at the national level through its mining development offices.

3 Results

From the outcomes obtained it is possible to conclude, as a first approximation, that the analyzed attitudes point to strengthen the position of the producer in the mining industry, assuming a current situation of disadvantage for them. It is determined that there are negative gaps that would friction and influence the approach of the small-scale sector to the financial market (“environment” and “risk”). However, there are positive gaps that could be worked on to shorten this distance as “knowledge” and “associativity”. The attitude that the mining producer considers predominant is “knowledge” as a mean to establish future sectoral transformation strategies, which endeavor to improve their competitive position, and to soften the so-called structural problems. Regarding the “knowledge” factor, it can be concluded that the producers are aware that only through training will they be able to raise the level of their skills and improve their productive capacities.

There some pillars that are established to improve competitiveness in small-mining, such as business management, security and financing. In this last point, it is possible that efforts could be generated by ENAMI, to contribute in the delivery of tools that allow producers to know new financing alternatives that the market could offer. The factor “associativity” presents a lower disposition to be adopted on the part of the same producers. It is perceived by them as that of minor importance in relative terms. However, it is advisable that it should be addressed, since producers perceive advantages when associating, nevertheless, they are unaware of how its form and practice could be addressed. According to the interviews, it can be inferred that “associativity” seems to be the factor with the least intentionality to be assumed among the same mining producers, since there is a great distrust in the final results derived from the particular efforts, a situation that it mainly faces a topic that must be approached from a cultural aspect. Regarding the “environment” factor, it is considered that it is necessary to project the business towards common long-term objectives for the development of the activity. It is not observed in the opinion of the producers that ENAMI establishes long-term definitions, which would be explained by the exogenous variables such as the price of copper, where its strong dependence on a high price (low price), improves conditions (worsens), thus affecting the assessment of the sector’s environment. They propose to search for mechanisms that would minimize the consequences derived from price fluctuations and diminish the volatility associated to the sector activity.

Finally, regarding the attitude perceived by the producers towards the scarcity of financing offers, different from public financing, oriented mainly in maintaining a sustainable level of production for the business to be profitable. This imply to discover new deposits that allow the producer to project its mining business, for this matter it is observed that producers are highly dependent on the ENAMI promotion program. In this situation, a disjunctive is visualized in terms of the strategy that ENAMI uses, mainly questioning whether the current policy allows the sector to boost its performance by enhancing competitive capabilities. There must be considered, however, that

there is a series of problems that affect the structure of development of the sector and that private venture capital market practically does not exist. In addition, there is no real known intention for the banking market to develop this kind of tool for the small-mining sector producers.

In general terms, there was determined that the satisfaction of the users towards the instrument is concentrated in high satisfaction ranges (very satisfied - satisfied), with assignment of confidence note also high. The processes and dimensions evaluated in the promotion instrument present satisfactory results for the users, however, due to the problems that the producers have in the access to the national financial market, is that the risk capital program that ENAMI offers, in terms of the magnitude of the amounts granted, is perceived as inadequate. Similarly, the times of resolution of problems that occur in the execution of the project are considered too long, concluding that it is mainly due to the centralization of internal processes. In relation to those satisfactory results, we can point out that the perceived trust of the producers towards ENAMI and the professional performance of the internal collaborators, is one of the best evaluated items, perceiving a very good fulfillment of the professional accomplishment of the project executives. It stands out, the aptitude of the professionals who make the technical visits, considering in most of the cases, the geographic extension that separates each miner from the promotion offices of ENAMI. This point is reaffirmed in the satisfaction that the respondents perceive and assign to the ENAMI-mining relationship. The confidence assigned to ENAMI by the respondents, presents favorable results, due to the perception of transparency in the delivery processes of the results obtained and the methodology used in their evaluation, highlighting the good communication channels used, considering the important geographical extension in some regions of the north of the country.

ENAMI's venture capital instrument maintained positive efficiency returns in its management for the 13 mining development offices, in which reserve recognition activities are developed. Regarding the selected variables, it is possible to infer that the variables comply with the estimated according to the program. It is concluded that the variable with a negative result (investment of the mining producer) is associated to the fact that the resources are destined not precisely in the development of exploration activities when the project is in execution. In the case of the variable man hours, which considers activities specific to the execution of the project as administrative management activities, it is concluded that although the variable presents the expected sign, it would be advisable to know the impact of these management hours in the activities of each promotion instrument, which could improve the efficiency of each office for each promotion instrument in general, considering that the hours of administrative management are prorated and in some years it covers 50% of the hours allocated to the program. The variable, related to the investment of ENAMI and the number of projects awarded, maintains results as expected, therefore, it is concluded that to increase the amount of resources found it is important that the number of projects awarded, the resources allocated for this ENAMI instrument, and, the meters executed per year, should increase. This would have as a direct consequence that greater number of mining producers would be reached, so they would have the financial resources necessary to perform this type of activity. Regarding the efficiency ranking, it is concluded that the results show a good level of technical efficiency for each office in the use of

available resources to recognize new reserves, reaching an average of 90% yield, which would demonstrate good management in project management capacity for each of the mining offices. On the other hand, when analyzing the data matrix, we can establish that, to achieve higher levels of efficiency, ENAMI's investment in supporting the awarded projects concludes that, the greater the number of awarded projects focused the resources in mining exploration, it would generate as a result, better outcomes in the management of each office, with the probability of finding more productive reserves. Therefore, it would be advisable that the amounts to risk capital be directed to fund drilling activities, as long as work activities are financed with a differentiated mechanism, because these two activities present different risks and profitability in their action. In general, efficiency returns demonstrate good management in the organization of resources (investment and man hours), positively impacting the discovery of new mining reserves for the benefit of the sector as a whole.

4 Conclusions

Based on the research outcomes, and the subsequent analysis of the results obtained, it is possible to conclude that an important part of the costs of the small-scale sector are used to finance exploration activities. ENAMI's promotion program is currently the only source of financing for this type of activity, which allows the sector to keep its production active and growing. The program was evaluated, both by the producer through the user satisfaction, as well as by its technical efficiency. The results indicated that although the program achieves its central objective of providing producers with mining reserves that allow them to maintain sustainable exploitation over time, this strongly depends on the quantity of projects awarded and the number is subject to budgetary restrictions. Therefore, it is necessary to make progress in focusing to improve those problems of the sector that are structural in nature and that hinder its development. It is recommended to improve the associativity among the producers, taking advantage of possible economies of scale; knowledge, focused on acquiring new skills; the management of positively facing price variations; innovations in business management; and, the risk of depending on only one source of financing, which depend on government goals, not necessarily constant in the long run.

Regarding a recommendation, to contribute to improve some aspects of the program, it is proposed to design and apply a study that analyzes the workload for the different mining offices spread throughout the country, which establishes the weight of each promotion tool, each office, considering the different realities that are conceived for each region, so that each project could be quantified according to activities involved and geographical extension for a better allocation of resources and endowments. With respect to the amounts contributed by project, a possible measure that benefits the efficiency of the resources allocated is to study new methodologies for evaluating mining projects under uncertainty, such as those proposed by [9, 10] (real options). Concerning the application times, it is recommended to implement management indicators that improve the time allocated in the internal processes of delivery of results and carry out process surveys, recognizing those critical points and necessary to correct.

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The Relationship between Knowledge Security and the Propagation of Innovation

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Abstract. The paper discusses the issues of knowledge creation, knowledge security management and the impact it has on the generation of innovative ideas in an organisational environment. Knowledge security seems to be the key factor in building competitive advantage for businesses. In order to be competitive these days, one has to be constantly implementing innovative products and solutions. A number of companies that are involved in innovative activities yet do not always provide sufficient knowledge resources, which lay the foundations to further growth. The aim of this paper is to recognize the security gap that opens up during the dynamic, knowledge-based and innovation-driven development of a company. This gap can be created if a company fails to identify appropriately the stakeholders and their needs or their intentions when time is scarce. The reflections are based on research conducted on a group of companies developing a pro innovative approach with a focus on knowledge management.

Keywords: Information security · Innovations · ISO 27001 · ISO 31000 · RODO · Industry 4.0

1 Introduction

The information protection is such an important issue that it should be considered in two aspects. First of all, the organization must fulfil all the requirements imposed by the common binding law. The second aspect is perceived only by some managers who are fully aware that the proper management of information security in the company refers not only to the limitation of security incidents (e.g. uncontrolled data leakage, external attacks on IT systems, etc.), but above all, it focuses on adapting information security measures into the company's strategy giving this issue a business priority.

However, in order to achieve the desirable effects, the introduced internal regulations should be accompanied by a change of mentality of the whole organization in the approach to the issue of information security. Many companies pay little attention to the issues of information security of the data they gather [1].

This phenomenon happens with a different intensity all over the world but the awareness referring to the dangers is almost everywhere the same- it is very low. Depending on the country and the kind of organization, the ways to obtain

unauthorized access to the gathered information are usually very different but unfortunately, they almost always finish with a success.

This situation causes that it become necessary to take actions to implement changes in this area. This happens because of the risk which comes to an existence while creating and spreading innovations in organizations and legal regulations referring to financial reporting and data protection which motivate the managers of the higher level to deal with these issues. Therefore, the legal requirements are main reason which makes companies take actions related to information security [2].

More and more managers see a necessity to adjust to the legal requirements and consider it to be one of the most important reasons to take actions connected with the information security.

The provisions specific for a given branch which become a stimulus to take decisions on activities in the given direction are the most important regulations referring to information security.

The issue of privacy protection looks quite similar. The meaning and the influence of provisions referring to the mechanisms of internal control and the operational risk for information safety (e.g. a creation of an adjustment of the policies and internal procedures in the company to the requirements of the law of Sarbanes-Oxley, VIII Directive or their counterparts) also increase. The companies should use the chance which is provided by the opportunity to adjust to legal requirements.

Unfortunately, so far, few organizations have shown due diligence, which would give grounds to conclude that their control mechanisms are effective and trustworthy and what's more that they are aware of existing vulnerabilities, threats and risks related to this. However, it is necessary to realize that soon the organizations which base their development on product and process innovations will be forced- mainly due to the appearing more and more numerous threats- to treat information safety as seriously as the defined business processes and analyse them as deeply as in case of financial reports and mechanisms of internal control. The activities related to this issue have a direct impact on the processes which happen within the organizations and on the obligatory activities resulting from law provisions [3].

2 Approach to Information Protection

The complexity of processes of disseminating innovations in the contemporary organizations creates the challenges which require an increase of the awareness referring to information safety. The existing risks and negligence can be cumulated causing the threat of serious distortions, significant financial loses and the loss of reputation. The insurance of a satisfactory level of safety requires a clear vision from the company referring to the resources which it intends to protect and the threats which can have impact on them.

The experience shows that if the management of the company can, even partially, recognize and understand the threats, it is easier for them to protect from them.

Regardless of the branch and the size of the company, a lack of consciousness related to information security is one of the most important and at the same time the most difficult problems in the process of effective information protection. In order to

avoid the consequences resulting from it the top management must treat the issue of information safety management as an integral part of the process of company management and a basis for the organizational culture. The employees who are trained in the proper way and who are aware of the threats can become the most effective elements of the strategy of building security in the company.

It is necessary to realize that security of the information which is processed by the company depends not only on the single persons who are responsible for the implementation of security. The safety is dependent on the activities of every user and the function of this user within the organization is not important. It is necessary to remember that the higher the employee is placed in the hierarchy of the organization, the wider is the access to the information protected in the organization, which contrary to the appearances generates one of the biggest threats for information security. Regardless of the position in the organization and the position as such and the activities which are executed, each of the users must be aware of the threats which are connected with the information they process on daily bases but also of the consequences which result from making them known, lost, modified etc.

It is necessary for the employees who process the information in the company to realize that the protection of this information is not only an additional duty for them but also is within their interests. The management of the company should intensify the activities which aim is to create the organizational culture based on the understanding of issues related to security and the feeling of responsibility for own activities. Such an approach to the problem so the creation of the security out of the information as a part of their own culture gives a positive chance for the change of behaviour within the organization and the implementation of the information security which guarantees the effective management of innovative processes [4, 5].

The experience shows that few companies apply such a complex approach to the issues of information security- including the analysis of possibilities, threats and opportunities. The approach of companies to the issues related to information safety has generally a reactive character. The organizations concentrate on eliminating the results of improper handling of information and not on preventing it that is finding the reasons which cause the threat for information security.

A proper approach to the information security management is an issue which should be equally interesting for the managers and the board of the company, taking into consideration the strategic meaning of information security for the results of the company. The units responsible for security need clear guidelines from the managers on the priorities and on the process of taking decisions in the area of security. On the other hand the authorities of the organizations must have an access to reliable information in order to realize what impact on the strategic activities of the company can be exerted by the issues related to proper information security management.

Thanks to a coupled and open communication between the managers of units implementing the information security functions and top managers the organizations can manage the risk in the proper way. It proves that the deep awareness on the meaning of information security must have a top-down approach.

The top management of the company must realize the importance of this issue since the achievement of a proper level of information security in the company will be

achieved only when a coherence of activities in the fields of information security and business aims will be ensured.

That is why it is necessary to overcome a hierarchical division between the board and operational staff which in the past perceived the information security as a technical and not a business issue.

Therefore, the active participation of top managers in taking the decisions concerning the information security becomes necessary as well as the increase of the activities connected with realizing the importance of security management to themselves and to all the staff members.

The majority of organizations need to do a lot of work which aim is to increase the importance of safety and bring it to the same level as other business issues tackled by the board.

3 Security Policy in the Innovative Company

The security policy must be understood as a set of rules and norms which should serve as a proper protection of the system resources. The system of protection in turn are the proper means and technical, organizational and legal mechanisms which must be used in order to protect the information.

It can be said that the system of information protection system is an executive tool of safety policy. There are of course many possibilities of information protection but the complex approach to these issues turns out to be the most effective.

Therefore, it is necessary both to implement proper technological solutions, create and implement the required procedures as well as train and build the awareness of employees for the security of the processed information [6].

However, in order to allow the information security policy to bring a desired effect, its creation should be proceeded by a detailed identification and learning about threats which the information gathered and processed by the organization may face, particularly in reference to the development activities such as innovative activities.

The policy is a general document which defines the rules of access to the resources gathered and processed by the system. It defines how to execute these resources and describes the basic system security architecture. This document has in the majority of cases the importance of the internal regulation accepted by the board of the organization. All the employees of the company are obliged to obey the rules resulting from security policy. Additionally, in order to ensure a smooth implementation of activities related to implementation and enforcement of security policy, within the structures of the company some people are appointed to fulfil these duties.

The properly constructed security policy, according to the opinion expressed by American National Institute of Standards and Technology (NIST) should include the following areas connected with the security of information system:

- identification and authentication - defining the mechanisms of user authorization in the system,
- access control – consists of defining the access rights of individual user groups to system resources,

- responsibility tracking - based on the ability to reproduce the history of operations performed in the system in connection with the unambiguous identification of users who initiated their execution and the time of performing these operations,
- examination of the safety status - it should be carried out periodically in order to ensure a continuous monitoring of hazards, assessment of the effectiveness of safety and continuous improvement of the safety area,
- protection of shared resources - it is a development of the access control issue, it concerns a group of resources that due to the fact that are shared by many users are particularly sensitive to behaviors that violate the principles of good cooperation,
- accuracy and reliability of protection - these are elements that are supposed to ensure the system resistance to any attempts to monopolize its resources by an ineffective or rashly privileged user as well as dismiss the threat of taking control of the system by unauthorized persons in a crisis situation,
- communication protection - an extremely important element of security policy, which refers to the area in which the data leave the system in order to reach the recipient safely and reliably.

Each organization disposes of IT system which in fact creates a basis for its functioning. The systems use more and more widely the IT technique which provide a wide range of possibilities for quick and easy processing, gathering and transferring information. However, the IT techniques are only the tools whereas it is the information which is the most important for the company. As far as information carriers are concerned these can be all the kinds of paper and electronic data bases, oral recommendations which are – generally speaking- processed in the information system of the company [7].

However, it is necessary to realize that the very fact of possessing the information is not the generator of innovativeness as paradoxically, very often the access of information can be detrimental for the development and for obtaining a competitive gain. Only a combination of information with the activities of people is a source of valuable knowledge as only people know how to use information in order to make it bring the visible effects.

It happens very often that the information protection is only connected with such activities which aim is to block the access of third parties to information systems. However, this approach is too limited e.g. because of the fact that this kind of threats can refer and can materialize in reference to a small group of big companies and organizations.

First of all, the big and the richest companies belong to this group as well as military, governmental, financial organizations, which due to their position and specificity of activities- which creates appearances and myths of unlimited advantages in the context of e.g. threats within them- are the common aim of attacks. However, in the majority of cases they dispose of sufficient resources to effectively repel and thwart attacks. In the smaller organizations the loss of date is definitely a bigger problem together with downtimes resulting from failures or errors due to incomplete information [8].

The information has always been susceptible to dangers. And the form of this information does not make a difference- whether it is in the paper or electronic form- because the threats have always existed- but they were simply of the different form. It shows that the information protection, regardless of the information form, is colloquially speaking always necessary.

However, in innovative organizations this problem got a slightly different dimension and a meaning. Taking into account the development of IT techniques, computer networks as well as an increasing dependence on them in the different areas of the company functioning, a necessity to plan and implement a proper system of protection which aim is to protect the processing of information of computer carriers is additionally imposed. The only reasonable option is to skillfully incorporate elements of security into the existing system. It is the only solution since almost none of the organizations can afford to create a new IT system- this would mean a closing of the company for the time of creating the system which is of course a solution which cannot be accepted. A trial to obtain answers to a few key questions is a starting point for such an approach so a trail to design and include in the system the elements of security and control mechanisms:

1. Where and how the information is stored in the organization?
2. What are the sources of threats?
3. What can be done to limit these threats?

The answer to the first question usually does not cause any problems because it is easy to define the places in which the information is stored within the organization:

- on computer media (magnetic discs, optical, magnetic discs, tapes, etc.),
- on paper (prints, handwritten documents, notes, etc.)
- in human memory.

The localization of carriers can be different (the servers of files, personal computers, card indexes, wardrobes for documents, safes etc.). However, this answer is possible after analyzing the resources of the organization. In the situation when the IT system functions in the proper way the analysis is not difficult- what is more, it allows to introduce the possible changes in the way of storing the information. The creation of security policy can be an occasion to modify the existing system, but it is necessary to adopt irrevocable rule that the system in which the security policy is implemented should be optimal as far as the management, flow and information storage are concerned [9].

It is not practiced to introduce a security system when the very information system functions badly since as the result it can bring more disadvantages than advantages.

Wanting to answer the last two questions it is necessary to understand it is not so easy. It requires a detailed identification and understanding of the threats that the information processed in the company in which the development is dependent on the adoption of innovation face.

4 Research

The target group of the research are the companies for which the loss of undesired modification of the data can be the source of the serious consequences because:

- They use the information which should not go outside,
- They use the information which is particularly sensible or prone to modifications,
- They produce valuable information,
- They are interested in increasing reliability in the contacts with other organizations,
- They should be interested in decreasing the risk of losing the information in their basis activity.

Therefore, taking the specificity of these companies into consideration and particularly their cooperation with other stakeholders, there is a risk of potential losses caused by insufficient protection of valuable informational resources and particularly of a technical thought.

The research survey was designed on the basis of the requirements included in the norm ISO/IEC 27002 and the requirements resulting from the provisions of law as well as the rules resulting from the specificity of operation and functioning of innovative companies. It is a survey which is a starting point to design the rules connected with an introduction and maintenance of the system of security in the organization adequate to the demands and needs. On its basis it should be possible to identify the main weaknesses of the activities of the company and to evaluate the existing protections in the context of the security of the information processed by the company.

The survey includes the questions which refer to a few areas first of all connected with the classification of the processed information, the organization of security in the company, the physical and personal safety, processing of information in the IT systems, the access to information, the safety of systems and networks, compatibility of the solutions applied in the management of information in the organization with the provisions of law.

In reference to the rules of information security which refer to the cooperation of the company with external stakeholders, the fulfillment of the requirements of this area was on the level of 23.8%.

The clear procedures referring to the cooperation of companies with other stakeholders were created (19.6%). The ways of handling the information which was obtained while creating other technical, technological solutions by the employees of the company, by trainees and scientists cooperating with the company were created (43.2%).

The procedures were created for:

- Dealing with the environment when the company plays a role of the implementation advisor, cooperates with other companies on the level of detailed solutions and know-how (22.8%),
- Dealing with the information obtained from the environment while conducting
 - Research (20.8%),
 - Scientific projects (19.3%),
 - For scientific advice (24.22%),
- Referring to the confidentiality of information (23.4%),
- Referring to activities done in cooperation with higher education institutions or with other scientific centers (43.3%) referring to information storage, access to information etc.,

- Procedures referring to patents in the area of storing information, access to information (31.3%),
- Procedures referring to other forms of cooperation referring to information storage, access to information etc. (29.7%).

Many companies have prepared clearly defined and public rules of publishing the results obtained within scientific activities (32.8%).

The company's procedures ensure that the information is kept confidential to external organizations with which or for which the company:

- Conducted research (39.4%),
- Cooperated or worked in the framework of scientific projects (43.5%),
- Cooperated and worked in the framework of other forms of cooperation (39.2%).

The companies in every case fulfilled the duty to inform the external company they were cooperating with in the framework of the above-mentioned activities how the information which will be obtained during and after the work will be stored also in reference to the products obtained at every stage of the activities (23%).

5 Conclusions

It must be remembered that the improvement of safety should include not only the physical and technical security but also the organizational security which would effectively eliminate the existing weak points. Only a complex approach to safety will allow to adjust the security to the requirements which allow to use them fully.

A proper choice of the applied protections, their design and implementation should take into consideration the specificity and defined dedicated requirements connected with the information security in such a company and a pro-innovative company.

Thanks to such an approach the following aspects will take place simultaneously: the issue of analyzing the risk of the different areas of company's activity taking into consideration the information safety and updating and improving the security rules on the basis of such reviews. This will allow to prepare the solutions which give a coherent integrity, to limit the weaknesses of the existing systems to an acceptable minimum and to point at the activities which improve the security- which is one of the main aims of information security management.

The presented results underline the convictions of the unit managers about the described situations. The interviews and observations conducted during the research point that the level of security presented in the surveys is in the majority of cases the level which the respondents want to achieve and not a reality. Despite the declarations about the existence of specific solutions (described in the surveys), in the majority of cases they could not be verified in reality because they did not exist. The fact that this kind of organization obtained such a medium level of the fulfillment of requirements shows a good understanding of the issues and a willingness to implement them. It was also proved by direct interviews. Many respondents pointed at the fact that the survey allowed to identify many threats and a necessity to implement quick actions in the field of security management and the company management as such.

Technical protection measures are the most popular element of security in the majority of organizations. Nevertheless, this does not mean that they are the most effective element.

However, the application of the proper technical protection measures constitutes a necessary compliment for the existing or created organizational elements increasing security.

The appropriate selection of the applied protections, their design and implementation must take into consideration the specificity and the dedicated requirements connected with information security in the organization such as the company which bases its development on innovative activities.

Unfortunately, it often happens that such companies are not perceived by employees as an area with the risk of losing information and as a result, a comprehensive risk analysis is not carried out.

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Perceptions of Market Competition: What is the Difference between Contractors and Clients?

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Abstract. A comparative study was conducted to gain the perception of competition rule in the construction industry. A 4-category and 34-item market competition perception criteria were identified via qualitative approach - content analysis. This paper reviewed 217 bid documents and administrated 500 questionnaires to collect the opinions among both clients and contractors in China. It is found that the perception difference of the market competition rules between clients and contractors from the highest to the lowest were economic part, comprehensive part, commercial part and technical part. Moreover, clients and contractors had the largest perception difference in wage payment guarantee measures for peasant workers. This study contributes to an understanding of perceptions of competition rule in China. It may help to formulate guidelines to manage the unreasonable factors in market competition rules and improve construction market efficiency.

Keywords: Competition · Perception · Competitiveness · Construction market China

1 Introduction

Construction contracts are normally awarded to contractors through competitive bidding [1]. Competitive bidding is the major mechanism of competition [2]. Competition perception is clients' and contractors' perception for bidding. Thus, it is very important that clients can receive assistance in the selection of proper contractors and contractors can be guided to develop more competitive bidding strategies [3]. Typically, in a bid process, clients state clearly project requirements in tender documents and require contractors to deliver the project as specified and achieve the best value for the money. Accordingly, contractors prepare bid documents based on their understanding of tender documents to response clients' specifications and instructions.

However, clients' and contractors' market competition perception vary from one sector to another. The study by Zedan et al. indicated clients' market competition could be classified into (1) financial soundness; (2) technical ability; (3) management capability (4) health and safety; (5) and reputation [4]. Lin et al. proposed a set of criteria for assessing contractors' market competition perception, including nature, competition,

value of the bid opportunity, resource capabilities, and reputation of the company [5]. Waara et al. revealed a significant competition perception differences among public clients, private clients, and contractors in U.K. construction market [6]. A similar study conducted by Thomas et al. also found the existence of differences in perception among the groups of architects, quantity surveyors, civil engineers, and project managers [7].

Numerous studies argued that clients and contractors perceive market competition differently. However, there is little empirical evidence to support the assertion. In order to cater this issue, this paper presents a comparative study on clients' and contractors' market competition perception. By combining quantitative and qualitative analysis of perception survey results, this study: (1) examined clients' and contractors' market competition perception and (2) identified the perception variation existed between contractors and clients.

2 Materials and Methods

2.1 Market Competition Criteria

By conducting content analysis on 217 bid documents (with a ten-year time span including 30 provinces of China), the market competition rules were identified and classified into four categories: commercial (5 rules) part, economic (5 rules) part, technical part (14 rules) and comprehensive part (10 rules). Commercial part describe bidding enterprises' comprehensive abilities. Technical part refer to criteria that relating to onsite construction work, include schedule control, construction plan and material plan etc. Economic part means bid price, both clients and contractors paying much attention to this part. Comprehensive part include criteria that describe enterprises' working abilities and comprehensive abilities.

2.2 Clients' Perception of Market Competition

The frequency and amount of score the market perception criteria appear in bidding documents is a good reflection of clients' market competition perception. Thereby, these two indicators were used to measure clients' market competition perception. To avoid extremes and consider frequency and average score at the same time, clients' market competition perception was calculated as follows:

$$Sum(i) = \sum_{i=1}^{Quantity} x_i \quad (1)$$

$$RM(i) = Relative\ Mean(i) = \frac{Sum(i)}{Quantity} \quad (2)$$

$$AM(i) = \text{Absolute Mean}(i) = \frac{\text{Sum}(i)}{\text{Total Quantity}} \quad (3)$$

$$\text{Importance}(i) = -\{\text{Rank}[RM(i)] + \text{Rank}[AM(i)]\} \quad (4)$$

$$\text{Rank}(i) = \text{Rank}[\text{Importance}(i)], (i = 1, 2, \dots, 34) \quad (5)$$

Where $I_i (i = 1, 2, \dots, 34)$ stands for the market competition criteria, and $\text{Sum}(i)$ is the sum of a particular criteria's score. $RM(i)$ stands for relative mean of the criteria's score, while $AM(i)$ stands for the absolute mean of the criteria's score. Rank is a descending sort function, and $\text{Rank}(i) \in (1, 2, \dots, 34)$ is the importance index, the smaller this index, the more important the criteria.

2.3 Contractors' Market Competition Perception

A questionnaire was devised to survey contractors market competition perception. The survey included 34 identified market competition criteria. Respondents were asked to indicate the level of importance of these criteria in assessing the market competition perception of the contractors on a five-point Likert scale, where 1 means the criterion is irrelevant, 2 means the criterion has “very low importance”, and 5 means it is “very important.” The questionnaire was divided into two sections. The first section was contractors’ personal information; and the second section was market competition perception of surveyed contractors.

The questionnaire survey was conducted from November 2015 to December 2015, in the area of China. The questionnaire survey was given to a total of 500 construction workers. Not counting the omitted and invalidated surveys, a total of 274 valid questionnaires were collected.

And contractors’ market competition perception was calculated as follows:

$$\text{Importance2}(i) = \frac{\left(\sum_{j=1}^M z_{ij}\right) * 100}{5 * M}, (i = 1, 2, \dots, 34) \quad (6)$$

$$\text{Rank2}(i) = \text{Rank}[\text{Importance2}(i)], (i = 1, 2, \dots, 34) \quad (7)$$

Where M refers to valid questionnaires. $\text{Rank2}(i)$ is contractors perception to a certain market competition criteria, the bigger the perception, the more important this criteria. In a certain questionnaire ($j = 1, 2, \dots, M$), the score of criteria $I_i (i = 1, 2, \dots, 34)$ is z_{ij} .

2.4 Perception Comparison

This paper measured and compared the perception difference between contractors and clients as follows:

$$a_i = \sqrt{\frac{(Rank_1(i) - Rank_2(i))^2}{2}} (i = 1, 2, \dots, 34) \quad (8)$$

The greater the value of a_i indicates the perceived gap between clients and contractors in criteria i is bigger.

3 Results

Economic part includes the most critical criteria in construction market competition rules, which usually determines the final bidder [8]. As shown in Fig. 1, this part has the highest accumulated perception difference of 9.37. The accumulated perception difference in comprehensive criteria is 8.25. The comprehensive criteria involving a wide range of indicators for which information is often qualitative, subjective, and imprecise [9]. The perceive process for these criteria remains largely an art where subjective judgment, based on the individual's experience, becomes an essential part of the process [10]. The accumulated perception difference in commercial part ranks third, which is 5.80. Technical criteria are objective and precise, which is important for project quality, clients and contractors hold similar attitude to technical criteria and the accumulated perception difference in this part is 3.54.

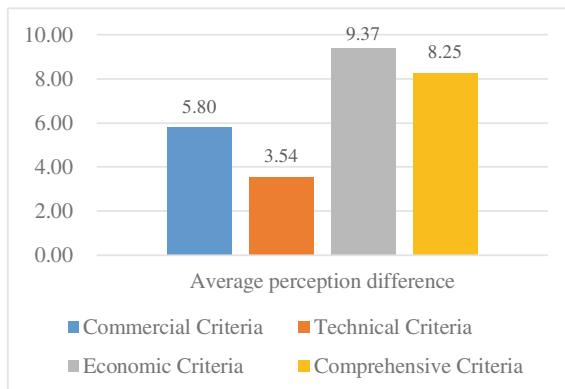


Fig. 1. Comparison of perception of market competition between contractors and clients

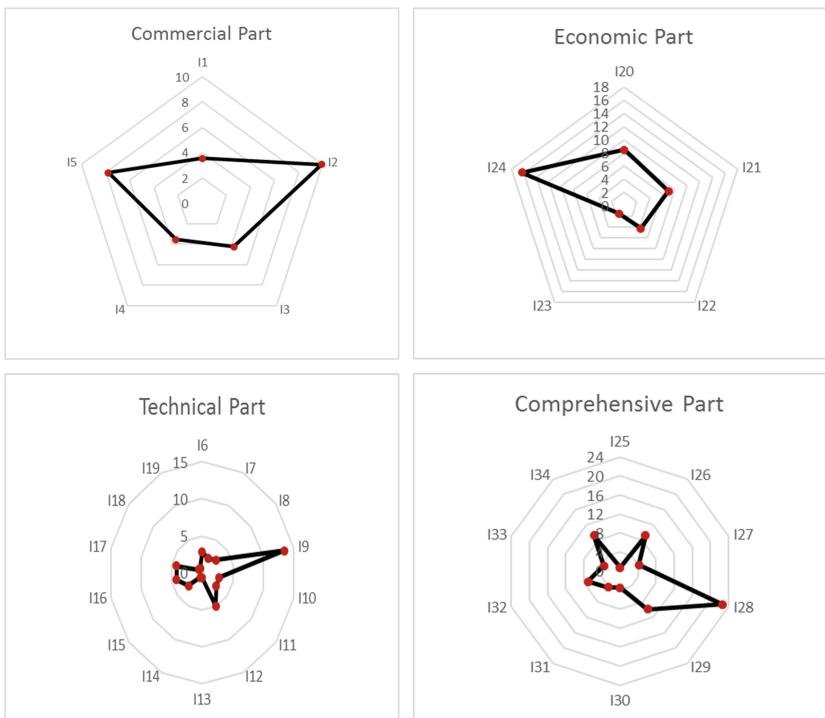


Fig. 2. Perception difference of market competition between contractors and clients

3.1 Commercial Part

The most important rule for clients in commercial part is I1 (bidding enterprise performance), whilst the least important rule for clients is I4 (preferential terms of bidder). As for contractors, I1 (comprehensive strength of bidding enterprises) ranks first, and I4 (preferential terms of bidder) is the last thing that contractors care about. As shown in Fig. 2, Clients and contractors share quite different view on bidding enterprise qualification and credit and honors and awards of bidder. Both clients and contractors pay little attention to I4. The most important factor in the eyes of the contractor is indicator I1 (Comprehensive strength of bidding enterprises), which ranks sixth for clients and the ranking gap between them is not very big, implying that this factor is one of the most important ones in the views of both groups during construction market competition. For clients, the most important indicators of market competition rules are indicator I20 (Total bid price), which just takes the thirteenth place on the factor list of contractors. Pricing of bidders is regarded as an optimum decision on account of cost and market competition level by previous studies [11–13]. However, the abnormally low bids were blamed as the main cause of poor quality in projects [14] (Table 1).

Table 1. Perception of market competition in commercial part

| Categories | No. | Name of the criteria | Clients | Contractors |
|-----------------|-----|---|---------|-------------|
| Commercial part | I1 | Comprehensive strength of bidding enterprises | 6 | 1 |
| | I2 | Bidding enterprise performance | 3 | 17 |
| | I3 | Bidding enterprise qualification and credit | 9 | 3 |
| | I4 | Preferential terms of bidder | 29 | 34 |
| | I5 | Honors and awards of bidder | 22 | 33 |

3.2 Technical Part

In technical part, the most important rule for clients is I7 (construction technical measures), the least important rule is I17 (protection measures for finished and semi-finished products). As for contractors, the most important rule is I6 (general scheme of construction organization design), and I14 (Construction measures on seasonal and special conditions) is the least important rule. Contractors and clients have a large

Table 2. Perception of market competition in technical part

| Categories | No. | Name of the criteria | Clients | Contractors |
|----------------|-----|--|---------|-------------|
| Technical Part | I6 | General scheme of construction organization design | 8 | 4 |
| | I7 | Construction technical measures | 2 | 5 |
| | I8 | Construction site layout (including temporary facilities) | 24 | 20 |
| | I9 | Project schedule targets | 31 | 12 |
| | I10 | Construction progress plan and guarantee measures | 10 | 14 |
| | I11 | Quality management system and guarantee measures | 14 | 10 |
| | I12 | Labor, materials, machinery and equipment investment plan | 13 | 20 |
| | I13 | Key points, difficulties and solutions of engineering projects | 16 | 15 |
| | I14 | Construction measures on seasonal and special conditions | 29 | 30 |
| | I15 | Applications of new technologies, processes, products, and materials | 27 | 31 |
| | I16 | Safe and civilized construction and environmental protection measures | 10 | 16 |
| | I17 | Protection measures for finished and semi-finished products | 33 | 27 |
| | I18 | Energy saving and cost reduction measures | 24 | 23 |
| | I19 | Construction subcontracting plan and the management measures on subcontracting teams | 26 | 25 |

perception gap on I9 (project schedule targets), this criterion ranks twelfth in contractors' perception, whilst ranks thirty-first in clients' perception. It is due to the fact that contractors would suffer from a large amount of fine once the expected project delivery date is delayed. Clients and contractors perceive criteria I13 (key points, difficulties and solutions of engineering projects) and I19 (construction subcontracting plan and the management measures on subcontracting teams) almost equally (Table 2).

3.3 Economic Part

In economic part, the most important criterion for clients is I20 (total bid price), and the least important criterion is I21 (completeness and correctness of commercial bid documents). As for contractors, the most important criterion is I23 (comprehensive unit prices of main bill quantity items), the least important criterion is I24 (price review of measure item fee and other item fees). However, I24 ranks fifth in clients' market competition perception. This criterion shares a large perception difference among all the economic criteria. And both contractors and clients agree that I23 is important in bidding (Table 3).

Table 3. Perception of market competition in economic part

| Categories | No. | Name of the criteria | Clients | Contractors |
|---------------|-----|--|---------|-------------|
| Economic Part | I20 | Total bid price | 1 | 13 |
| | I21 | Completeness and correctness of commercial bid documents | 19 | 9 |
| | I22 | Rationality in the bid price quotation | 14 | 8 |
| | I23 | Comprehensive unit prices of main bill quantity items | 4 | 6 |
| | I24 | Price review of Measure Item Fee and other Item Fee | 5 | 28 |

3.4 Comprehensive Part

In comprehensive criteria, I26 (response to the tender documents) is the most important criterion, and I25 (the quality of bidding documents) is the least important criterion. For contractors, the most important criterion is I28 (wage payment guarantee measures for peasant workers), and I34 (final bidding defence of project leading management team) are the least important criteria. The internal balance for comprehensive indicators is very poor as present in Fig. 2. Clients and contractors share the most difference in I28 (wage payment guarantee measures for peasant workers). It is shown according to data analysis that this factor is most unimportant from the perspective of clients and it goes to the bottom in the contractors' rank, and it is the second important criterion from the top for contractors. In practical, migrant workers wage payment guarantee measures are fairly significant. It will harm contractors' credit and may cause construction delay due to the strikes. However, this factor is not valued by clients in the tendering documents. And surprisingly, except I28, contractors and clients share similar opinions on other criteria in comprehensive part (Table 4).

Table 4. Perception of market competition in comprehensive part

| Categories | No. | Name of the criteria | Clients | Contractors |
|--------------------|-----|--|---------|-------------|
| Comprehensive part | I25 | The quality of bidding documents | 27 | 26 |
| | I26 | Response to the tender documents | 6 | 19 |
| | I27 | Reasonable suggestions on the project | 23 | 29 |
| | I28 | Wage payment guarantee measures for peasant workers | 34 | 2 |
| | I29 | Warranty, follow-up service and commitments | 21 | 7 |
| | I30 | Performances and qualities of project manager | 16 | 11 |
| | I31 | Institutional settings, comprehensive quality and management experience of the project leading management team | 12 | 18 |
| | I32 | Cooperative measures among general contractor, design companies and supervision | 32 | 22 |
| | I33 | Sample quality | 18 | 23 |
| | I34 | Final bidding defense of the project leading management team | 19 | 32 |

4 Conclusions

Bidding is critical for both clients and contractors. Although clients develop multi-criteria tender documents to deliver construction project as specified, contractors take a different view on these criteria. Contractors need to understand their specific resources that generate competitive advantage and accordingly develop strategies to win contracts. The study presented in this paper aimed to (1) examines clients' and contractors' market competition perception and; (2) identifies the perception variation existed between contractors and clients. This study has identified a 4-category 34-item market competition perception criteria. Based on the collected information, perception scores were calculated for clients and contractors individually, and statistical comparisons were performed to examine perception difference.

Clients and contractors take a different view on market competition. More specifically, the perception difference of the market competition rules from the highest to the lowest were economic part, comprehensive part, commercial part and technical part. Clients and contractors share similar opinion in criteria I13 (Key points, difficulties and solutions of engineering projects), I14 (Construction measures on seasonal and special conditions), I18 (Energy saving and cost reduction measures), I19 (Construction subcontracting plan and the management measures on subcontracting teams), I25 (The quality of bidding documents). In contrast, clients and contractors have the largest perception gap in I28 (Wage payment guarantee measures for peasant workers).

The identification of market competition perception criteria and comparison of market competition perception difference between clients and contractors provide

valuable information for helping clients to better select contractors. The research results are also useful for contractors to prepare themselves effectively for bidding. Moreover, the perceived difference among clients, contractors or other types of participant group on the same market competition rules is a good measure to evaluate the reasonability and order of the specific market. The findings also help manage the unreasonable factors in market competition rules, and improve construction market efficiency.

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Relationship Between Firm's Performance and Factors Involved in the Selection of Innovation Providers

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Abstract. Innovation is the backbone of the product development in present era for the survival of the corporate organization in the respective market. Changing trends in every passing day are making the product development more competitive and innovative. This paper investigates the relationship between firm's performance with respect to outsourcing innovations and factors affecting the selection of contract research organizations or innovation providers. The research is conducted by a self-designed instrument in the form of a survey form on 112 respondents internationally in 17 countries. The paper will give empirical relationship among firm's performance, outsourcing innovations and six major factors, which play a vital role in the selection of CROs. Proposed hypotheses in this article are based on empirical relationship, which is validated by SPSS 24. The findings support the conceptual model and offer many managerial implications, which are described in detail at the end of the paper.

Keywords: Innovations · Firm's performance · Contract research Organizations · Outsourcing

1 Introduction

The dynamics of product development industry has been changing with rapid pace according to recent reviews of the international business, management, and innovations. Every research-based company wants to compete in a market with unique innovations. To be successful in this competitive environment companies are outsourcing innovations. Although some researchers have paid attention to risks of outsourcing innovations [1], little is known about the impact of outsourcing innovations on firms performance. Some research has been carried out to measure the relationship of firm performance and CROs they engaged.

Firm's performance has typically been measured based many other parameters such as marketing, sales, management, human resource, and production. The literature of firm's performance based on these parameters is very rich [2]. However, the previous researcher has not focused on the impact of outsourcing on the performance [3], especially when we talk about outsourcing core and unique skills. Some studies show that innovations should not be outsourced [1]. One of the reasons for unavailability of

such measurement might be because measuring the firm's performance based on outsourcing innovations is different from other conventional ways and different tools may be required to measure this relationship. Researchers have discussed innovation performance [4] but very few have addressed phenomenon empirically [5]. A major point of difference between measuring firm's performance based on production, management, marketing, sales in comparison to innovation-based measurement is that innovations always decide the future of performance of the new product in the market, which directly impacts overall firm performance in the market [6].

Moreover, in recent past companies are outsourcing innovations from other companies or contract research organizations (CROs) [7]. As a result, the parent company's performance is not only related to innovations but also to the innovation provider's performance and quality of innovation they provide to parent company [8]. Thus, outsourcing innovations play a vital role when we measure firm's performance, which is intensely dependent on such innovations and CROs. That is, outsourcing innovation involvement in the overall process is very useful and critical while measuring the performance of such organizations [8]. Past research on measuring firm performance only revolves around following broad issues: Firms performance based on quality and quantity of production rate, managing the overall firm, level of marketing and sales and human resources impact [9].

This research attempts to examine the relationship of firm's performance with outsourcing innovations and ties CROs while measuring the performance of parent company. Essentially, this paper responds to the call for the new thinking about measuring R&D based firm's performance and draw inspiration from the work of Chesbrough and Crowther 2006 [9]. They stressed the need for outsourcing innovations, open innovation paradigm, the primary concepts employed in this process and challenges faced by firms while adopting this whole process [9]. Additionally, the research has focused on the business-to-business process because outsourcing innovations and open innovations are in numerous number in the form of business-to-business partnerships in the modern economy but are not intensively researched.

The main **research question** driving this study is as follows:

"Does factor affecting the selection of outsourcing provider effect performance of outsourcing".

We have included six factors namely reputation of innovation provider, the flexibility of innovation provider, technological resources of provider, past relationship with the provider, policy of provider about intellectual property rights and cost-effectiveness of the provider. The findings of this research are expected to provide guidelines to the firms that are extensively using outsourcing innovations and CROs for their business.

The paper has four parts. First part reviews the existent literature relevant to outsourcing innovations, open innovations, CROs and their relation to firm performance. The paper then represents data collection methods, research instrument description, data analysis techniques and overall research methodology. After that, findings are described and summarized. The paper concludes with the relationship of factors affecting in the selection of CROs or innovations provider with firm's performance and discuss theoretical and managerial implications and directions for further research.

2 Research Background

The concept of firm performance based on innovations is not very new. In the past, this concept was studied in the broader picture and with general understanding. It was studied with reference to firm policies and creative ideas within the firm. During this process companies also analyzed their innovative products and firm performance together in different markets [10]. After the 1980s all the international markets became very competitive and companies started to look for partners to improve the overall productivity. Another challenge in this competitive environment was to make partnerships with innovative companies [11]. All this environment collectively leads towards outsourcing innovations by firms.

The outsourced innovations, directly and indirectly, started to play their role in overall firm performance. The firm performance is a broad area and extensive research is already being done, based on traditional factors. The firm performance was measured mainly using financial ratios, based on supply chain collaborations, decision-making, information technology, human capital, intrapreneurship culture, customer relationship management, intellectual capital, and leadership. Different tools and patterns were used to evaluate firm performance based on these parameters described earlier [12].

The innovation impact on firm performance was studied based on the type of innovation involved in each scenario. These include the impact of four types of innovations on firm performance which were a product, process, marketing and organizational innovation [13]. Another determining factor in recent studies was the scale of innovation activity and its economic impact [14]. Few other studies showed that the relationship between the specific type of innovation and its direct effects on firm performance [15].

The concept of innovation moved further from the introduction of newness in the market towards its active role in firm's performance. Outsourced innovations started to play a vital role for competitive advantage for the firms. This has not only helped the firms to grow from their competitors, but it also started to impact the countries. Higher the number of innovative firms in a country more and more growth of country's economy was observed [16]. However, this environment started to move towards saturation. Partnerships and sharing innovations did not remain that simple anymore. Selecting an innovative partner for a company is becoming a dilemma for all companies [1].

Several factors play vital roles in the selection of the outsourcing firm. Each firm requires different levels of innovations thus there can be various factors which possibly be considered while the selection of innovation provider. While doing the collaborations with outsourcing provider parent companies look in to different factors such as, how the provider can help them to take competitive advantage of market opportunities, technological expertise of future partner firm, level of responsiveness of the provider to changes in market, time improvement factor for their future innovative products, cost-effectiveness in comparison to in-house innovations and quick entry into new markets [17]. Even firms are focusing a lot on different factors but still, according to some estimates, 70% of such partnerships fail [18].

Nevertheless, the literature shows that there can possibly be six major factors which are connected to the selection of innovation providers one way or another. These factors include reputation of innovation provider, the flexibility of innovation provider, technological resources of provider, past relationship with the provider, policy about intellectual property rights (IPRs) of provider and cost-effectiveness of the provider. This article discusses relationship among these six factors, associated with selection innovations providers, and the performance of the firm.

3 Research Framework and Hypotheses

When firms make a partnership with innovation providers, firm's performance is not only dependent on the innovative idea that they are trying to outsource but also is directly dependent on their relationship with innovation providers. There are many factors which play a vital role in the selection of innovation providers named earlier, but this paper investigates six main factors which are involved in all types of open innovation contracts and their relationship with overall firm performance.

H1. Firm performance measurement is based on many parameters from different angles as described earlier [12], however, the recent literature does not give any explicit relationship between firm performance and reputation of innovation providers in the industry. But, there were very few specific studies and the relationship had been studied between the strategic orientations of a parent company with respect to the selection of cross-border outsourcing partners for acquiring knowledge. The study emphasized to give maximum attention while doing such knowledge attainment [19].

***Hypothesis 1:** There is positive relationship between firm performance and reputation of innovation provider in the industry in terms of R&D.*

H2. Few studies measure the supply chain and supply chain management flexibility in general and their relationship with performance outcomes in manufacturing firms [20]. Keeping in view the previous literature that within a firm flexibility mostly increase the performance of the firm, therefore it is expected that there must be similar relationship while firm does a partnership with outsourcing providers [21].

***Hypothesis 2:** There is a positive relationship between firm performance and flexibility of the innovation provider.*

H3. While outsourcing from a third party the main purpose is to attain the best innovative and updated technology available. So, the strength of technological resources of the innovation provider always has key importance. Some studies are available which had measured the impact of the external expert organization on firm's own R&D [22] but still, there is no specific study which measures the relationship and its extent between firm's performance and provider's technological resources.

Hypothesis 3: *There is positive relationship between firm performance and provider's latest technological resources.*

H4. There is strong evidence regarding business to consumer (B2C) healthy relationship impact on firm's overall performance [23]. But when we talk about the healthy relationship of one firm to another firm while providing R&D services, not many direct studies available for such relationship and its impact. Few studies are available with reference to supply chain collaboration and their impact on firm performance [24].

Hypothesis 4: *There is a positive relationship between firm performance and innovation provider's long-term working relationship with hiring firm.*

H5. The intellectual property rights (IPRs) is getting high importance especially firms involving open innovation process [25]. But it is not necessary that both partnering firms always have the same level of values or standard operating procedures (SPOs) to handle intellectual property. This directly impacts the firm's performance in long run or sometimes in the middle of the collaborative project. Thus,

Hypothesis 5: *There is a positive relationship between firm performance and strictness of provider's policy for intellectual property rights (IPRs).*

H6. Literature pointed out about the relationship between firm's performance and selection of cost-effective partners. Many studies concluded a direct relationship between these two [26]. But all studies had different environmental factors which had played a vital role while testing this relationship. Assuming the similar relationship, this paper also hypothesizes about the positive relationship between these two.

Hypothesis 6: *There is a positive relationship between firm performance and provider's cost-effectiveness in industry.*

All hypotheses are represented in the following Fig. 1.

4 Methodology

The target population for this study consisted of professionals (Managers, Scientists, and Developers), all of them have immediate experience in outsourcing innovations or somehow associated with the specific segment of R&D in respective firms. The participated individuals were from 17 different countries across the globe. Approximately 60 companies were involved in this survey. The survey is conducted in 2016–2017 approximately in the one-year time frame. The unit of analysis was individual professional. The sampling frame was randomly selected, 260 professionals. The professionals were working in countries such as Finland, Sweden, Denmark, USA, Canada, Germany, UK, Cyprus, Singapore, UAE, KSA, Oman, Netherlands, Malaysia, Pakistan, and India. The selection criteria were related to the dependency of the firm on outsourcing innovations for their product development.

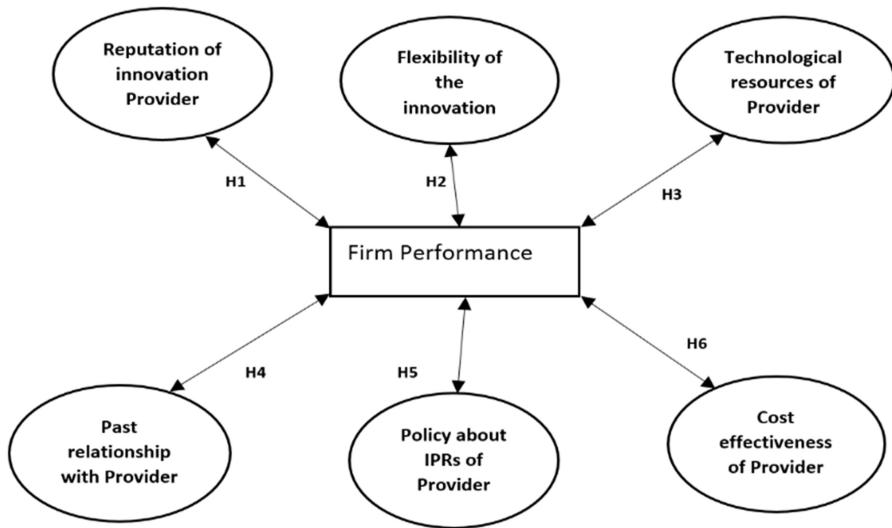


Fig. 1. Research framework and hypotheses

The industrial segments involved in this research was distributed among the sectors such as pharmaceutical industry (42%), ICT industry (20%), life sciences (6%), Engineering services (11%), financial services (6%), robotics (3%), logistics (3%), telecommunication (2%), chemical industry (5%) and automotive industry (2%). Concurrently face-to-face interviews were also arranged, mainly the selection of candidates was dependent on their strong profiles, availability for interview and their key position in the organization. Appointments were requested by phone and official emails with an offer letter for participation in research and privacy policy. Interviews were conducted by the corresponding author. Few interviews were also conducted on phone. Survey forms were given to interviewees and questions were asked in the same order.

The final realized sample consisted of 112 usable questionnaires, representing a 43% response rate. All 112 responses were analyzed. The firm's revenues who participated in the survey were varied largely between less than 1 million USD to more than 10 Billion USD in 2015–2017, the main reason of this variation was involvement of various demographic areas in research due to local currency values at the time of the survey. The questions were also asked about profiles of respondents who participated in the study. Approximately 39% of respondents had more than 10 years of experience, 26% had more than 6 years up 10 years of experience while 31% having 1 to 5 years of overall experience in the respective industry.

The initial survey form was pre-tested with a convenience sample of 10 researchers involved in similar kind of working fields, using the collaborative participant pre-testing method explained by Cooper and Schindler [27]. Data for the actual study was collected in approximately one-year time from February 2016 to April 2017. Some of the reasons behind the longer duration of data collection were that it was collected from many countries and in many cases, respondents need permission from higher management before participation in research. Google forms were used for the survey but in

some cases, respondents preferred hard copies of survey forms by mail or in person. Two weeks after initial contact with suitable respondent, follow up reminders were also sent. No incentives were given to respondents to participate in the survey. All the data was confidentially handled, and no names will be revealed due to each company's privacy policy except those who allowed revealing their names. The questions involved in this survey were seven-point Likert scale statements. All the scale points of these questions were labeled ranging from 1 (Strongly disagree) to 7 (Strongly agree).

These questions and respective options were designed, keeping in view the open innovation concept described by Chesbrough [9]. The question was asked, "Outsourcing innovations in product development process leads to increase in firm's performance". Another question was asked "What are the most important factors in my view (respondent's view) while the selection of contract research organization (CROs) or outsourcing providers" The answer to this question was in the form of six different options, respondents had chosen as many as they wanted to choose or at least one of them. Answers to the questions were scaled on Likert's scale as described earlier.

The empirical analysis is performed between firm performance and all the six factors to find out how significantly each factor related to firm's performance. The answers given by the respondents acted as variables in the hypotheses developed in this paper and tested statistically against each other to measure the correlation significance and later firm performance. The similar research approach is done as of Gunday et al. [13], but in their research, they measured the firm performance with respect to the innovativeness of firm, but in this current study, firm performance is measured based on the factors affecting the selection of innovation providers or CROs. So, to summarize the method, analyzing the performance of the firm with respect to factors acquiring open innovation is the main scope of the method.

5 Analysis and Findings

The data was collected from ten industrial segments as described earlier with the help of self-designed research instrument. To test the hypothesis the correlation analysis was performed using SPSS 24. Three of the hypotheses are validated by the empirical analysis while on the other hand three of them are not statistically significant. Table 1 shows all the six hypotheses (H1 to H6). The first hypothesis (H1) claimed that firm performance directly dependent on the reputation of the innovation provider, but the statistical analysis shows that there is non-significant ($p > 0.05$) relationship exists between these two. The second hypothesis (H2) is validated as it is statistically significant ($p < 0.05$) relationship between firm performance and flexibility of innovation provider. Third and fourth hypotheses (H3, H4) also validated because it is significant ($p < 0.01$) relationship between firm performance and quality of technological resources and long-term past relationship with innovation provider. Hypotheses 5 and 6 are not validated because of non-significant ($p > 0.05$) relationship between firm performance and policy of innovation provider about intellectual property rights and cost-effectiveness of innovation provider.

Table 1 shows the clear findings of the statistical analysis performed on collected data. It shows that Hypotheses H1, H5, and H6 are not supported while Hypotheses H2,

Table 1. Correlation analysis

| Hypotheses | Factors | Correlation significance | p-value | Result |
|------------|--|--------------------------|------------|---------------|
| H1 | Reputation of innovation Provider | 0.122 | $p > 0.05$ | Not supported |
| H2 | The flexibility of the innovation provider | 0.034* | $p < 0.05$ | Supported |
| H3 | Technological resources provider | 0.004* | $p < 0.01$ | Supported |
| H4 | Past relationship with provider | 0.009* | $p < 0.01$ | Supported |
| H5 | Policy about IPRs of provider | 0.252 | $p > 0.05$ | Not supported |
| H6 | Cost-effectiveness of provider | 0.087 | $p > 0.05$ | Not supported |

**Correlation is significant at 0.01 level

*Correlation is significant at 0.05 level

H3, and H4 are supported. Findings expose that firm performance is positively affected by Flexibility, technological resources and past relation of innovation provider. But on the other hand, reputation, policy about IPRs and cost-effectiveness of innovation provider have no direct impact on firm's performance.

6 Discussion and Conclusion

This study investigates the potential relationship between firm performance and six major factors which play a key role while selecting an innovation provider partner. To our best knowledge that is the first study of this type which specifically deals with these factors in an open innovation environment. The results indicate that firm performance is positively related to three factors, on the other hand, it does not depend on other three factors while making a partnership with innovation providers. Three positively related factors are in line with previous studies related to firm performance [19], but other three factors have given different prospects as compared to previous studies.

The results are less clear with respect to the reputation of innovation provider, the policy of innovation provider about IPRs and cost-effectiveness of innovation provider. But these factors give us new prospects about partnering with innovation providers rather than focusing on traditional ones. The factor that was believed strongly in previous literature [26] that firm performance is somehow directly dependent on the cost-effective partners, is not validated by this research. The participants of the survey do not believe in the fact that cheaper the services or innovative processes provided by their partners more will be the firm performance. Similarly, respondents also believe in the fact that previous reputation of innovation provider and policy about IPRs are not crucial factors which can be related to firm's high growth. This is because they strongly believe in the quality of the innovation provided by their partners. The highly

significant values in the remaining three factors validated that fact. The inconsistency in the validation of H1, H5, and H6 might be explained by the fact that all the six factors were put together during same survey and interviews. The respondents preferred H2, H3, and H4 in comparison to other three (H1, H5, H6). It seems that these three factors are more important for them as being highly active innovative R&D professional in the industry. The disagreement with the cost-effective factor [26] is one of the most noticeable things in this research. The relationship between firm performance and reputation of innovation provider also does not statistically significant. The most probable explanation of this non-significance is ever changing in dynamic market of innovation providers. Sometimes in past companies do not have good experience with one provider but the later same provider can shock them with remarkable innovation and their improved service.

The explanation behind IPRs inconsistency might be the thought that parent company's strong policy regarding IPRs should protect information leakage. They should make such partnership in which they are highly protected from their end and they know very well which information must share with their partner and when. Limiting the information sharing and designing of contract mostly in the hands of the parent firm which is going to outsource innovation.

In general, the results of this research indicate that flexibility of provider, technological resources and past relationship with a provider has a highly significant relationship with firm performance. This makes clear that although there are inconsistencies exist in above-explained three factors but the inclination of respondents towards remaining three factors show the current approach of respondents at the time of research. Moreover, current study empirically validates important factors related to the business-to-business context in the bigger picture. Business-to-business previous research was conducted on many factors, but there is no specific research available testing this type correlation between firm performance and these six factors described above. The best possible reason for a non-significant relationship in IPRs case is that all the functional innovation providers in the market follow the country-specific IPRs by default.

Consequently, the paper also reveals that the factors which were center of attention in last decade are not anymore very important for professionals or scientists involved in such contracting today. There are many new variables and factors involved with a high significance which in many respondents' opinion are more favorable and important now. Examples of such factors are quality of technological resources of provider, past relationship with innovation provider and flexibility of the provider. The past studies indicate that cost-effectiveness might be an important factor in general business-to-business partnerships based on transaction cost theory (TCT) [28]. However, when we talk about this specific partnership which, involves outsourcing innovation and new technologies in a cost-effective way, does not give guaranteed firm growth both in short run and longer terms. As a result, the managers involved in the selection of partner companies or innovation provider should be more focused on the quality of technology or innovation they are going to get from the provider and overall relationship. Managers and scientists involved in this process need to be trained and motivated in this rapidly changing outsourcing innovation industry.

In addition, several studies and researchers warned [21] about the flexibility factor as an important factor to consider while doing cooperation. This study also validates that factor and its significant relation to firm performance. Managers and scientists need to be vigilant enough about the fact that if the provider is not flexible enough it can cause serious problems in outsourcing innovations in the long run. Nevertheless, the past relationship with innovation provider cannot be ignored for making new partnerships. The reason behind this factor is that if there is successful innovation outsourcing has been done previously with some provider, it can be good decision to consider them in next project as both partners have a good understanding of each other's working environment. These findings support the conceptual model and offer many managerial implications. However, a certain or maybe bit longer time might be needed to study long-term implications of these factors while selecting the innovation provider. This is the reason many managers complained in other studies that such cooperation varied a lot case to case [29].

7 Limitations and Direction of Future Research

Some limitations might be due to collecting data and interpreting results. The first limitation might be demographics of data set. For example, data were collected from 17 different countries at the same time in which developing, and highly developed countries were included in the same dataset. Although, many developed countries are outsourcing innovations from developing countries and vice versa still there is a huge difference in working culture. There is another potential reason for inconsistency due to common method bias. The study used a single questionnaire to measure all factors and patterns. So perhaps the significance of relationships in different factors and firm performance may be somewhat inflated.

The third potential limitation is related to the fact respondents involved in this survey have vast experiences of both sides of the working environment. It means that they have experience with parent companies and with outsourcing providers during their overall experience in the industry. They tried their best to answer the questions according to best of their experience and knowledge, but the fact is that both prospects are widely different when we do the analysis. The research approach in this study was very specific overall. It would then possible that these recognized shortcomings could inspire researchers to define their prospects with similar research agendas.

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Understanding Behaviour Patterns of Multi-agents in Digital Business Ecosystems: An Organisational Semiotics Inspired Framework

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Abstract. Digital business ecosystem (DBE) is a collaborative network of organisations, processes and technologies that collectively create value. Thus, value creation in DBEs is jointly undertaken by multiple human and digital agents. To aid appropriate apportionment of work and design of information systems, it is essential to understand behaviour of both human and digital agents. However limited attention has been paid to agents' behaviour in the extant DBEs literature. Moreover, multi-agent research has also largely focused on technical issues while limited research exists on agents' behaviour. As such, in this paper, we develop a framework to understand behaviour patterns of multi-agent in DBEs. This framework builds its foundation on the theoretical lens of Organisational Semiotics, a sociotechnical theory towards contribution to DBE research.

Keywords: Behaviour analysis framework · Multi-agent behaviour
Digital business ecosystem (DBE) · Organisational semiotics
Social and digital agents

1 Introduction

Digital business ecosystem (DBE) refers to a sociotechnical collaborative environment of different organisations supported by information and communication technologies (ICTs) to collectively create value [12, 13]. In DBEs, two main entities—people within organisations and digital artefacts, are the actors responsible for value creation. As such, DBEs can be viewed as a multi-agent environment constituted by social and digital agents. An agent refers to an entity capable of carrying out some behaviour to produce some effect. For instance, an organisation responsible for supplying inputs in a DBE is an agent due to the role it performs. Similarly, a digital platform for processing transactions within the DBE is also an agent due to its facilitation of operations.

Agent behaviour refers to any course of action undertaken by an entity during execution of activities [8]. These behaviours include seeking for resources, producing goods and services, as well as communicating with others. Additionally, agent behaviours occur in different forms, levels, modes and among different entities. As such, understanding these behaviours is vital but difficult in multi-agent environments. Within DBEs, agent behaviours occur in a sociotechnical nature due to the presence of both social and digital agents. Social agents refer to individuals, department and organisations that undertake certain behaviours in DBEs [6]. On the other hand, digital agents are technologies that usually undertake delegated duties based on pre-defined rules on behalf of social agents [2]. Digital agents perform computer mediated activities that are repetitive and mostly do not require high level discretionary decisions. The performance of activities by the social and digital agents is what result in different behaviours.

In the extant DBE research, limited attention has been paid to multi-agent behaviour. We argue that understanding multi-agent behaviour is important to: (1) accurately apportion work among agents according to their capabilities, (2) support design and development of appropriate information system for DBEs, and (3) promote operational efficiency. Based on the knowledge gap in the extant literature and the crucial importance of understanding multi-agent behaviour, in this study, we postulate the research question: *what behaviours do multi-agents exhibit in digital business ecosystems?* To address this research question, this study develops a multi-agent behaviour analysis framework through the lens of organisational semiotic theory.

The rest of the paper is organised as follows. Section 2 presents literature review on DBE and multi-agents. Section 3 discusses the theoretical foundation of organisational semiotics. Section 4 presents our proposed framework while Sect. 5 demonstrates its application through a case study of Ghana's port DBE. Finally, Sect. 6 presents discussions and conclusion.

2 Literature Review

2.1 Digital Business Ecosystems

As business environments experience increasing sophistication in customer preferences, in response, organisations are forming alliances to adequately address these needs. These alliances have led to new collaborative networks referred to as DBEs. DBE is a digitally enabled collaborative network of individuals, organisations, and technologies that collectively create value [12, 13]. DBE offers an innovative way for organisations to collectively create value that is usually beyond their individual capabilities. DBE is made up of two main dimensions: digital ecosystem and business ecosystem [12]. Digital ecosystem refers to a virtual environment populated by digital species such as software, applications, hardware, and processes analogous to organisms in the biological ecosystem [3]. Digital ecosystems operate as a peer-to-peer distribution technology infrastructure that creates, disseminates, and connects digital services over the internet.

On the other hand, business ecosystem refers to an economic community of individuals and organisations operating outside their traditionally define industry boundaries to collectively create value for customers who themselves are participants in the ecosystem [11]. Drawing from the two main concepts, we can argue that DBEs are multi-agent environments made up of two agent classes—social and digital agents. The *social agents* are individuals and organisations that undertake operations in the business ecosystem aspect of DBEs. In contrast, *digital agents* refer to technical components within the digital ecosystem aspect of DBEs that perform delegated tasks from social agents. Thus, for service delivery in DBEs, there is a need for coherent interaction between social and digital agents.

While the extant DBE literature provides interesting insights, there is still a paucity of research on other fundamental aspects such as multi-agent behaviour. Drawing from the trend in the extant DBE literature, there is a dearth of knowledge on the behaviour analysis of multi-agents. Given that comprehensive understanding of multi-agent behaviour will lead to better analysis, design and alignment of DBE information systems, it is therefore important to understand how this phenomenon occurs. Thus, the task going forward is how to comprehensively analyse the behaviour of both digital and social agents within DBEs. To fill this gap, this study develops a multi-agent behaviour analysis framework for DBEs.

2.2 Multi-agents

Multi-agent is a well-grounded concept that describes a composition of multiple interacting entities. While some studies [e.g., 2, 5, 14] view agents as computer software that act either for an agency relationship or autonomously to achieve some objectives, in reality, an agent is more than just a computer software. An agent could be a person, an organisation, device, or a computer software that performs a task. In this vein, we argue that the term multi-agent is a characterisation of two agent classes—social and digital. Social agents represent actors such as people, departments and organisations [6] while digital agents signify computer enabled actors such as devices and software [2]. Thus, for agents to successfully interact and pursue their respective objectives, there is a need for cooperation, coordination and negotiation among agents.

While multi-agent research has witnessed many studies over the years, much focus has been on digital agents. Largely, these studies focus more on digital agent modelling [1, 2, 6], and simulation [5] within multi-agent systems while limited understanding exists on the underlying behaviour of both social and digital agents. Although the contributions from the extant multi-agent studies are vital, we believe the outcomes of these studies would have significantly improved if better understanding exist on behaviour pattern of both social and digital agents. As such, there is a vital need to understand the behaviour of multi-agents.

3 Theoretical Foundation

Organisational semiotics is a branch of Semiotics that investigates the use of signs in organisations. A sign is something that stands to someone or a community for something in a particular setting [9]. In this study, organisational semiotics is used as the theoretical foundation for our proposed behaviour analysis framework because (1) it is firmly grounded in agents and behaviour investigation [9], and (2) it supports the sociotechnical nature of DBEs by accommodating both social and technical perspectives [10]. For this study, we adapt the *norm analysis* and *organisational morphology* methods of organisational semiotics theory for our investigation. These methods are chosen because they prescribe actions that foster better understanding of behaviours. Also, these methods accommodate both social and digital agents present in DBEs.

Norm analysis is a method that delineates triggers, events and constraints to capture dynamics within a domain. Norms refer to dynamic conditions that underlie behavioural patterns and dictate how members behave, think, make decisions, and perceive the world [9]. Thus, norms include formal and informal rules, regulations, and laws. The norm specification format is as follows:

Whenever <context> if <condition> then <agent> is <deontic operator> to <action>

Organisational morphology studies behaviours using three norms – substantive, communication and control [9]. Substantive norms direct core business functions. For instance, substantive norms can direct how customer orders are processed. Communication norms govern activities involving message passing between agents. For instance, communication norms are responsible for directing how an application confirmation email is sent from a system to an applicant. Control norms regulate substantive and communication norms through sanctions and rewards. For instance, control norm is responsible for denying access if a user provides invalid credentials in logging into a system.

4 Behaviour Analysis Framework

In this section, we address the research question: *what behaviours do multi-agents exhibit in digital business ecosystems* by presenting our proposed framework. The framework as presented in Fig. 1 has three iterative stages to identify, analyse, and understand the behaviour of multi-agents in DBEs. Each stage of the framework shows components, techniques, and outcomes as discussed below.

Stage 1. This stage focuses on establishing the context in which multi-agent behaviours occur. The techniques supporting this stage are the partner analysis and the partner-machine interaction observation. First, the *partner analysis* technique provides a systematic approach to elicit social agents as well as determine their role and responsibilities to understand the DBE partnership, scope, and behaviour. We define a *DBE partner* as an individual or organisation that contributes direct inputs into core DBE processes or exchanges resources with another partner. Partner identification in DBEs is a challenging task. In fact, Iansiti and Levien [4] allude that it is impossible to

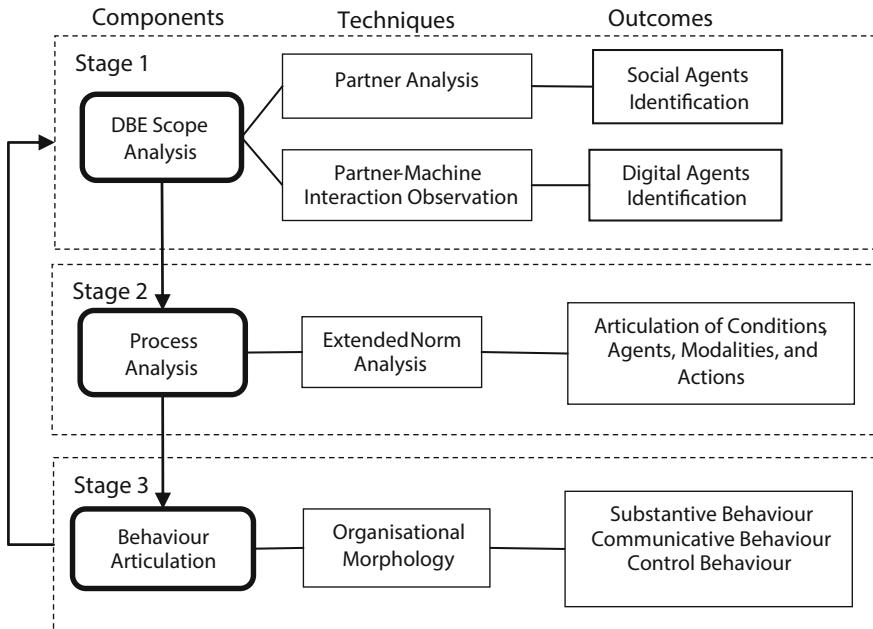


Fig. 1. Multi-agent behaviour analysis framework in DBEs

articulate all partners of an ecosystem. Thus, they suggest that in partner identification, consideration should be given to partners with whom the future of a DBE intertwines.

Based, on our definition of a DBE partner, we proposed an identification procedure in Fig. 2. Drawing on the stakeholder analysis approach from the organisational semiotics theory [7], we categorise DBE partners. The categorisation determines the roles, responsibilities and influence a partner has in a DBE. Partner role refers to the capacity to perform some functions. Similarly, partner responsibility refers to the obligation accorded a role to perform functions. Partner influence represents the impact the partner has on a DBE and vice versa. The partner analysis technique arranges the roles chronologically based on their influence in the DBE. As such, the closer the partner category to the DBE, the more influential the partner. Based on our definition of DBE partner, we outline four categories and associated roles namely, actor, client, facilitator and regulator.

$$\text{Role} = \text{Actor} | \text{Client} | \text{Provider} | \text{Regulator}$$

Actor represents a key partner that contributes to core processes within the DBE. *Client* is the beneficiary of DBE efforts. On the other hand, *provider* offers resources and conducive environment for the smooth running of a DBE. *Regulator* refers to an organisation that provides guidelines that controls the behaviour of other partners in a DBE. Thus, partner roles and responsibility in DBEs can be formalised as: $\text{DBE} \supset \{\text{partner, roles and responsibility}\}$. Figure 2 shows partner roles and their level of influence in a DBE. It is worth noting that partners may perform multiple roles with varied responsibilities. Given that partner identification and analysis, especially in

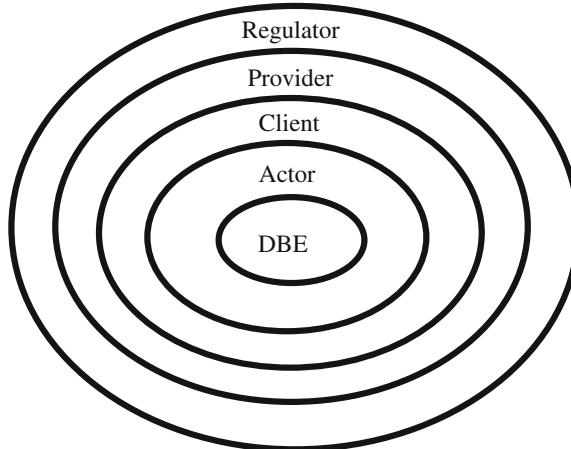


Fig. 2. Partner roles (adapted from [7])

DBEs, is very difficult we consider our approach a significant contribution to DBE research.

Second, the *partner-machine interaction observation* technique focuses on how partners use digital agents within a DBE. The aim of this technique is to delineate the behaviour of digital agents by observing how they interact with others as well as partners. This technique is carried out by observing and taking comprehensive notes of how partners interact with digital agents. Also, partners are asked for additional information regarding the operation, purpose, and meaning of their interactions with digital agents. Thus, by observing the interaction between these agents, we can derive their behaviours to support information system analysis, development and alignment.

Stage 2. This stage takes a process perspective by analysing the sequence of interactions between social and digital agents to understand interactions towards articulation of conditions, agents, modalities and actions that cause behaviours. We extend the original norm specification to include *process*, *predecessor*, and *successor* components to aid the multi-agent behaviour analysis. As a result, the extended norm specification is:

```
<Process ID> <Process> <Predecessor> Behaviour specification {whenever
<Context> if <Condition> then <Agent> is <Deontic Operator> to <Action>}
<Successor>
```

The *process ID* is an identification for process. The *process* element details the series of actions to achieve a goal. The *predecessor* element determines triggers for processes while the *successor* refers to the next activity to be undertaken when all predecessor conditions are met. The *context* represents the environment in which an agent occupying a role can perform an action. The *condition* component refers to constraints that must be met for an agent to perform an activity. The *agent* component designates a partner or digital agent who performs an activity. On the other hand, *deontic operator* denotes the expressiveness of norms by establishing whether an agent

is *permitted or obliged* to take an action in relation to a process. Lastly, the *action* refers to a process an agent performs because of a triggered predecessor.

Stage 3. This last stage utilises the result from stages 1 and 2 to derive the behaviour of multi-agent in DBEs. This stage involves analysis and classification of processes undertaken by agents to delineate their behaviours. We define three main behaviours, namely *substantive*, *communication*, and *control* [13] for interactions between multi-agents. Even though we proposed three main behaviour classifications, there could be further expansion. As a result, substantive actions may include communication and control behaviours. Similarly, communication actions may also include substantive and control behaviours. Lastly, control actions may also include substantive and communication behaviours.

5 Case Study Application

To demonstrate application of our framework in understanding multi-agent behaviours in DBEs, we conducted a case study in the vehicle clearing domain at Ghana's main harbour, Tema Port. We chose Ghana's port because it provides an empirical instantiation of a DBE. Ghana is a middle-income Sub-Saharan African country. One of the main sources of revenue for the Government is import duties. As such, significant investment has been made to streamline processes at the ports of entry to generate more revenue. In this study, a high-level view of the vehicle clearing process are as follows: (1) Importer uses an electronic ministry department and agency (e-MDA) platform to obtain a unique consignment reference (UCR), (2) Importer uses the e-MDA platform to submit import declaration form (IDF), (3) Importer uses the Pre-Arrival Assessment Reporting System (PAARS) to apply for Customs Classification and Valuation Report (CCVR), (4) Customs valuation officers use the PAARS to process application for CCVR, (5) Importer uses the Ghana Customs Management Systems (GCMS) to submit customs declaration, (6) Customs compliance officers process declaration using the GCMS to determine import duty, (7) Importer relies on banks to make duty and other charges payment, (8) Importer uses the Ghana Integrated Cargo Clearance System (GICCS) to submit request for shipping release, (9) Customs examination officers use GCMS to release vehicle after physical examination, and (10) Importer relies on the Driver and Vehicle Licensing Authority (DVLA) for temporary number plate.

Stage 1: DBE Scope Analysis. From our framework (see Fig. 1), we perform partner analysis and partner-machine interaction observation to articulate social and digital agents in the import DBE. As established earlier, partners such as individual and organisations in DBEs are analogous to social agents. From the analysis, we identified five key partners as social agents in the vehicle clearing domain of Ghana's port DBE. These social agents are importers, Customs, shipping lines, banks, and DVLA. Table 1 presents the social agents, their category, and responsibilities in the import DBE.

Table 1. Ghana's port DBE social agents and responsibility

| Partners (social agents) | Category | Responsibility |
|--------------------------|----------|--|
| Importers | Client | Submitting vehicle clearing application and paying appropriate duty |
| Customs | Actor | Performing vehicle clearing application valuation, compliance processes and physical examination |
| Shipping lines | Actor | Processing shipping release request |
| Banks | Actor | Receipts of duty payments and sending payment notification to Customs |
| DVLA | Actor | Provision of temporary vehicle number plate to importers |

The partner-machine interaction observation articulates digital agents through scrutiny of their interaction with social agents. This step is mainly achieved by observing the interaction between social agents as they carry out work. From the case study, we identified five major digital agents, namely e-MDA, PAARS, GCMS, banking systems and GICCS. Table 2 shows the digital agents articulated and their responsibilities.

Table 2. Ghana's port DBE digital agents and responsibility

| Digital agents | Responsibility |
|-----------------|--|
| e-MDA | For generating UCR and processing IDF |
| PAARS | For processing CCVR |
| GCMS | For declaration processing, receipts of payment notification and release of vehicles |
| Banking systems | For processing and notification of Customs of duty payment |
| GICCS | For processing shipping release requests |

Stage 2: Process Analysis. This stage focuses on establishing conditions, agents, modalities and actions underpinning processes. We utilised the extended norm analysis technique to understand the underlining rules, conditions, agents and triggers in a particular process to articulate multi-agent behaviour. Table 3 presents the extended norm analysis based on the processes identified from our case study. From the case study, 10 processes were identified and assigned identifications P1 to P10. Similarly, the predecessors identified from the case study are triggers for each process. The behaviour specification aspect of the extended norm analysis technique entails the *context, condition, agents, and deontic operator* elements related to processes. Lastly, the *successor* element presents processes that will be triggered because of a successful execution of a current process.

Table 3. Behaviour specification of vehicle clearing processes in Ghana's port DBE

| ID | Process | Predecessor | Behaviour specification | Successor |
|-----|--|---|---|--|
| P1 | Obtaining UCR | <vehicle is imported> | WHENEVER <a vehicle is imported> IF <importer is ready to clear the vehicle> THEN <importer> IS <permitted> to obtain UCR through the e-MDA platform | Submission of IDF |
| P2 | Submitting IDF | Obtaining UCR | WHENEVER <importer generates a UCR> IF <all required documentation are provided> THEN <importer> IS <permitted> to submit IDF through PAARS | Submitting CCVR application |
| P3 | Submitting CCVR application | Submitting IDF | WHENEVER <importer submits IDF> IF <all required documentation are provided> THEN <importer> IS <permitted> to submit CCVR application through PAARS | Processing CCVR application |
| P4 | Processing CCVR application | Submitting CCVR application | WHENEVER <importer submits CCVR application> IF <all required documentation are provided> THEN <Customs> IS <obliged> to process CCVR application through PAARS | Declaration submission |
| P5 | Declaration submission | Processing CCVR application | WHENEVER <Customs processes CCVR applications> IF <all requirements are met> THEN <importer> IS <permitted> to submit declaration application through GCMS | Compliance & duty determination |
| P6 | Compliance & duty determination | Declaration submission | WHENEVER <importer submits declaration application> IF <all required documentation are provided> THEN <Customs> IS <obliged> to perform compliance processes and determine duty to be paid through GCMS | Duty payment |
| P7 | Duty payment | Compliance & duty determination | WHENEVER <Customs performs compliance processes and determines duty to be paid> IF <importer pays the right amounts> THEN <bank> IS <obliged> to process duty payment and notify Customs of the transaction | Shipping release request |
| P8 | Shipping release request | Duty payment | WHENEVER <importer pays import duty> IF <all charges are paid> THEN <importer> IS <permitted> to make shipping release request through the GICCS | Physical examination and release of vehicle |
| P9 | Physical examination and release of vehicle | Shipping release request | WHENEVER <importer makes shipping release request> IF <request is granted> THEN <Customs> IS <obliged> to perform physical examination and release the vehicle through GCMS | Procurement of temporary number plates from DVLA |
| P10 | Procurement of temporary number plates from DVLA | Physical examination and release of vehicle | WHENEVER <Customs completes physical examination and release a vehicle> IF <importer fulfils all obligations> THEN <DVLA> IS <obliged> provide temporary number plate to importer | <vehicle cleared> |

Stage 3: Behaviour Articulation. Based on the last stage of our framework, we perform behaviour articulation. The aim of this stage is to derive behaviours of multi-agents from the case study. The result from the stages 1 and 2 are essential to behaviour articulation. Using the adapted organisation morphology technique from organisational semiotics theory, we classify multi-agent behaviours in DBEs as: *substantive, communication, and control*. However, there are further breakdown of these three main behaviours into sub-behaviours. Drawing from the results of stages 1 and 2 in our case

study, we identify the behaviours exhibited by agents as they undertake processes. Table 4 presents behaviours articulated from our case study based on the interaction between social and digital agents.

For instance, from our case study, process P3 in which importer submits vehicle clearing application electronically for CCVR involves two agents – importer and PAARS. The importer as a social agent performs a key function of submitting vehicle clearing application form. As such, we articulate the substantive behaviour from this process. On the other hand, PAARS as a digital agent is responsible for enabling the importer to submit application (core function), checking for accuracy (control function) and communicating outcome of the process (communication function). As such, the substantive.control.communication behaviour is delineated for PAARS under process P3. This behaviour of PAARS in process P3 is evident in other digital agents under processes P1, P2 and P5.

Table 4. Behaviour articulation from vehicle clearing processes of Ghana's port DBE

| Process ID | Processes | Agents and behaviours |
|------------|--|---|
| P1 | Obtaining UCR | Importer → Substantive
e-MDA → Substantive.control.
communication |
| P2 | Submitting IDF | Importer → Substantive
e-MDA → Substantive.control.
communication |
| P3 | Submitting CCVR application | Customs → Substantive
PAARS → Substantive.control.
communication |
| P4 | Processing CCVR application | Customs → Substantive.control
PAARS → Substantive.control |
| P5 | Declaration submission | Importer → Substantive
GCMS → Substantive.control.
communication |
| P6 | Compliance & duty determination | Customs → Substantive.control
GCMS → Substantive.control |
| P7 | Duty payment | Importer → Substantive
Bank → Substantive.communication |
| P8 | Shipping release request | Importer → Communication
GICCS → Substantive.
communication |
| P9 | Physical examination and release of vehicle | Customs → Substantive.control
GCMS → Substantive.control |
| P10 | Procurement of temporary number plates from DVLA | Importer → Substantive
DVLA → Substantive |

Furthermore, there are other behaviour types exhibited by multi-agents in DBEs. From our case study, under process P6 in which Customs officers as social agents evaluate declarations to determine their compliance with clearance regime is a core function. However, in performing this function, the officers are required to check if certain established rules are obeyed by importers. As such, there are elements of both substantive and control behaviours with respect to Customs compliance processes hence, the substantive.control behaviour delineation. Similarly, the digital agent GCMS under process P6 demonstrates substantive.control behaviour since it helps checks declarations for compliance and also makes sure all mandatory checks are made before allowing the process to be completed. Given that human errors are inevitable, the control behaviour of digital agents in the case study is to safeguard some of these eventualities. As illustrated in Table 4, the three main behaviour classes can have sub-categories. Thus, we proposed appropriate sub-categorisation to accommodate complex behaviours.

6 Discussion and Conclusion

This paper presented a behaviour analysis framework as its main contribution to research and practice. The framework provides a mechanism to understand multi-agent behaviours in DBEs since limited research exists on this perspective. The framework establishes three main and other sub-behaviours for multi-agents in DBEs (see Table 4). The three main behaviours are *substantive*, *communication* and *control*. The other sub-behaviours are *substantive.communication*, *substantive.control*, *communication.substantive*, *communication.control*, *control.substantive*, and *control.communication*. These behaviour taxonomies can be further expanded to accommodate three sub-behaviours such as *substantive.control.communication*. With these behaviour taxonomies, our framework provides a novel multi-level view to articulate agent behaviour in complex DBE interactions. As a result, DBE functions can be better delegated between agents for optimal operation since our framework reveals which behaviours are mostly suitable for social and digital agents. As agent behaviour is fundamental to DBE success, it is vital to have a holistic understanding especially for systems analysts, developers, and managers who confront the complexities of supporting multi-agent and developing new service innovations. Our study extends DBE research by presenting a framework that specifies taxonomies of multi-agent behaviours. With this framework, systems analysts and developers can design effective systems for DBEs to achieve their goals by accurately classifying multi-agent behaviours and appropriately apportioning activities.

Aside the multi-view of behaviour articulation, our framework provides a technique to systematically delineate DBE agents to correctly define the scope of investigation. We consider this a vital contribution to DBE research since it has been difficult to articulate agents for further analysis [4]. Given that DBEs comprise complex interdependencies between multi-agents, the extant research mainly resorted to perceptual approaches in articulating agents. For instance, due to unavailability of a systematic approach to articulate DBE agents, in developing a conceptual foundation for smart tourism ecosystems, Gretzel et al. [3] used perceptual means to identify agents.

In addition, this study shows that digital agents mostly carry out communication and control behaviours while social agents perform substantive behaviours. This insight confirms the position in the IS literature that giving responsibility to digital agents to enforce rules ensures better results. In addition, using digital agents to enforce rules offer benefits such as elimination of favouritism, efficient processes, shorter processing times, reduced errors, corruption minimisation and so on. With this knowledge, it is easier for system analysts and developers to decide which functions to apportion to digital agents in DBEs.

Notwithstanding the capabilities of digital agents, our study buttresses the point that not all behaviours can be undertaken by digital agents [13] specifically, core processes requiring unplanned discretionary decisions. As such, some substantive behaviours must still be undertaken by social agents to augment limitations of digital agents. While there are arguments that digital agents can learn through machine learning techniques, our study demonstrates that heterogeneous environments like DBEs need both social and digital agents to operate effectively. We illustrated our framework in a single DBE, hence we call for validation of our framework in other ecosystems such as mobile, e-commerce, and software DBEs.

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Convolutional Gravitational Models for Economic Exchanges: Mathematical Extensions for Dynamic Processes and Knowledge Flows

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Abstract. The Gravity Model of trade is a regression model for exchanges between countries. The model comprises a measure of exchange as its dependent variable, a measure of mass for each of the two exchanging parties, and a distance. Typically, the dependent variable represents exports, the measures of mass are the GDPs of two countries, and the distance is geographical distance. The analysis in this paper yields a number of simplifying assumptions, which if relaxed may yield a stronger model. The paper focuses on knowledge flows as measured through citations as a use case of a new convolutional gravitational model, which includes an element of delay in between the production of a good and its acquisition. The convolutional model further extends the concept of a distance between two entities to include a measure of affinity. These extensions clarify some limits of the basic model and conditions when it is appropriate.

Keywords: Exchange processes · Knowledge flows · Citations
Entity affinity · Convolution · Approximation

1 Introduction

The Gravity Model (GM) of international trade has been introduced by Anderson in 1979 [1], as a regression model for economic exchanges between countries and has been extensively applied in the field with various refinements [2–7] and generalizations [8, 9]. The approach is inspired by the gravitational force between two bodies in Newtonian mechanics: the GM in economics comprises a measure of economic exchange as its dependent variable, a measure of mass for each of the two exchanging parties, and a measure of distance. In the international trade literature, typically the dependent variable of the gravity model represents exports, the measures of mass are the GDPs of the two countries, and the distance measure is, quite naturally, geographical distance as transport

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costs affect exports. This intuitive model has been utilized heavily over the past 40 years and has worked very well for the application area of international trade. The basic framework comprising a measure of flow as a dependent variable, measures of economic output of two parties, and a distance measure, has found applications to numerous other areas of economics, including workforce migration [10, 11], retail [12], traffic flows [13], waste transportation [14], and knowledge flows [15]. All these gravitational models were satisfactory validated empirically.

In related work of the author [15], a typical gravitational model empirical strategy was found relevant in representing knowledge flows within multinational firms based on IP measures such as patent stocks and patent citations. In the literature and that work, the main variations for the gravity model were in the type of distance measure used and its interpretation. While the models work well both empirically and intuitively, a mathematical analysis in this paper yields a number of simplifying assumptions not explored in the literature, which if relaxed may yield a stronger model for particular applications.

The paper focuses on knowledge flows as measured through citations as a use case of a new convolutional gravitational model (CGM), which includes an element of delay in between the production of a good and its acquisition by the trading partner (for example, transport duration, or time to publication). The model is analyzed both in the discrete case and in the continuous time case, the latter where the convolution sum is replaced by an integral; several cases of good approximation of this continuous sum are explained, including the assumptions necessary in this model to derive the traditional gravity regression model used in the literature. The generalized convolutional gravity model, as proposed in this article, further extends the concept of a distance between two entities to include a measure of temporal affinity, where concept based distances, such as textual cosine similarity, can vary over time between the exchanging entities. This extension may provide additional value to economics researchers and especially to modeling knowledge flows. In addition, the extension clarifies some limits of the basic gravitational model and conditions when the basic model is appropriate.

We investigate the potential mathematical foundations of the gravitational models and show that their application to economic processes requires detailed analysis of temporal aspects and has several limits that we expose. Then, we lay down extensions of the basic gravitational model and expose the conditions when the basic GM is a reasonable approximation of the processes. We find that the limits of the basic GM may not become apparent under certain circumstances, when the basic model preserves a character of rough approximation. Even in those cases, the understanding of the mechanisms of the approximation is important, at least for preventing work on model extensions that are unsuitable.

While the main attention in previous papers [4, 7, 16] was turned toward finding a realistic interpretation and definition of the distance in the gravitational models, we turn our attention primarily to the dynamics of the process. Previous empirical studies indicated the need to include in the gravitational regression the year of exchanges represented by a set of indicator variables [15]; that study assumed that the requirement is due only to the variability of contextual economic conditions. We show why an inherent mathematical reason of the dynamic model requires the year to be included.

2 Analysis of Dynamic Exchange Processes

In exchange processes, such as commercial exchanges and knowledge exchanges that manifest themselves through citations, two entities (companies, countries, regions) trade quantities of some valuable goods, such as merchandizes and knowledge, in bidirectional flows.

According to the basic gravitational models, the volumes of exchanges proportionally depend on the overall volumes of goods the entities produce and inversely proportional with the second power of the distance, d , between the entities. The volumes of goods produced stand for the “masses” of the respective entities, M_1, M_2 . The standard GM stipulates that the exchanges stand for the “attraction” force between the entities, that is, the exchanges are given by $\frac{M_1 M_2}{d^2}$, where k is a “universal constant”.

2.1 Asymmetry (Non-reciprocity) of the Gravitational Models for Exchange Processes

We denote the volume of exchanges from the first entity to the second by $n_{1,2}$ and the volume of exchanges from the second entity to the first by $n_{2,1}$. In real life, the exchanges are rarely balanced, that is, $n_{1,2} \neq n_{2,1}$. This is the first departure from the Newtonian model, where the attraction forces are equal. Instead, in the models applied in the economic realm, evidence shows that we have to use the formulas

$$n_{1,2} = k_1 \frac{M_1 M_2}{d^2}, \quad n_{2,1} = k_2 \frac{M_1 M_2}{d^2}. \quad (1)$$

For example, the exports from country A to country B are not balanced by the exports from B to A; similarly, the number of citations from papers published by scientists from A to papers published by researchers from B is unequal to the citations from B to A. In physics, this contradicts the first law of mechanics, requiring that the action is equal to the reaction. Therefore, the gravitational models in economics and sociology are asymmetrical models. However, in the remaining part of this article we neglect the asymmetry as have others in the economics literature.

2.2 Support for the “Mass” Concept in Gravitational Models

Economic processes are stochastic processes. Consider that a population A produces a good that is not produced with the same features (technical characteristics, price) by the population B. Then, an individual I from B may wish to buy the product with some probability $p(I)$. The estimated number of goods bought by the population B is then $\langle \sum_{i \in B} p(I) \rangle$, where $\langle \rangle$ denotes the estimator. When all probabilities are equal, $p(I) = p_0$, the number of goods bought is $N_B p_0$.

Further, one may simplistically assume that the number of objects available for sale outside the borders of A, after satisfying the internal demand and at a price low enough that the transportation cost makes them palatable for import from B’s perspective, increases proportionally with the number of produced units, N_A . Then, the exchange is proportional to the product of the masses, $N_A N_B$.

The model including the product $N_A N_B$ is even more reasonable for citations. Denote the numbers of papers published by entities A and B as N_A and, respectively, N_B . Assuming a fixed probability that a paper from A cites a paper from B, the number of citations from a paper from A to all papers from B is proportional to N_B and the total number of citations from A to B is proportional (on average) to $N_A N_B$. The citing probability may be thought of as being inversely proportional with the total (worldwide) number of articles in the corresponding field.

The simplifying assumptions above are quite strong. An correction can be made by assuming that the masses N_A and N_B are used at some powers, N_A^α and N_B^α .

2.3 Role of Time: Process Dynamics and Lags

In all exchanges, various time lags occur. Excepting a limited range of products, from the moment of goods production to the time of actual product acquisition, several months or years may elapse. When exchanges refer to manufacturing products, several transportation stages and customs and acquisition procedures may last months. In case of citations, delays represent the interval between the time the cited article appears and the time the readers apprehend the information and use it by citing the paper; moreover, the publication time for the citing article adds a delay.

Next, consider the case of knowledge flows, where the delays may be more significant. The case of articles published by the entity A are cited by the articles of entity B (knowledge flow from A to B, where A and B may be firms, countries, industries and the like. The number of articles published by A in year j is denoted by $N_A(j)$ and the number of articles by B in year j is $N_B(j)$. The probability that a specified article of B published in year j cites a specified article of A published in the year $j - h$ varies with time lag denoted here as h [17–20]. This probability of citation with a lag h , averaged over the articles of A in that year, is denoted by $p(h)$, considering the value of j fixed. Then, the total number of articles by A published in the year $j - h$ cited by the specified article of B is $N_A(j - h)p(h)$. The total number of articles of A published in the year $j - h$ cited by all the articles of B published in year j is

$$n(j, k) \sim N_A(j - h)N_B(j)p(h). \quad (2)$$

Summing over all the years previous to the year j , the total number of citations by B of the articles of A in year j is

$$n(j) \sim \sum_{h=0}^{\infty} N_A(j - h)N_B(j)p(h), \quad (3)$$

which represents a convolution sum standing for the convolution product of $N_A(j - h)p(h)$ and $N_B(j)$. In fact, the sum does not extend to infinity, because the probability of citing an article published k years ago becomes virtually null after some time T ; therefore, (3) becomes

$$n(j) \sim \sum_{h=0}^T N_A(j - h)N_B(j)p(h). \quad (4)$$

In (2), (3), and (4), one assumes that $p(h)$ is independent on the year j ; however, it may vary with j . In this case, we indicate the variation by the index j , $p_j(h)$.

Equation (4) is further expounded by denoting the variation of N_A with respect to the current year as $N_A(j-h) = N_A(j) + N_{Ah}(j)$. Denoting $N_{Ah}(j) = a_{jh}N_A(j)$, (4) becomes

$$n(j) \sim N_A(j)N_B(j) \sum_{h=0}^T (1 + a_{jh})p_j(h). \quad (5)$$

Further observing that $\sum_{h=0}^T (1 + a_{jh})p_j(h) = \sum_{h=0}^T p_j(h) + \sum_{h=0}^T a_{jh}p_j(h)$ and assuming that $\sum_{h=0}^T p_j(h) = c$, that is, that the sum of the lag-related probabilities is independent of the year j , Eq. (4) reduces to

$$n(j) \sim N_A(j)N_B(j) \left(c + \sum_{h=0}^T a_{jh}p_j(h) \right). \quad (6)$$

The convolution and its need is exemplified in Table 1, where one assumes that $T = 4$.

Table 1. Example of the effects of the convolution sum.

| k, year before current year | Number of articles of A in that year | Number of articles of B in current year | $p(k)$ the probability that an article of B cites a specified article of A from year $-k$ | Number of articles of A cited by the articles of B in the current year proportional to |
|-----------------------------|--------------------------------------|---|---|--|
| 0 | $N_2(0)$ | $N_1(0)$ | $p(0)$ | $\sim p(0)N_1(0)N_2(0)$ |
| 1 | $N_2(1)$ | $N_1(0)$ | $p(1)$ | $\sim p(1)N_1(1)N_2(0)$ |
| 2 | $N_2(2)$ | $N_1(0)$ | $p(2)$ | $\sim p(2)N_1(2)N_2(0)$ |
| 3 | $N_2(3)$ | $N_1(0)$ | $p(3)$ | $\sim p(3)N_1(3)N_2(0)$ |
| 4 | $N_2(4)$ | $N_1(0)$ | $p(4)$ | $\sim p(4)N_1(4)N_2(0)$ |

The proportionality \sim is mediated by a constant Λ that varies inversely with the “distance” between the entities A and B, $\Lambda = \frac{\lambda}{d^b}$, which is combined in (4),

$$n(j) = \frac{\lambda}{d^b} \sum_{h=0}^{\infty} N_A(j-h)N_B(j)p_j(h), \quad (7)$$

where b is a constant. Comparing (4) with (1) one derives that the number of citations (or items exchanged) is not dependent on the product of the total “masses” of articles, N_A and N_B , but on weighted sums of the products of the yearly masses, $N_A(j-h)$, $N_B(j)$, where the weights are the probabilities $p_j(h)$. Using (6) in (7), the convolutional gravitational model becomes

$$n(j) = \frac{\lambda}{d^b} N_A(j)N_B(j) \left(c + \sum_{h=0}^T a_{jh}p_j(h) \right), \quad (8)$$

with the difference between (1) and (8) represented by the term

$$\frac{\lambda}{d^b} N_A(j) N_B(j) \sum_{h=0}^T a_{jh} p_j(h). \quad (9)$$

Notice that $\sum_{h=0}^T a_{jh} p_j(h)$ depends on the current year j because $a_{jh} = N_A(j-h) = (N_A(j-h) - N_A(j))/N_A(j)$ might be year-dependent; therefore, (9) explains the necessity of the independent variable “current year” in the model. However, when the variations with respect to the current year satisfy a linear expression, $N_A(j-h) - N_A(j) = h\gamma$, with γ a constant, moreover assuming that $p_j(h)$ is constant with respect of j ($p_j(h) = p(h)$), (9) becomes

$$\frac{\lambda}{d^b} \gamma N_A(j) N_B(j) \sum_{h=0}^T a_{jh} p(h) = \frac{\lambda}{d^b} \gamma N_A(j) N_B(j) \sum_{h=0}^T h p(h) \quad (10)$$

and the sum is no longer dependent on year j . This proves:

Consequence 1. In case of linear variation of the masses and $p_j(h) = p(h)$, under the assumptions in this Section, the convolutional correction factor $(c + \sum_{h=0}^T a_{jh} p(h))$ to the gravitational model is independent of the current year.

For exchange processes with small delays, such as commercial exchanges where the delays are of the order of one year or less between production and sale, the linear approximation is applicable. As a result of *Consequence 1*, when linear increments apply, the standard GM is a good approximation. This explains why the standard model was found so effective in modeling international commercial exchanges.

In the remaining part of the paper, we assume that a_{jh} and $p_j(h)$ are independent of j , $a_{jh} = a_h$, $p_j(h) = p_h$.

2.4 Role of the Probability of Citation as a Function of Time – Continuous Time Case

Denote by $p(\tau)$ the probability that an article is cited after a (continuous) time τ since publication. The number of papers published by the first entity at time $t - \tau$ and cited by the second entity at time moment t is

$$n(t, \tau) = p(t - \tau) \cdot \frac{k N_1(t - \tau) N_2(t)}{d^b(t)}. \quad (11)$$

Assuming that $p(t - \tau)$ does not depend on time moment t and denoting $p(t - \tau) = p(\tau)$, in case of continuous (instead of discrete time, as above), the model is

$$n(t) = \int_{t-T}^t p(\tau) \cdot \frac{k N_1(t - \tau) N_2(t)}{d^b(t)} d\tau = \frac{k N_2(t)}{d^b(t)} \cdot \int_{t-T}^t p(\tau) \cdot N_1(t - \tau) d\tau \quad (12)$$

where $N_2(t)$ is the number of “recent” articles (or patents for instance), where recent means in the last T years (time interval). If the cited entity has an almost constant output of articles or patents, $N_2(t) \approx ct = N_2$,

$$n(t) = \frac{kN_2}{d^b(t)} \cdot \int_{t-T}^t p(\tau) \cdot N_1(t-\tau) d\tau. \quad (13)$$

If $N_2(t) \approx \alpha t + N_{20}$,

$$n(t) = \frac{k(\alpha t + N_{20})}{d^b(t)} \cdot \int_{t-T}^t p(\tau) \cdot N_1(t-\tau) d\tau. \quad (14)$$

If $N_1(t-\tau) \approx ct = N_1$,

$$n(t) = \frac{kN_1N_2}{d^b(t)} \cdot \int_{t-T}^t p(\tau) d\tau. \quad (15)$$

which is the ‘standard’ GM, with $\int_{t-T}^t p(\tau) d\tau$ a constant ($\int_{t-T}^t p(\tau) d\tau = c$ if T is $-\infty$).

For entities having an increasing number of articles or patents, $N_1(t) = N_{01} + \beta t$, $N_{01} = N_1(t-T)$,

$$\begin{aligned} n(t) &= \frac{kN_2}{d^b(t)} \cdot \int_{t-T}^t p(\tau) \cdot (N_{01} + \beta\tau) \cdot d\tau \\ &= \frac{kN_2}{d^b(t)} \cdot \left(N_{01} \int_{t-T}^t p(\tau) d\tau + \beta \int_{t-T}^t p(\tau) \cdot \tau \cdot d\tau \right). \end{aligned} \quad (16)$$

which is the continuous-time version of the gravitational model, under the assumption of linear variation of the number of items, e.g., articles published or manufactured.

Example

Denote by $N_1(t)$ the number of articles of the first (citing) entity at time t and by $N_2(t-\tau)$ the number of articles of the cited entity at time $t-\tau$. Following [18], assume that the citation probability decreases exponentially in time, $p(t) = Ae^{-ct}$, with A, c constants.

Using discrete (yearly) variables, and assuming that the gravitational model is valid, then the number of citations at time t is given by

$$n(t) = k \cdot \frac{\sum_{\tau}^T (Ae^{-a\tau}) N_2(t-\tau) N_1(\tau)}{d^b} \quad (17)$$

where T is the lifetime of citations (about 3 to 10 years) and $b \approx 1\dots2$. An example of exponential decaying probability in time is shown in Fig. 1.

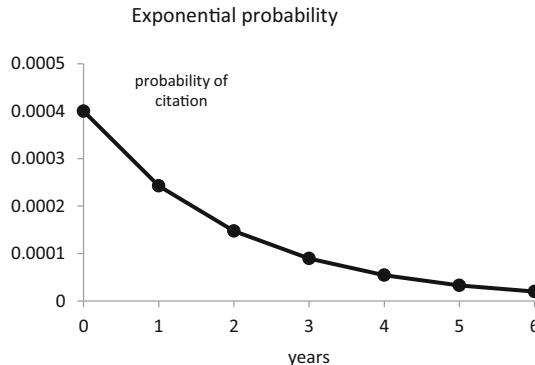


Fig. 1. Graph of the probability of citation as a function of the number of years passed.

Table 2. Apparent and real values of the constant k using the basic model and the one incorporating the role of the delays, for three cases of the variation of N_B .

| Case for variation of $N_B(h)$ | Constant | Decreasing by about 50 yearly | Increasing by about 80 yearly |
|--|----------|-------------------------------|-------------------------------|
| Apparent k | | | |
| Apparent k , using formula
$k = \frac{n}{N_A(0)N_B(0)}$, $d = 1$ | 0.000976 | 0.00092 | 0.00109 |
| Apparent k , using formula
$k = \frac{n}{N_A(0) \sum_{h=1}^6 N_B(h)}$, $d = 1$ | 0.000140 | 0.000132 | 0.000157 |

The value of k differs by almost an order of magnitude when computations use the current year number of patents of B compared to the case when one uses the total number of patents for B. Also, the value of k differs when one takes into account the delays, according to the convolutional model, see Table 2 for the influence.

Notice that there is no consensus on the distribution $p(t)$. Burrell [19] names it *obsolesce distribution* and recalls that some authors proposed a lognormal distribution [19], while [20] proposed an empirically derived polynomial model [20].

2.5 Cases of Good Approximation by the Basic Gravitational Model

The convolutional models may reduce, under some circumstances, to the basic GM with reasonable approximation errors. Consider that yearly the number of patents of A, $N_A(j - h)$ is almost constant, $N_A(j - h) \approx N_{Ay}$, $\forall h, j$. Then, in (3),

$$n(j) = \sum_{h=0}^{\infty} N_A(j - h)N_B(j)p(h) \approx N_{Ay}N_B(j) \sum_{h=0}^{\infty} p(h) = cN_{Ay}N_B(j) \quad (18)$$

because $\sum_{h=0}^{\infty} p(h) = c$. Assuming that the mutual affinity represented by the distance between the entities does not change in time, the above Eq. (18) leads to the basic GM.

Consequence 2. The convolutional gravitational model (8) reduces to the standard gravitational model, up to a multiplicative constant, iff $c + \sum_{h=0}^T a_h p(h)$ is constant, equivalently iff $\sum_{h=0}^T a_h p(h)$ is constant.

The proof is direct, based on (8). The corollary of *Consequence 2* is that whenever the dynamics of the process preserves similar characteristics as expressed by the constant value of $\sum_{h=0}^T a_h p(h)$, the standard GM applies. The processes where $\sum_{h=0}^T a_h p(h) = \text{constant}$ have therefore an invariant dynamic property that has important consequences on their modeling.

3 The Dynamics of the Distance: “Mutual Affinity” of the Entities and Human Factors

During time, the distance between (similarity of) the entities evolves. For example, the scientific, technological, and economic distances between USA and China significantly decreased during 2000 through 2015. Therefore, regardless of the type of distance between A and B, one may take into account its temporal variability, $d = d(t)$. Then, the gravitational-like model (4) becomes

$$n(t) = k \cdot \frac{\sum_{\tau}^T (A e^{-a\tau}) N_2(t - \tau) N_1(\tau)}{d^b(\tau)} \quad (19)$$

where the dependence on time of the distance shows a change in the affinity between the two entities performing the exchanges.

There is evidence that human subjects identify themselves with a self-determined group status and react accordingly in their behavior [21]. Therefore, the identification of an inventor or a sub-group of inventors with a specific international group of inventors will influence the chance of reading and citing more frequently patents from that group. In this respect, the inter-group perceived distance would influence the distance in the gravitational model. A similar argument is brought in [22], where the “perception of similarity” of individuals and groups modulates their behavior and propensity to respond to signals from inside the group. In essence, Ames [22] supports the view that the self-projection in another group is accompanied by a measure of closeness (or distance) to that group, which is an “inferential tool”. Therefore, the “similarity contingency model” may have an important role in determining the distance between sources of exchanges, especially of knowledge flows. On the other hand, such perceptions are very mobile and may significantly change over the lapse of a few years, even at the level of multinational companies or entire countries as groups; hence, the need to include in the gravitational exchange models the distance $d(t)$ as a time-dependent quantity.

4 Conclusions

The analysis of the dynamics of the exchange processes shows that time and delays (lags) play an essential part, leading to a convolutional model, not to a simple, Newtonian type relation as in the basic gravitational model. The convolutional model reduces to the standard gravitational model from the literature under certain conditions explained in this analysis.

The analysis has detailed the cases when the standard gravitational model applies as a very good approximation (Sects. 2.3 and 2.5) of the convolutional model. One case where the standard gravitational model applies well is that of small lags in the exchange processes, where the variation of the process parameters are easily approximated with linear variations. Another case where the standard model works well is that of processes with invariant dynamic properties. The analysis thus introduces a new type of gravitational model for exchange processes, a convolutional model, and derives the conditions under which the convolutional model reduces to the standard gravity model.

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From Coconut Husk Waste to Community Business

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Abstract. This research aimed to develop mechanical properties of coconut husk paper and the products from coconut husk paper to assess the efficiency of design towards marketing needs and to create management guidelines for the coconut husk paper existing manufacturers. This study was performed at Kaset Lak Song Phattana Kaset Phopaing Yang Yun community, Ban Phaew District, Samut Sakhon. To develop mechanical properties of coconut husk paper, coconut husk was added with Saa pulp at different mixed ratio of 95:5 and 70:30. The results showed that, the tear index was increased with adding Saa pulp. The optimum ratio of coconut husk paper and Saa was 70:30. The production of developed coconut husk paper is extended for local business operation. The production capacity is 100 sheets per cycle for 5 days and it cost 9 Bath per sheet. The products made from coconut husk paper includes lamp, wall clock, and herb sachet.

Keywords: Paper · Coconut husk · Mechanical properties
Community business

1 Introduction

Hundreds of millions of people consume coconut and coconut products every day. Coconut produces a wide range of products from various parts of the tree and nut. The husks are typically discarded. Coconut is one of the Thai way of life and it is an important economic crop for Samut Sakhon Province, Thailand. Samut Sakhon is 36 km from Bangkok, the capital city of Thailand. It is part of the Bangkok Metropolitan Region and is divided into 3 districts: Muang Samut Sakhon, Krathum Baen, and Ban Phaew. Ban Phaew District has produced approximately 5,000 kg of coconut husk per month for coconut growing area of 5 rai. The coconut husks are the waste in this community. New material concepts that incorporate waste materials are also becoming increasingly attractive to many consumers and businesses [1]. Paper production from agriculture waste is one option to utilize and reduce waste. Since the Thai economic crisis in 1997, community enterprises have been regarded as one of the key-driven for sustainable economic growth of Thailand. The community enterprise is a significant sub-sector within the wider social enterprise sector. It involves community business activities in both manufacturing and service. Small and Micro Community Enterprises (SMCE) in Samut Sakhon province, Thailand is a key driven of sustainable

economic growth [2]. The best community businesses will have regular, continuous and transparent processes for hearing from, reporting to, and taking direction from key stakeholder groups, such as residents or service users. A key feature of community business, as distinct from local charities, is their financial sustainability through trading activities, whether by selling to the public or operating services for public agencies [3]. In order to add the value of the coconut and also to solve the problem of the organic waste in the community, the researchers try to mix coconut husk paper with various kinds of materials at a different ratios to obtain the appropriate paper for development of coconut paper products. Management guidelines for marketing the coconut husk paper will be also created for the community coconut husk paper factory. This product will be a unique community product that can build a revenue and make a return to sustainable business management.

2 Methodology

2.1 Raw Material

Coconut husk were obtained from the waste of Kaset Lak Song Phattana Kaset Phopiang Yang Yun community, Ban Phaew, Ban Phaew District, Samut Sakhon Province, Thailand. In coconut shell, fiber is composed of cellulose which is suitable for paper making.

2.2 Sample Preparation

A 100 g of coconut husk was boiled with 1 and 3 mol Sodium hydroxide (NaOH) at 100 °C for 2 h to study the effect of Sodium hydroxide concentration on paper quality and to optimize the best mixture content for further preparation [4]. The coconut husk pulp was washed with water 3 times, bleached with 12% Hydrogen peroxide (H_2O_2) at 100 °C for 1 h and washed with water again. The coconut husk pulp was disintegrated in a laboratory blender and added with pectin solution. The pulp was formed in a mold of A 4 size. The paper was dried for 2 days until the pulp was fully dried as shown in Fig. 1.

2.3 Analysis of Physical and Chemical Properties of Coconut Husk Paper

Color Quest XE Spectrophotometer was used to measure color paper. Water immersion tolerance analysis is as follows; cut coconut husk paper 3×3 cm, weighed then immersed in 10 mL of water and observed the physical changes of paper with the naked eye for 27 days. The tearing resistance test or Elmendorf tear test was used to measure the internal tearing resistance of the paper rather than the edge-tear strength of paper [5]. PTA-Line BEKK Smoothness Tester was used to measure paper smoothness [6]. Water absorption analysis is measurement the time in seconds for the drop of water droplets through the paper sample. TAPPI T 831 om-14 was used for testing. Test conditions is Relative humidity and temperature at $65 \pm 2\%$ and 27 ± 1 °C respectively.

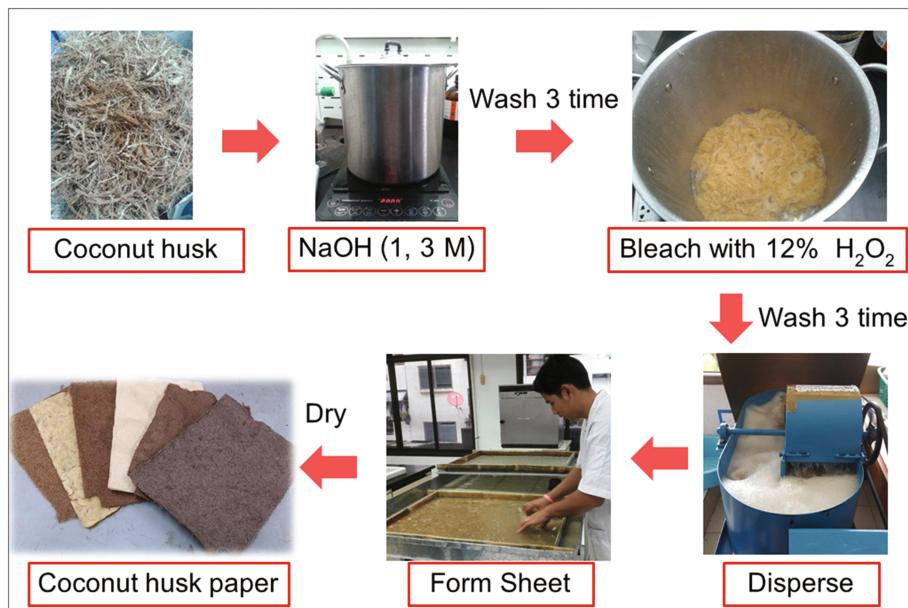


Fig. 1. Coconut husk paper production process in laboratory

2.4 Coconut Husk Paper with Saa Pulp Production

A 100 g of coconut husk was boiled with 1 mol Sodium hydroxide at 100 °C for 2 h. The coconut husk pulp was washed with water 3 times. In case of bleaching, bleached with 12% Hydrogen peroxide (H_2O_2) at 100 °C for 1 h and washed with water again. The coconut husk and Saa pulp at different mixed ratio of 95:5 and 70:30 was blended and then put the mixed pulp into a mold size 60 × 80 cm. the thickness of the paper was varied by volume of the pulp. The paper was dried until the pulp was fully dried. Name the sample as shown in Table 1.

Table 1. The sample type of paper details

| Sample name | Coconut husk pulp | Saa pulp | Thickness | Bleaching |
|-------------|-------------------|----------|-----------|-----------|
| B9505L | 95% | 5% | Thick | Yes |
| B7030M | 70% | 30% | Medium | Yes |
| O7030L | 70% | 30% | Thick | No |
| O7030M | 70% | 30% | Medium | No |
| O7030S | 70% | 30% | Thin | No |

2.5 Assessing the Opinions of Entrepreneurs

The population of this study was Manufacturers of paper handicrafts and paper-based packaging who jointed in the exhibitions. The sample size of 15 manufacturers was

selected for this research by convenient sampling. Structured interview and questionnaire were used to collect data from respondents through face to face interview by the researcher. The data were analyzed using descriptive statistics such as frequency, percentage, mean, and standard deviation to explain the respondents' opinion.

2.6 Finding a Way to Manage Coconut Husk Paper Producers for Existing Manufacturers

Participatory action research (PAR) fosters collaboration among participants and researchers. It is a valuable research methodology to be considered by any researcher wanting to take action and make changes [8]. Therefore, PAR was used to organize a community forum for community to learn together and set guidelines for community business. Scope of study area is Kaset Lak Song Phattana Kaset Phopaing Yang Yun community, Ban Phe District, Samut Sakhon. Focus groups and interviews as methods for data collection. A workshop was used to learn coconut paper production, design and development of coconut husk paper products, to extend scale of coconut husk paper production to commercial and to empower members and researchers about product design techniques and marketing management. Organizing meetings between research teams and members were performed to set the management guidelines.

3 Results and Conclusion

3.1 Coconut Husk Paper

Physical characteristics of coconut husk Papers are shown in Table 2. Paper produced from condition 3 (boiled with 1 mol Sodium hydroxide for 2 h, bleached and us Pectin added), condition 6 (boiled with 3 mol Sodium hydroxide for 2 h, bleached), and condition 7 (boiled with 3 mol Sodium hydroxide for 2 h, bleached, and Pectin added) have Homogeneity, good distributing of coconut fiber because concentration of NaOH affects the fiber's characteristics. If concentrations are high, Lignin HCl silica cellulose can be further purified. Moreover, the use of viscous pectin solution makes the fibers disperse well. As a result, the plate is homogeneous. The optimum condition for boiling the pulp was to boil with 1 M NaOH to reduce the amount of pesticide residue in the pulp cleaning process. Measured color of coconut husk paper showed that coconut husk paper which boiled with 1 mol Sodium hydroxide for 2 h, bleached and Pectin added is yellow and the brightness is 80.11. The color fades due to the reaction between H_2O_2 and NaOH. So that the samples treated by boiling with 1 M NaOH was used to study the immersion resistance. The results clearly showed the efficiency of fiber distribution in the sheeting process which affected on the fabric and make the paper more ductile and water resistant. The paper produced by the most appropriate process was determined for the refractive index and smoothness. The result indicated that Tear index was 7.35 Newton-square meter per kilogram ($N \cdot m^2/Kg$) and Smoothness was 2.00 s-Beck (s-BEKK). However, the smoothness of the paper is low, this characteristic creates a barrier for printing or writing on coconut husk paper. So produced paper can be better applied for a product wrap or a gift wrap.

Table 2. Physical characteristics of coconut husk Papers

| Condition | Physical characteristics | Photo |
|---|--|--|
| 1. NaOH 1 M : 1 Hour | - Coconut fiber remains clear
-Paper is not homogeneous
-Dark brown |  |
| 2. NaOH 1 M : 1 Hour bleaching | -Coconut fiber remains clear
-Paper is not homogeneous
-yellow |  |
| 3. NaOH 1 M : 2 Hours Bleaching: Pectin | - Good distribution of coconut fiber
-Paper is homogeneous
- Pale yellow |  |
| 4. NaOH 1 M : 2 Hours | -Coconut fiber remains clear
-Paper is not homogeneous
-Dark brown |  |
| 5. NaOH 3 M : 2 Hours | -Good distribution of coconut fiber
-Paper is homogeneous
-Dark brown |  |
| 6. NaOH 3 M : 2 Hours Bleaching | -Good distribution of coconut fiber
-Paper is homogeneous
-Pale yellow |  |
| 7. NaOH 3 M : 2 Hours Bleaching 60 Mins. Pectin | -Good distribution of coconut fiber
-Paper is homogeneous
-Pale yellow |  |

3.2 Mixed Coconut Husk and Saa Pulp Paper

Physical characteristics of mixed coconut husk and Saa pulp paper in different ratios, thickness and bleaching are shown in Table 3. All paper samples were not smooth and coconut fiber scattered throughout the sheet but the production process can produce paper with uniformly distributed coconut fiber throughout the sheet. This is due to the mixture of carboxymethyl cellulose, which is a water-soluble natural polymer that makes the pulp viscous, so the fibers can stick together and spread better [7]. Measured color of B9505L and B7030M paper showed that they were yellow and the brightness were 68.24 and 81.02 respectively. B9505L paper was more yellow than B7030M paper due to the higher proportion of coconut fiber and lignin content. On the other hand, O7030L, O7030M, and O7030S, which were not bleached, were brown according to the decomposition of hydrocarbons in coconut husk. The brightness were 60.02, 61.90, and 65.00 respectively. Adding pulp to paper also increased the tear resistance of paper. The tear index of mixed coconut husk and Saa pulp paper had a good value, it can be used instead of mulberry paper. Tear resistance is a must in crafting because it can produce a variety of products. The drop of water showed that the coconut fiber has good water absorption. Water absorption increased with increasing thickness and proportion of coconut fiber but it can also maintain the shape of the paper. From such features, it is possible for the paper to be produced as agricultural material. It can be biodegradable which is environmentally friendly.

3.3 Feasibility Study of Coconut Husk Paper Products

Based on a survey of 15 entrepreneurs involved in paper-based products, we looked at the feasibility of a coconut husk paper product. It was found that 80 per cent saw that the external features were suitable for use in the work. 93.33% agree that the touch features are suitable for use in the work. 100% of respondents are interested in bringing paper from coconut husk to use. O7030S paper, which is light brown, can be flexibly folded and has the potential to be used in the products of the operator has received the most attention. The reason s for attention are it is a material in Thailand that is added to the natural products, It is beautiful nature to support the waste to add value, It is an exotic material and it can be presented to the customer. Factors to consider in choosing the natural products that entrepreneurs have priority is the raw materials were local raw materials ($\bar{X} = 4.87$, SD. = 0.352). Secondly, it is eco-friendly production ($\bar{X} = 4.80$, SD. = 0.414) and it is a supporting the professional development of the community ($\bar{X} = 4.73$, SD. = 0.458). Guidelines for the application of coconut husk paper to create a product are as follows: Shopping bag, home decoration, Card Storage and product tags.

3.4 Development of Coconut Husk Paper Products According to Market Demand

The results of the survey of consumption behavior of natural products from 89 samples showed that 66.3% were women and 32.6% were men. 49.4% were between the ages of 25–40 and 32.6% were in the government service sector. The first factor that

Table 3. Physical characteristics of mixed coconut husk and Saa pulp papers

| Samples | Physical characteristics | Photo |
|---------|---|---|
| B9505L | Paper is yellow , coconut fiber scattered throughout the sheet , not smooth |  |
| B7030M | Paper is yellow , coconut fiber scattered throughout the sheet , not smooth |  |
| O7030L | Paper is brown , coconut fiber scattered throughout the sheet , not smooth |  |
| O7030M | Paper is brown , coconut fiber scattered throughout the sheet , not smooth |  |
| O7030S | Paper is brown , coconut fiber scattered throughout the sheet , not smooth |  |

consumers are interested in buying natural products is the most environmentally friendly product ($\bar{X} = 4.54$, SD. = 0.739). Secondly, it is products processed from natural resources ($\bar{X} = 4.40$, SD. = 0.765). Thirdly, it is produced by the community ($\bar{X} = 4.36$, SD. = 0.727). Consequently, the price of natural products is close to the general products price but they are the unique ($\bar{X} = 4.36$, SD. = 0.772). Based on the coconut husk paper trial commercial production for 5 kg coconut husk with coconut husk 90%, 10% Saa pulp and bleaching spend for 5 days. The production capacity is 100 sheets, 70 thick sheets and 30 thin sheets, per cycle for 5 days and it cost 9 Bath per sheet. Experimental production of coconut husk paper products is based on the idea

of using the original production base of the community, low cost and the main material is paper. The prototype of the product as follow, coconut husk paper lamp with coconut shell which Use 90% thick coconut husk paper as a lamp as Fig. 2. Coconut husk wall clock which use 90% thick coconut husk paper as a clock watch and use corrugated paper as a base attached to the watch body. It has lightweight features and can design a variety of dials as Fig. 3. Coconut paper soap package as Fig. 4. Survey results for prototype products by interviewing 25 interested visitors to analysis of opinions on prototype products and product marketing feasibility found that, prototype products are usability. Products are beautiful that can be used as a home decoration which is modern style and emphasize simplicity. Products are made from the waste that is valuable to the environment and the product is unique from the beautiful pattern of paper in coconut fiber which differ from other paper. According to the market survey, there is a shop that order 500 pieces of coconut paper soap package each month. It indicated that products from coconut husk paper to assess the efficiency of design towards marketing needs. Researchers and community groups have a clear goal to be productive income earners.

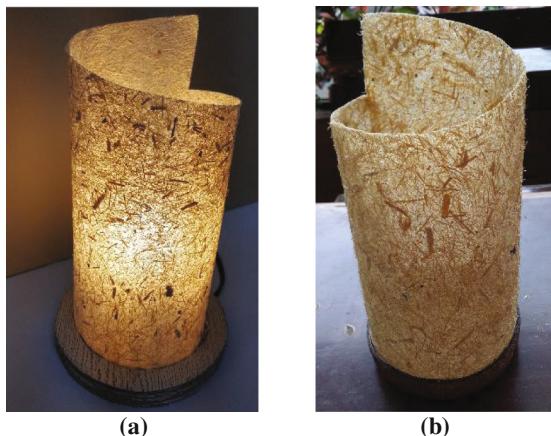


Fig. 2. (a) Master coconut husk paper lamp from corrugated base (b) Coconut husk paper lamp from coconut shell base

3.5 Guidelines for the Management of Coconut Husk Paper Producers Existing Manufacturers

Kaset Lak Song Phattana Kaset Phopaing Yang Yun community has the potential for establishing a group of coconut husk paper because it has 30 members which 90% are housewives and gardener. They will be free time during the day. The community has produced approximately 5,000 kg of coconut hush per month for coconut growing area of 5 rai. Therefore, the community can produce paper from coconut husk without the cost of coconut husk. It has also space available for building a paper mill and there is a solar power plant it is used to reduce production time. The structure of the coconut husk paper production group consists of head of coconut husk paper production, head of marketing, head of paper production, head of accounting, head of product processing

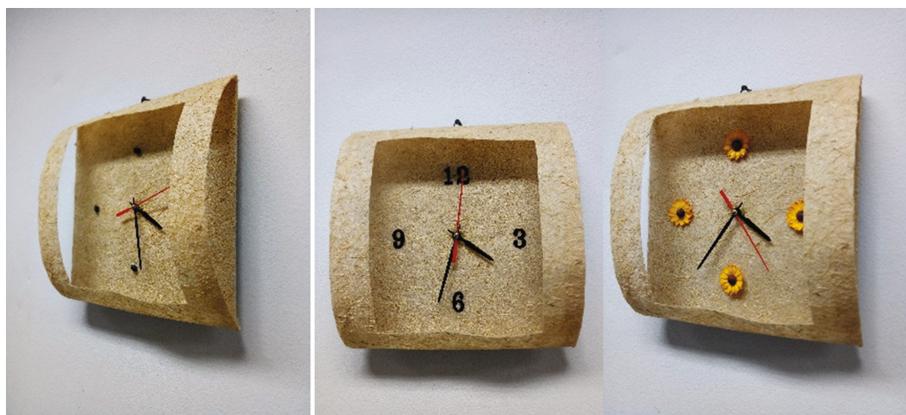


Fig. 3. Coconut husk wall clock



Fig. 4. Coconut paper soap package

and 18 general members. This community has the main tools for paper production such as a big mop, Sifted, 100 sheet frames and 3 treatment tanks. From the above mentioned, Kaset Lak Song Phattana Kaset Phopaing Yang Yun community strong enough to manage the production of coconut husk paper and processed coconut husk paper products for the group's products for example coconut husk paper lamp, Coconut husk wall clock and Coconut paper soap package. There is a market for products that are produced in the early stages of the group's satisfaction. It will make extra income from a regular job. From the above research, it is possible to introduce the coconut paper production process into community business in order to support the revenue generating activities of coconut husk and it also encourages communities to have unique products.

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Use of Technology and Virtual Communication via Global Virtual Teams at Arnhem Business School

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Abstract. Numerous educational institutions made efforts to provide their students opportunities to benefit from cross-cultural experiences in order to take advantages of multicultural and international interactions [1–4]. This study is looking at the specific challenge that is represented by the selection and use of the appropriate technology for Global Virtual Team (GVT) and virtual communication. This specific study evaluates the impact of GVT based experiential learning in business education at Arnhem Business School, the Netherlands. It tries to identify the major challenges global virtual teams face and existing frameworks for successful global virtual teams. It provides also evidence for the usefulness of GVT-based approaches and facilitates a better understanding of the challenges (use of technology and virtual communication in particular) and learning opportunities in using this type of experiential learning activity at Arnhem Business School.

Keywords: Global Virtual Teams · Higher education · X-Culture
Virtual communication

1 Introduction

Nowadays the business landscape on global scale together with the technological progress has developed a favorable environment for working teams in the virtual environment [5]. In order to save costs generated with expatriation and travel, the global businesses are looking forward to such virtual international teams that should work on common projects. Using this technological progress, global businesses benefit from an accessible and practical cooperation on the global scale in the virtual environment. As consequence, many multinationals use such global virtual teams.

Due to the increasing of global interactions and economies, all students have to face the need to develop a diversity of cross-cultural experience, which is usually obtained through different internships abroad or study programs in international mobility. The increasing of virtual technologies and international virtual teams represent a new chance for all students to achieve multicultural experience. It is very important for the stakeholders, including students, to be aware the responsibilities and the roles in such virtual teams at global scale.

Despite the fact that cross-cultural collaboration using the Internet seems to be very easy, in fact it is not enough to click a button to have these interactions [6, 7]. The interactions and decisions are influenced at each level of the educational process of the effects between stakeholders. The success of this kind of initiative depends on the interactions among institutions, faculty and students. It is important to ensure access to the same technology for all the members of the virtual team. The selection of the wrong technology can create numerous problems, such as misunderstanding among virtual team members and communication difficulties. These misunderstandings and communication difficulties will harm trust among team members and productivity [8]. This study in particular is looking at the specific challenge that is represented by the selection and use of the appropriate technology for GVT and virtual communication.

During virtual communication, nonverbal cues like facial expression, hand movements or tone of voice are lost. These nonverbal cues are present when we communicate face-to-face with other people. The communication via virtual environment generates its own challenges. The use of the technology to a certain level that can be considered as a natural part of the team's process is seen as a critical mass. In order to be effective, collaborative technologies require numerous users that must use this technology [9, 10]. According to Grudin (1994), the continued use of a particular technology without prior achievement of a critical mass means that the technology has not been adopted. If this happens, the work of the team will be impeded [10].

This study in particular is looking at the specific challenge that is represented by the selection and use of the appropriate technology for Global Virtual Team (GVT) and virtual communication. This specific study evaluates the impact of GVT based experiential learning in business education at Arnhem Business School, the Netherlands. It tries to identify the major challenges global virtual teams face and existing frameworks for successful global virtual teams. This study provides also evidence for the usefulness of GVT-based approaches and facilitates a better understanding of the challenges (use of technology and virtual communication in particular) and learning opportunities in using this type of experiential learning activity at Arnhem Business School.

2 Problem Definition and Research Design

The research context for the present study was student participation in the X-Culture project (www.X-Culture.org). X-Culture is an ongoing educational activity in which university students participate in GVTs in order to prepare a business proposal. Students were assigned to teams of five to seven members, each member from a distinct country. In their teams, the students chose a real-life company from an approved list and developed a business plan for that company to expand into a foreign market with an existing or a new product or service for example. Participation in the GVT-based project allowed students to experience challenges and form more realistic expectations with respect to intercultural and international virtual team collaboration [11].

This study evaluates the impact of Global Virtual Team - based experiential learning in business education at Arnhem Business School. This research made use of the extensive data available over a period of 2 years from the X-culture participants from last semester of 2015 till last semester of 2017 (5 seasons, approximately

4000 students per season, around 800 teams of students from more than 40 different countries per season); the Arnhem Business School participants in the project (66 students and 2 instructors) and 14 SME's in de region of Arnhem and Nijmegen, who had interest in Global Virtual Teams.

Post-project surveys applied to participating groups and to a control group of Arnhem Business School students reveal significant learning in terms of perceived difficulties related to use of technology and virtual communication. This study provides evidence for the usefulness of GVT-based approaches and facilitates a better understanding of the challenges and learning opportunities in using this type of experiential learning activity.

Evidence is based on a longitudinal waves of surveys responses from undergraduate business students before, during, and after participation in the X-Culture project, starting with the pre-project survey of the students and instructors; weekly surveys and data records during the project and post-projects surveys, interviews and evaluations.

Various measures of individual and team performance and outcomes, including multi-dimensional multi-rater assessment of the team report quality, ability to meet deadlines, satisfaction, peer evaluations and the like were taken as well as original team reports and other records suitable for qualitative and content analysis.

The data from the internationally X-Culture administered surveys were analyzed and presented with basic descriptive statistics and coding. To evaluate the impact of having participated in the X-Culture project, this study relied on two sources of data: (1) X-Culture, internationally administered, pre-, mid-, and post-project surveys and (2) a study-specific, locally designed and administered post-project survey at Arnhem Business School.

3 Results and Outcomes

As globalization and de-centralization of work processes have increased in the last decades, virtual teams have been used in many organizations as response to this dynamic environment. The members of such virtual teams that are worldwide dispersed are coordinated using communication technologies, such as video-conferencing or e-mail, and electronic information. These Internet-based technologies have been developed very fast in the recent years and the trend in most of the larger organizations is to employ virtual teams [12–15]. Curriculum in traditional courses now include specific international modules, and new distinctively international courses are incorporated into the portfolio of obligatory and elective courses just as companies themselves often use international assignments for developing internationally competent managers [16, 17]. Business universities are in search of international immersion opportunities for their students

This study specifically measured perceptions of difficulty directly related with the virtual aspect and students rated their perceptions of difficulty arising from:

- (1) Coordination of time zones [18]
- (2) Differences in personal abilities [19]
- (3) Coordination of work [19, 20]

- (4) Lack of authority and clear leadership [20–23]
- (5) Differences in motivation of members [19]
- (6) Electronic-virtual means of communication [18]
- (7) Technology used to facilitate the GVT.

This article is concentrating on the last two dimensions: electronic-virtual means of communication and technology used.

By taking an interest in GVTs, the understudies participate directly in a mimicked business setting, with their outside partners. This experience prompts finding out about other persons, different cultures, and about inborn challenges in working together with people who come from distinct social and semantic environments. Moreover, by taking an interest in this business setting, the understudies find out about GVTs on their own, about the set-up and organization, and their characteristic ramifications.

These virtual teams can bring numerous advantages over traditional teams. The most important advantages of virtual teams may include the better utilization of human resources since the best experts can be hired, the ability to bridge space and time, organizational flexibility and employees should not be physically relocated [24–26]. According to IJsendoorn (2002) and May and Carter (2001), several companies have used virtual teams, with more or less success, in order to develop their products [27, 28].

At ABS, students perceive virtual teams as an added value to what the school already offers as modules and extracurricular activities. Most of the students joined the x-culture programme not from curiosity but believing to add a new virtual experience that otherwise would not have had the chance to.

Zaugg (2012) states that without having face-to-face contact, oral and written communication among students became extremely important [29]. Other findings reported in other studies mention that strong written and spoken language skills were essential. In addition, knowing a second language was very helpful too [30–32].

Our students experiences sort of a privilege by being able to communicate very well in English as they pointed out that many students from other countries in their teams were lagging behind because of it.

Based on previous research, the project development and implementation has been facilitated due to the pre-existing relationships of confidence and trust among virtual team members [33, 34]. Still, the lack of open knowledge sharing using virtual tools has damaged those positive trusting relationships [35]. In order to build and maintain trust, “social” interactions among members of global virtual teams have to be planned before, during, or after their team meetings. This is not the case of teams that are situated in the same location.

Our students experienced trust issues with other group members due to virtual communication as well. Still, they acted immediately upon it by taking charge of planning meeting and enforced communication deadlines and open discussions.

Cohen and Gibson (2003) mention that virtual teams or individual workers those join different projects from geographically dispersed locations have to achieve inter-dependent tasks and share responsibility for their outcomes [13]. Besides, these virtual teams’ communications are mostly relied on Internet-based technology. According to

Bell (2005) and Morello (2005), this kind of collaboration and virtual teams became usual in many organizations [36, 37].

The companies we have interviewed mentioned a big trend when working and communication virtually. In a “glocal” setting where local companies need to act globally, the use of modern communication and technology is inherent to daily operations. Their employees must be able to act accordingly and virtually communicate at ease while projects can globally interlink (different deadlines, time zones, means of communication etc). They see virtual teams as opportunities where professionals and talented management professionals can develop their skills. Besides, these professionals will be responsible for the selection of appropriate technologies and the training for the use of those technologies.

Our students made it very clear that the lack of facilitation from school regarding the use of technology for virtual communication was a drawback in this project. Their ideas and desire of having a classroom with live streaming possibilities was taken into account in our conclusions and recommendations.

The virtual team concept has to face inherent challenges. The highest challenge is represented by the communication, especially among global virtual teams. Overcoming cultural barriers among global virtual teams represents another challenge. Due to the lack of face-to-face interactions among virtual teams, it is difficult to build and maintain trust, or to manage possible conflicts among team members [38].

However, several challenges related to this “virtuality” seem to be generally accepted. Virtual communication is one of these major challenges related to this “virtuality”. The lack of face-to-face time in global virtual teams can create this challenge, as one of my previous blog posts related to the virtual teams highlight. During virtual communication, nonverbal cues like facial expression, hand movements or tone of voice are lost. These nonverbal cues are present when we communicate face-to-face with other people. The communication via virtual environment generates its own challenges. Have you managed to maintain a good relationship with your friends, foreign colleagues or acquaintances using only virtual communications like social media or e-mails? How often you get answered to your e-mails later than you expected? How many times your video conversations have been hampered due to time differences and how many times your instant social media messages haven’t been understood by your interlocutor? This is what ABS students experienced as well. These drawbacks of virtual communication are known. In order to deal with them, some extra effort added into the process can help.

Regarding Arnhem Business School, the lack of a proper equipped room where students could meet up virtually was mentioned in the both the interviews and the feedback sessions. Students brought up different possible virtual settings which may have enhanced their abilities to communicate virtually.

Global virtual teams, as a type of virtual teams, may bring several advantages and disadvantages for the organizations that choose to use them. One advantage may be given by the increasing of the execution and productivity on a project since virtual teams can work 24 h per day. According to Lerner (2008), this 24-h model combined with opportunities to work on global teams is favorable to support a shared leadership for the project [39]. Another advantage is represented by the lower costs for the organizations, since the costs for virtual communications technology are cheaper than

costs generated with employees moving in order to facilitate face-to-face interaction. On the other hand, the disadvantages of virtual teams include aspects such as feelings of isolation, ambiguity of employee's role, cross-cultural nuances and the difficulty to make decisions as part of global virtual teams.

4 Conclusions and Further Research

International, intercultural academic experiences provide students with a preview to the real-world, globally interconnected workplace. Participation in the GVT-based project allows students to experience the challenges of collaborating cross-culturally and virtually and aids them in forming more realistic expectations with respect to what it takes to successfully collaborate across cultural and national borders via virtual means. These skills will prove essential in the student's future professional life. In an increasingly globalized world, all businesses today are to some degree internationalized. Employers respond accordingly by expecting their employees to be acclimatized to this new reality.

Taking into account the comments and feedback from both the students and companies interviewed, we developed an idea to transform and create different "virtual rooms" at ABS that will facilitate both the students and staff members in their virtual communication endeavors.

Room 1: The International Class Room

Classroom with live streaming possibilities. All lectures will be broadcasted live and saved for independent of time viewing. This room can be used for guest lectures, connection with whole classrooms at other universities or different word wide locations.

Room 2: Virtual Reality (VR)/Skype Room

In today's digital world, finding new ways to engage students is ever more difficult. In a normal classroom, this can even be harder, especially if the technology deployed is less engaging than the technology used at home. Virtual, augmented and mixed realities have been available for several years, but only recently, the technology is at such a level it can be used successfully in the international classroom.

VR can deliver experiences and interactions for students that are either not practical or not possible in the real world; it provides an unparalleled way to immerse and captivate students of all ages. Edgar Dale theorized that we retain only around 10% of what we read, yet 90% of what we experience ourselves. VR facilitates knowledge retention at the highest possible level through personal experience.

Skype, the free VOIP, offers unique opportunities for lecturers to get their students learning in new exciting ways. Here are some several ways that ABS can use skype in the classroom:

- (1) Meet with other classrooms worldwide: one of the most common projects educators utilize Skype for is setting up exchanges with classrooms around the world, usually for cultural exchange purposes or working together on a common

assignment. At ABS, there are two projects already that run using Skype: X-culture and the cooperation with Bradley, Preori, USA.

- (2) Practice a foreign language: connect with individual learners from a different native tongue can use a Skype collaboration to sharpen grammar and pronunciation skills through conversation.
- (3) Around the World with 80 Schools: this challenge asks participating schools to hook up with 80 worldwide and report what all they have learned about other cultures and languages. ABS year 1 Course ICA might create an assignment around this idea.
- (4) Record a podcast: download or purchase an add-on that allows for recording audio via Skype and use it in conjunction with GarageBand (or similar program) when looking to set up an educational podcast for or with students.
- (5) Record video: numerous plugins allow Skype users to record video of their chats, lectures, and presentations for later use, and students who miss class might very much appreciate having what they missed available for viewing.
- (6) Provide tutoring and office hours: if students need some supplementary help with their assignments or simply something they cannot get past in the lessons, videoconferencing allows their teachers to offer up tutoring and opportunities for extra help. Special education classrooms might find this strategy particularly valuable.
- (7) Make Skype the classroom: the growth in online classes means Skype itself works as a platform to conduct lessons, share presentations, provide tutoring and support, and more.
- (8) Study groups: instead of staking out precious library or coffee shop space, holding study groups via Skype provides a cheaper, more time-manageable alternative.
- (9) Meet exchange students early: before shipping off to live with a host family or bringing in an exchange student, arrange meetings ahead of time and get to know one another's unique needs, wants, and expectations.
- (10) Interviews: rather than a lecture, try hosting a Skype interview with professionals and – if the money is right — game-changers happy to answer student questions.
- (11) Guest lecturers: many plugged-in professionals these days will gladly offer up special lectures and lessons to classrooms via Skype, and sometimes charge a much lower fee than if they were to travel!
- (12) Connect with students that are away. ABS 3rd years students are away on their study abroad or placement so via Skype, they can communicate easier with their coaches that stay at home.

Room 3: Green Screen Room

This room is completely dedicated to record on-line classes. Using the newest technology lecturers can record the lectures and make them available for students in Arnhem but also for students who are not in Arnhem at the moment.

What is important here is that there is a coordinator/web-lecturer assistant available, who is able to do the actual recording, gives support, set the stage (light, sounds, and mics). An online-producer so to speak.

How would such rooms look like?

We need four small private cubicles for skype meeting. In the private cubicles the lightning, mic and camera are integrated and are working perfectly. All you need to do is plug in your mobile phone or laptop to make skype work, or Adobe connect/Facebook Chat/Facetime or any other program that works.

One room is fitted with a Microsoft HoloLens a new technology with new possibilities; two bigger cubicles where 3–5 students can meet to have skype meetings with the peers at other universities and one VR room where students can experiment/learn new skills via Virtual reality with courses offered at other university or developed at Arnhem Business School.

In the middle of the room there is a small round desk with 2/4 screens for multi-media development. If possible, a nice brainstorm chair would be a good idea.

Based on Mindrum (2011), the advantages and benefits provided by virtual learning are more important and positive than disadvantages [40]. In order to reduce the risks associated with virtual learning, there is need for an effective design and plan for this type of collaboration. Virtual learning is a great opportunity for students to benefit from additional experience into a rich learning environment.

The advice that we present to the Management Team at Arnhem Business School regarding the Virtual Rooms is also meant to facilitate the new International Business Programme Development as well.

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Successful Creation and Communication of Human Resources Strategies in Germany

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Abstract. Human resources strategy is very important for companies and need to be accepted by the employees. The human resources strategy is responsible for the success of the company. This paper investigates the opportunities to involve employees in the human resources strategy creation and to communicate the human resources strategies via different communication channels. The paper compares the different opportunities to present the human resources strategy e.g. online based and offline based channels and compares by the different options to involve employees in the creation of human resources strategy.

Keywords: Employees · Strategy · Channels · Social media · Involvement

1 Introduction

The paper evaluates different channels to communicate human resources strategies to employees. The second part is about the involvement of employees in the creation of the human resources strategy. Both questions are related with each other and important for companies.

The strategy is important for companies and has different parts. It exists one general strategy. The functional strategies e.g. human resources, finance or marketing are deviated from the general strategy. The functional strategies support the general strategy and this paper concentrates on the human resources strategy [1]. The Human resources strategy is important for the success of companies and to reach the objectives of the company.

Human resources management is important for companies. The employees are the most important asset of companies and a competitive advantage. The employees need to be involved in decisions and motivated to follow the strategy. That the company reaches the objectives. The motivation is influenced by the power about the decision and involvement of the decision about the strategy for example [2]. The communication is important for the acceptance of decisions. The expectation of employees is that there is a transparent communication about essential topics with the opportunity to ask questions or to give comments. Social media provides new channels to communicate and to

transfer information [3]. The opportunities and values provided by social media as a communication tool is increasing the opportunities to reach recipients.

New technologies provide new opportunities to communicate and cooperate with employees. This channel enables employees to provide feedback or to add new ideas. The presentation of results is via social media tools anytime and anywhere available for the employees. They can comment and like the information – or share the information with other individuals [4]. A discussion and feedback option is possible. The question is if the new tools are accepted and used by individuals to discuss or to collect information about the human resources strategy.

The assumption of the research is that there is a difference between the channels and demographic factors. This information is important for the management to use the most effective opportunities to create and communicate the human resources strategy. The new technologies provide new channels and cooperation tools to develop human resources strategies [5]. Further investigate and identify the paper the most suitable and successful channels to communicate about human resources strategies with employees.

The two research questions are “Would you be interested to take an active part in the development of the human resources strategy?” and “What is the best communication channel to present the human resources strategy successfully to the employees?”. The assumption for the research is that there is a difference between online and offline channel. The statement is that the direct approach by a human to discuss or present a human resources strategy is more accepted compared with an online opportunity. Further is expected that demographic factors especially work experience and age have an influence on the evaluations. The experience is an important factor to evaluate opportunities and existing knowledge about opportunities to cooperate or to communicate influence the evaluation. The educational level influences the knowledge and skills of individuals and can have an influence on the evaluation of the research questions, that participants with different degrees have various responses. That leads to the statement that demographic factors influence the choice of the respondents to participate in the creation of human resources strategy or to get presented the human resources strategy [6, 7]. That the evaluation depends on the demographic factors.

2 Human Resources Strategy

Human resources are responsible that today and in future the best suitable skilled employees quantitative and qualitative are available to fulfil tasks for the company. The human resources strategy has different flavors. The employees are the most important resource and the resource-based view explain the importance of the knowledge and skills of the employees as an important asset for the company [8, 9]. The strategy is a framework for the employees and a direction to find decisions. The vision and mission is an objective that support the motivation of the employees and gives the employees to work for the company a meaning.

The human resources strategy is part of the company strategy and support the company strategy to reach the company objective. That the company has a framework and message for the stakeholder. The strategy presents the company and support people to find a decision for the company.

Human capital is important in the knowledge industry. The human resources strategy develops and creates the skills and knowledge of employees to improve the results of the work, to enable employees to create value for the company [10, 11]. That needs the knowledge about the human resources strategy and that employees know what the company is offering to their employees to prepare them for the future and to support the success of the employees. This is important for potential candidates to know the importance of employees in the company, the respect of companies for their employees. That helps individuals to decide to stay with the company or to join a company [12]. That this operates need the human resources strategy communicated.

The human resources strategy is important to prepare the company for the future and to survive the competition and that the company has experienced employees with the needed knowledge for the future [13]. The human resources strategy is a plan for the future, to react on changes and to be prepared on the requirements.

3 Communication Channels for Human Resources Strategy

Companies can use different communication channels to transfer information to their employees. There are online and offline communication channels to transfer information. The channels and use of the channel depends on the availability and objective of the companies [3, 14]. There are international companies who needs a tool to transfer the strategy at the same time to many different places. Some companies are keen to get the feedback from the employees to evaluate the acceptance of the strategy or to collect feedback about the human resources strategy. The transfer of information can be personnel by colleagues or managers or indirect via an offline or online medium e.g. social media, black board or e-mail.

The channels have different risk and opportunities. The risk of electronic transfer of information is that the reaction of the recipients cannot be recognized. The transfer of information via social media tools or e-mails is fast and easily. The risk is that the information is forwarded to none authorized individuals or accessible by none authorized individuals. The advantage is the easy transfer of information, costs and anytime available for individuals [15, 16]. Social media is a great opportunity to exchange information. Some companies have internal social network sites or platforms to exchange information and this support the information exchange and to develop ideas, to create new innovative ideas [17]. The power and functionalities of social media support the development of human resources strategy for example.

The offline media channels or personnel channels provide a more sensitive channel. The importance to transfer information could be influenced by the choice of the channel. The collection of reactions and feedback is easily. If the information is not understandable than are explanations immediately possible [18]. That can avoid misunderstanding.

The meaning and idea about the human resources strategy needs to be transferred. If the strategy is not understandable for the employees or the employees do not agree with the human resources strategy than would be the human resources strategy ineffective.

4 Method and Demographic Data

The research has been done with an online survey in cooperation with a project at university of Ludwigshafen. Online surveys are very useful to collect data [19]. The number of respondents is 127–135 depending on the question. The questionnaire is in German and the scale to answer the questions is from one for full agreement to six for full disagreement. The scale is inspired by the German school mark system that support the respondents to evaluate the items. The demographic data is presented in Table 1.

Table 1. Demographic data, age, social status, education level, results in %.

| Age | | Education level | |
|----------------|------|---|------|
| Below 21 years | 7,3 | School degree | 17,1 |
| 21–25 | 43,9 | Practical training degree | 17,9 |
| 26–30 | 22,8 | University degree e.g. Bachelor, first academic grade | 45,5 |
| 31–35 | 8,9 | University degree, second level e.g. Master degree | 19,5 |
| 36–40 | 4,9 | n | 123 |
| 41–45 | 1,6 | | |
| 46–50 | 4,1 | Social status | |
| 51–55 | 3,3 | Employed e.g. employee, contractor | 45,5 |
| 56–60 | 1,6 | Student | 54,5 |
| Above 60 | 1,6 | n | 123 |
| n | 123 | | |

The share of men is 32.3% and for women 67.7%. The participants have collected work experience. For the participants work experience is the median 4 years and mode 2 years. The majority of the participants are at the moment students with 54.5% and employees with 45.5%. The students have had already some work experience or have had a practical education before they started to study. The data has been evaluated with descriptive statistics e.g. mean, median, mode, standard deviation, t-test to identify differences between the gender and Pearson's Chi Quadrat to support the t-test, LSD ANOVA for the differences between educational level and Spearman correlation coefficient for the demographic factors for work experience and age with the research items. The paper presents the statistical relevant significant results.

5 Analysis of Descriptive Statistics

The first research question which is analyzed is “Would you be interested to take an active part in the development of the human resources strategy?”. The items of the research question evaluate the most valuable channel to take part in the creation of the human resources strategy [20]. The results are mainly positive with a median 2 or 3 except one item with median 4. The results are supported with the mode on 2 and 3 for all items. The distribution for all items is skewed to full agreement with all respondents

above 61% on the first three stages except one item which has only 46.6% on the first three stages. The results and items in detail presented in Table 2.

Table 2. Descriptive statistics and distribution in % for the items of the research question “Would you be interested to take an active part in the development of the human resources strategy?”, scale from 1 for full agreement to six for full disagreement

| Questions | | | | | | | | |
|--|---------|-------|-------|-------|-------|-------|-------|--|
| n | 135 | 134 | 133 | 134 | 134 | 133 | 133 | |
| Mean | 3.05 | 3.15 | 2.35 | 2.99 | 2.49 | 3.26 | 3.70 | |
| Median | 3.00 | 3.00 | 2.00 | 3.00 | 2.00 | 3.00 | 4.00 | |
| Mode | 2 and 3 | 3 | 2 | 2 | 2 | 3 | 3 | |
| Std. dev. | 1.523 | 1.406 | 1.349 | 1.466 | 1.231 | 1.380 | 1.414 | |
| Full agree-
ment | 16.3 | 11.2 | 30.8 | 15.7 | 18.7 | 8.3 | 5.3 | |
| 2 | 25.2 | 25.4 | 33.1 | 28.4 | 42.5 | 24.1 | 16.5 | |
| 3 | 25.2 | 26.1 | 20.3 | 22.4 | 20.9 | 29.3 | 24.8 | |
| 4 | 12.6 | 19.4 | 5.3 | 16.4 | 10.4 | 18.8 | 22.6 | |
| 5 | 11.9 | 10.4 | 6.8 | 9.7 | 3.7 | 11.3 | 18.0 | |
| Full disa-
greement | 8.9 | 7.5 | 3.8 | 7.5 | 3.7 | 8.3 | 12.8 | |
| The evaluation of the human resources strategy on online rating platforms would be an important opportunity to take part | | | | | | | | |

Interesting is that the approach to a responsible manager has 84.2% on the first three stages of the evaluation scale, the conversation with the manager at the annual feedback meeting has 82.1% and on the third place with 66.7% is the opportunity to participate in the development of the human resources strategy is to take part in a workshop. There is a clear preference for real communication compared with the opportunities for virtual communications. The technology is not as good as accepted compared with the communication between humans to discuss important issues. In general, explores the result that people are interested to participate in the creation of human resources strategy because the tendency for all communication channels is to full agreement except the rating on platforms. That is the weakest opportunity to take

part in the creation if people can only vote for or against a decision. The influence with online platforms to vote is restricted on agreement or none agreement.

The second evaluated question is “What is the best communication channel to present the human resources strategy successfully to the employees?”. There is one item with median 1, four items with median 2, two items with median 3 and two items with median 4. The results are supported by the mode. The most suitable transfer of the human resources strategy is via the manager. That means the personnel contact and information of the manager is mainly appreciated. In general, are the personnel information channels are more positive evaluated compared with online or none personnel channels. The results and items are presented in detail Table 3.

Table 3. Descriptive statistics and distribution in % for the items of the research question “What is the best communication channel to present the human resources strategy successfully to the employees?”, scale from 1 for full agreement to six for full disagreement.

| | ... via the
information
black board
in the
company | ... via
e-mail | ... via
a
website | ... via the
company
newspaper | ... via
the
manager | ... via
workshops | ... via
social
networks
in
companies | ... via
company
internal
social
networks |
|----------------------|--|-------------------|-------------------------|-------------------------------------|---------------------------|----------------------|--|--|
| n | 127 | 127 | 127 | 126 | 127 | 126 | 127 | 126 |
| Mean | 4.10 | 2.97 | 3.58 | 3.48 | 1.98 | 2.33 | 3.37 | 3.17 |
| Mode | 4.00 | 3.00 | 4.00 | 3.00 | 2.00 | 2.00 | 3.00 | 3.00 |
| Median | 3 | 2 | 4 | 3 | 1 | 2 | 2 | 2 |
| Std.dev. | 1.413 | 1.453 | 1.342 | 1.270 | 1.054 | 1.257 | 1.495 | 1.418 |
| Full
agreement | 2.4 | 15.7 | 3.1 | 3.2 | 40.9 | 30.2 | 8.7 | 8.7 |
| 2 | 10.2 | 28.3 | 21.3 | 22.2 | 30.7 | 34.9 | 26.0 | 30.2 |
| 3 | 26.8 | 23.6 | 25.2 | 28.6 | 21.3 | 15.1 | 21.3 | 25.4 |
| 4 | 18.9 | 14.2 | 26.0 | 19.8 | 3.1 | 13.5 | 18.9 | 15.1 |
| 5 | 18.9 | 11.8 | 13.4 | 21.4 | 3.9 | 4.8 | 14.2 | 12.7 |
| Full
disagreement | 22.8 | 6.3 | 11.0 | 4.8 | 0.0 | 1.6 | 11.0 | 7.9 |

The majority of the participants evaluate on the first three stages the items above of 54% and the best result on the first three stages with 92.9% has the opportunity to get information about the human resources strategy via the manager. The second place to announce the human resources strategy with 79.2% on the first three stages is via a workshop. There is again the direct communication opportunities between humans more positive related than the technological opportunities. The offline information via the blackboard in the company is on the last place with 39.4%.

6 Influence of Demographic Factors

The assumption is that the transfer of information or involvement in the creation of human resources strategies is influenced by demographic factors e.g. work experience or level of education. This section investigates the statement regarding the influence of demographic factors (Table 4).

The first analysis is about the gender differences with a t-test. For the gender differences are only statistical relevant factors for the questions “What is the best communication channel to present the human resources strategy successfully to the employees?” are available and the results are presented in Table 3.

Table 4. T-test for the research question “What is the best communication channel to present the human resources strategy successfully to the employees?” and gender

| | | Levene's test
for equality
of variances | | T-test for equality of means | | | | |
|--|-----------------------------------|---|-------|------------------------------|--------|------------------------|--------------------|--------------------------|
| | | F | Sig. | t | Df | Sig.
(2-
tailed) | Mean
difference | Std. error
difference |
| ... via the manager | Equal
variances
assumed | 0.042 | 0.837 | 2.007 | 122 | 0.047 | 0.405 | 0.202 |
| | Equal
variances not
assumed | | | 2.025 | 78.623 | 0.046 | 0.405 | 0.200 |
| ... via social networks in
companies e.g. colleagues | Equal
variances
assumed | 4.826 | 0.030 | 2.351 | 122 | 0.020 | 0.670 | 0.285 |
| | Equal
variances not
assumed | | | 2.161 | 62.889 | 0.034 | 0.670 | 0.310 |
| ... via company internal
social networks e.g.
Yammer | Equal
variances
assumed | 7.891 | 0.006 | 2.452 | 121 | 0.016 | 0.665 | 0.271 |
| | Equal
variances not
assumed | | | 2.274 | 62.210 | 0.026 | 0.665 | 0.292 |

The results are supported by Pearson's chi square and the Likelihood quotient. The results are presented in Table 5.

Table 5. Pearsons chi square and Likelihood quotient for the significant relevant items of the research question “What is the best communication channel to present the human resources strategy successfully to the employees?”

| Asymp. Sig (2 tailed) | Pearsons chi square | Likelihood quotient |
|--|---------------------|---------------------|
| ... via the manager | 0.04 | 0.04 |
| ...via social networks in companies e.g. colleagues | 0.038 | 0.04 |
| ... via company internal social networks e.g. Yammer | 0.028 | 0.032 |

The distribution is visible in Fig. 1 and provides the result that women have the majority on the first three stages compared with the answers from the men. Especially two results present differences between man and women. The details are presented in the following figures.

The differences between men and women are 23% between 3%. The results give a clear picture that women are more agree than men for the significant relevant different results. That means for some items exist a statistical relevant difference between men and women. This result present differences between men and women for the presented items and has to be under consideration for the communication of human resources strategy. It could be usefull to use some channels only for women.



Fig. 1. Age distribution for the items of the question “What is the best communication channel to present the human resources strategy successfully to the employees?”, results in %, n = 126–127, scale from 1 for full agreement to 6 for full disagreement

The demographic factors age and work experience in years have significant correlation coefficients for the question “Would you be interested to take an active part in the development of the human resources strategy?”. The item “It is important for me to take part in the development of the human resources strategy via a workshop” with the demographic factor “age” has a Spearman Correlation Coefficient of -0.265 , Sig. 2 tailed 0.003 . The work experience has influence on the item “to take part via company intern online forums and communities is important for me” with correlation coefficient is 0.180 , Sig. 2 tailed 0.048 .

The differences between the educational level has been evaluated with an LSD ANOVA and for the first question “Would you be interested to take an active part in the development of the human resources strategy?” the results are showed in Table 6.

The first interesting insight in the results is that the university degrees do not have significant differences with each other. They have only significant differences with other degrees. That means there is a difference between university degrees and other degrees is visible and supported by the result that if differences exist than are the university degrees involved.

The second research question “What is the best communication channel to present the human resources strategy successfully to the employees?” is tested for the educational level with LSD ANOVA. The significant results are in Table 7.

Table 6. LSD ANOVA for the question “Would you be interested to take an active part in the development of the human resources strategy?” and educational degree

| (J) Educational degree | | | Mean difference (I-J) | Std. error | Sig. | |
|---|--|--|--|------------|-------|-------|
| It is important for me to take part in the development of the human resources strategy via a workshop | University degree - first academic grade. e.g. bachelor degree | School degree | 0.988 | 0.360 | 0.007 | |
| | | Practical training degree | 0.821 | 0.354 | 0.022 | |
| It is important for me to take part via the employee suggestion system | University degree. second level e.g. master degree | School degree | 0.970 | 0.376 | 0.011 | |
| | | Practical training degree | 0.951 | 0.372 | 0.012 | |
| A direct approach to an responsible employee | School degree | University degree. Second level e.g. Master degree | -0.839 | 0.380 | 0.029 | |
| | | Practical training degree | University degree - first academic grade. e.g. Bachelor | -0.700 | 0.321 | 0.031 |
| | | Practical training degree | University degree. second level e.g. Master degree | -1.019 | 0.375 | 0.008 |
| | | Practical training degree | University degree - first academic grade. e.g. Bachelor degree | -0.727 | 0.343 | 0.036 |
| The opportunity to vote about specific strategic options is important | Practical training degree | University degree. Second level | -1.186 | 0.403 | 0.004 | |

Table 7. LSD ANOVA for the research question “What is the best communication channel to present the human resources strategy successfully to the employees?” and educational degree

| (J) Educational degree | | | Mean difference (I–J) | Std. error | Sig. |
|--|--|--|-----------------------|------------|-------|
| ... via e-mail | Practical training degree | University degree. Second level e.g. Master degree | -1.004 | 0.428 | 0.021 |
| ... via workshops | Practical training degree | University degree. Second level e.g. Master degree | -0.834 | 0.370 | 0.026 |
| ... via company internal social networks e.g. Yammer | Practical training degree | University degree – first academic grade. e.g. Bachelor degree | -0.821 | 0.344 | 0.019 |
| | | University degree. Second level e.g. Master degree | -1.196 | 0.408 | 0.004 |
| | University degree. Second level e.g. Master degree | School degree | 0.839 | 0.413 | 0.045 |
| | | Practical training degree | 1.196 | 0.408 | 0.004 |

It is a similar picture as before with the items of the first research question. The university degrees have statistical significant differences and there are only some items with statistical relevant differences. That means there do not exist a general answer for all items regarding differences between the educational level.

7 Conclusion and Practical Recommendations

The two research questions were “Would you be interested to take an active part in the development of the human resources strategy?” and “What is the best communication channel to present the human resources strategy successfully to the employees?” to investigate the most suitable channels to transfer the human resources strategy to employees and to create a human resources strategy in cooperation with employees. The items are different opportunities and channels to cooperate to create a human resources strategy or to forward the human resources strategy to employees.

The statement that offline channels e.g. workshops, meetings or communication between humans are preferred to create and to communicate human resources strategy is confirmed. This is an important information for organizations to transfer important information to their employees. That the individuals are involved in the creation of human resources strategy. The communication and creation process of human resources strategy improve the acceptance of the human resources strategy.

The second statement is only in parts confirmed. Some demographic factors influence the items of the questions. The results show that the gender, social status, work experience and age does not have many statistical relevant influence on the use of the different channels and opportunities. The work experience has a significant result on the question regarding the communication channels on a week level. That means the assumption about the influence of demographic factors is weak and only particular. A general statement is not possible.

The gender difference for some items is presented in the paper and the differences between the educational levels is visible. But the results are only for some items and cannot be generalized. The same picture with the demographic factor work experience and age. That means it is not possible to generalize the influence of demographic factors on the items for transfer of the human resources strategy or to create the human resources strategy. There is a similar picture for the educational level. Further research needs to investigate further factors which are responsible for a successful transfer of the human resources strategy or to create a human resources strategy. There does exist only some preferred tool or platform by different demographic groups which is investigated by the research. If companies use this tool or platform which is influenced by the demographic factor than they have to take under consideration the different influence.

That the human resources strategy is of interest for the participants is assuming because they evaluate all kind of creation and transfer of the human resources strategy mainly with the tendency full agreement.

The limitation of the paper is that the research concentrates on Germany and the human resources strategy. Further research needs to identify further factors and to generalize the results.

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New Innovation Identification Approach Development Matrix

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Abstract. Innovations have become one of the contemporary economics key driving forces behind competitive advantages and have become socioeconomic category of their own. Diffusion of innovations, which is an integral part of the scientific and technological base of national economies, promotes structural changes in economy. Companies have to pay close attention to market trends and have to be able to identify and create new innovations, thus increasing their competitiveness and meeting consumer demands and expectations. The objective of this research is to evaluate the concept of different innovations in organizations and propose a complex approach to identifying innovations in the form of a matrix that would aid in creating new and competitive innovations, based on the study of scientific literature and expert surveys results theoretical evaluation of different innovation approaches in organizations and the scientific and practical approaches to identifying innovative ideas at the initial stage of the innovation process.

Keywords: Innovation · Marketing · InnoMatrix · Survey · Process

1 Introduction

Scientists introduce the term “innovative economy” in their latest studies, thus marking the current stage of development of the most developed countries in the world. Studying economic cycles in the beginning of the previous century, it was discovered that innovation is the key to economic growth and a new economic cycle. Also thousands of marketing executives from all over the world every day come to a similar discovery by analyzing current sales results. However, in scientific literature, the review of the phenomenon of commercial success or failure of innovation in the conceptual phases of the emergence of their ideas is relatively poor. In professional literature of various fields is emphasized that only 2–10% of the innovations created are commercially successful in the economy [1]. In this article the authors make an in-depth analysis of the origin of the ideological concept of innovation and analyze their linkage with successfully implemented innovations. Based on the approaches of scientific literature, two ways of

obtaining potential innovative concepts - generation of ideas or identification of ideas - can be distinguished [2, 3]. Generation of ideas is a direct way of reaching the potential concept of innovation, but identifying innovative ideas is the processing of relatively widely available information.

Emphasizing that the methodology of identification of innovations differs from the methods of generating ideas with the scope of objective information available in a method, group of methods or authors' approach, one can summarize different authors' approaches that include elements of both qualitative and quantitative methods. In order to make an in-depth analysis of the origin of commercially successful innovation concepts, the authors of the article have developed a complex methodology - a methodological model of ideological concepts of innovations, *InnoMatrix* (here and further), by synthesizing methodologies and methods for identifying relative volume innovation concepts, studied in scientific literature, and authors' approaches. For empiric approbation of *InnoMatrix* model in practice, the 100 most outstanding innovations in international food industry in 2016 and 2017 were identified from professional literature; and methodological, methodic or ideological creation of author's approach was applied to each of the innovations, using expertise. Thus, it was revealed which of the authors' tools, methods or methodologies consciously or unconsciously was the basis of the creation of the initial innovation concept. Out of over 150 approaches for identifying innovation concepts the newly created *InnoMatrix* model is able to generate, the 100 most outstanding food industry innovations in 2016 and 2017 were developed from only 18 methodological approaches. The obtained results were compared with the experts' assessment of the methods of identifying ideological concepts of innovations.

2 Identification and Process of Information Source for the Conceptual Ideas of Innovations

The identification of conceptual ideas of innovations is sometimes mistakenly understood only as a way of generating ideas and is therefore associated with a complexly measurable creative process that is difficult to adapt to social science research methods [1]. It is based on the frequently used idea generation approach, which is one of the ways to reach the potential innovation idea. In a wider aspect, identifying innovation ideas stands for the cognitive perception of the process, which involves deducing the process, starting from exploring the potential information sources and managing to the second stage of innovation development process - the evaluation of ideas. The identification and processing of information sources for potential innovation ideas is related to research and the conclusions to be drawn on its basis. *InnoMatrix* model is based on the hypothesis that commercially successful innovations are algorithmically synthesizable and repeatable.

Figure 1 is the authors' process image based on the review of scientific literature. It summarizes the research findings of innovation identification approach [1, 2, 4] where the authors distinguish the two ways of obtaining the concepts of innovation ideas.

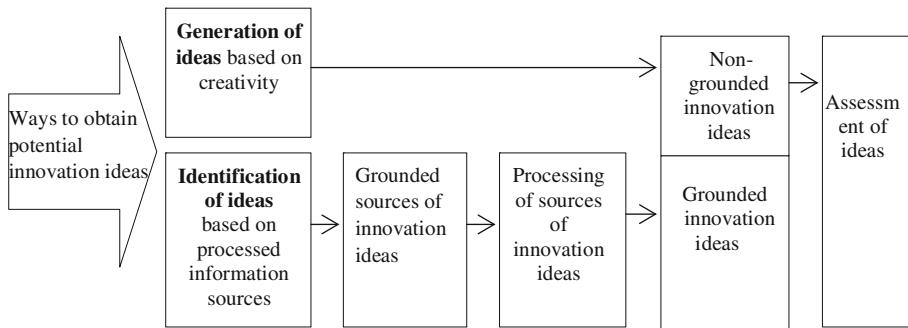


Fig. 1. The process of obtaining conceptual ideas of innovations.

In scientific literature, the identification of conceptual ideas of innovation with information processing methods, their complex or expert-based approaches has been relatively little reviewed, in contrast to the generation of ideas. When considering a specific information source with a particular method, set of methods or expert approach, it is hypothetically more likely that identifying idea ideas for innovation is grounded and potentially more commercially successful in the process of creating or diffusing innovation. The author Drucker emphasizes that the identification of innovation ideas starts with a study of opportunities from seven sources [2], of which four are related to the opportunities in the existing industry or business (see Table 1).

Table 1. The identification of innovation ideas starts with a study of opportunities from seven sources [2].

| Opportunities in the existing business or industry | Opportunity outside the existing business or industry |
|--|--|
| 1. Unexpected success or failure | 1. Changes in demography |
| 2. Non-compliance | 2. Changes in the perceptions of the importance of social and economic processes |
| 3. Process needs | 3. New knowledge |
| 4. Changes in the industry or market structure | |

Drucker does not separately distinguish information sources and their processing methods like other authors do; instead, he considers the method of identifying innovation in combination with the source. For example, the source of information on the unexpected success or failure, mentioned by the author Drucker, is the company's sales data and/or market conjuncture data, which can be obtained by appropriate processing with qualitative or quantitative methods.

The authors of the article conclude that in scientific literature the sources of information are often confused with their processing methods and identification of innovations is equalized with the generation of ideas. Information sources alone do not

provide potential innovation ideas; they need to be treated with specific quantitative or qualitative methods [5]. Summarizing scientific and professional literature [1–3, 5, 8], the process of identifying innovation can be divided into two stages: (1) identification of sources of information available to the company; (2) the processing of information sources using specific methods in order to identify potential innovation (see Fig. 2).

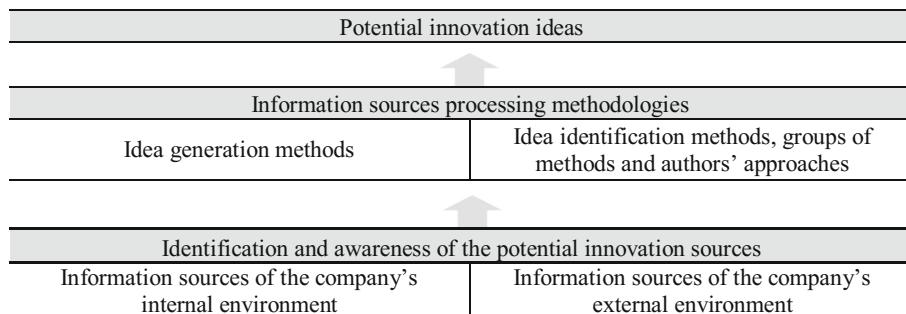


Fig. 2. The scheme for the process of identifying innovation ideas in the company.

Some of information sources is available to each company; problems appear mainly due the processing of information and opportunities they provide, leading to practical conclusions - sources of conceptual innovation ideas. In scientific literature, a detailed breakdown is not available; there is only a general guidance, because, as mentioned above, the identification of innovation ideas in scientific literature is still very little systematically analyzed [6]. Scientist Kotler notes that the employees of a company may have significant innovation ideas, as they are in the closest possible relationship with the client and the product or service process [7]. The company's sales people are also another good source of innovation initiation. Kotler points out that Toyota receives about two million ideas from internal environment and emphasizes that the main source of enterprise innovation is directly dependent on employees [7]. An equally important source of information for potential innovations is the wishes expressed by the company's customers. According to the statistical data by Kotler, 28% of new successful product ideas are customer-inspired. By analyzing the customers' queries and complaints, it is possible to find new conceptual initiatives for innovation ideas that would solve the customers' needs. Knowing the wishes of the client, Kotler proposes to convene the company's production people to solve the customer's needs in an unordinary way [7]. The company's consumers are one of the most common and, at the same time, the most complex sources of potential innovation as the ability of consumers to express their wishes in terms of innovation is limited, according to Morita, the former innovation manager of Sony, and the former leader of Apple, Jobs, kept to this opinion [8].

The field of unexpressed consumers' wishes raises a lot of new questions on how to identify the consumers' needs. The new techniques of awareness of consumers' wishes concerning new products are different from marketing communications, traditionally applied for assessment. Author Trott believes that the ultimate goal is to look into the future and to imagine what products will be used by the future consumer [8]. As per author

Drucker, information on changes in the industry and market structures that are related to changes in consumers, preferences, choices and values provides an excellent source of potential innovations [2]. Such changes are evidenced by the rapid growth of one industry, as well as industry journals, which quickly catch up the latest events and quickly identify the change of direction in a sector. Kotler has emphasized that the consumers often create new products themselves and get the companies that identify them and create new products based on them. It is also emphasized that the company's competitors, their products and services are an important source of conceptual innovation ideas. According to Kotler, an in-depth analysis of competitors' products, focusing not only on their copying or successful adaptation, but also on potential improvements, can provide valuable information [7].

The dominant trends in lifestyle trends in the society (*trends and megatrends*) play an important role in identifying consumers' needs in terms of innovation sources, and they are more sustainable than temporary seasonal fluctuations, as emphasized by Kotler [7]. The trends uncover future curtains, offering a variety of options. New knowledge in science, both technological and non-technological, is the longest path to the creation of innovation. In average, it takes 20–30 years from the appearance of a new technology to its introduction in mass consumer market [7]. In this regard, the observation of Drucker is in line with the observations of researcher Saffo, the researcher of the remarkable Silicon Valley phenomenon, whose main thesis is the conclusion that it takes 20–30 years until a significant innovation emerges in the mass consumer market, mentioning as the most significant examples of this phenomenon Internet and the home robot brand I-Robot [9].

An information resource, little mentioned in scientific literature, but commonly used in the professional environment is company's cooperation partners. Suppliers or distribution partners have provided a rich environment for innovation initiatives, most often because the suppliers are themselves interested in selling their new products and services [10]. The company's suppliers regularly report on the latest technologies, concepts, techniques and materials that they themselves have begun to use. A source of information, little used in professional environment, while widely used in academic environment is knowledge, experience, opinions and vision of industry experts. Industry experts usually have a broad knowledge base, which allows conclusions to be drawn quickly and accurately, to make forecasts as well as to find out the regularities that can be significant for the identification of innovations, the authors conclude. The authors of the article conclude that in scientific literature 11 sources of information have been considered unsystematically, which includes potential innovation ideas; therefore, the authors generalize the identified sources in Table 2.

Table 2. Sources of information for innovation ideas in a company.

| Information sources of identification of innovation ideas in an organization | |
|--|--|
| Internal information sources | External information sources |
| 1. Employees (management, key specialists) | 1. Clients and consumers |
| 2. Financials of the existing products and services | 2. Competitors' production |
| | 3. Leading lifestyle trends in the society |
| | 4. Demographic changes |
| | 5. New knowledge, both technological and non-technological |
| | 6. Market conjuncture |
| | 7. Patent database |
| | 8. Cooperation partners |
| | 9. Sector experts |

These sources of information are identified by consolidating the tractates of different authors on the creation of innovations, which can be divided into two categories – company's internal environment information sources and company's external environment information sources.

3 Information Sources Processing Methodologies

Information processing methodologies in information sources are critically important for the identification of innovative ideas. Information without proper processing, from which it is possible to extract potential innovation ideas, is not valuable. Formal statistical and marketing research methods in scientific literature and in practice are mainly related to the evaluation of sales results, the development of marketing communications, the control of alternatives and the evaluation of returns, as well as the assessment of brand value, strengths and weaknesses, and the past, present or future behavior of other existing phenomena and objects. The authors of the article emphasize that the methodologies for identifying innovations are unique with the setting of the objective of recognition of the object that previously did not exist.

Sometimes it is mistakenly believed that methodical identification of innovations from the source of information is not possible, as related to the difficultly controllable creative process. In the middle of the previous century, the notable Russian scientist Altshuller refused to agree with it and, via content analysis method, investigated both Russian and international patent databases, as a result of which he found a logical scheme for identification of innovations, called TRIZ™ model [11, 12] which was adapted by the United States in a successful commercial approach, thus strengthened the value of their companies in the markets. In scientific literature a classification of the methodologies for identifying the ideological concept of innovations is not available; therefore, the authors of the article offer the following classification: (1) methods (which can be expert methods,

groups of methods, creative, forecasting methods, etc.) and (2) authors' approaches, which include a unique author approach to identifying of innovation idea. The authors' approaches include complex sets of methods, which are often not specified by the author. Leonard and Rayport mention empathic design method as one of the most efficient and relatively financially beneficial methods [13]. In the opinion of Leonard and Rayport, in order to improve little-known products, the companies need to be able to reveal and to satisfy those consumers' needs that the consumers were even not aware of, where the empathic design method would be the most appropriate one. The authors' approach DARPA™ suggests that there are two ways to identify innovation ideas that would make sense to use the company's resources [13]. First of them is to identify a newly emerging field of science or to identify a point when some of the scientific fields has reached a new stage in which a significant practical problem can be solved in a new way. The second way is to reveal an emerging consumers' need that current technology cannot provide for [14]. Author Radeka in the research believes that the main source of information for a grounded innovation idea is the problems, defined by the customers and consumers, as well as by the organization itself [15]. Finding out the problem, analyzing its causes, it is possible for the organization to find the way to create a grounded innovation, the author believes.

As a practical method for defining the problem, the author of the approach suggests the A3 problem definition report form, which is completed by each of the department heads, identifying the most important issues in their department. In turn, the approach of the author Saffo includes 6 steps for identifying innovation ideas. The "6-step approach" is summarized by the idea of uncertainty cone [9]. The uncertainty cone outlines the opportunities that arise from a particular moment or event. In turn, according to Basadur [6], one of the most efficient ways of revealing consumer needs is to identify the topical problems faced by the consumers in a particular category and market, as, since it is impossible to offer the consumer a desirable solution if the consumer's problem is not understood and identified. Drucker emphasizes that the identification of conceptual innovation ideas begins with the analysis of opportunities from 7 information sources [2], among which one is discrepancy - the dissonance between the existing reality and the assumption, which is an interesting source of information for identifying potential innovation ideas. It is significant that the rapid changes in industry between business sectors or in a sector Drucker [2] and Saffo [9] mention as an important indication of significant changes that will be related to innovation. Even a small, rapid change, seemed to be insignificant for current business, can signal a significant upheaval. In practice, one of the most widespread methods in the field of innovation is the combination of existing products, Hären concludes [16].

Godin [17] believes that the generation of innovation ideas does not work because its members have a reason to criticize ideas for a variety of reasons; moreover, in organizations not extraordinary ideas are usually required, but the implementation of direct job responsibilities by the participants of the idea generation meeting. Also, this author believes that an appropriate alternative to generating innovations is to move towards the ultimate boundaries of consumer needs [18, 10].

As a result, a detailed analysis of the content of scientific literature, the authors of the study have developed a matrix of sources and methods that summarizes the revealed sources of information, which include innovation ideas, their processing methods, groups of methods and authors' approaches, by means of which the ideas of innovation concepts can be extracted (see Table 3).

Table 3. InnoMatrix model - the approaches and methods of information sources and the authors of their processing, by means of which potential conceptual ideas of innovations can be synthesized.

| Company's internal information sources | Company's external information sources |
|---|--|
| Methods of information source processing and methodologies for identifying innovation ideas | Company's employees
Company's quantitative information
Clients and consumers
Competitors products
Lifestyle trends
Demographic changes
New scientific discoveries
Market conjuncture
Cooperation partners
Patent database
Industry experts |
| Generation of ideas methods | |
| 1 "Brainstorm"
2 "Delphi method"
3 Morphologic analysis
4 Focus groups
Etc. | |
| | Company's employees
Company's quantitative information
Clients and consumers
Competitors products
Lifestyle trends
Demographic changes
New scientific discoveries
Market conjuncture
Cooperation partners
Patent database
Industry experts |
| Identification of ideas methods | |
| 1 Content analysis
2 "5 "why""
3 "Ishikawa's fishbone"
4 Interrogation
Etc. | |
| | Company's employees
Company's quantitative information
Clients and consumers
Competitors products
Lifestyle trends
Demographic changes
New scientific discoveries
Market conjuncture
Cooperation partners
Patent database
Industry experts |
| Authors' methodologies | |
| 1 "Empathic projection"
2 "DARPA"™
3 "Redeka's A3"
4 "6 steps by P. Saffo"
5 "6 questions by M. Basadur"
6 "Non-compliance dissonance"
7 "Rapid changes in the industry"
8 "Vivid idea"
9 "Combination of objects"
10 "Topical problems"
11 "Hot points"
12 "Extreme boundaries"
13 40 principles of TRIZ™
14 "Valuable innovation curve"
15 "LIAA black box"
16 Open innovations
17 Casual luck or failure
Etc. | |
| | Company's employees
Company's quantitative information
Clients and consumers
Competitors products
Lifestyle trends
Demographic changes
New scientific discoveries
Market conjuncture
Cooperation partners
Patent database
Industry experts |

The selection of methods and authors' approaches is based on the scientific literature available to the authors. The list is not complete, it is changeable and is constantly improved; it reflects the widest known and used methods (content analysis, "Ishikawa's fishbone", etc.) the most promising ones (TRIZ™, DARPA™, etc.) and the latest ones ("6 steps by P. Saffo", "Hot points", etc.) [11, 12, 19].

4 Approbation of the Sources and Methods of Innovative Model InnoMatrix in Food Industry

The *InnoMatrix* model is a developed theoretical model, based on scientific literature reviews, and its empirical approbation in market sectors is essential for its validation. One of the first industries in which *InnoMatrix* is approuted is food industry. Its choice is related to a number of factors that, by interacting with this industry, make it highly vulnerable to innovations. The influencing factors are related to the industry's challenges in the conditions of Industry 4.0, the size of the industry and the expected growth dynamics up to 2023, which greatly increases the industry's openness to innovations [20]. Food production and processing industry is the context of the mentioned set of factors, compared to other industries, is one of the most open to innovations and with the highest innovation growth potential. An empirical study of the 100 most significant innovations of 2016 and 2017 in food industry of Western Europe, described in professional literature, has been conducted; the authors of the article, using grouping approach and content analysis, applied to them the reverse principle of *InnoMatrix* model – not creating, but decoding, based on which method or authors' approach the innovation was consciously or unconsciously created. By analyzing the most outstanding and topical 100 world food innovations [21–25], highlighted in sectoral professional literature in 2016 and 2017 with qualitative content analysis and grouping method, the authors of the article have grouped 18 leading methods from the *InnoMatrix* model provided scope of opportunities. The innovations themselves were considered as product objects, but innovations in marketing communications of food industry were not reviewed and analyzed, maximally focusing on innovative components of the product and their conceptual and ideological basis in the context of some of the aforementioned innovation fields. The following 18 creative methodological directions of innovation concepts have been crystallized, on the basis of which the most promising innovations of the 2016 and 2017 food industry were created (see Table 4).

By frequency of usage, from global innovations in food of 2016 and 2017, the most commonly used concept of innovation is the one which involves hybridization between the largest and most rapidly growing industry category and/or segment, following the approach of using hybridization between the largest category or segment concept with addition of a highly innovative component. The following next most popular methodological directions are geolocation approach and component reduction, making the product simpler. It is interesting to note that the division between the leading methodological directions of innovation concepts is remarkably smooth, without significant graduations. However, parodied version and a relatively small portion of the changed condition should be mentioned, which indicate that innovation is not being ignored, being at the same time not so close to the boundaries where even minimal

Table 4. 18 conceptual ideation methodological directions of TOP 100 food and beverages international innovations launched in 2016 and 2017.

| No | 18 methodological directions of innovation concept | Total weight:
100% |
|----|---|-----------------------|
| 1 | Hybridization between the largest industry category or segment and the fastest growing category and/or segment | 14 |
| 2 | Hybridization between a major industry category or segment and an innovative component | 8 |
| 3 | Maximum geolocalized - either globalized or localized product | 8 |
| 4 | Maximum reduced or propagated components | 8 |
| 5 | Hybridization without definite analysis, between previously unmatched categories | 7 |
| 6 | Maximum reduced or enlarged product size | 7 |
| 7 | Color and perfume maximum and zero gradations | 7 |
| 8 | Maximum or reduced product exposure (power) | 6 |
| 9 | Transfer of the fastest growing category or segment component to another segment | 6 |
| 10 | A time-saving approach to achieving the desired end position | 5 |
| 11 | Copy/paste to fast growth leader | 4 |
| 12 | High-speed product segment transfer to highly low or high price segments | 4 |
| 13 | Personalization gradations | 4 |
| 14 | Hybridized product packaging mixing different physical states (free-throw solid-state, hard-core, solid form, etc.) | 3 |
| 15 | Existing brand transfer to the largest or fastest category or segment of another category | 3 |
| 16 | A simpler approach to achieving the desired end position | 3 |
| 17 | Components that physically change the states of the ego consciousness (without alcoholic absorption) | 2 |
| 18 | Pardodicum | 1 |

risks of ethics and legalization could occur. The category of changed perception condition includes such innovations, as products that use virtual and augmented reality components to intensify any of the effects of the product though. The broad hybridization approach is extremely interesting, that, in essence, has a low degree of creativity and a hypothetically low added value of innovation, but apparently this approach has significant benefits, either resultative or procedural, making it the most commonly used approach. The copy/paste approach to rapid innovative concept that is diffused across different modifications has a relatively large proportion - 4%.

The 18 methodological directions of innovation concepts point to the most commonly used approach to the creation of innovations amongst selected innovations in food industry, but they do not explain or ground whether they were created consciously or unconsciously. An in-depth research of the elaboration of *InnoMatrix* model has historically indicated that in practice in creation of innovative concepts the unconscious

field of perception dominates more often in relation to the identification of innovation concepts, but consciousness – in relation to processual creation of innovation concepts. It was essential for the authors of the article to compare the newly made conclusions on the leading methodological directions in food innovations with food industry experts' opinion. A total of 50 food industry experts, representatives of international food manufacturers, were asked to evaluate each of the 18 crystallized methodological keynotes of innovations concepts in food industry and to assess their suitability in the context of successful innovation creation. As a result, 22 responses, suitable for processing, were received, suggesting a very interesting conclusion that there is a synchronization between the TOP 100 methodologies of creation of ideological innovation concepts in food industry and the approaches that received the highest values by experts, although the experts were not acquainted with the results of analysis of the TOP 100 food innovations (Table 5).

Table 5. 18 methodological innovation concepts importance in evaluation of experts.

| No. | Result analyses | | | | | | | |
|-----|-----------------|--------------------|------|--------|---------------------|--------------------|------------------|---------------------|
| | Sum of scores | Average arithmetic | Mode | Median | Variation amplitude | Standard deviation | Variation factor | TOP 100 innovations |
| | Sum | X | M o | Me | R v | S | C v | Weight % |
| 1 | 89 | 4.0 | 5 | 4 | 3 | 0.90 | 22% | 14 |
| 2 | 85 | 3.9 | 4 | 4 | 3 | 0.94 | 24% | 8 |
| 3 | 91 | 4.1 | 5 | 4 | 3 | 0.94 | 23% | 8 |
| 4 | 83 | 3.8 | 4 | 4 | 3 | 0.75 | 20% | 8 |
| 5 | 66 | 3.0 | 3 | 3 | 4 | 1.02 | 34% | 7 |
| 6 | 77 | 3.5 | 4 | 4 | 4 | 1.14 | 33% | 7 |
| 7 | 75 | 3.4 | 4 | 4 | 3 | 0.96 | 28% | 7 |
| 8 | 61 | 2.8 | 2 | 3 | 4 | 1.07 | 38% | 6 |
| 9 | 76 | 3.5 | 4 | 4 | 3 | 1.01 | 29% | 6 |
| 10 | 73 | 3.3 | 3 | 3 | 3 | 0.89 | 27% | 5 |
| 11 | 78 | 3.5 | 4 | 4 | 3 | 0.91 | 26% | 4 |
| 12 | 81 | 3.7 | 4 | 4 | 3 | 0.84 | 23% | 4 |
| 13 | 80 | 3.6 | 3 | 3 | 3 | 1.00 | 28% | 4 |
| 14 | 77 | 3.5 | 4 | 4 | 4 | 0.96 | 28% | 3 |
| 15 | 77 | 3.5 | 4 | 4 | 3 | 0.91 | 26% | 3 |
| 16 | 74 | 3.4 | 3 | 3 | 3 | 0.85 | 25% | 3 |
| 17 | 75 | 3.4 | 4 | 4 | 3 | 0.85 | 25% | 2 |
| 18 | 51 | 2.3 | 2 | 2 | 3 | 0.78 | 34% | 1 |

The most widely used methodological approach to innovation concept in TOP 100 food innovations is hybridization between the largest and fastest growing categories or segments, which was also assessed by the experts to be the most appropriate one. The next synchronizations were also observed in innovative approach, by combining the

largest category with some innovative component, following geolocation innovation approach and Godin [17], for the widely described reduction or maximization of components. There are no significant incompliances or deviations in expert assessments, and, although not as direct as for the top four methodological directions of innovation concepts, a relative similarity remained for the other 14 approaches. The use of paradox was the least-used method of identification of ideological components of innovations in TOP 100 and also the lowest-graded in experts' assessment. It is interesting to note that 3% of TOP food innovation concepts have been created by maximum simplification of some of the components of their usage, while in experts' assessment this approach was undervalued.

The conclusions related to approbation of *InnoMatrix* model in food industry indicate that the model is applicable to innovation analysis and requires further research. The phenomenon of synchronization between the experts and TOP 100 innovations also requires further research and extends the research field not only in scope of approbation of the methodology of ideological concepts of innovation in certain sectors, but also the research of the synchronization between the experts and the most outstanding innovations.

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Human Factor and LEAN Analysis at Industrial Manufacturing Plants

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Abstract. The aim of the research was to find out effective identification and prevention of ergonomics problems in industrial metal processing manufacturing plant, based on human factor workload analysis and LEAN failure mode and effect analysis. Creation of safe, effective work places, emphasizing human oriented approach and implementing ergonomics in business process management is one of the main conditions for sustainable development of an enterprise. For the research were chosen packaging, assembling and quality control manufacturing plant operations due to main complaints from workers about physical overload, intensive work pace and task complexity. Human factor analysis provides holistic understanding of work conditions that can save and avoid costs in long-term. If used in combination with LEAN methodologies, such as FMEA analysis, manufacturing operations can significantly be improved, by increasing productivity and save costs resulting in total efficiency of company, not only considering it as issue of health and safety.

Keywords: Analysis · Ergonomics · Workload · Risk · Improvement

1 Introduction

Organizations of today have a highly dynamic character both to management systems and to undertaken business efficiency improvements [1]. In contemporary perspective the modern business process management allows increasing the operation efficiency and production quality, but at the same time remain human resources minimize operations costs [2, 3]. Consequently, we can state that no business is possible without processes and their quality management and most importantly – without workforce – employees [4]. This is particularly important in the conditions of competition when the enterprise management must actively engage in the acquisition of the latest information and trends for continuous improvement of the existing and creation of new processes. Lean systems are supposed to result in long term strategic goals of the organization and beginnings are associated with Toyota's meteoric rise in the automotive industry [5]. High number of industrial manufacturing enterprises in Latvia have introduced LEAN as part of various management systems, but at the same time there still exists

productivity and effectivity difficulties. These challenges are related to lack of employee's involvement in production improvement, decision making, as well as several ergonomics issues: manual handling, compulsory work postures, repetitive motions, insufficient physical activities, frequently workers agree to work with poor safety culture. All these factors are interrelated within human factors, ergonomics and LEAN scientific disciplines. In recent years combining ergonomics and LEAN improvement methodologies are successful implementations by many world-class companies all around the world [6, 7]. Such approach emphasizes change from occupational safety, cost-intensive understanding to holistic direction that involves well-being aspects and overall business performance [4]. Hence business managers should pay stronger attention to the implementation of efficiency in business operations, processes, as well as establishment of business process management criteria, constant process control, assessment, and supervision. Considering the fact that in Latvia increases health problems caused by ergonomics risks at the workplaces, the new approach is necessary for supplementing the business management [8].

Contemporary rapid changing work environment focuses on work organization and new forms of business cooperation, for example, outsourcing, decentralization of resources, introduction of new technologies, etc. [9, 10]. Creation of safe, effective work places, emphasizing human oriented approach and implementing ergonomics in business process management is one of the main conditions for sustainable development of an enterprise. Hence work in safe and ergonomically favorable working conditions is economic necessity.

The aim of the research was to find out effective identification and prevention of ergonomics problems in industrial metal processing manufacturing plant, based on human factor workload analysis and LEAN failure mode and effect analysis.

For the research were chosen packaging, assembling and quality control manufacturing plant operations due to main complaints from workers about physical overload, intensive work pace and task complexity. The all-male (right-handed) group consisted of packing operators ($n = 5$), assembling operators ($n = 5$), quality control operators ($n = 5$). The following selection criteria were used: full-time workers, no acute musculoskeletal symptoms, work experience at least five years in the metal processing industry, and full consent to participate. The average length of service was 7.3 ± 4.1 years and workers were subdivided into 2 age groups: 21–30 and 31–45 years old. Background factors of the subjects are shown in Table 1.

Table 1. Background factors of the subjects, standard deviation (SD) and range.

| Variable | Workers ($n = 15$) | |
|--|----------------------|---------|
| | Mean \pm SD | Range |
| Age (years) | 31.4 ± 6.3 | 21–45 |
| Height (cm) | 178.4 ± 4.8 | 171–192 |
| Weight (kg) | 82.6 ± 6.4 | 65–97 |
| Body mass index (BMI, kg/m^2) | 22.6 ± 6.2 | 15–34 |
| Rest heart rate (beats/min) | 67.4 ± 7.2 | 56–78 |

2 Methods

The Checklist Method. Questionnaire was conducted to find out the opinion of the workers on the condition of existing workplaces, complains about after the work, work organisation as well as worker's opinion on necessary improvements. The results acquired were processed by applying statistical data processing program SPSS.20.

Key Indicator Method (KIM). Key indicator method was used to determine physical work load, assess lifting, holding, carrying of heavy loads and analyze manual handling operations [11, 12]. By means of this method it is possible to identify overloaded lifting or moving heavy loads or performing other dynamic operations.

Physical load identification criteria is also taken into account and according to this method there can be characterized I – IV (light, moderate, hard, very hard) work hardness categories. It is showed in Table 2.

Table 2. Workload (WL) assessment criteria.

| Description | Points | Risk height |
|---|---------------|-------------|
| Minimum physical load
No significant endangerment to health | <10 | I |
| Increased physical load. Overload possible for persons with low physical abilities (workers older than 40 or younger than 21 "beginners") | from 10 to 25 | II |
| Significantly increased physical load. Overload possible also for persons with normal physical abilities | from 25 to 50 | III |
| Physical overload possible for everyone | >50 | IV |

Calculation of Conditions of Lifting and Moving of Heavy Loads (NIOSH Equation). American National Institute for Occupational Safety and Health (NIOSH) has developed mathematical lifting equations comprising biomechanical, physiological and psychophysical criteria [13]. This method allows assessing conditions, when heavy loads are lifted by both arms and makes corresponding demands to performers of physical work. The NIOSH equation (developed in 1981, revised 1994) shows Recommended Weight Limit (RWL) and Lifting Index (Li). The RWL comprises different multipliers, which numerical value is determined using certain coherencies or correspondent tables.

In the study on existing and potential effectiveness of ergonomics interventions in packaging, assembling and quality control manufacturing plant operations the method of analysis of fault modes and their effects - Failure Mode and Effects Analysis (FMEA) was used [14, 15]. FMEA by its means is used to identify problems with products or processes before the errors take place and the possible unfavourable effects occur [16]. Thus the task of FMEA is to determine the causes of errors, the significance of the created effects as well as establish the necessary preventive measures to provide for the enterprise efficiency [17]. With the method of functional disturbances of the process,

parameter deviations, etc., as well as danger degree of these faults and priority (value scale from 1 to 10) were determined. Within the FMEA analysis also the Risk Priority Number (RPN) was determined. It represents the total number of points gained by multiplying the value of individual risk (fault severity, occurrence, detection possibilities) points. FMEA has been done using computer program 'Xfmea' of American corporation 'ReliaSoft'. FMEA provided efficiency assessment and analysis in the LEAN framework.

3 Results and Discussion

Questionnaire results reveal that workers in metal processing enterprise complain about the exposure to physical strain and compulsory work postures, manual handling operations and repetitive arm movements. Employees in packaging and assembling processes were subjected mainly to the heavy manual work, physical load, repeated and frequent movements of the arms and body, as well as to awkward work postures. Operators also complained about too intensive workload and short rest breaks during work cycle. Almost all workers, including packaging, assembling and quality control operators, recognized that ergonomic risks were influenced also by other risks at work environment (noise and vibration levels, poor lighting conditions etc.). The packaging operators lift and move heavy loads with weight 10–20 kg from 150 to 250 times within a shift, but the packing operators lift and move heavy loads weighing 20–30 kg from 100 to 180 times within a shift. It was interesting to find out that operators indicated high requirements at work, errors at work, defective production, but at the same time they haven't asked management about improvement opportunities and they do not do any physical activities during the rest breaks or outside the working hours. 80% of respondents admitted that they lack management support and they have low control over the work process. This emphasizes the importance of the ergonomic risks in order to improve work efficiency and pay greater attention to human resources as a key component in whole company's system.

According to Key indicator method score for total workload was calculated and such parameters were considered: workload, value points dependent on the weight of load to be moved, value points dependent on position of the body during performance of operations, value points dependent on working conditions, value points dependent on the length of work shift. The human factor analysis regarding lifting and moving physical load was done and the results are shown in Table 3.

Assessing physical workloads of the packaging, assembling and quality control operators during lifting or moving heavy loads, the assemblers and packaging operators are exposed to most severe loads, what corresponds with the risk degree IV. According to the methodology, the workload in these occupations is an endangerment to the workers' health. For this reason, special attention has to be paid to necessary preventive measures in order to allow fatigued muscle groups to relax and further, more detailed investigation of physical load. Quality control operators falls within category 2 (moderate work), where their workload with respect to lifting of heavy loads are small. It should be considered that the KIM method don't analyze local muscle loads. For example, for packaging operators the total weight when lifting and moving loads is

severe and their work involves also frequent arm movements, what indicate a local load of these muscle groups.

Table 3. KIM risk degree for human factor analysis regarding lifting and moving physical load (L-load weight, P-work posture, C-work conditions, I-work intensity), standard deviation (SD), Work load score (WL), risk degree (R_d).

| | L \pm SD | P \pm SD | C \pm SD | I \pm SD | WL | Risk degree
R_d
I – V |
|-----------------------------------|------------------|---------------|---------------|---------------|-------|-------------------------------|
| | Number of points | | | | | |
| Assembling operators (n = 5) | 2.6 \pm 1.5 | 4.5 \pm 1.6 | 0.8 \pm 0.6 | 7.8 \pm 1.4 | 46.52 | IV |
| Packaging operators (n = 5) | 4.1 \pm 2.1 | 4.4 \pm 1.5 | 0.8 \pm 0.6 | 8.0 \pm 2.7 | 55.43 | IV |
| Quality control operators (n = 5) | 2.4 \pm 1.8 | 4.2 \pm 1.7 | 1.0 \pm 0.1 | 2.3 \pm 2.5 | 11.86 | III |

NIOSH Recommended Weight Limit and Lifting Index was determined for packaging operators, assembling operators, quality control operators and results are shown in Table 4.

Table 4. NIOSH Recommended Weight Limit (RWL) and Lifting Index (Li).

| Profession | RWL | Li | Actual lifting mass |
|-----------------------------------|-------|-----|---------------------|
| Assembling operators (n = 5) | 14 kg | 1.7 | 25 \pm 5 kg |
| Packaging operators (n = 5) | 11 kg | 1.6 | 18 \pm 3 kg |
| Quality control operators (n = 5) | 4 kg | 1.1 | 5 \pm 2 kg |

The results reveal that recommended weight limit for both packaging operators, assembling operators is highly exceeded. After having estimated individual work phases, it was found out that the most serious risks to the skeletal and muscular system of the workers are possible when heavy loads are lifted by stretched arms too high from the ground in such working phases: rotary equipment assembling, manual directing of metal products and packing operations of metal parts.

In order to create profitable manufacturing, the work efficiency should be improved and constraints and faults in the system have to be minimized.

Thus the FMEA analysis of the risks and errors in packaging, assembling and quality control operations allows to identify and predict potential risk severity from the LEAN and quality management perspective.

The results of FMEA analysis are summarized in the Table 5.

Table 5. FMEA analysis results on evaluation of existing situation and after potential improvements.

| | | Evaluation of existing situation | | | | Evaluation after potential improvements | | | |
|--|----------------------------|----------------------------------|------------|-------------------------|--------|---|------------|-------------------------|-------|
| Process | Likely kind of fault | Severity | Occurrence | Detection possibilities | RPS | Severity | Occurrence | Detection possibilities | RPS |
| Metal processing, core business operations | Assembling operations | 6.6 ± 0.9 | 6.4 ± 0.5 | 7.4 ± 1.3 | 316.2 | 6.4 ± 0.5 | 4.3 ± 0.8 | 3.8 ± 0.8 | 99.6 |
| | Packaging operations | 6.8 ± 1.1 | 7.4 ± 0.8 | 7.4 ± 1.1 | 380.8 | 6.4 ± 1.3 | 5.0 ± 1.0 | 4.0 ± 1.0 | 140.0 |
| | Quality control operations | 7.4 ± 0.9 | 7.8 ± 1.5 | 7.8 ± 1.1 | 468.8 | 6.6 ± 1.3 | 4.6 ± 1.3 | 4.0 ± 0.7 | 123.2 |
| Total RPS | | | | | 1165.8 | RPS after possible LEAN and human factor improvements | | | 362.8 |

After the assessment of the modes of errors, error consequences and causes as well as the existing and potential LEAN and human factor improvements, risk priority number can be decreased significantly more than three times from $RPN = 1165.8$ to $RPN = 362.8$. Such reduction could be possible if the manufacturing operations will improve the work organization as well as implement ergonomic measures. As a result also, the production volume can be increased and its quality accordingly improved.

Ergonomics intervention in manufacturing operations can result in LEAN system improvement, but sometimes some advantages can cause also negative side-effects as well. Some of them are summarized in the Table 6. These side-effects if coordinated and monitored, can be easily overcome.

Table 6. Advantage and side-effects, introducing ergonomic solutions in production technologies [18].

| Advantages | Side-effects |
|---|--|
| <ul style="list-style-type: none"> • Work productivity and process performance increases • Supply period of parts and raw materials decreases • Manual work in moving heavy loads decreases • Rotation of employees is possible • Saved time for frequent hand and leg movements • Number of damaged products and clients' complaints decreases • Amount of spare stocks (raw material, materials, etc.) decreases | <ul style="list-style-type: none"> • Errors are possible in automated technological system due to corrosion or aging • Investment costs grow • Effect of cognitive ergonomics increases (concentration necessary, incl. visual and hearing load) • Process performance decreases during stoppage of automated line |

Hence the role of human factor in Lean is very important and sometimes Lean production system assures that the humans is the most important element of the organization, but only some researchers emphasizes that Lean implementation causes a

decline in their working conditions, for example increase of stress level, psychological discomfort among the workforce [19]. In such situations the most appropriate solution is to involve employees in decision making process, participation in work organization, workplace design planning and development of preventive measures [20]. But our research proved that ergonomics and human factor analysis ensures wellbeing at work, which can promote positive process result and combination of workload analysis and LEAN process analysis methods can be successfully applied.

4 Conclusion

The approach of combining human factor analysis with LEAN management methodologies can result in effective identification and prevention of problems in business management and improved competitiveness of whole company. Human factor analysis provides holistic understanding of work conditions that can save and avoid costs in long-term. If used in combination with LEAN methodologies, such as FMEA analysis, manufacturing operations can significantly be improved, by increasing productivity and save costs resulting in total efficiency of company, not only considering it as issue of health and safety. Failure Mode and Effects Analysis (FMEA) is appropriate method for identification and prevention of problems in products and processes as well as it can be valuable LEAN efficiency tool to predict risk priority before the faults take place and the unfavorable consequences arise. The research will be continued and cost-benefit analysis including return-on-investment (ROI), the break-even point, and net present worth analysis will be included.

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Exploring the Role of Service Eco-system in Developing Countries: A Case Study of Ride Hailing Service in Pakistan

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Abstract. The application of sharing economy in developing countries has the potential to increase the social capital and economic growth. It can assist with economic development and enable entrepreneurship. However, there are still some barriers to the sharing economy in developing countries. They include a lack of trust, social and cultural norms regarding ownership, inadequate technology, lack of electronic payment systems, insufficient assets, skills, and inappropriate regulations. The aim of this research is to better understand the differences between the ride-hailing value co-creation process typically found in developing countries, and prevailing ride-hailing value co-creation process in developed countries. The insights provide useful information, which allow harnessing sharing economy for the benefit of developing countries.

Keywords: Sharing economy · Service eco-system · Ride hailing
Value proposition · Service dominant logic

1 Introduction

The sharing economy is “a powerful cultural and economic force reinventing not just what we consume, but how we consume, an effective transition from a culture of me to a culture of we” [1]. The ride-hailing service Uber is one of the pioneers and key players in the sharing economy. The service was founded in 2010 and in the meanwhile, Uber has been growing rapidly and became popular all over the world. Nevertheless, there are some countries – in the Middle East, North Africa and South Asia – where another service, which is similar to Uber, could gain significant market share: Careem was founded in 2012 and became a popular ride-hailing platform in 13 countries across the Middle East, North Africa, and Pakistan. In most cities where Careem operates, the company has a larger market share than Uber [2].

By analyzing the ride-hailing business models of Uber and Careem at first glance it appears that ride-hailing services all over the world work the same way. The ride-hailing service provides a platform (website and app) which connects drivers and customers. The drivers are legally independent people who own a car and want to offer driving services. They are, for example, registered on the ride-hailing platform. At the same time, the registered drivers need to satisfy specific conditions of the platform. For example, drivers need to have a valid driving license. This procedure allows the

ride-hailing service to guarantee a certain level of quality and to establish trust. The customers (people who need a driving service) will find a corresponding driver by using the platform. Hence a ride-hailing platform as intermediary by enabling customer and driver to find each other and to co-create values.

However, sharing and renting goods is not a concept that is widely-known in developing countries. People are used to buy things since they lack knowledge regarding sharing possibilities. Sharing economy business models are still rare. According to the founders, the strength of Careem is that the company understands and adapts to local problems, customs and specific needs in the countries where the service is available.

From service science perspective the service dominant logic provides theoretical foundation for a better understanding of sharing economy business models. The SD logic explains how value is co-created between actors of an eco-system. The social and environmental impacts of the sharing economy have not been conclusively determined in any economic setting. An examination of literature reveals the absence of studies that incorporate the utilization of the service dominant logic framework to explain the concept and the implication of sharing economy in developing countries. By better understanding the eco-system, the mechanisms of value co-creation and the value proposition research could contribute to poverty alleviation in developing countries. Furthermore, there are many indications that the sharing economy could provide social, environmental and economic benefit.

The aim of this research is to (1) understand and depict the eco-system of Careem with all involved actors, and (2) to evaluate the value propositions that are co-created. This research contributes significantly to a better understanding of the sharing economy in developing countries. It has the potential to adapt the sharing culture to appropriate sectors, business models and conditions to enable and foster sharing economy.

This research draws upon qualitative research methods. Pakistan was selected as use case for this study, since Pakistan is a developing country. Careem has been introduced in Pakistan officially in March 2016 and has grown steadily. The research methodology is structured as follows: in a first step a comprehensive literature review was conducted about the state of the art on sharing economy in developing countries. In a second step a semi-structured interview has been developed. We conducted total 25 interviews: 5 interviews with members of the Careem management, 10 from Careem drivers (2 of them were women drivers), 10 from customers who use the services of Careem. The relevant interview statements were extracted, transcribed and analyzed using thematic technique mainly.

In a first step Careem and Uber (developing vs. developed country) have been compared to discover the commonalities and differences between both ride-hailing services. Then a model was developed which includes all stakeholders participating in the Careem eco-system. This model was deeply analyzed aiming at understanding and describing the eco-system and the co-created values of ride-hailing services in a developing country. After that the value propositions of Careem were derived and the conclusions were drawn.

2 Literature Review

2.1 Service Dominant Logic

The research area of service science aims at explaining the co-creation of value and the interaction that takes place in services systems. Furthermore, it explains and classifies service systems. Latter can be described as “value-co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information” [3]. The ‘philosophical foundation’ for service systems is the service-dominant-logic of [4], referred to as SD logic.

Latter serves as basis for the theoretical foundation of service science. Vargo and Lusch distinguish between goods-dominant logic and service-dominant-logic. A service is “the application of specialized competences (operant resources – knowledge and skills), through deeds, processes, and performances for the benefit of another entity or the entity itself” [5]. The premise of the SD logic is, that value creation occurs among multiple actors. The SD logic explains how value is created between various actors of an economic system. Actors are focused on exchange of resources. This goes along with the application of knowledge and skills for the benefit of all parties that are involved. Hence the focus is on the service rather than on goods.

2.2 Enablers and Barriers of Sharing Economy in Developing Countries

Most of the literature about sharing economy is addressing successful business models in developed countries. Here, an abundance of assets can be observed, because the customers are saturated with goods. Therefore, the underlying idea is to share assets that are not used in order to use it more effectively and moreover to earn money. However, in developing countries with low or middle-income classes the idea of sharing serves a different purpose and has the potential to achieve a significant benefit for the whole society. For example, some poor people will hardly be able to ever afford a car. Sharing economy gives them the opportunity to have for little money access to assets they normally can't afford [6]. Sharing economy business models go along with some key benefits for developing countries. They can foster entrepreneurship, improve sustainability of consumption and support the development of regulations. However, there are some key barriers to sharing economy in developing countries.

Trust in the service provider is a key success factor. It is important, since the provider of a platform is collecting personal data and has to ensure that the customer gets a good service quality. If there is lack of trust, a sharing economy business model can struggle to take roots in a specific environment [7].

In some countries the social norms regarding ownership do not allow or prevent the idea of sharing. Owning assets is the predominant paradigm. Hence, cultural expectations regarding ownership can be a major barrier [8]. For example, in Vietnam and Thailand there are social norms that appeared to be barriers, since people still prefer to own their goods [9]. A lack of proper technology, such as poor internet connection, can be a major issue [10]. The majority of businesses in the sharing economy require a smartphone app. In developing countries there is a lack of network coverage and a low rate of smartphone ownership. This can limit the ability of developing countries to

participate in sharing economy. Another technological issue in developing countries is the credit and debit card ownership. In this cases people need to be able to pay cash or they require alternative payment systems, such as payment via mobile phone [11].

A lack of regulations from the government is one of the biggest issues [12]. Digital technology needs to be enabled and supported by governmental rules and frameworks. In many developing countries regulations do not keep pace with the technological advancement [11]. Flexibility is missing and there is a lack of legal rules for sharing and renting, in particular with respect to ride-hailing services [9].

3 Results and Discussion

From the interview analysis and web survey, some interesting results are drawn. The generated results show that there are significant differences between public transport in developed and developing countries. Generally, highly developed countries provide their citizens with a proper transportation system, such as trains, trams or busses. Many people can own a car, or they afford a driving service. However, in developing countries the public transport system is often perceived as poor. Public transport vehicles, such as buses, trains or trams are for many routes either not available or outdated. Rules and regulations which ensure safe travelling are often missing.

In comparison to developed countries there are low rates of car ownership, since many people can't afford to buy a car. This is an important impact factor which is considered in the business model of Careem. In comparison with Uber, Careem business model explains the service system well by involving drivers, customers, a third and fourth stakeholder group, the investors and the banks as shown in Fig. 1.

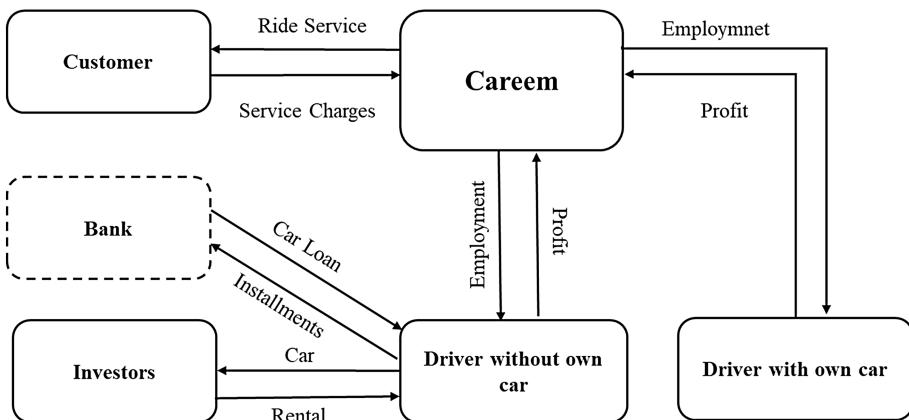


Fig. 1. Interaction between the actors of Careem

In Pakistan high-income citizens who can afford to buy many cars act as investors. They provide the cars and hire drivers who work for them. The reason is following: In Pakistan around 40% of the population is economically vulnerable. They have a low

expenditure level. Hence, there is a large group of people that can drive but can't afford to buy a car. They are referred to as driver without own car as shown in Fig. 1. It is an important target group, since it represents large parts of the population. People of these target groups can also become Careem driver. In this case the profit will be shared between investor and driver and is subject to the contractual conditions between these two parties. It must be pointed out that the income of drivers without car is lower than the income of drivers with own car. Nevertheless, the business model of Careem fosters low income classes by enabling them to have a regular income.

Figure 1 explains the working style of Careem that is quite similar to other hailing services but with few different entrepreneurship behavior. While comparing with UBER (that gives certification under the company who have their own cars and who wanted to drive for the customer on demand basis similar to the traditional TAXI system), Careem has hybrid behavior, if a person owns a car or not, he still can become a driver 'captain' by Careem. For a driver who doesn't own the car Careem provides the car, and give a strong reference to the bank or local investor. By doing this Careem has involved the whole society to contribute in the sharing culture towards sharing economy.

3.1 Service Eco-system of Careem in Pakistan

In Careem service eco-system involves many sub systems of actors and technologies (see Fig. 2).

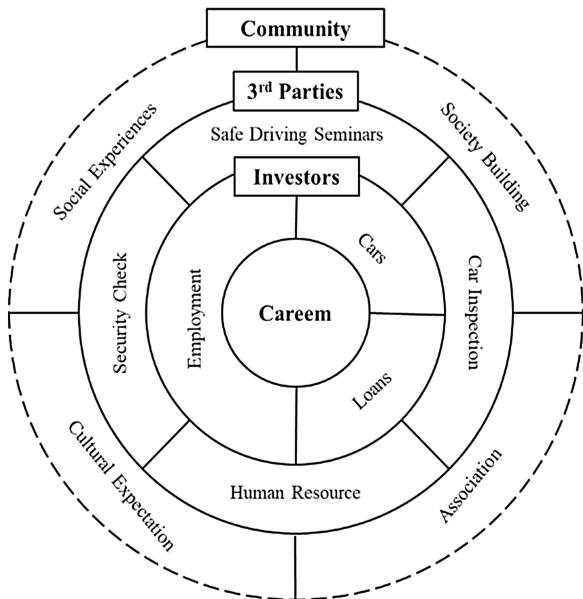


Fig. 2. Service eco-system of Careem

As explained, Careem itself is a ride hailing service like UBER, but different on the basis of involving many actors in its business model to evolve a service eco-system based on network. This network covers Careem itself, investors, 3rd parties and community as shown in Fig. 2.

For the sake of completeness, the banks are also mentioned as ‘investors’. This model is not prevalent in Pakistan, since Pakistan is a Muslim country and charging interest is not compliant with the rules of Islamic banking. However, in other Middle East countries banking loans are very popular and a well-known way to finance a car for people who can’t afford to buy their own car. In this case Careem provides a bank guarantee so that the drivers get the loan. It can be concluded that the business model of Careem is tailored to the needs of a developing country. In comparison to ride-hailing services in highly developed countries, it allows the participation of all social classes in the sharing economy. Besides this major aspect the business model of Careem draws upon a sophisticated eco-system including the drivers, investors, customers and third parties.

3.2 Value Co-creation Process in Careem

The parties involved in the service eco-system of Careem have strong interaction with each other that ensures value co-creation with the joint efforts to grow Careem services. Figure 3 explains the role of investors in terms of providing assets, loans, skills, and technologies to create employment opportunities for the drivers of Careem to earn profit on the basis of pre-decided ratio as partner. That results in co-creation.

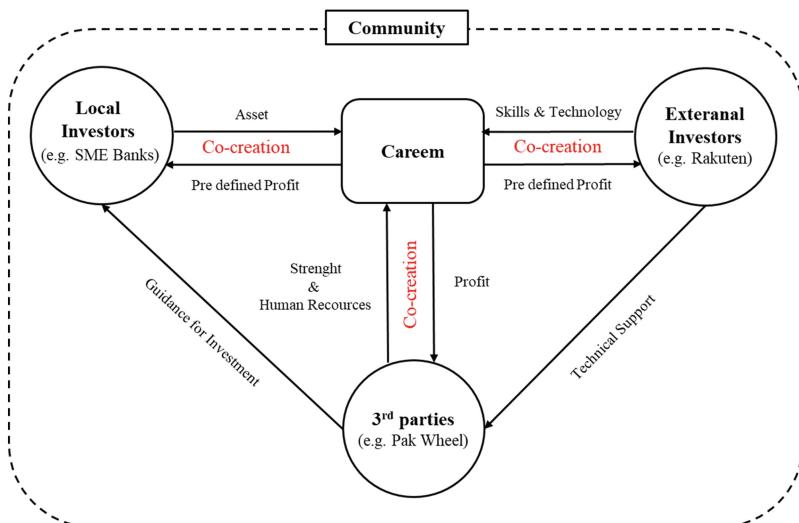


Fig. 3. Value co-creation process

On the other hand 3rd parties are the individual bodies or organizations which were working before Careem launch in Pakistan. These 3rd parties ensure the security, car inspection and hiring of the staff or drivers to facilitate the customers. Also they guide the local investors by recommending the professional drivers to ensure safe transactions. In return they get the profit and brand image. All the parties involved in the service eco-system act as partners for the well-being of community.

The following paragraphs explain the values extracted by the interaction between the actors of the eco-system.

Trust in Careem Platform. Careem is in the meanwhile widely-known as platform in Middle East, specifically personalized to the needs of the population in this area. Careem is perceived as a trustworthy platform, because it provides customers with several information before the drive, which are not available when using the services of regular taxi driver companies. Customers of Careem can see before the drive the calculated costs, the time to arrival destination and an authenticated driver profile with reviews and ratings. For customers in highly developed countries these might be an information that is already to be expected. Hence, if it is not offered customers are not satisfied with the service. For a developing country the transparency of the process is a novelty. In comparison to local taxi providers it can be considered as an important aspect of the trust building in the Careem service.

Foster Regulations. Developing countries often face the problem that they have regulations, for example for the public transport, but these regulations are not implemented properly and there is a lack of control mechanisms. In particular, the area of sharing and renting is not regulated as it should be. Hence, Careem could gain the trust of the customers by implementing rules and regulations for the safety of driver, customer and in general the public traffic. For example, they involve organizations for the recruitment of the drivers. These organizations check if the documents of the drivers are compliant with the law (driving license, criminal records etc.). Careem ensures the safety of the cars by collaborating with car maintenance companies, which inspect the cars (seat belts, car condition, air condition, tires, availability of insurance etc.). Driver can use their cars only if they are compliant with the Careem rules.

Assets and Skills. Like the lack of implementation of safe public transport rules, there is also a lack of control mechanisms regarding skills and driving behavior on the road. Careem collaborates with external institutions and experts to increase the safety level. For example, they organize safe driving seminars and awareness programs for the drivers to increase customer safety. Drivers who do not own a driving license get support to receive a license. Only then they can officially work as Careem driver.

Social and Cultural Norms. In Pakistan only about 22% of the women have an employment outside the house and around 78% are housewives. Careem launched in December 2016 the first women drivers in Pakistan [2]. Latter can pick up both female and male drivers. Careem empowers women by giving them the opportunity to be more independent and generate a healthy income. This is not only beneficial for the women drivers, but also for the business model of Careem. The demand for security is strong among women in Pakistan. Women appreciate Careem's driving services. They feel more secure to use a driving service offered by other women.

Technology and Payment Systems. Ride-hailing services are normally ordered by using a smartphone app. However, the distribution and use of smartphones in Pakistan is lower than in developed countries. Another challenge is that some people own a smartphone, but don't know how to use the apps on the smartphone. Therefore, it is an important part of Careem's business model to enable customers to make a booking by phone by calling Careem's call center. Customers can also call the call center if they, for example, want to complain about a driver or other issues. The penetration of credit cards in Pakistan is low due to security perceptions. Furthermore, charging interest is not compliant with rules of Islamic banking. Therefore, Careem offers the opportunity to pay the drivers in cash. On one hand it takes Careem a lot of logistic effort to manage cash payments. On the other hand, the effort pays out, since there is great demand for cash payments.

3.3 The Value Propositions of Careem

When discussing the value propositions provided by Careem one can distinguish between three main stakeholder groups: customer, driver and the society as depicted in Table 1. Value propositions relating to the customer explain why it is worth to use the service of Careem. Customer can expect a safe transportation and reliable (punctuality, integrity) transportation. This is a value that cannot be taken for granted in a developing country. Careem has a very attractive pricing. It enables all classes of the society to use the driving services. Freedom of movement means that Careem enables all people in the society to use a driving service. This is in particular important for minorities, who were not able to move freely due to safety or financial reasons (e.g. women, old people, handicapped people). Driver value propositions relate to the motivation of the driver to work for Careem. Many drivers come from humble backgrounds. They get not only the opportunity to have a regular and healthy income, but over time they also train their skills and become more educated and better drivers. This has also an impact on the family of the drivers, since it helps them to educate their children.

Table 1. Value Proposition derived from co-created values

| Value propositions of Careem | | |
|------------------------------------|---|--|
| Customer | Driver | Society |
| Safe transportation | Healthy income | Empowerment of women |
| Attractive price/performance ratio | Education | Establishing a sharing culture |
| Reliability | Employment opportunity | Increase of social capital (trust) |
| Freedom of movement | Support equality between genders (labor market) | Increase safety in public transportation |

The value propositions for the society show how the whole Pakistani society benefits from Careem's business model. By introducing rules for the regulation and safety of public transport Careem enables a higher level of security. This goes along

with an increase of social capital respectively trust between people. This can happen, because Careem provide mechanisms that ensure that people 'play fair'. For example, customers know before they use the driving service how much it costs. Careem supports women in two ways. On one hand it gives many women, which normally would not have the chance, the opportunity to work outside the house and to have their own income. On the other hand, it increases the visibility of working women in the society. If more and more women work, it will increase their acceptance and influence and give them a stronger voice in a male dominated society.

4 Conclusion and Outlook

This study shows the eco-system and the co-created values in a ride-hailing business model in Pakistan. Careem creates an eco-system where value is exchanged amongst the actors. These co-created values then create and boost up the value propositions and lead to satisfied customers. This ensures new service transactions as shown in Fig. 4.

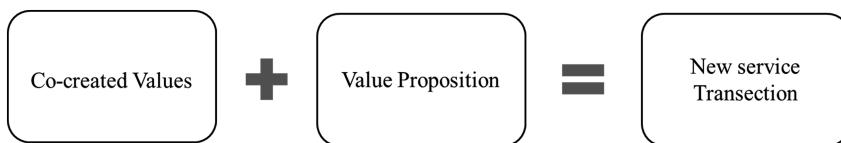


Fig. 4. Process for service transection

The study explains how a commercial business, privately owned, can be used to create a significant social impact for the benefit of a whole society. In developing countries resources and opportunities are limited. Here is also the main difference between the impact of ride-hailing services in highly-developed and in developing countries. In developed countries citizens are used to have an effective public transportation system, which is safe and scheduled. In developing countries citizens have less expectations towards the public transportation system. The financial resources for public infrastructure are insufficient. Hence the public transportation system is limited in terms of availability, punctuality and safety. Therefore, the impact resulted from the business model of Careem can't be compared with the impact it would have in a developed country.

Careem is more than just a business model which allows people to get a good driving service. The eco-system of Careem contributes to fight poverty, since it involves all classes of the society. Careem supports people from lower social classes who struggle to find a job in Pakistan. Many of these people would normally leave Pakistan and seek for job opportunities abroad. Enabling them to stay in Pakistan and to work in their home country contributes not only positively their financial situation, but also to their domestic happiness. Furthermore, the government of Pakistan benefits from the jobs and additional taxes.

5 Future Research and Limitations

This research shows the potential of sharing economy business models in developing countries, which needs to be investigated in further studies. In order to deepen and validate the results, more interviews with Careem stakeholders are required. In particular, stakeholders from other developing countries besides Pakistan should be interviewed. Moreover, the research is limited with respect to the area and country. So far only the sharing economy business model of ride-hailing in Pakistan has been examined. Further studies should analyze a broader range of sharing economy business models in various countries. By better understanding the relevant impact and success factors of sharing economy business models in developing countries, research could contribute to poverty alleviation, economic growth and women empowerment.

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An Integrated Holistic Conceptual Framework for Marketing Construction Business Enterprise

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Abstract. The research details out an integrated framework for construction business marketing that is comprehensive and has capabilities of bridging the gaps in extant models and structures on construction marketing. The paper is descriptive. It uses literature review as the method and draws on models of strategic management and construction specific marketing models as the theoretical lens to achieve its objective. Findings reveal that existing models of construction marketing are mere replica and reminiscence of strategic management process/planning models and lacks acceptance and behaviour constructs that are reported as impediments to commercialisation as a management function in construction. The paper justifies the need for combine human related factors with strategic management process/planning factors to create an integrated construction marketing framework capable of holistically dealing with construction marketing challenges. Human related factors are both complement and indispensable to strategic management approach to marketing management in construction to archive successful outcomes. A merger of strategic management factors and associated human factors provides a comprehensive framework for study marketing related issues in construction. Construction management researchers will find this framework useful.

Keywords: Behavior · Construction marketing · Human factors
Strategic management

1 Introduction

Extant construction marketing models are replica of strategic management process/planning models because marketing is a vital management function. It consists of numerous stages which are spread throughout strategic management processes with mostly four phases: strategic analysis, strategy formulation, implementation and monitoring [1–7]. For instance, the work of Yisa et al. [8] highlight four elements as the determinants of successful marketing of construction business enterprise, which are: Planning and strategic formulation, Marketing activities, Implementation and control,

Evaluation and marketing intelligence. Macnamara [9] also concur that construction business marketing encompasses four distinct activities namely: Analysis, Plan formulation, Implementation/Sales, Monitor and feedback. On the other hand, Harris et al. [10] dwelt extensively on the analysis stage as the critical aspect of the whole process of construction marketing.

Marketing as a strategic management function has received acceptance and application in many industries. However, in the construction industry marketing as a management function is challenged by many human related factors which are impediments towards the adoption and implementation of marketing in construction [11]. The application of strategic management perspectives to marketing management even though is appropriate may not be comprehensive enough in the case of marketing management in construction [12]. Strategic management approach focuses on the process and provides useful results in industries other than construction because those industries see marketing as integral part of management. The construction industry characteristics, its orientation and education are all geared towards production efficiency which makes production related management function such as estimating, engineering, quantity surveying among others receives more attention than other management functions such as marketing [13, 14]. Dikmen et al. [14] reiterated the assertions of many other authors on the subject mainly [15, 16] and concurs that:

'Apart from the physical nature and organisational structure of the construction industry, major bottleneck that plugs the way of marketing-oriented, management practices in the construction industry are dominated by the engineers paradigm which leads to a limited scope of implementation of contemporary business theories, management processes and behavioural change, such as marketing-driven strategic management. According to Richardson, if marketing is to be adopted by construction companies, the most important hurdle to be overcome is the internally generated barrier of resistance...'. [14], p. 258

Models for marketing in construction must, therefore, address those challenges in addition to the strategic management approach in order to produce beneficial results.

The research brings to focus construction business managers' acceptance of marketing and the behaviour towards marketing as human factors issues that deserves consideration in construction marketing frameworks. These two additional constructs are the gaps identified from the review of literature, which are found peculiar to marketing in the construction industry because marketing in the construction industry is new phenomena that is viewed with scepticism and it is also challenged by several other human related factors [11, 12]. Combining strategic management constructs with associated human constructs results in an integrated framework that overcomes the inherent weakness of the existing models of construction marketing that are based predominantly on imperative management constructs.

Yisa et al. [17] admits that resource allocation is central to any management activity which allows for strategic implementation, such as the case of marketing management, particularly in construction. However, the authors draw on the work of David [18] and concurs that efficient resource allocation does not, in itself, guarantee successful strategy implementation because programme, personnel, controls, and commitment must breathe life into the resources provided. It becomes evident that successful implementation of marketing programmes hinges on managers' ability [8] to motivate employees and also on interpersonal skills [8]. The challenge is to stimulate managers

and employees throughout the organisation to work with pride and enthusiasm towards achieving marketing objectives [8]. The proposed integrated model for marketing in construction is unique in the way it combines strategic management process factors and the human behaviour factors required to breathe life into the process by measuring both dimensions indicated as exogenous variables.

In depth examination of construction marketing models or frameworks reveals a close resemblance and similarity of such models or structures to strategic management process. This is not surprising as marketing is in effect a strategic management tool. This paper begins by clarifying the confusion that seems to exist over the three related terms that are mistakenly often used interchangeably: model, methodology and framework. It continues to review the generic models of strategic management to undercover the critical tenet that constitute such models/frameworks. It further examines tailor-made construction marketing models with the view to identify the fundamental constructs that makes up the models/frameworks. Comparisons of the two groups of frameworks are made, and conclusions are drawn to end the paper.

2 Model, Methodology and Framework

2.1 Characteristic of Model, Methodology and Framework

Requirements of Framework

A critical review of literature reveals that the term framework is often used interchangeably with other closely related terms such as model and methodology. There exists some confusion over the terms model, method and structure [19], as they are used somehow interchangeably in literature. Table 1 gives some characteristic differences in the three terms, in an attempt to clarify the differences between the three conditions.

Table 1. Characteristic differences between a model, methodology and framework

| Term | Answers | Nature | Design |
|-------------|------------------------|------------|--------------|
| Model | 'What is.' | Conceptual | Descriptive |
| Methodology | 'How to.' | Methodical | Prescriptive |
| Framework | 'How to' and 'What is' | Conceptual | Descriptive |

Source: Authors' construct based on the work of Wong [20]

From the Table 1, it is apparent that a model for marketing business would show the elements that should be considered to achieve successful marketing performance of a construction business enterprise. A framework, on the other hand, would not only present such features but also, it would also offer ways on how to put such aspects into practice to achieve successful marketing performance. With methodology, detailed steps of guidance will be given to show how to make successful marketing of construction business enterprises. To provide a complete picture and the overall structure for adoption and implementation of marketing, a framework would be the best option.

According to Tzortzopoulos et al. [21], for a framework to be practical and widely adopted, it should satisfy a set of desirable and compulsory requirements. Corbella and Maturana [22] divides the elements of a framework into two categories as ‘expected’ and ‘attractive’. The ‘expected’ according Delgado-Hernandez and Aspinwall [19], refers to those requisites that must be satisfied to ensure that the framework answers both ‘what is’ and ‘how to’ improve construction marketing performance of construction business.

Attractive and Expected Requirements of Frameworks

A framework must also satisfy a set of ‘attractive’ requirements [19], for the framework to be effective and enhance wide adoption. These requirements can also be used as criteria for evaluation of frameworks [19]. They guide the development of framework, the ultimate objective of which is to produce a tool that could be applied in construction businesses to improve the marketing performance, to enhance financial prosperity and business survival. The term ‘attractive’, refers to features that may enhance the framework but are not essential. Table 2 gives the constituents of the ‘attractive’ requirements.

Table 2. Summary of attractive requirements of a framework for marketing of construction business enterprises

| | Requirement | Conceptualization |
|---|-------------------|--|
| 1 | Simplicity | User is friendly to everyone involved in the construction business management |
| 2 | Understandability | Easy to understand by all the participants in construction business management |
| 3 | Systematic | Gives guidance on how to perform various activities in each of the stages of the construction marketing process and provides the necessary methods to support these activities |
| 4 | Structure | Well-structured that presents both the elements that will help to incorporate marketing in the operations of a construction business enterprise and the links between the various construction operations. |
| 5 | Comprehensive | Applies to a great variety of businesses and supports the activities performed during the whole construction marketing process |
| 6 | Practical | The relevant participants for management of construction business can use it in real situations without the need of experts |
| 7 | Applicable | It is accepted and perceived as credible and valuable by its users in a wide variety of construction business enterprises |

Source: Authors’ construct based on the works adopted and adapted from Ebuomwan and Anumba [23], Koskela [24], Yusof and Aspinwall [25], Tzortzopoulos et al. [21] and Delgado-Hernandez and Aspinwall [19].

With the ‘expected’ requirements, the authors adopted and adapted the ideas of similar works from other disciplines with relevant modifications to suit their application in marketing as management function in construction. The authors amongst others include: Dale and McQuarter [26], Yusof and Aspinwall [25], Dale [27], Delgado-Hernandez and Aspinwall [19] who have developed frameworks for Total Quality

Management. The adopted frameworks were suitably modified and altered to be fit for construction marketing. This was done to generate the following requirements. A framework for marketing construction business must:

- (1) Be able to answer ‘What is marketing in construction?’ (i.e. present the elements that constitute construction marketing);
- (2) Display a general picture of the activities that could be applied to market a construction business enterprise, and
- (3) Determine the role of various marketing improvement methods within the whole construction marketing process (i.e. show how to improve marketing performance).

3 Proposed Framework Specification and Justification

The central aim of this paper is to develop a conceptual construction business marketing framework for construction SME businesses in Ghanaian construction industry. The theoretical integrated conceptual framework for the current study builds on the works of Harris et al. [10], Macnamara [9], Yisa et al. [8] models of construction marketing, which are based on strategic management models.

Harris et al. [10] conceptualisation of the marketing process involves formulation of the business forecast based on market analysis and market trends and company analysis that provides information regarding the company’s strength and weaknesses. The matching of the two exercises results in a revised company policy towards development of offerings that meets clients’ needs and expectations. Harris et al. [10] therefore conceptualised marketing in construction to be hinged on three cardinal issues: market trends monitoring, market analysis (external business environment analysis) and company analysis (internal business environment analysis).

The framework by Macnamara [9] conceptualised marketing in construction as the organisation’s interface with its environment. It, therefore, links the firm’s marketing system which comprises of market analysis, planning, implementation and monitoring to the broader business environment, companywide, in the market place, and nationally/globally. The model was anchored on the following processes: market analysis, plan formulation, implementation, monitor and feedback.

Similarly, Yisa et al. [8] determined that marketing in construction is a function of planning, marketing activities, implementation, evaluation. The systems approach adopted for this model improves the effectiveness of the marketing function within the construction enterprises. The model represents a clear and practical approach for formulating, implementing and evaluating corporate marketing programmes.

Examination of the frameworks discussed reveals that they are predominantly strategic management process models of which the widely known are the works of Rothaermel et al. [7], Thompson and Martin [6], David [5], Johnson and Scholes [3], Rue and Holland [2] and Sharplin [1]. The parameters in the models of strategic management are similar to the parameters highlighted earlier in the [8–10] models of construction marketing.

Table 3. Factors of construction marketing

| Frameworks / Models | | <i>Human related factors</i> | | <i>Management Process factors (strategic)</i> | | | | | |
|--|--|------------------------------|-----------|---|-----------|----------|-------------|------------|----------------|
| | | Acceptance | Behaviour | Analysis | Selection | Planning | Formulation | Activities | Implementation |
| Generic Strategic Planning Models (Antecedents) | Rothaermel (2012) – Analysis-Formulation-Implementation (AFI) Strategy Framework | | X | | | X | | X | |
| | Thomson and Martin (2010) – Strategic Management Framework | | X | X | | | | X | X |
| | David (2009) – Model of the Strategic Management's Process | | | | | X | | X | X |
| | Johnson and Scholes (1993) – Trilogy of strategic management | | X | X | | | | X | X |
| | Rue and Holland (1989) – The strategic management process | | X | X | | | | X | X |
| | Sharplin (1985) – Models of Strategic Management | | | | | X | | X | |
| Construction Industry Specific Marketing Models | Harris <i>et al.</i> (2013) - Marketing process model | | X | | | | | | |
| | Polat and Domnez (2010) - Marketing activity selection model | | | | | | X | | |
| | Macnamara (2002) - Marketing of engineering consultancy model | | X | | X | | X | X | |
| | Yisa <i>et al.</i> (1996) - Systems framework for marketing of construction services | | | | X | | X | X | X |
| | Judd (1987) - Modified marketing mix theory | | | | | | X | | |

Source: Author's construct based on literature review

Therefore, the proposed conceptual framework is primarily based on the approach used by Harris et al. [10], Macnamara [9], Yisa et al. [8] which views marketing as a strategic management function in the operations of a construction business enterprise. Using the factors and the constructs in the previous models/frameworks in Table 3, the present conceptual framework looks at factors as analysis of construction business environment, planning for construction marketing activities, selection of beneficial construction marketing activities, implementation of construction marketing activities and evaluation of construction marketing activities performance, which are the essential variables that exist in extant construction marketing literature, together with marketing function acceptance and behaviour towards construction marketing function; which have been classified as the exogenous variables and their role in predicting marketing performance of construction SME contractors, which endogenous variables.

This will, in turn, predict the outcomes such as increased target market, long-term relationships with client, improvement in clients' satisfaction, and enhancement of the desired profitability, strengthens the firms' competitive advantage, sustainable business culture, enhanced company succession planning, assistance in workforce talent management, enhanced customer/client's retention. The study further aims to the relative predictive power of these different variables for construction businesses marketing performance in order to test/determine marketing performance depends on the supposed attributes, considering the effects of construction SME business managers' acceptance of marketing and behaviour behaviour towards marketing as necessary management function in the operations of a construction SME business enterprise as advocated by other construction marketing frameworks and strategic management framework.

4 Structural Components of the Framework

In this study, the conceptual model hypothesize that Construction business Marketing Performance Outcomes (OCM) of SME contractors is in Ghana is derivative of overall performance in construction marketing function acceptance (CMA), behaviour towards construction marketing function (CMB), analysis of construction business environment (BEA), planning for construction marketing activities (PMA), selection of beneficial construction marketing activities (SMA), implementation of construction marketing activities (IMA), evaluation of construction marketing performance (EMP) in the entire marketing management process in the operations of construction business enterprise.

The model to be tested in the hypothesis postulates a priori that OCM is a multi-dimensional structure composed of CMA, CMB, BEA, PMA, SMA, IMA and EMP. This is presented schematically in Fig. 1. The theoretical underpinning of this priori is derived from the works of Harris et al. [10], Polat and Domnez [28], Macnamara [9], Yisa et al. [8] and Judd [29] models of construction marketing, which are grounded in strategic management process models of which the widely known are the works of Rothaermel et al. [7], Thompson and Martin [6], David [5], Johnson and Scholes [3], Rue and Holland [2], Sharplin [1].

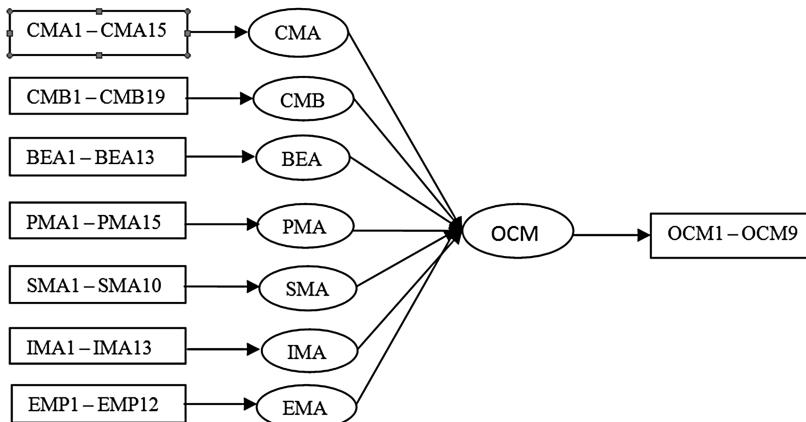


Fig. 1. Integrated conceptual framework for construction marketing.

5 Measurement Components of the Framework

The hypothesized measurement component of the framework comprises the following marketing performance factors: CMA = 15 measurement variables; CMB = 19 measurement variables; BEA = 13 measurement variables; PMA = 15 measurement variables; SMA = 10 measurement variables; IMA = 13 measurement variables; EMP = 12 measurement variables and OCM = 9 measurement manifest variables.

In this study, it is therefore theorised that marketing performance is to be considered as a sufficient indication to show the attributes for achieving competitive advantage that is necessary to engenders growth, survival and profitability in construction SME's in Ghanaian construction industry.

6 Latent Constructs of the Conceptual Framework

Based on review on extant construction marketing literature on variables that has potential influence on construction marketing performance, this study considers the marketing performance bundle in construction SME business management to contain the analysis of business environment with 13 variables; planning of marketing activities with 15 variables; selection of marketing activities with 10 variables; implementation of marketing activities with 13 variables and evaluation of marketing activities with 12 variables. The latent constructs together with their measurement variables are given in Table 4.

Table 4. Latent constructs of the conceptual model

| Latent variable construct | Measurement variables |
|---|--|
| Construction marketing function acceptance attributes (CMA) | Marketing enhances increases in profit
Marketing improves sales effort
Marketing improves clients' satisfaction
Financial capability for marketing activities
Technical capability for marketing activities
Having marketing expertise
Availability of resources for marketing activities
Marketing improves client relations
Marketing engenders creativity in business
Marketing improves adaptation capability
Marketing improves business management
Marketing enhances business development ability
Marketing leads to quality of services and products
Marketing improves image of the firm
Marketing enhances strategic alliance |
| Behaviour towards construction marketing function (CMB) | Preparedness to do anything to implement marketing
Having an intention is to be a construction marketer
Making all effort to start and run marketing department
Having a determination to create marketing department
A view that marketing manager job is attractive career
Conviction that marketing function is advantageous
Conviction that being marketer gives excellent satisfaction
Desire to be a marketer amongst other options
Capability for creation process of marketing function
Conviction that starting marketing would be easy
Having control over running a marketing department
Preparedness to doing anything to be a marker
Knowledge of details needed to start marketing
Desire to start and run marketing department
The easement to start and run marketing department
Conviction of high chances of being successful
Knowing that family will approve to start marketing
Knowing that friends will approve to start marketing
Knowing that colleagues will approve to start marketing |

(continued)

Table 4. (*continued*)

| Latent variable construct | Measurement variables |
|---|--|
| Analysis of construction business environment (BEA) | Analysis of competition for contract
Analysis of market potential
Analysis of competition for resources
Analysis of current and prospective clients
Organizational structure analysis
Management details analysis
Analysis of departments
Engineering experience analysis
Physical resources analysis
Corporate trading analysis
Contract trading analysis
Market trend analysis
Analysis of industry bodies and regulations |
| Planning for construction marketing activities (PMA) | Development of corporate mission and vision
Establishment of corporate objectives
Development of marketing objectives
Development of marketing strategies
Development of marketing programmes
Devising policies for marketing implementation
Generation of alternative marketing strategies
Generation of alternative marketing programmes
Creating policies for marketing activity selection
Market modeling and forecasting
Market positioning, segmentation and targeting
Policies for penetration into new markets
Matching of capabilities to opportunities
Planning for order of execution of programmes
Redirecting efforts and preparing budgets |
| Selection of beneficial construction marketing activities (SMA) | Developing human resources to provide better services
Offering extended services
Offering customised services
Providing more competitive prices
Conducting out-bound focused campaign
Conducting in-bound focused campaign
Cultivating goodwill and alliances
Market development
Diversification of services and field of specialisation
Supporting geographical expansion into new markets |

(continued)

Table 4. (*continued*)

| Latent variable construct | Measurement variables |
|---|--|
| Implementation of construction marketing activities (IMA) | Having a supportive culture of resources allocation
Presence of information systems
Utilization of information systems
Enthusiasm of individual employees to action
Allocation of resource in sufficient amount
Undertaking research and development activities
Management support in all activities
Management commitment
Managers' ability to motivate employees
Stimulation of managers and employees
Executing activities as planned
Ensuring conformity of actual to the planned operation
Taking prompt remedial action whenever necessary |
| Evaluation of construction marketing performance (EMP) | Use of performance evaluation framework
Use of an ideal performance index
Realistic levels for satisfactory performance
Adequate and timely feedback
Identification of cause of poor performance
Use of marketing Information System (MIS)
Uses of effective control systems
Tracking of developments in the business environment
Use of performance checklist
Taking action needed to minimise the impact of threats
Taking action needed to capitalise on the opportunities
Use of a good marketing information system |
| Marketing performance outcomes (OCM) | Increased target market
Long-term relationships with client
Improvement in client's satisfaction
Enhancement of the desired profitability
Strengthens the firms' competitive advantage
Sustainable business culture
Enhanced company succession planning
Assistance in workforce talent management
Enhanced customer/client's retention |

Source: Authors construct based on literature review

7 Conclusions

The proposed conceptual framework is holistic. It integrates strategic management factors with human related elements required to breathe life into strategic management process. The proposed conceptual framework, therefore, satisfies both the ‘attractive’ and ‘expected’ requirements of frameworks. The frameworks can be a useful tool in achieving successful marketing performance of construction business.

Future research must examine the influence of the identified factors on successful marketing outcomes. Determination of the goodness-of-fit of the hypothesised integrated construction marketing model to a given sample such as construction SME contractors provides a unique avenue for future research.

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Human Factors in Organizations and Skill Development



Conceptual Approach to Integrated Human-Centered Performance Management on the Shop Floor

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Abstract. The aim of this paper is to present a conceptual approach for an integrated human-centered performance management on shop floor level. Existing practical and theoretical approaches to both performance management and shop floor management in the context of production are commonly based on managerial driven key performance indicators (KPIs). These metrics neglect a worker-oriented preparation and visualization, thus being detrimental to the motivation of workers. With our concept we address this shortcoming by (1) considering and aligning both strategy and operations, (2) directing on the shop floor level, (3) considering explicitly the perspective of workers, and (4) integrating motivational gamification elements. The development of the approach included extensive literature review to identify existing research deficiencies. Subsequently, we derived requirements for an integrated human-centered approach to performance management on the shop floor. Finally, the results were used to define an overriding research framework and to conceptualize the aspired performance management approach. Central to this are digitalized data collection, intelligent KPI calculation and consolidation as well as motivating visualization and presentation of information dedicated the needs of shop floor workers.

Keywords: Human-centered · Socio-technical production systems
Performance management · Shop floor management · Operational performance
Industry 4.0

1 Introduction

The concept of Industry 4.0, grounded on the integration of key technologies and cyber-physical systems (CPS), is expected to profoundly disrupt conventional approaches to industrial production [1]. Within the factory environment, there is great consensus that so-called *smart factories* (i.e., production systems of digitalized and interconnected devices, machines, processes and products) will change the organization of work [2]. It is not clear yet, however, how the organization of work will evolve [3].

The challenge is how to govern this evolution and how to guide the process of integrating people as a social component within cyber-physical production systems.

In this regard, the socio-technical interaction in such systems will be managed through changes of how people at each organizational level interact with the technical system and the underpinning technologies [4]. Particularly, on shop floor level, workers, i.e., employees who are directly involved in the execution of production processes [5], are not being considered anymore as passive agents who will carry out their tasks without reference to their working environment. Rather they will be elevated to the status of ‘knowledge workers’ [4] who are able to monitor their performance as well as the status of the entire production system, react quickly to turbulences and identify and solve problems immediately [6]. This profound change requires that (1) available data from the production system is adequately processed and provided for use on the shop floor and that (2) the workers are motivated and empowered to use the provided information in order to drive operational performance.

Yet, neither approaches to shop floor management (SM), nor performance management (PM) systems, nor existing IT systems in production and manufacturing are designed to cope with the issues outlined above. Traditional approaches to shop floor management, which are designed to provide information, e.g., information dashboards, typically provide only rudimentary information [7]. Existing performance management systems are commonly used on middle management or top management level. Key performance indicators (KPI) reported from these systems are not adjusted in terms of scope, representation and their effect on the understanding, acceptance and motivation of workers [8]. Finally, dedicated IT systems to production, e.g., enterprise resource planning (ERP) or manufacturing execution systems (MES), are designed for information delivery on enterprise or manufacturing control level [9].

To address this shortcoming, we present a conceptual performance management approach providing detailed and personalized (near) real-time information on the shop floor level. It is intended to motivate and empower workers as well as to enable information transparency on the operational level of socio-technical production systems. The remaining paper is organized as follows. Section 2 illustrates the applied research methodology within this paper. Subsequently, Sect. 3 briefly presents the relevant theoretical concepts for the purpose of this paper. Section 4 comprises a literature review of previous research concerning human-oriented approaches to performance management and shop floor management in a production context. Based on the need for further research, an approach to human-centered performance management on shop floor level is developed in Sect. 5. Finally, the paper concludes with a discussion of results and formulates implications for future research.

2 Research Methodology

This paper focuses on a problem with practical relevance and implications. As such, we adopt the research process of applied science by Ulrich [10], depicted in Fig. 1. The structured approach targets the development of models that shape the future by describing, explaining and configuring parts of the reality [11].

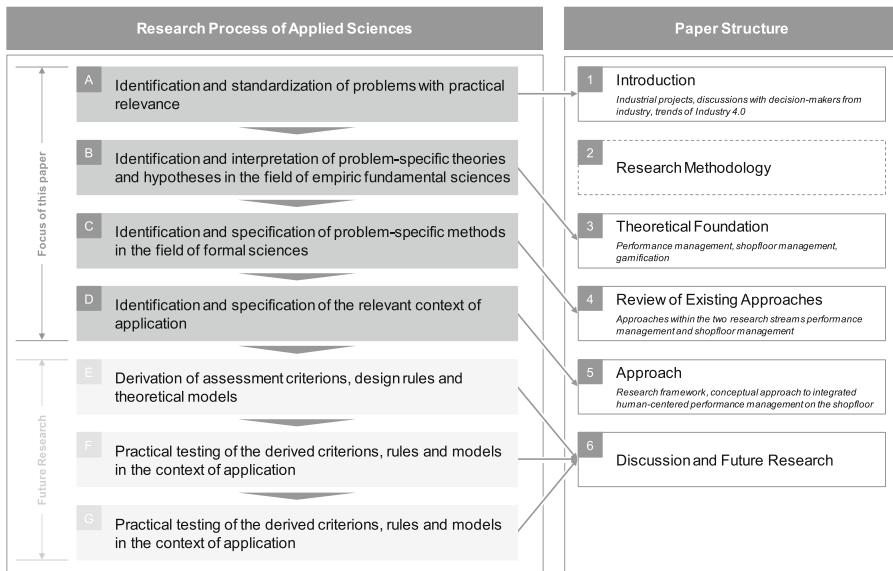


Fig. 1. Structure of the selected research methodology based on the research process of applied sciences according to Ulrich [9].

The research process can be divided into seven sequential steps. This paper covers steps A to D; steps E to G are not in scope. Following the process of applied sciences, problems with practical relevance have to be identified and structured first. Consulting projects, semi-structured interviews and discussions with 20 decision-makers in the field of organizational development and production management as well as the review of emerging trends in the context of Industry 4.0, e.g., availability of large volumes of data [12], have been the key input for the derivation of the underlying practical problems in Sect. 1. Subsequently, in steps B and C problem-specific theories and approaches of existing research have to be identified, analyzed and interpreted. Sections 3 and 4 cover these process steps with the presentation of the theoretical background and the review of existing approaches. Hereinafter, step D is addressed in Sect. 5 by conceptualizing the approach of an integrated human-centered performance management on the shop floor. The following step E addresses the detailed elaboration of the approach by developing a practical applicable model. Consecutively, this model has to be validated in practice according to step F. Finally, step G proposes the application of the finalized model in industrial practice. Steps E to G are out of this paper's scope and should be addressed in future empirical research as explained in the concluding section.

3 Theoretical Background

The following section comprises a brief overview of the theoretical concepts underlying (1) performance management, (2) shop floor management, and (3) gamification as promising approach to enhance employee motivation. In this way, a theoretical foundation for subsequent model development is prepared.

3.1 Performance Management

The term *performance management* is commonly referred to strategic and monetary-oriented decision processes on middle and top management level that aim at performance improvements [13]. In this regard, *performance* is understood in terms of effective and efficient action [14]. Further, PM is defined as an organization-wide management system, which operationalizes long and middle-term strategies in rather short-term actions and initiatives [15].

According to Santos et al. [16], performance management is a management instrument that requires the conduction of four main phases: (1) definition, (2) implementation, (3) data collection and reporting, and (4) management. In the first place, the definition of a performance management system includes the selection and definition of relevant measures (synonyms: metrics, ratios or key performance indicators). Here, important factors concern multidimensional coverage of performance metrics [17] as well as ensuring linkages between strategy and operations [18]. The second phase deals with the implementation of the system and its procedures. It is key to successful implementation that personnel is actively involved and motivated to facilitate the change process [19]. Within the third phase, i.e., data collection and reporting, data needs to be collected amongst the entire organization. This phase is often referred to what is called *performance measurement*. In accordance with the performance definition provided above, Neely [20] defines performance measurement as the process of quantifying efficiency and effectiveness of past actions through acquisition, collation, sorting, analysis, interpretation, and dissemination of appropriate data. In this respect, Johnston et al. [21] emphasize the need to grant operators access to performance data to be used for performance review. The final phase is focused at the targeted management of performance, such as improvements or communication. Dumond [22] showed that defined activities based on the measured performance outcomes help to guide an individual's performance.

3.2 Shop Floor Management

Shop floor management is a central concept of the lean management philosophy that aims at encouraging self-management of workers on the operational level, i.e., the shop floor [23, 24]. The term *shop floor* has been used by a variety of scholars. De Leeuw and van der Berg [25] refer it to processes close to production or distribution, excluding strategic processes. Suzuki [26] understands shop floor or *gemba* as a physical or virtual place where value creation takes place. In both understandings, SM lays the focus on humans as the social component of the shop floor level. This approach counteracts the limited viewpoint of planning and operational execution of work tasks [27]. In general,

schools of thought within SM literature include four main aspects: (1) creation of transparency, (2) standardization and optimization of processes, (3) provision of KPIs for operational controlling, and (4) culture and organization [28, 29].

In order to address these aspects worker qualification, empowerment, and motivation are the key enabler of SM. Worker qualification refers to the methodological qualification of the workforce in order to enable fast, efficient, and effective problem-solving on-site, e.g., in production processes. Worker empowerment understands the workforce as an active element in the management on the operational level. This includes communication with middle management and top management on equal footing to increase responsibility and the promotion of self-management. Finally, workforce motivation is a prerequisite for self-management and independent acting [26].

3.3 Gamification

Numerous motivation theories and approaches have been adopted to an industry context. A common feature of these theories and approaches is to facilitate the understanding of workforce needs in order to emphasize the importance of increasing the motivation in the interests of the organization. In this regard, *motivation* is to be understood as the product of individual characteristics of people, their motives and the characteristics of their external environment [30].

One promising approach to enhance employee motivation and to address motivational drivers specifically is *gamification*. The term refers to the application of game elements in a game-alien context, with the aim of motivating the user to perform certain activities or behavioral adjustments [31–33]. It uses an empathy-based approach to introduce, transform, and operate a system in an organization that allows players to reach a playful state and to achieve benefits for players and other interested parties [34].

A variety of different game elements are used in a corporate environment, such as points, awards, leaderboards, levels, challenges etc. [35]. For example, points are used to inform the user about his progress, thereby activating the motivation driver “feedback”. Furthermore, the user may be awarded when a certain number of points has been reached. This activates the motivation drivers “collection” and “achievement” [33]. Gamification also creates a suitable environment for learning processes, since “out-of-the-box” thinking and willingness to try out new things are promoted [34, 36]. Further, the employees’ engagement [37] and attachment to the process are increased [38].

In the future, gamification will become increasingly important in the context of Industry 4.0 [32, 33, 39]. Currently gamification is used primarily for web and mobile applications. However, a growing trend can be observed with business applications [37].

4 Review of Existing Approaches

The following section comprises the review of existing approaches to human-centered performance management on shop floor level in the context of industrial production to illustrate the current status in research. The underlying literature can be divided into two research streams, i.e., performance management stream and shop floor management stream. Consequently, the review will be divided according these two research streams. It is directed to reveal possible contributions to our research as well as major deficiencies of existing approaches. Both aspects will be summarized and discussed at the end of this section.

4.1 Performance Management Stream

Numerous contributions to guide employee performance with performance management can be found in literature [40]. However, these approaches do not focus on a production or manufacturing setting. Consequently, we excluded those from our review and focused on approaches related to production and the operational level instead.

Aichele [41] proposed a KPI-based performance management approach to analyze business processes. The approach is capable of benchmarking different organizational units including production. KPIs used to measure production performance are consolidated by a strict bottom-up approach for the purpose of reporting to the management.

Gronau [42] describes a steering instrument for controlling the operational level of production. The approach is based on a task-oriented information needs analysis, which is integrated in a decision model. The model covers three main dimensions in context of production: processes, orders, and products. The processual dimension includes KPIs regarding materials, resources and the workforce. The order dimension covers metrics regarding internal and external orders. Within the product dimension, it is distinguished between standardized and customer-specific products. Similar to the approach of Aichele [41], KPIs are consolidated hierarchical according to a bottom-up logic. However, employee-oriented information are included in the resulting system.

The approach of Groth [43] is based on the assumption that traditional performance management systems do not fully consider cause-effect-relationships on the shop floor level. For this reason, the underlying KPI system specifically focuses on performance evaluation on the operational level. In this regard, it is distinguished between human, organizational and technical dimensions. For each dimension, defined KPIs are provided that can be prioritized according organization-specific preferences. Although the resulting KPI system represents possible performance weaknesses, no specific measures to increase performance by workers are proposed within this approach.

Reichmann [44] proposed a rather monetary-oriented performance management system that is intended to coordinate and control activities in production. However, the focus is not exclusively on production-related units, but on the entire organization. In this regard, again a bottom-up approach is proposed to consolidate performance measures from different organizational units. Based on the achieved performance, the concept requires management to take action in the first place.

The approach of Syska [45] is primarily directed to logistics. Again, the proposed performance management system includes employees from the operational level only partially as it is intended to be steering instrument for management level.

Schnell [46] suggested that the key driver to increased performance on the operational level is not the measurement of KPIs itself but an addressee-oriented selection and provision to the different stakeholders. In consequence, it would be possible to reveal weaknesses of the different elements, e.g., worker, and their interactions. However, the approach lacks clear suggestions how to address possible weaknesses to drive performance.

4.2 Shop Floor Management Stream

Within the SM literature, several concepts focus on the provision of visualized information or KPIs via dashboards. Business activity monitoring (BAM) has been introduced by McCoy [47]. The corresponding dashboards address the enterprise control level and focus on the real-time monitoring and analysis of critical business processes. In this ways, irregularities should be detected in real-time to promptly initiate measures [48]. Bracht et al. [49] were the first to provide a monitoring approach that is specifically dedicated to shop floor workers in logistics. Their visualization system for operational logistics includes a dashboard for the real-time presentation of process-oriented KPIs. Groeger et al. [6] built their concept on basis of existing dashboards. Their operational process dashboard for manufacturing (OPDM) extends existing approaches by providing data-mining-driven and knowledge-based services on mobile devices. Moreover, literature provides numerous examples of dashboard-based SM approaches that have been developed for specific cases. As these approaches are non-generic for the most part, they do not fulfil the required generalizability and are therefore not taken further into account.

Other SM concepts focus on the empowerment of employees. Otsusei [50] has integrated concepts of the balanced score card (BSC) for managing the activities on the shop floor. Based on a systematic selection of independent KPIs, this BSC approach aims at aligning operative actions with organizational strategy. Diez et al. [29] proposed a so-called hoshin kanri tree (HKT) based on the PDCA (i.e., plan – do – check – act) cycle. The approach targets the standardization of communication patterns between the shop floor stakeholders in order to increase the performance of the value stream.

Detached from a strict scientific point of view, it should be mentioned that there are numerous standard software solutions offering KPI dashboards related to production processes. For instance, standard ERP software SAP provides a production operator dashboard for workers [51]. It focuses on the data collection and the presentation of work instructions. On manufacturing or operations control level, production managers are supported by MES cockpits – dashboards for manufacturing operations management that support tasks like scheduling, monitoring or resource management [9]. These systems lack generic structures as they are often adjusted to a specific production environment. Moreover, these software-based control panels mainly use simple statistics and reporting with basic alerting services. Consequently, we did not considered them sufficient for addressing our research goal.

4.3 Review Summary

Figure 2 summarizes the main findings of the literature review. For this purpose, we evaluated the reviewed literature regarding requirements, which we derived and formulated on the basis of the practical problem statement in Sect. 1:

- consideration of strategic focus of the overall production system,
- direction to the shop floor or operational level of the production system,
- alignment of strategy and operations,
- explicit consideration of the workers needs and perspective, and
- integration of motivational elements, e.g., gamification elements.

| Evaluation Criteria | Existing Approaches | | | | | | | | | | |
|--|-------------------------------|--------|-------|-----------|-------|-----------------------------|-------|---------------|----------------|---------|-------------|
| | Performance Management Stream | | | | | Shopfloor Management Stream | | | | | |
| | Aichele | Gronau | Groth | Reichmann | Syska | Schnell | McCoy | Bracht et al. | Groeger et al. | Otsusei | Diez et al. |
| Strategic focus | ● | ○ | ● | ● | ● | ○ | ● | ○ | ● | ● | ● |
| Operational focus | ○ | ● | ○ | ○ | ○ | ● | ○ | ● | ● | ○ | ● |
| Alignment of operational and strategic perspective | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ | ● | ● |
| Consideration of worker-perspective | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | ● | ○ | ○ |
| Motivational aspects | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ |
| References | [41] | [42] | [43] | [44] | [45] | [46] | [47] | [49] | [6] | [50] | [29] |

● Criteria fully fulfilled ● Criteria mostly fulfilled ○ Criteria partly fulfilled ○ Criteria hardly fulfilled ○ Criteria not fulfilled

Fig. 2. Qualitative evaluation of existing approaches to performance management and shop floor management in the context of production.

The main finding is that none of the approaches meets the listed requirements holistically. Consequently, research lacks a profound approach to a human-centered and motivating performance management system on shop floor level. The reviewed performance management approaches partly highlight the necessity of an addressee-oriented provision of information and KPIs to workers. However, none of them suggest explicit measures how to attain this objective. The same is true for concepts of the shop floor management stream. Although SM focuses on the worker as the central element, the reviewed concepts do not provide concrete solutions on how to design a motivating human-centered KPI system that enables workers to decide on actions independently. Besides, only few concepts are directed explicitly to workers on the shop floor level.

5 Approach

Based on the need for further research that has been pointed out in the previous section, the approach to provide shop floor workers with personalized, addressee-oriented, and motivating information in form of KPIs is conceptualized in the following. At first, we will derive a research framework including our main research hypothesis. Afterwards, we will conceptualize the approach and present a descriptive model to illustrate the structure and logic of the proposed approach to human-centered performance management.

5.1 Research Framework

The development of the main research hypothesis is essentially based on factual considerations from iterative expert panels, taking into account the identified deficiencies from literature. From this, we suggest that the operational performance on the shop floor can be positively influenced by an addressee-oriented and motivational approach to performance management specifically dedicated to the needs of the workers. Building on this research hypothesis, we focus on the overall question of how the constituting elements, namely (1) human-centered performance management system for the shop floor, (2) worker motivation, and (3) the operational shop floor performance are interrelated to each other. These elements have been integrated into a preliminary research model, shown in Fig. 3, which serves as a framework to guide and further elucidate the development of the conceptual approach.

The approach that is presented hereinafter should serve as a practical research object that enables the specification of the framework's elements and linkages in further research. For this purpose, it should be capable to fulfil the requirements presented in



Fig. 3. Research framework.

Sect. 4.3. Additionally, following requirements should be met to benefit practice:

- identification and collection of relevant data across the production system,
- design of a human-centered KPI system with motivating elements that is dedicated to the information needs of shop floor workers, and
- personalized and addressee-oriented provision of visualized KPIs.

5.2 Conception of a Human-Centred Performance Management Approach on the Shop Floor

A variety of approaches for classification of models can be found in literature [52]. For the purpose of this paper, we use a classification approach, which distinguishes descriptive models, explanatory models, and decision models. A descriptive model is typically applied to reflect and characterize the logic of a system, whereas explanatory models are used to describe cause-and-effect relationships. Decision models target the determination of optimal actions respective given preferences [53]. The purpose of this paper is to conceptualize an approach that describes and links relevant elements for a human-centered performance management on the shop floor. This requires the elaboration of a descriptive model, leaving the development of the other two models for future research.

As the model in Fig. 4 illustrates, our approach consists of three main modules, namely (1) data provision, (2) data analytics and consolidation, and (3) visualization. These modules have been derived by considering the requirements presents in Sect. 5.1. Moreover, the contextual design of the modules reflects the constituting elements of the research framework, which in turn have been identified as highly important to the design of a human-centered performance management in Sect. 4.

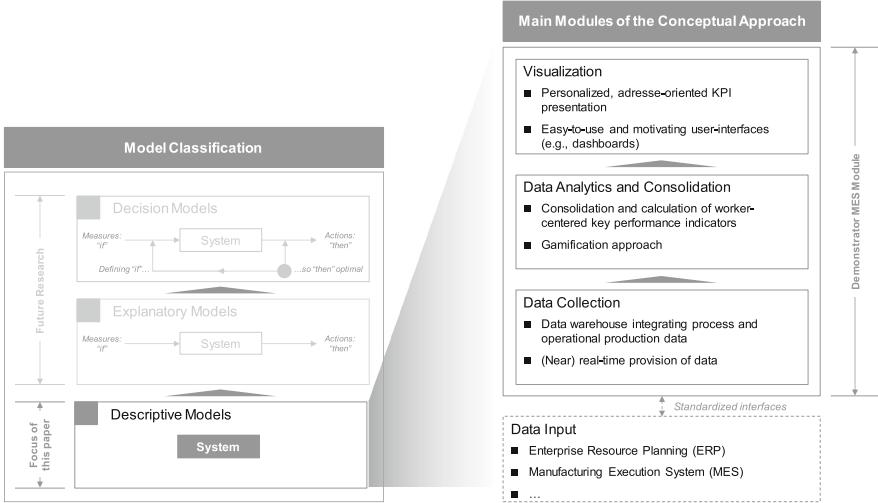


Fig. 4. Descriptive model of the conceptual approach to integrated human-centered performance management on the shop floor. Model classification based on [53].

Data Collection Module. Within the data collection module, all relevant data is collected in a so-called data warehouse. This includes data about the production processes and its resources as well as operational data representing the human elements on the shop floor, e.g., details about employees. For integrating all relevant data, standardized interfaces to existing IT systems, e.g., ERP and MES, need to be defined. Moreover, the concept is intended to stipulate additional interfaces to be able to collect data from CPS-based key technologies, sensors, data storages or access services. In this regard, another key requirement of the first module will be the provision of near real-time data. This ensures that information provided to the workers is always up-to-date.

Data analytics and Consolidation Module. The objective of the data analytics and consolidation module is to consolidate the collected data and to calculate KPIs dedicated to the needs of the workers. This requires the design of a KPI system, which covers the “voice” of the workers and can be aligned with mandatory performance objectives or measures of middle and top management. Additionally, motivational aspects have to be integrated in the design of the KPI system. For this purpose, we

suggest a gamification-based approach as gamification is particularly suitable to motivate the introduction and operation of new systems. Moreover, it is considered to be robust against changes of the underlying systems [34]. Such changes may be induced by the developments of Industry 4.0.

Visualization Module. The calculated KPIs are distributed to the designated addressees on the shop floor within the visualization module. This includes a personalized, addressee-oriented KPI presentation that takes into account the different roles, competencies, and tasks of the shop floor workers. Moreover, we propose either self-learning or maturity-based visualization concepts. Finally, the visualization module includes a digitized and mobile usage of the system on smart devices (e.g., tablet, mobile phone, smart glasses) including intuitive and easy-to-use user interfaces. This allows workers a high degree of flexibility while using the system.

6 Discussion and Future Research

In this paper, we presented a novel approach to an integrated human-centered performance management system on the shop floor that should provide shop floor workers addressee-oriented KPI. Thus, the approach is intended to increase workforce motivation and in consequence operational shop floor performance. The approach particularly integrates gamification elements to motivate and empower workers for self-management.

The presented approach is new in both fields of performance management and shop floor management. However, it is of conceptual nature and it is based on findings from extensive literature reviews in the first place. This implies that (1) the practical applicability and (2) the resulting managerial and research-oriented implications have to be further elaborated and validated empirically in future research. For this purpose, we plan to implement a demonstrator system in several industry cases targeting small and medium sized enterprises from the German manufacturing and equipment industry.

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Old and Wise? Linking Age, Intrapreneurship, Social Capital and Production

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Abstract. In the current study, we examine the connections linking employee age and intrapreneurial behaviors (entrepreneurs inside the firm), and their effect on employee performance. We also investigate whether intra-personal social capital (ISC) and personal social capital (PSC) mediate the connection between age and intrapreneurial activities. A paper-based survey was conducted among 539 participants. The findings show that while age had a positive direct connection with employee performance, age also moderated the connection between intrapreneurial activities and performance, i.e., older workers who engage in intrapreneurship evaluate their performance higher than younger employees. However, workers with low intrapreneurial behaviors evaluate their performance lower compared to younger employees. We also found that intrapreneurial activities was negatively connected to age, but was mediated by both ISC and PSC. The results have both theoretical and practical implications, which can aid HR managers in their attempt to establish a positive age-diversity climate.

Keywords: Age · Intrapreneurship · Employee performance
Intra-personal social capital (ISC) · Personal social capital (PSC)

1 Introduction

Over the last several decades, the number of older employees has constantly been on the rise. According to the U.S. Bureau of Labor Statistics (BLS), in 2014, about 40% of people, aged 55 and older, participated in the labor force or were actively looking for work. BLS also predicted that by 2024, the segments of the oldest workers - people aged 65 to 74, and 75 and older - would experience the most rapid increase. Similar trends can be seen in other countries as well [1]. Together with these recent rapid demographic changes, organizations have begun to introduce age-diversity programs, in an attempt to reduce barriers between younger and older employees [2]. These programs highlight the tendency to judge older employees as a liability to the organization, based on the notion being that older employees are not only more costly in terms of wages and social benefits, but their production is also lower compared to younger workers.

The current study aims to explore whether this argument captures the true connection between age and performance. Former studies found complicated and even contradicting results. Some studies indicated a negative connection, confirming managers' beliefs

about the redundancy of older workers to organizational success. However others found an inverted U-shaped connection, a positive connection and, in some cases, no connection at all (for a review, please see [3]). One explanation for these mixed results is that the age-performance connection is moderated by other factors, including organizational aspects, such as job type [4, 5]. Therefore, in the current study we ask whether intrapreneurial activities are moderated by employee age, thereby influencing employee performance. *Intrapreneurship*, or corporate entrepreneurship (CE), describes innovation activities conducted by workers within an existing organization, in an attempt to develop new business, services, technologies, administrative practices and strategies within established firms [6, 7]. While the connection between intrapreneurial activities and organizational performance was demonstrated in several studies [8–10] it has received scant research attention from the employees' perspective [11, 12]. Itzkovich and Klein [11] found that work culture and managerial behavior can either be a motivating force or it can inhibit employees' desire to become an intrapreneur. In another domain, we ask the same question: Does age serve as a motivating force that encourages workers to exploit their tacit knowledge in the firm's favor, or is it a force that inhibits workers from engaging in intrapreneurial activities, therefore negatively impacting employee performance? The links connecting intrapreneurial activity, age and performance have received little scholarly intention up until now. Therefore, this study will attempt to expand our knowledge regarding older employees' contribution to the area of intrapreneurship and organizational performance.

Team collaboration and trust among team members are essential elements during the development of new projects [13, 14]. Therefore, the ability to rely on one's social capital will aid the leading team members to execute their ideas. Hence, the current study also investigates how intra-organizational social capital (ISC) and personal social capital (PSC) impact the connection between age and intrapreneurial behavior. In other words, we examine which segment has a wider network connection and how it affects one's ability to become an intrapreneur?

In light of the above, the present study aims to expand our knowledge in regard to the role of older employees' intrapreneurial activities, and the impact of age and intrapreneurial activities on employee performance. Since both aspects have barely been previously explored, this study will contribute to the existing organizational literature. In addition, the study's results will also have practical implications, and hopefully contribute to HR practices regarding the shaping of their age-diversity programs and strategies.

2 Theoretical Framework

2.1 The Effects of Employee Age on Employee Performance

In recent years, we have been witness to various demographic changes: where societies are ageing from one hand, and at the same time face a growing need to foster productivity [15]. Thus, a central question in the organizational literature is the effect of age and age diversity on employee and organizational performance. From the employee perspective (i.e., the micro level), the picture is still inconclusive in regard to the connection between

age and performance [16]. While some studies found a negative connection [15, 17], others indicated an inverted U-shaped relation [16, 18] in which the employees reach their peak productivity at around 35–45 years of age, after which productivity begins to decrease. In contrast, a growing body of research has indicated that age and productivity are, in fact, unrelated [19, 20]. Therefore, higher percentages of older employees do not necessarily lead to a decrease in organizational productivity. Some studies even indicate that, under certain conditions, the presence of older employees increases performance [5, 21] and decreases the incidence of error [22]. Ng and Feldman [23] observed ten dimension of job performance, showing that not only are older employees not a liability on the firm, quite the opposite; they contribute more than younger employees to the organization, especially in the non-core domain of job performance. Older employees were found to demonstrate more citizenship behaviors, greater safety-related behaviors, engage in fewer counterproductive work behaviors, and to exhibit less workplace aggression, tardiness and voluntary absence. They also present less exhaustion, cynicism and burnout, while presenting a positive connection to professional efficacy and firm engagement [5]. From an organizational perspective, Bohem et al. [2] found that age-inclusive HR practices can impact mutual employees' age-diversity climate perceptions, which are indirectly linked to firm performance through collective perceptions of social exchange. The scholars explain that when employees apprise their firm as being tolerant and fair towards elderly workers, it fosters employees' sense of justice, trust in their employers, accelerated long-term relationship with their employers, and ultimately creates a more affirmative atmosphere toward the firm. In exchange, employees feel higher commitment to the company and respond by enhanced performance.

One explanation for the mixed results is that the two variables are associated through intervening variables [23]. Indeed, studies found that factors such as work type [24], type of abilities required, cognitive demands and experience among others [25], intervene between age and performance. For example Heidemeier and Staudinger [15] demonstrated that performance orientation goals were moderated by employee gender. Older males were the most likely to report dominant performance-avoidance achievement goals compared to younger employees, but this orientation decreased in women as they aged. In another study Backes-Gellner and Veen [4] show that increasing age diversity has a positive effect on company productivity only if the company engages in creative rather than routine tasks. In fact, they found that in a creative company, a 10% increase in age diversity would increase productivity by approximately 3.5% per year; however, this effect is offset and may even be perceived as negative in companies with routine tasks. Based on Backes-Gellner and Veen's [4] results, we argue that age and performance will be moderated by intrapreneurial activities, since intrapreneurship requires creative thinking.

2.2 Intrapreneurial Activities, Age and Employee Performance

The concept intrapreneurship, also known as corporate entrepreneurship, was coined by Pinchot [26] as the activities taken by employees exploiting organizational resources in order to develop new intra-organizational ventures. With the emergence of the field, the definition of intrapreneurship was extended to also include activities aimed at creating

new ventures, new products, services, technologies, administrative practices, strategies and competitive poses within established firms [6, 9, 27].

The need to embed intrapreneurial culture within the company has become more prominent as evidence accumulates, indicating the contribution of intrapreneurship to organizational performance (e.g., [6, 8, 28, 29]). However, previous studies have barely explored the impact of age and intrapreneurship on employee performance. Since several studies indicated that organizational factors moderated the connection between age and the performance of creative tasks [4], we assume that the connection between age and employee performance will be moderated by intrapreneurial activities. As Belousova and Gailly [27] demonstrated, the intrapreneurship process begins with one worker's dream. However, once the idea has attained managerial authorization, workers need to acknowledge how to leverage organizational resources and harness them in order to make the dream a reality. This type of 'know-how' knowledge is not obvious. It is part of the tacit knowledge that accumulates as the employee gains tenure and organizational wisdom [30]. The more organizational wisdom you possess, the more you know how to exploit the available resources to your benefit. Frosch [16] suggested that tacit contributions - such as knowledge transfer or managerial support for overall innovative performance - are more likely to be found among older individuals. Therefore, the older you get, the more tacit knowledge you gain, which allows you to contribute more in innovative firms. Based on these arguments, we suggest that older employees with a higher tendency to engage in intrapreneurship will be more productive compared to younger employees, since they know how to leverage the organization's resources and support and harness them to execute their ideas. On the other hand, older workers who do not engage in intrapreneurial activities will be less productive compared to younger employees, resulting in a negative connection between age and productivity.

2.3 Social Capital, Intrapreneurship and Age

Past studies found different and contradicting connections between age and intrapreneurial activities, which might imply an intervention effect with other variables [12, 31–33]. In the current study, we suggest that one factor which mediates the connection between age and intrapreneurship is the amount of social networks, i.e., *social capital* the worker possesses.

The term Social Capital (SC) describes the different levels of resources accessible from social connections with others, including the individual level [34]; through the intermediate level, such as one's coworkers [35]; to the broadest level, such as the national level [36]. *Social capital*, therefore, can be defined as an intangible asset that stems from our networks with others [37]. In the organizational context, SC is used to describe resources or benefits accessed from several layers of interpersonal connections [38]. The first layer is *Personal Social Capital* (PSI) [39], which relates to employees' individual connections. These connections exist within the organization, among colleagues and other employees, but also from ties extrinsic to the company. For example, they can evolve as a connection among neighbors, classmates and family members [40]. The second layer of organizational SC is *Intra-organizational Social Capital* (ISC). This level is based on the social relationships among employees with other employees working in

their organizational units, as well as in different departments in the firm [41]. The third level is *External SC* – which is generated from the connections between employees, who usually hold senior positions in the organization [42], and stakeholders extrinsic to the company. These ties include connections with investors, competitors and media professionals [43]. Since the current study focuses on intrapreneurship within organizations, we found that the third level provides a smaller contribution. Therefore, we investigated only the personal and intra-organizational variables.

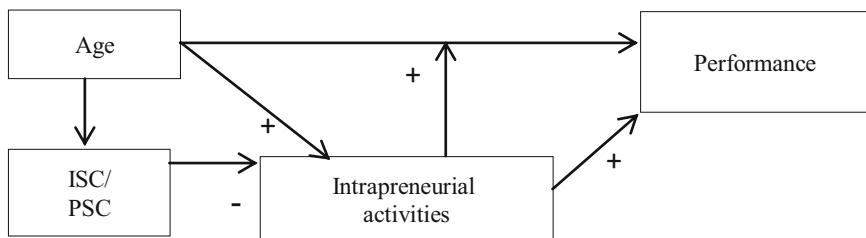
The few prior studies that have investigated the connection between SC and intrapreneurship often indicate a positive connection between the two [13, 14]. Monnavarian and Ashena [13] demonstrated how two dimensions of SC (i.e., cognitive and structural) were found to be positively associated with intrapreneurial behavior in a manufacturing company. Between the two types of SC, the *structural dimension*, represented by the formality of the networks, had a higher contribution to intrapreneurship compared to the *cognitive dimension*, represented by the quality of the social networks (e.g., trust and reciprocity). In another study, Toledano et al. [14] inspected the connection between social capital and intrapreneurship in two family companies. The scholars demonstrated the effect of social capital and network communication on the ability to extract trust from their employer, which contributes to the success of new ventures created by these firms. Based on these findings, we expect that employees who engage in intrapreneurship will have more extensive social networks than employees who do not engage in such activities.

While SC has an effect on intrapreneurial behaviors, former studies indicate a negative connection between age and SC [44–46]. Studies demonstrated that teenagers use social network sites, such as instant messaging and chat sites, to interact with their coworkers on a daily basis. Compared to older people, Zaphiris and Sarwar [46] found that teenagers are more activate on social networks, sending higher numbers of messages per person and longer messages on average, compared to older persons. Pfeil et al. [45] also demonstrated that teenagers have more friends in social network sites (e.g., MySpace) compared to older people, and these ties are more homogeneous. Younger people not only have more extensive networks ties (SC), but most of the ties lead to offline friendships.

In regard to the working arena, McDonald and Mair [47] were among the few scholars who followed different types of work-related social capital and examined their connection to employees' age. The scholars found that the connection depends on the type of social capital measurement and gender. While the amount of trustworthiness in social connections accumulates over the years, the volume of daily contact and closeness decreases, as the employee ages. On the other hand, the number of connections with high-prestige others and the density among network members first rise, only to drop later among the 50+ employees.

Since intrapreneurship depends on the ability to encourage teamwork and extract support and trust from coworkers [14, 27], we suggest that age and intrapreneurial activities will be mediated by social capital. In other words, younger employees with extensive social networks will benefit from this connection and leverage them to perform intrapreneurial activities. On the other hand, older employees will have narrower social capital, which decreases their ability to form new ventures, create new products and services and engage in other organizational practices.

Model 1 demonstrates the study's assumption regarding the connection linking age, intrapreneurial activities, social capital and employee performance.



Model 1. The connection between the research variables.

3 Materials and Methods

3.1 Participants

To test our hypotheses, we conducted a paper-based survey among 617 employees working in five organizations operating in Israel. Three organizations operate in the industrial industry, while the other two operate in the service field. Participants included 617 employees, 44.2% of whom were male. Their average years of schooling was 13.5 ($SD = 2.2$) and the average age was 37.7 ($SD = 12.2$). On average, employees worked in their organizations for 13.4 years ($SD = 5.5$).

3.2 Measurements

3.2.1 Dependent Variable-Performance

Employee performance was measured based on the self-perceptual scale developed by Pearce and Porter [48] and modified by Black and Porter [49]. Respondents were asked to evaluate their performance compared to that of their co-workers using a 5-item scale, ranging from 1 = very low (i.e., well below average) to 5 = very high (i.e., well above average). The overall Cronbach's alpha was .849.

3.2.2 Independent Variables

Intrapreneurial Behaviors. Intrapreneurship was measured using De Jong et al.'s [31] questionnaire. The questionnaire consisted of nine items ($\alpha = .889$); respondents were asked to self-evaluate their activities based on a scale from 1 (not at all) to 5 (very often). The questionnaire included nine items on various intrapreneurial behaviors, mainly: innovativeness, taking charge and risk taking. Originally, the participants were asked to assess the amount of intrapreneurship behavior displayed by their colleagues. However, in the current study respondents were asked to evaluate their own intrapreneurial behavior, similarly to previous studies [11].

Personal Social Capital (PSC). PSC was measured using Chen et al.'s [50] personal SC scale, later shortened and refined by Wang et al. [40]. This scale consists of six categories; for example, "With how many people in each of the following categories do you keep in routine contact?" In this category, respondents needed to rate on a five-point Likert scale their level of routine contact with their family members, relatives, people in their neighborhood, friends, coworkers, and former acquaintances/old classmates. Altogether, there are 27 statements with a Cronbach's alpha of .930.

Intra-organizational Social Capital (ISC). A questionnaire developed by Carmeli et al. [51] was used, with a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree, consisting of six items such as, "I share common goals with my colleagues at work". The scale reliability is 0.74 Cronbach's alpha.

Age. Age was measured based on the demographic question, regarding the age of the participants.

3.2.3 Demographic Variables

Gender ("gender", 0 = male, 1 = female), marital status ("marital" 0 = single, 1 = other), number of years of education ("education") and years of working in the content role ("seniority_role"). We also measured the employee's seniority in the organization; however, we did not include this variable in the regression, based on its high correlation with age ($r = .715$).

4 Findings

4.1 Descriptive Statistics

Table 1 presents the means, standard deviations, and correlations among all variables under scrutiny.

Table 1 shows that age was positively connected with performance ($r = .099$, $p < .05$); meaning, older workers report on better performance compared to younger employees. On the other hand, age was negatively connected with intrapreneurship ($r = -.106$, $p < .05$), personal social capital ($r = -.107$, $p < .05$) and intra-organizational social capital ($r = -.218$, $p < .05$). The results indicate that as employees aged, their tendency to engage in intrapreneurial activities declined. Similarly, as employees aged, both intra-organizational and social capital decreased. Performance was positively connected to intrapreneurship ($r = .233$, $p < .01$), intra-organizational social capital ($r = .251$, $p < .01$) and personal social capital ($r = .284$, $p < .01$). Personal social capital and intra-organizational social capital were positively correlated ($r = .483$, $p < .01$); however, the medium correlation indicated that they measured different aspects of social capital.

Table 1. Means, standard deviations and correlations

| | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--|-------|-------|---------|---------|--------|-------|--------------------|---------|---------|---------|--------|----|
| <u>Control variables</u> | | | | | | | | | | | | |
| 1. Seniorityorg | 12.56 | 10.92 | 1 | | | | | | | | | |
| 2. Seniorityrole | 9.39 | 9.97 | .671** | 1 | | | | | | | | |
| 3. Education years | 12.76 | 1.99 | -.238** | -.168** | 1 | | | | | | | |
| 4. Gender (0-male,
1-female) | | | -.013 | .014 | .108 | 1 | | | | | | |
| 5. Marital status
(1-single, 0-other) | | | .247** | .312** | -.009 | .111* | 1 | | | | | |
| <u>Independent variables</u> | | | | | | | | | | | | |
| 6. Age | 39.14 | 12.48 | .715** | .682** | -.094 | .003 | -.080 ^a | 1 | | | | |
| 7. Intrapreneurial
activities | 2.85 | .81 | -.059 | -.162** | .202** | -.063 | -.053 | -.106* | 1 | | | |
| <u>Social capital</u> | | | | | | | | | | | | |
| 8. PSC | 3.16 | .55 | -.051 | -.057 | .159** | .080 | -.033 | -.107* | .352** | 1 | | |
| 9. ISC | 3.69 | .62 | -.019 | -.205** | .103 | .106* | -.062 | -.218** | .482** | .483*** | 1 | |
| <u>Dependent variables</u> | | | | | | | | | | | | |
| 10. Performance | 3.95 | .54 | .062 | .094 | .094 | .008 | .019* | .099* | .233*** | .284*** | .251** | 1 |

Note: ^aP < 0.10, *P < 0.05, **P < .01

4.2 Hypothesis Testing-Moderation Effect Between Age and Intrapreneurial Activities on Employee Performance

Previous to moderating inspection, we first wanted to inspect the contribution of employee age to employee performance. Table 2 presents the results of a stepwise

Table 2. Moderated regression analysis results (n = 539)

| | Model 2.1 | Model 2.2 | Model 2.3 |
|----------------------------|-----------|-----------|-----------|
| <u>Control variable</u> | | | |
| Gender (0-male, 1-female) | .061 | -.001 | .007 |
| Status (0-single, 1-other) | .108 | .075 | .064 |
| ^a Seniority_rol | .012 | .036 | .003 |
| Education | .118 | .017 | .018 |
| <u>Social capital</u> | | | |
| Personal | | .173** | .173** |
| Intra-organizational | | .104* | .139** |
| Intrapreneurial activities | | .128** | .128** |
| Age | | | .161** |
| Adj R ² | .011 | .098** | .121** |
| Chg. R ² | | 0.08** | .025** |
| Incremental F-test | 1.59 | 19.179** | 18.294** |

Note: Standardized regression coefficients are reported; the dependent variable was *employee performance*^a; seniority_rol represents the years of working in the content role;

*p < 0.05, **p < 0.01

(three-step) regression procedure with demographic variables in the first step, social capital and intrapreneurship in the second step and age in the third step, with employee performance as the dependent variable.

Model 2.1 indicates that the control variables did not significantly contribute to the overall variance of employee performance. In contrast, the second model was significantly connected to employee performance, contributing almost 10% to the overall variance. Intrapreneurial activities, as well as the two types of social capital, were positively connected to performance, indicating that workers with wider intra-organizational social capital and personal social capital, and who engage in intrapreneurial activities evaluate their performances as being high. Entering age in the last model (Model 2.3) reveals that age has a unique influence on the other variables regarding performance, adding a significant contribution of 2.5% to the overall variance. In fact, age showed a higher impact on performance ($\beta = .161$, $p < .01$) compared to intra-organizational social capital ($\beta = .139$, $p < .01$) and intrapreneurial activities ($\beta = .128$, $p < .01$), but a smaller contribution compared to personal social capital ($\beta = .179$, $p < .01$). The positive connection between age and employee performance indicates that in our sample older employees evaluated their performances as being higher compared to younger employees.

In order to inspect the moderating hypothesis between age and intrapreneurial activities on employee performance, a factorial ANOVA was conducted. We first divided the two independent variables, age and intrapreneurial activities, based on their median score¹. Then, we compared the main effect of age and intrapreneurship and the interaction effect between age and intrapreneurial activities on employee performance. The result of the factorial ANOVA indicated a significant result for the main effect as well as for the interaction. The main effect for age was close to significant and yielded an F effect of $F(1,515) = 3.664$, $p < 0.06$, showing close to significant differences between younger employees ($M = 3.92$, $SD = 0.50$) and older employees ($M = 3.98$, $SD = .58$), thus confirming the assumption that older employees were more productive than younger employees. The main effect for the intrapreneurial activities also yielded an F effect of $F(1,515) = 18.64$, $p < 0.01$. Significant differences were found between the low intrapreneurial employees ($M = 3.86$ $SD = .54$) and higher intrapreneurial employees ($M = 4.04$ $SD = .52$), confirming that employees with lower levels of intrapreneurial behaviors indicate low levels of productivity compared to employees that engage in entrepreneurship. A statistically significant interaction was found between age and entrepreneurship, $F(1,515) = 1.741$, $p < 0.05$. Figure 1 shows the mean differences between the two factors.

The results demonstrated that in the group that did not engage in intrapreneurial activities, younger employees indicated higher performance ($M = 3.87$, $SD = .50$) compared to older employees ($M = 3.85$, $SD = .58$). Cohen's effect size value ($d = .47$) suggested a moderate significance level for the differences between the two employee groups. However, employees who engage in intrapreneurial activities showed reversed

¹ Age was divided into younger (below 38 = 0) and older (over 38 = 1) employees. A low level of intrapreneurial behavior was calculated as lower than 2.77 (0); a high level of intrapreneurial behavior was calculated as higher than 2.78 (1).

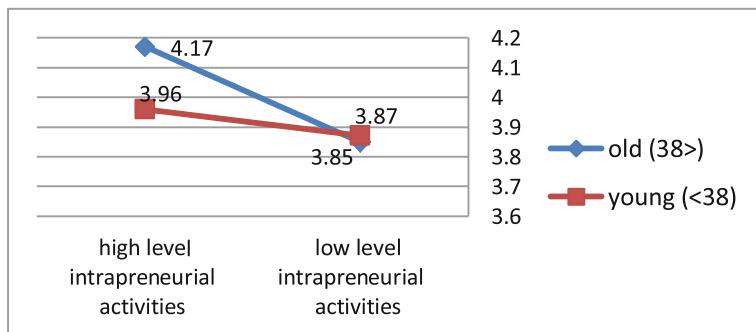


Fig. 1. Mean differences among intrapreneurial activities, age and employee performance

results: older employees had higher performance levels ($M = 4.17$, $SD = .54$) compared to younger employees ($M = 3.96$, $SD = .50$). Cohen's effect size value ($d = .54$) also suggested moderate significance level differences between the two groups.

4.3 Mediation Affect for Age, SC and Intrapreneurial Activities

In our next hypothesis, we argue that the connection between age and intrapreneurial activities will be mediated by employees' social capital. Table 3 shows the results of a mediation analysis between age and intrapreneurship with intra-organization and personal social capital behavior as the mediators according to Baron and Kenny's [52] model.

Table 3. Mediation analysis with age, social capital and employee performance

| Dependent variable/predictors | Weight (β) | Statistical error (SE) | Coefficient (B) | R^2 |
|--|--------------------|------------------------|-----------------|--------|
| DV intrapreneurship | | | | |
| Age | -.106* | .003 | -.007* | .123* |
| DV Personal social capital (PSC) | | | | |
| Age | -.107* | .002 | -.005* | .011* |
| DV Intra-organizational social capital (ISC) | | | | |
| Age | -.218** | .002 | -.011** | .047** |
| DV Intrapreneurship | | | | |
| Personal social capital (PSC) | .350** | .060 | .502** | |
| Age | -.068 | .003 | -.004 | .132** |
| DV Intrapreneurship | | | | |
| Intra-organizational social capital (ISC) | .473** | .003 | .600** | |
| Age | -.003 | .051 | .000 | .225** |

*The correlation is significant at the 0.05 level; **The correlation is significant at the 0.01 level

According to the mediation analysis, the direct effect between age and intrapreneurship was negative and significant ($c = -.106$, $p < 0.05$). Both social capital dimensions were negatively related to age ($a = -.107$, $p < 0.05$ for intra-organizational social capital and $a = -.218$, $p < 0.05$ for personal social capital). However, when the indirect effect was measured the connection between age and intrapreneurship failed to be significant, suggesting full mediation ($c' = -.068$ and $c' = -.003$, $P > 0.05$), while the connection between intra-organizational and personal social capital with intrapreneurship was positively significant ($b = .350$, $b = .473$ $p < 0.01$, respectively). Based on Baron and Kenny's [52] model, these results support our assumption that social capital mediates the connection between age and intrapreneurship. This implies that older employees have narrower social capital compared to younger employees; this inhibits older employees' ability to perform intrapreneurial activities in the organization².

5 Discussion

This study brings to light interesting findings regarding the impact of age on intrapreneurial activities and employee performance. The findings demonstrated a positive connection between age and employee performance, indicating that older employees appraise their performance as being higher than that of their younger co-workers. This result is in line with recent findings suggesting that older employees are more engaged in their work, feel more confident in their abilities, experience less exhaustion and feel less cynicism compared to younger employees [5, 53]. Nevertheless, previous studies also reveal mixed and conflicting results [23]. In three highly cited meta-analytic studies, the scholars concluded their research with three different results. Waldman and Avolio [20] found that age was positively associated with performance, while McEvoy and Cascio [54] argue that in regard to most parameters, they are unrelated, and Sturman [55] indicted an inverted U-shape. Ng and Feldman [23] suggested several explanations for the mixed findings. In addition to the differences in measurements and samples, the scholars suggested that the nature of the work environment has changed substantially since the 1970s. In many companies, HR initiated age-based strategies and age diversity programs [56], which changed both the companies' culture as well as the older workers' perceptions regarding their contribution to the company. The consequences of these changes appear in the positive evaluation of the older workers regarding their contribution to the company in the current study.

In addition, Ng and Feldman [23] suggest that the different results may also evolve from a moderating effect with other organizational factors. The current results confirm the scholars' argument, showing the effect of intrapreneurial activities, which has received very little previous research attention in this context, as moderating the age-performance connection. Older workers who engage in intrapreneurial activities evaluate their performance as being higher than that of their younger intrapreneurial counterparts. On the other hand, in the group that did not engage in intrapreneurial

² We also conducted a mediation analysis for social capital, age and performance, but the results did not indicate a mediation effect.

activities, both younger and older employees evaluated their performances as being lower compared to the intrapreneurial workers. We suggested that the moderation effect resulted from the ability of the older employees to exploit their “know-how” knowledge [30]. As Teece [30] argued, in the current economy, knowledge and knowledge-sharing is a basis of competitive advantage for the firm. The scholars suggest that know-how knowledge represents tacit information that accumulates with experience. As the employees age, they have more tacit knowledge regarding subjects that can foster ideas into outcomes. Matters such as how to convince your manager to allow you to develop your ideas, how to differentiate between cooperative employees and those who will be a burden on the team, and how to convince them to join your team, are crucial, yet tacit. Even the procedures related to receiving an office and equipment are not obvious to everyone in the firm. While many employees have ideas that can contribute to the firm, understanding how to execute them requires another type of knowledge that develops and accumulates as workers gain experience. As such, we found that older employees have the benefit of using their tacit, know-how knowledge, to fulfill their desire to become an intrapreneur, which is reflected in their performance.

We also found that workers with a lower tendency to engage in intrapreneurial activities were far less positive about their contribution to the company. The ability to develop new products, services, practices or strategies fosters employee creativity, and encourages workers to step out of their work routine and diversify their career. All these aspects can reduce burnout and increase worker engagement, which will impact their performance [5]. However, in the group that did not engage in intrapreneurial activities the positive affect failed to have an influence; workers felt their contribution to the firm was minor compared to the intrapreneurial workers, especially the older employees. This group demonstrated the negative connection between age and performance, supporting [56] argument that aging workers tend to adopt more conservative thinking and safety-related values that increase resistance to change. While our study confirms Camel-Ordaz et al.’s [57] argument, we argue that this pattern is relevant only for older workers who refrain from participating in intrapreneurial activities.

Findings also confirm that the connection between age and intrapreneurial activities is mediated by the workers’ social capital. This can explain why a negative connection was found between age and intrapreneurial behaviors. We found that as the workers aged, both their intra-organizational social capital (ISC) and personal social capital (PSC) decreased, affecting their ability to perform intrapreneurial activities. Studies showed the critical influence of social networks on the ability to attract workers’ trust in order to participate in intrapreneurial activities [13, 14]. Since young workers have wider networks [45, 46], they had more coworkers they can trust and participate while engaging in entrepreneurship. Thus, the current findings contribute to our understanding of how employees’ social capital can be inhibited or can motivate their readiness to become intrapreneurs. Since this study is among the few researches examining the connection between age and social capital in the work-related field [47], more studies should be conducted to strengthen the generalization of the current results.

This study has some limitations that should be taken into consideration. The main limitation of this study concerns the factors that influence employees to perform intrapreneurial activities. Previous research has categorized the antecedent of entrepreneurship factors into three main groups: environmental factors, internal

organizational attributes, and individual characteristics (e.g., [6, 7, 11, 29]). The current study limits itself to the third group, attempting to examine how age and social capital inspire workers to become intrapreneurs. However, other antecedents may also impact this tendency, some encouraging while others inhibiting this behavior. In line with this limitation, we suggest that future studies should include other environmental, organizational and dispositional factors, to provide us with an extended picture regarding the connection between intrapreneurship and performance. Another difficulty relates to the measurement of intrapreneurial behaviors. Former studies used a macro perspective and investigated intrapreneurship either through organizational factors such as the number of patents, new products or new markets [30] or by focusing on the managerial perspective [28]. Since our study explores employee performance, we used de Jong et al.'s [31] questionnaire. However, we felt that this method did not capture the entire range of attributions of intrapreneurial activities as indicated by Auer Antoncic and Antoncic [28]. Therefore, a more comprehensive measurement is needed to capture intrapreneurial activities, especially from the employee's point of view. The third limitation evolves from the sampling method. The study applies a convenient sample procedure, which might present difficulties when attempting to generalize to other firms. Future studies should use a more proportional sampling method. We also suggest that more types of organizational sectors need to be included in future studies. In the current study, we sample three industrial organizations and two firms from the service field. Future studies should expand this sample to include more firms, both in high-tech and low-tech industries, and distinguish between industries that are more and less directed toward intrapreneurship.

5.1 Conclusions and Implications

Age-diversity in organizations is no longer a theoretical issue, but a common workplace reality. The U.S. Bureau of Labor Statistics (BLS) estimates that by 2024, the labor force will grow to about 164 million people. Among them, about 41 million people will be aged 55 and older—out of whom about 13 million are expected to be aged 65 and older. Exploring the effect of diversity on organizational performance suggests that diversity has both positive and negative impacts. Diversity was found to contribute to team-member performance, foster creative thinking and innovative solutions, enhance problem solving, and increase workforce satisfaction (e.g. [58, 59]). Nevertheless, when not implemented properly by the organization, diversity was found to undermine team performance, damage trust, create communication interruptions, foster cohesion problems, increase biases and contribute to greater turnover [59]. Therefore, HR managers should implement strategies that will reduce antagonism toward elderly workers. However, they also must accompany these strategies with a deep change in the firm's cultural and environment. A more accepting environment will not only contribute to the older employees, it will also foster feelings of justice and kindness among employees about the firm which, in turn, influence the workers' welfare and production [2].

Managers should also recognize the contribution of older employees to organizational success. Unfortunately, in regard to older workers, organizations often prefer to use *outwards* strategies and to encourage older workers to retire from the company

[56]. Our findings suggest that not only do older workers feel they contribute more to the firm; they also engage in intrapreneurial activities. Therefore, instead of trying to remove older workers from the company (moving outwards), managers should encourage older workers to move *upwards*, i.e., encourage older employees to take part in research and development teams. This can be accomplished by either leading the team or by serving as an advisor. Older employees should exploit their tacit knowledge to produce a competitive advantage for the firm. Participating in intrapreneurial activities will not only contribute to the firm's profits, it will also serve to reduce burnout, increase older workers' engagement and contribute to their self-esteem.

Unfortunately, one of the problems in creating a development team is the workers' tendency to choose to collaborate with coworkers who are similar to them in demographic attribution, known as *homophily* [60]. Therefore, we suspect that younger employees will also prefer to collaborate with similar coworkers, excluding older employees from their networks. This can hinder older workers from expanding their social networks, which reduces their social capital. Since social capital influences intrapreneurial activities, older employees can be negatively impacted from working in teams, especially in organizations that have a higher percentage of younger employees, such as in the high-tech industry. As a result, organizations should encourage employees to work in an age-diversity team. HR should also make a point of emphasizing the centrality of extended networks to older workers, in order to succeed in developing new products.

Given the dominance of older employees in the employment market and their positive contribution to performance, our study indicates the need of managers to create an age-diversity climate, while at the same time encouraging older employees to engage in intrapreneurial activities. This will not only benefit the firms, it will also contribute to the workers' self-esteem.

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Command of Vessels in the Era of Digitalization

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Abstract. Recent discussions on digitalization, and autonomous ships provide a disruptive picture of how the maritime industry may be transformed in this process. The magnitude of this digitalization trend is very different from the one of implementing e-Navigation initiated by the International Maritime Organization (IMO) in 2006 to harmonize, integrate, exchange, present and analyze marine information on board and ashore by electronic means. A rapid speed of digitalization of ship operation is causing controversy. For example, the maritime industry has not yet come to a consensus about agreed definitions of “autonomous ship”, “unmanned ship” and a “remote-controlled vessel”. Some pioneering industry developers, invest in the digitalization of ship operation to make the maritime transport more reliable, safe and efficient. Whilst such technological developments promise safe and efficient business models to a greater extent, it has not been much discussed how people on board will be affected by digitalization with a particular attention to the notion of leadership. Command of vessels has been traditionally considered as a human domain. The ways in which leadership is displayed on board and how each task is dedicated to the members of a shipboard organization will be radically different in the era of digitalization. Based on the qualitative data obtained from semi-structured interviews, group interviews and participant observation with maritime experts in Norway, the paper discusses the impact of digitalization on organized work in ship operation, implications of digitalization for leadership, and leadership required in the era of digitalization. It concludes that human-automation coordination as well as human-human coordination are the key to support the future operation of ships.

Keywords: Leadership · Digitalization · Autonomous and unmanned ships
Maritime industry · Human-automation interaction
Human-automation coordination

1 Introduction

Digitalization is seen as in the process of modernization in the maritime industry. While partial automation in ship operations has opened up a technological connectivity between ship and shore, vessels are primarily commanded by a Master and any

assistance from the shore does not necessarily imply the removal of leadership from a Master. Recent development of autonomous ships provoke a debate on how the maritime industry may be transformed by digitalization.

However, the digitalization of ship operations is not an overnight shift. For example, e-Navigation was initiated by the International Maritime Organization (IMO) in 2006 to harmonize, integrate, exchange, present and analyze marine information on board and ashore by electronic means. E-Navigation focuses on the support of human operators on-board and ashore but not replacing them. However, the implementation of the e-Navigation concepts and the provision of a far enhanced information and communication infrastructure is providing a strong basis for autonomous ships and even unmanned ships respectively.

Whilst a series of technological developments enabled the digitalization of ship operation [1], it has not been much discussed how people on board will be affected by digitalization with a particular attention to the notion of leadership. The lack of human factor approach in the development of autonomous ships or more digitized operation of ships is problematic as in the past documented by numerous tragic accidents [2]. The role of human operators, including their capacity of leadership, has to be kept in mind when designing future operation of ships.

This paper employs qualitative research methods, including semi-structured interviews, group interviews and participant observation with maritime experts of a case study. Norway as one of the leading nation for autonomous ships has been chosen for this research to provide a new insight to address a knowledge gap anticipated in the existing research. Further, commands of vessels can imply various versions of leadership and teamwork. In this paper, our focus of discussion is a Master's leadership on the vessel of his/her command.

Remaining parts of the paper are organized as follows. In Sect. 2, human-automation interactions in the maritime industry is reviewed. In Sect. 3, leadership and digitalization is discussed in the context of maritime industry. In Sect. 4, methodology on exploring viewpoints of stakeholders is structured. In Sect. 5, findings including impacts of digitalization on leadership are groomed. Last but not least, discussions and further research directions are presented.

2 Human-Automation Interactions in the Maritime Industry

Human-automation interactions have been discussed in various modes of transportation, for example, road [3], sea [4], air and rail [5]. Similar to other transport sectors, the maritime transportation concerns how human operators interact with automation technology within a socio-technical system. In the last couple of years, however, there is a growing interest in autonomous ships led by several industry players, like Rolls-Royce, Svitizer, and Wärtsila to name a few. In the era of disruptive technology, such projects are considered to be part of the Industry 4.0 movement across the industries. The following sections will review the current discussions on the development of autonomous ships as well as how the maritime industry is adopting automation technologies in ship operations.

2.1 Disruptive Technology and Degrees of Automation for Ships

Research and development for automation solutions in operation of vehicles for all kinds of transports are going far back to the last century. Such concepts, techniques and algorithms have been developed over time [1, 6]. It seems that the time has come that the industry is ready for implementing them for various application cases in an economically beneficial manner and that soon may result in a new quality of maritime transportation.

Today, autonomous ships or unmanned vessels have been internationally creating an intense debate and sometimes a confusion among stakeholders due to the lack of common understanding about autonomy. One of the critical problems lies in no universally accepted terms of ‘autonomous ships’ and ‘unmanned vessels’. The majority of literature on the current technological developments and research use ‘unmanned’ and ‘autonomous’ ships interchangeably [7]. An unmanned ship is one which has no crew or human operator on-board. Meanwhile, an unmanned ship may be controlled or monitored remotely from the shore or another mobile station (e.g., another vessel, truck or train). An autonomous ship, by contrast, is one which has systems that can steer the ship and make decisions about any change in control settings without human intervention; the use of Artificial intelligence (AI) can deliver the necessary decision supporting tool. It is important to point out that autonomous ships may be manned or unmanned. Since things can go wrong, it is possible to control such ships from the shore (remote override procedure), or even have a very limited number of humans on-board to take control in case things go wrong (local override procedure). With respect to command of vessels, which is not directly addressed or discussed in those approaches, increasing automation indicates increasing level of decision supports.

IMO as an international regulatory body needed to respond to this industry-driven debate and uses their term, ‘Maritime Autonomous Surface Ships (MASS)’. During the MSC 98/23 meeting, IMO recognizes the ongoing discussions of MASS affecting many areas of maritime operations, including safety, security, interactions with ports, pilotage, responses to incidents and marine environment. While some Member States claim the need for a definition of MASS for a clear understanding, others anticipate that it will limit the application of their regulatory scoping exercise on MASS if another type of technology arrives beyond the fixed MASS definition [8].

In addition, there are other stakeholders who attempted to create a consensus about autonomy. For example, the Danish Maritime Authority proposes the definition of autonomous ships as ‘ships capable of providing – via automatic processes – decision-support or a possibility of taking over parts of or the entire human control and management of the ship, irrespective of whether the control is exerted from the ship or from somewhere else’ [9].

Another approach to this problem is to establish autonomy scales and categorize various types of autonomous vehicles. In most cases, this approach makes relations to the role of human operator(s) in the overall process of controlling the vehicle and consequently to the level of manning or unmanning a vehicle. It helps to identify a certain need for rules, regulations, and standards to be modified or newly created and later on monitoring its compliance. Indeed, various transport sectors came up with their own versions of autonomy scales. In the maritime sector, a range of autonomy between

fully-manned and unmanned vessels, for example, by Lloyd's Register (LR) [10] is commonly referenced among others. The LR scales represent technical scales of autonomy in our view and it is necessary to take a more human factor approach in order to understand the impact of digitalization on leadership. Based on literature review on autonomy scales, the WMU research team has developed a more simplified scale, corresponding to the LR scale (see Table 1).

Table 1. A range of autonomy between fully-manned and unmanned vessels.

| Lloyd's Register | WMU |
|---|--|
| (AL 0) Manual: No autonomous function. All action and decision-making performed manually (n.b. systems may have level of autonomy, with Human in/on the loop.), i.e. human controls all actions | 0: No automation
Human operator is in the loop in all actions and decision-making; Technical system plays a passive role |
| (AL 1) On-board Decision Support: All actions taken by human Operator, but decision support tool can present options or otherwise influence the actions chosen. Data is provided by systems on board | 1: Partial automation
Human operator takes most decisions and actions; Technical system presents relevant information and possible actions |
| (AL 2) On & Off-board Decision Support: All actions taken by human Operator, but decision support tool can present options or otherwise influence the actions chosen. Data may be provided by systems on or off-board | |
| (AL 3) 'Active' Human in the loop: Decisions and actions are performed with human supervision. Data may be provided by systems on or off-board | 2: High automation
Human operator takes some decisions and actions; can intervene and override; Technical system takes most decisions and actions and presents relevant information and actions |
| (AL 4) Human on the loop, Operator/Supervisory: Decisions and actions are performed autonomously with human supervision. High impact decisions are implemented in a way to give human Operators the opportunity to intercede and override | 3: High autonomy
Human operator supervises the system and can override; In technical system, all decisions and actions are performed autonomously |
| (AL 5) Fully autonomous: Rarely supervised operation where decisions are entirely made and actioned by the system | 4: Full autonomy
Human operator can engage in case the system decides is necessary; In technical system, all decisions and actions are performed autonomously |
| (AL 6) Fully autonomous: Unsupervised operation where decisions are entirely made and actioned by the system during the mission | |

It may sound that the maritime industry is now exposed to waves of automation technologies and have difficulties in importing concepts and definitions developed in

other sectors. However, it is necessary to recall that shipping already experienced serious automation waves in the late 20th century with unmanned engine rooms and increasing number of computer systems onboard engaged in navigation, propulsion and cargo-related operations (referring to the WMU scale 1 in Table 1).

2.2 Selected Aspects of Maritime Industry's Experience in Partial Automation

Indeed, automation is not new in the maritime industry. Each segment of the maritime industry (i.e., ships, shipyards, ports and logistics, shore-based businesses and maritime markets) invests in automation to improve safety and enhance productivity and particularly to reduce manpower.

For ships, autopilot devices might be considered as one of the earliest examples of automation. Looking at the specific sub-process of collision avoidance, the introduction of Automatic Radar Plotting Aids (ARPA) realizing automated tracking of targets and by this, supporting the overall collision avoidance process can serve as another sample case. Automation in engine-rooms and deck equipment; digitalization of sea charts (e.g., ENC, ECDIS etc.); and decision-support systems for maneuvering, berthing and docking becoming available and are further samples of increasing automation in shipping. Simultaneously and similarly, digitalization of information and communication technology (ICT) impacts the autonomy of ships at sea. The ICT infrastructure is strengthening ties to shore facilities.

Since the 81st Maritime Safety Committee in 2006, the IMO Member States work on the concept of e-Navigation clearly aiming at supporting human operators, not to replace them. One of its fundamental purposes is to harmonize data transfer between ships and shore-based facilities such as Vessel Traffic Service (VTS). The multiplication of uninterrupted communication systems with satellite support and enhanced data processing capacities with computers, has fostered the development and establishment of company-owned and -related Fleet Operation Centres (FOC) enabling the monitoring of numerous ships. Such systems allow to provide all support from the shore through the communication between human operators on-board and ashore [7].

What we observe here is not a direct vector towards an ultimate autonomous system like unmanned vessels but rather a gradual shift towards the integration of maritime operations into digitalization from both ship and shore. In this digitalization process, permanent connectivity between ship and shore has been justified by its promoters to enhance safe, secure, and environmentally friendly ship operation system. As part of ship operational data, a Master and his/her crew are also being monitored while leaving a degree of his/her autonomy on board a ship. Monitoring systems, decision-support systems and autonomous systems constitute attempts to influence and/or control ships' conduct from remote locations and potentially limit ship's crew inputs.

3 Leadership and Digitalization

In recent technological developments, influencing our everyday life, leadership is one of popular topics to discuss in management and organizational studies. During 14 years between 2000 and 2013, 864 articles on leadership were published in 10 top journals. Such leadership research include charismatic leadership; transformational leadership; strategic leadership; leadership and diversity; participative/shared leadership; and trait approaches to leadership [11]. However, by acknowledging a rapid change in businesses and organizations brought by digitalization, it is noticeable that there are very little research on the combined field of leadership and digitalization [12]. Such a gap between contemporary leadership studies and digitalization is also the focus of this paper.

3.1 Leadership and Organized Work on Board

Seafarers' organizational roles and responsibilities are specifically given based on the organizational ranks, such as a Master, Chief Officer, Chief Engineer, Second Engineer, and so on. A division of work is clear and each seafarer's work contributes to the organizational goal of a ship commanded by a Master. Based on the history of Merchant Navy, a traditional ship organizational structure mirrors an absolute hierarchy; A Master is an authoritarian who makes all the important decisions, including navigation, engines, cargo handling and others, and looks after his/her crew [13]. In exchange of ultimate power, a Master owe huge responsibilities and liabilities for ship, cargo, people, and environment under the international regulatory framework set out by IMO.

With all technologies introduced to ships, it is possible to assume that a Master's leadership and organized work on board would be somehow modernized. Indeed, some manual jobs were partially replaced with a new technology; for example, a manual chart work to make a passage plan can be done by using electronic charts like ECDIS. By pursuing an overall efficiency and productivity of work, how much has seafarers' work been integrated into technology? Did digitalization affect leadership and organized work on board?

Arguably, the way of getting the work done on board has not been significantly changed yet. A Master and the rest of the crew are basically in the same pattern of work despite technological development. On the contrary, a Master's responsibilities and liabilities are becoming even greater due to stricter legal obligations and newly introduced technical systems. It requires further training to update their legal and operational knowledge. This complex workplace on board creates a unique context where a Master is a leader bound by so many rules and regulations. In the era of digitalization, how this type of leadership is affected can be investigated from a human factor approach. New concepts, radically breaking with traditional hierarchies are hardly to find. Such approaches like task-oriented concepts to organize bridge teams' work for vessel's command [14] have opposite effects and increase number of crew.

3.2 Leadership in Digitized Maritime Systems

The permanent connectivity between ship and shore implies that a Master is no longer a sole decision-maker despite the confirmation of his/her overriding authority and responsibility as laid down in article 5.2 of the International Safety Management (ISM) Code incorporated in the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS) Chap. 9. As discussed earlier, it leads to the preliminary conclusion that the legal rules and regulations that form the basis for leadership of a Master on board are hardly influenced by technological developments as such. On the other hand, there is an obvious tendency to influence a Master's leadership by external (shore-based) monitoring facilities becoming more and more comprehensive and complex in a socio-technical system.

4 Methods

The research primarily explored the perspectives of current and earlier seafarers, from ratings to officers, onboard vessels as well as on land, regarding the relation between leadership and digitalization. An extensive literature review was conducted throughout the research. This paper is based on our case study in Norway. Norway was chosen because of the traditionally maritime nation with 100,000 km coastal lines and well-established maritime cluster. Norway is also known as one of the leading countries towards autonomous ships. In early 2016, the Norwegian Maritime Administration, the Norwegian Coastal Administration, the Federation of Norwegian Industries and MARINTEK (now SINTEF Ocean) took an initiative to establish the Norwegian Forum for Autonomous Ships (NFAS) [15]. Furthermore, Norway has led the establishment of the International Network for Autonomous Ships (INAS) in October–November 2017 [16]. Norway is eager to show a business case. The world's first autonomous containership, YARA Birkeland, is being implemented in a Norwegian fjord. The test areas, currently Trondheimfjorden, Storfjorden and Horten, will be expanded to Grenland and possibly Tromsø. By studying the case of Norway, it is possible to anticipate some of the future challenges and opportunities in terms of human-automation interactions and the issue of leadership.

All the accounts were taken from our case study in Norway in early 2018. Qualitative research methods include semi-structured interviews, group interviews and participant observation. Methods were employed in order to understand in-depth how digitalization is perceived and experienced by Norwegian seafarers and stakeholders in their maritime industry. Two group interviews were conducted in Oslo and Trondheim and the total of 18 people participated in interviews. The interviews were audio-recorded upon the participants' consent and transcribed for qualitative data analysis. A telephone interview with a Norwegian researcher as an expert was also used to verify our data collected in the field study.

5 Findings

Based on qualitative data analysis from our case study in Norway, there are three key issues important to the digitalization process in the maritime industry and its impact on leadership. The following sections explain (5.1) Impact of digitalization on organized work in ship operation; (5.2) Implications of digitalization for leadership; and (5.3) Leadership required in the era of digitalization.

5.1 Impact of Digitalization on Organized Work in Ship Operation

Norway as a traditionally maritime-oriented nation is still supported by people who want to work at sea. Even today, a good number of young people who have chosen to study at maritime education and training (MET) institutions are motivated with maritime desire as one of the MET teachers explains:

“Those guys that want to sail a ship, that still has this “I want to go to sea”, those guys still exist, and in all classes I know of, about 50 to 60 per cent of the students are like that. They have decided to go to nautical because they want to [go to] sea.”

It is true in the Norwegian context that the industry is supported by people who knows the maritime world. Nevertheless, the crew size has been significantly reduced due to economic pressures. Similarly, the industry’s main drive for technology seems to be economy as one union representative shared this view as:

“It’s about making money, and it pushes forward development of technology.”

Though technology is another means to reduce operational costs, partial automation or digitalized systems are still believed to require interventions by humans whose cognitive skills and tacit knowledge are essential for safe operation of ships as the same MET teacher explains:

“All those small things that engineers are doing now, like changing that wheel a bit, “I’ll have to take this one, I have to change this oil a bit now,” there’s something wrong, all those small things – can you automate those ones? (...) we can’t do this automated, it’s impossible.”

It was also mentioned during the field study that passenger ferries, particularly in short distance, have a good potential to the use of fully autonomous ships. However, one ferry captain questioned rhetorically:

“If you’re on a ferry, a cruise ship, transporting passengers, would you be comfortable on board a ferry and know that there’s no crew on board? I don’t think I would have done that.”

From the data and observation, seafarers were relatively optimistic about the impact of digitalization on their work. Despite the literature review which makes us reasonably assume that digitalization can influence patterns of organized work in ship operation, a radical change does not seem to be projected as an immediate event happening within their maritime careers. The current technological development is considered to be still possible to absorb in their business-as-usual operation of ships. This could lead to some surprising and sudden changes, one day in their work organization. With disruptive technology which is still in acceptable speed, Norwegian maritime professionals try to

negotiate their work space and responsibility in the partially automated socio-technical system. Subsequently, what are the implications of digitalization for leadership in ship operations?

5.2 Implications of Digitalization for Leadership

In the extreme concept of unmanned vessels where no human operators intervene unless the system requests so, there will be no leadership in the conventional idea of what a Master does. However, in the process of digitalization, including partial automation in which the maritime industry has been already experienced, there seems to be a room for leadership by humans. A Norwegian researcher also verified this view during the telephone interview that the survey participants in Norway identified 'leadership' as the number one quality for future seafarers/operators.

Then, what would be the role of human operators, in particular a Master, in the development process of digitalization? As digitalization within existing merchant cargo ships goes on, increasing computerization of systems will possibly affect the role of human operators, shifting towards increased monitoring of engine and navigational systems where a decreased degree of leadership to demonstrate is anticipated.

A case study of Norway also highlights energy efficiency on board as a driver for digitalization; for example, the government is pushing its strategic direction to be a global forerunner in the field of electromobility by creating economic incentives, such as the subsidized cost of electric (and other alternative) propulsion systems and the exemption from purchase tax and VAT [17]. It will contribute to lend human operators to monitoring as their principal roles, either on board and/or ashore. In terms of a Master's leadership, it is clear that a Master has no longer sole autonomy; a Master is one leader and there will be 'the other' - shore-based human operators and/or high-tech machines. It is sensible to consider more collaborative leadership through the human-automation coordination.

Furthermore, it is worth noting that the emergence of non-maritime leadership to operate ships will be also possible. We witnessed how internet giants, such as Amazon and Ali Baba, have involved in digitalization of commercial activities in shipping industry [18]. In Norway, technical experts explained that some manufacturers are looking for new solutions to their supply chain transportation needs. Especially, short inland routes spread out in Norway may possibly attract some manufacturers to invest and operate autonomous ships, thus they will be able to manage and control the whole supply chains. If traditional maritime leadership by a Master is transformed to non-maritime leadership in ship operations in the era of digitalization, what kind of leadership will be required in the future?

5.3 Leadership Required in the Era of Digitalization

The majority of Norwegian maritime stakeholders agreed to the need of adaptation to whatever changes the new era of digitalization brings to maritime transport operations. In terms of new skills required for future seafarers, the interview quote refers to commercial education which may enable onboard personnel to take over some of

business tasks from shore-based managers. Attitudinal quality was also mentioned as important for future seafarers by a MET teacher:

"That's the sort of skills that I mean that we have to develop further, because as I say, if we are moving some of the work tasks from shore on board, then the people on board must know how this cargo was bought, how they are sold, who's going to take it, who's insure it. How is the insurance at the moment. They stood, the traditional rite of whatever happens here in my problem, you have to remove that attitude. Being proactive on maybe saying that yes, we see the weather now, the change, we have to reroute the system now, and that discussion with the shore people, both persons understand what they're talking about. And maybe the ship guy can say, yeah, maybe we should reroute to another port and sell it, because that will be faster instead of everything. So, this is the short-term idea of getting more intermodal education."

From this account, leadership can be described as an ability to consult with a shore-based manager by proactively suggesting the best alternative solution for the company. It requires technical and cognitive skills to analyze and understand the situation based on ship operational knowledge as well as leadership and communication skills to support decision-making based on commercial knowledge.

This would be very different from the traditional sense of leadership displayed on board; A Master has a full autonomy and authority at all decision-makings. In fact, one of the Norwegian MET institutions has already introduced commercial subjects in the curriculum for future seafarers. With disruptive technology, boundaries between ship and shore, including the division of work, may become blur. A kind of co-management of ship and cargo operation between ship and shore may be a way forward from the analysis of Norwegian case study. It even suggests not only a human-automation (machine) coordination but also a human-human coordination between ship and shore with a new type of leadership.

In addition, the notion of leadership is extended to a pride of Norway as a maritime nation. Seafarers that Norwegians picture in their minds are multi-tasking with the combination of conventional maritime knowledge and contemporary knowledge of managing a variety of issues around shipping. The MET teacher states that:

"The whole broad picture should be that everybody in the maritime industry in Norway have a high skill level in certain areas, maybe some security and data chase and everything like that, and all engineers should be in green shipping and alternative fuels, because in two years, five years, ten years, we will get these new shifts all the time, and saying that we have to get new knowledge in the whole world. Look to Norway – they have it."

Norway has been leading the maritime industry for many years, thus it seems natural for Norwegian maritime stakeholders to envision their future as a strong maritime leading nation like their past and today's memories. In order to prepare for the future, Norwegian MET institutions are shifting towards research-based higher education. It is considered to resolve the current problem in the lack of qualified personnel in the shore-based maritime jobs. Such positions are currently occupied by highly educated foreign ex-seafarers. It is a rather strategic direction to become a world leader by resourcing Norwegian maritime professionals to the Norwegian maritime industry. In a wider context of leading the maritime industry, education and training seems to have an important role to play in building competences within the country to prepare for digitalization and autonomous future.

6 Discussions and Conclusions

Digitalization provides new opportunities to enhance the productivity and efficiency of ship operations beyond its traditional limits where reduced number of crew constitute nature of organized work in today's partially automated socio-technical system on board. The debates around autonomous ships and unmanned vessels often fall in technical, economic, and legal aspects of digitalization processes affecting the maritime industry. The lack of agreed definitions of autonomy makes it even more difficult to approach this topic.

However, there are few discussions on human factors, in particular, the impact of digitalization on leadership displayed on board the work organization. Based on the case study in Norway, the paper examined the impact of digitalization on organized work in ship operation, implications of digitalization for leadership, and leadership required in the era of digitalization. Norwegian maritime professionals appeared to be optimistic about the impact of digitalization on their work of ship operations, but the increasing level of technical support from shore to ship seems to put some pressure on Norwegian seafarers to negotiate their work space and responsibility in the partially automated socio-technical system. A future image of leadership on board can reflect both human-automation and human-human coordinations; in addition to ship operational knowledge, it suggests that future seafarers may benefit from a training course to build commercial knowledge.

Leadership remains as an important function of commanding a vessel as long as humans are involved. In addition, the process of digitalization has not significantly transformed the conventional notion of leadership by a Master yet his/her responsibilities and liabilities rather increased due to stricter legal obligations and newly introduced technical systems. The paper also referred to the possibility of non-maritime leaders who wish to operate ships and manage and control their whole supply chains. Digitalization will possibly allow new industry players to participate in ship operation businesses.

The limitation of this research is only taken from a case study of Norway and it will have a different result if developing countries like Philippines are studied. This paper also departed from a narrow definition of conventional leadership by a Master. Task-oriented concepts to organize bridge/engine teams' work for vessel's commands can bring about another scope of leadership-digitalization research. Finally, how laws and regulations can delimit human autonomy would be also an interesting topic for future research.

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Strategy and Structure in Public Organization

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Abstract. The functioning of the organization is related to the implementation of its mission and vision and the pursuit of specific goals set in the strategy. Regardless of the branch of production, sector of service or public administration, the strategy defining aims to be achieved and indicating the manner of their implementation it determines the path of development and survival in the turbulent times of change. The formal structure of the organization is also related to the functioning of the organization, regulating the level of dependence between the units inside it, creating a network of mutual connections in the form of an organizational scheme. The publication covers the features of the strategy as an obligatory document for public higher education institutions and the types and functions of the organizational structure specific to the sector of higher education in Poland. The article will present the relationships that occur between the organization's strategy and its structure in the area of higher education in Poland. The authors will seek answers to the question which of the two-factor system in public universities is an element that is more often subject to changes and whether the change of one of them always involves updating the other.

Keywords: Strategy · Structure organization

1 Introduction

By definition, each organisation is created by a certain group of people in order to achieve a shared goal. Goals are attainable when rational, measurable, adequate to a situation, determined in time and defined in a structured way. In each formally defined organisation operating in a rational way a set of objectives is determined as an action plan, which most often is then formed into a strategy. It is natural for most organisations that when assigning a set of objectives, they adjust to them the structure of the internal processes thanks to which the objectives can be achieved. A demand for human resources emerges based on such a structure of processes. In order for an organisation to function in a correct way the roles of authority have to be correctly defined and realised. Authority is inseparably associated with the notion of hierarchical relationships. Thus the notion of organisational structure emerges. A correctly developed organisational structure should assure full compatibility, convergence and harmony of both the individual and the group objectives [1]. Accordingly, the organisational structure is a formal mapping of dependencies – reporting lines within the organisation. The mapping defines responsibilities, issuing commands as well as enforcement of task performance. In most economic organisations the relation between strategy, process

mapping and organisational structure is determined in a clear and correct way according to the following order: first the strategy, then, on its basis, the structure of processes and only in the end (as a response to the human resources demand) an employment structure is determined. Yet it has to be kept in mind that economic organisations, i.e. the ones that have a clearly determined ownership structure and economic objective (most frequently associated with bringing profit to the owner or a group of owners) function slightly differently than the organisations that do not operate for the profit sake. A public university of technology, an example of an organisation that does not operate for profit, will be used as a case study in the article. The aim of a public higher education institution (HEI) is not work for profit but for development [2]. The specific character of this type of organisations enforces a slightly different method of defining a strategy [3] and building an organisational structure, based to a larger extent on academic tradition rather than on the rules emerging from the art of management.

Therefore building of both the strategy and the organisational structure is based on different paradigms and needs than rational premises resulting from the rules of management. A problematic issue in case of this organisation type is that it is difficult to define the entity performing the role of the owner and the role of the managing individual [4]. As a consequence the strategy is based on objectives that are not directly close to the organisation itself but they rather result from internal regulations and arrangements oriented towards achieving individual aims of internal entities in the organisation and some unspecified entities among external stakeholders. The entities influencing strategic goals include representatives of local governments, state government administration, business, community, applicants for studies and alumni. There exists a significant problem with distinguishing whether a strategy is based on rational premises favourable to the development of a given academic community and the region in which it operates. Hence it is difficult to clearly determine if a strategy is appropriate for further development of the organisation. The more it is problematic to detect to whom the university authorities report as to the owner. These difficulties with specifying the adequacy of the strategy to the needs of the university itself and of the region find reflection in the difficulties associated with construction of the organisation's internal structure. The research performed by the authors for a group of technical universities in Poland indicates that in most cases it is possible to observe a phenomenon of creating at universities structures based on the needs of their staff rather than on the needs resulting from the organisations' strategy. These needs of the staff include first of all the demand to maintain employment, which is supported and promoted by their direct superiors, who, in turn, are subordinates to their higher superiors. It is a frequent situation at universities that the predominant goal of their employees is not to compete with the outside entities (opposite to economic organisations) but to maintain the employment as the very aim in itself. Such an approach appears to be wrong only when looked at from the outside of the organisations. The university community itself is unable to identify such situations as risky for further existence of the university.

In order to assess the scale of the above phenomenon the authors present the way a strategy was developed and evolves and mechanisms with which the employment structure gets associated with the strategy. The research proved that the most common

motivation for elaborating a strategy is not the internal need for the organisation development but the requirement of legislation. As a consequence the organisation structure functions irrespective of the strategy. Yet these relationships are not clear, which means that it is hardly possible to determine whether there exists this strict relationship or if there is no connection at all. Most commonly the reality appears to exist in between these two extremities. The article presents the results of investigations in this area.

2 Research Method

A university of technology, with over 70 years of academic tradition, occupying leading positions in Polish higher education rankings was selected to be the object of the research. The research method is based on an insightful analysis of accessible documented information on the University structure and strategy. The article presents organisation structure of the selected HEI and the results of the overview of its strategic documents. The authors carried out the analysis of the above aspects in the selected university (as they developed in time) in the period of the recent twenty five years. All internal normative acts collected in the resources of the computer network of the university, including archival documents, were identified. Identification, analysis and in-depth study of these documents enabled to the authors formulating final conclusions and proposing improvement actions.

3 Results of Analysis

3.1 Strategy Analysis on the Basis of Internal Normative Acts

In the university's over 70 years history the earliest documented form of a strategy could be traced back as late as 25 years ago. The strategic document known as "the programme" was elaborated following the external legislation [5]. The first source document contains goals referring to the areas of university activities, at that time identified as the main ones, such as education, science and staff development. To a large extent the above refers to the role and mission of a University as described in the report on higher education [6], which is actually perceived positive by the authors. Yet in the original strategy the goals remain characterised by significant generalisation with no directions and no persons responsible for achieving the enumerated goals. As a result the strategy is impossible both to realise and to evaluate. However the original document refers to modifications in the management structure, from a centralised one to a decentralised one. In the opinion of early authorities the act of handing over the financial, infrastructure and human resources management processes to faculties served to support the achievement of the main strategic goals standing in front of the university.

Yet the above found no mapping in the strategy document. It has to be noticed at this point that in the analysed organisation the basic organisational units (faculties) were the ones that ought to concentrate their activities around common, university

goals. Still the authors do not analyse the internal structure on the central administration level. The history of changes of the strategic document adopted by the outgoing authorities suggests maintaining the programme “General development strategy” by the newly elected management bodies of the university. This situation clearly indicates the fact of continuation of the approved strategic goals, which again is positive. Yet the new strategy sets new tasks for realisation in particular areas (teaching, science, organisation and finances, as well as campus location issues). It has been noticed that the originally approved strategy did not specify time frameworks for realisation of strategic goals. Until the moment of elaborating a new update to the strategy the university published its mission in a separate document. The organisation mission, being the reflection of its vision [7] is the most important strategic communication [8], which makes it necessary to be published before the strategy or to become its integral part. After nine years the strategic programme underwent a thorough reconstruction and was published as the document entitled “Strategy: directions of development for the years 2008–2020”. In its first part the document contains “Programme of the University development”, and in the second part the mission, the vision, the goals and priorities can be differentiated. The strategy, elaborated under a statutory obligation [9], develops six adopted specific objectives into priorities that can be balanced by the tasks for realisation. Still the authors observed lack of time-frameworks and assignment of responsibilities as far as achieving of the set goals is concerned, which invariably makes the strategy inefficient for realisation and impossible to verify.

A presumption should be made that these reasons led to modification of the document after seven years and to transforming it into “Strategy of the University development for the years 2015–2020”, a document abiding to this day. The strategy currently functioning in the analysed university embraces 5-year time horizon, hierarchical structure of goals and determination of terms and units responsible for their realisation. 5 main strategic goals can be enumerated, each of them divided into a number of operational objectives. In order to realise altogether 34 operational objectives 136 activities were differentiated, for each of them a responsible person as well as the value indicator to be achieved in 5-year time horizon were assigned. Heads of units as well as the main authorities, i.e. the Rector, and Vice-rectors managing the units reporting to specific organisational divisions are responsible for realisation of particular activities. Implementation of the approved strategy and evaluation of the achieved results [10] are equally important in the process of the university strategic management as formulating the development strategy itself. Obtaining the university goals determined in the strategy becomes realistic, assuming that the activities are supported by appropriate assignment of duties and responsibilities of the staff in the organisational structure [11].

3.2 Evaluation of the Organisational Structure Variability

The timelines in which both the approved strategy of the university and the structure were evaluated can be symbolically divided into three periods. In years 1992–2000 the organisation structure was four times a subject to changes, each time altering basic organisational unit’s structure. In this period the organisation structure was not correlated with the strategy approved by the authorities and did not refer to it in any way.

Together with the strategy determined in a generic way the structure was a separate element in terms of goals realised by the university. In the second period, including the years 2001–2008, the organisational structure was sustained. It is considerably puzzling that both the organisational structure and the strategy remained unchanged in that time period. Supposedly the university authorities did not correlate a possibility to achieve the approved goals with a properly selected organisational structure, hence the lack of visible changes in both the aspects. The years 2008–2017 were the time of turbulent changes in the field of the university organisation. The functioning scheme for particular divisions and units was changed eight times. In this period petrification of structure was observed for basic organisational units with subsequent changes in central administration. The above is the consequence of the university decentralising carried out a few years earlier, which resulted in strengthening the role of faculty as the basic organisational unit supervising all subordinate resources, including human resources, infrastructure and finances. Organisational scheme from this period included eight updates, out of which three were convergent with the term of inauguration of a new academic year, which clearly indicates that organisation structure is treated as a tool in the hands of the university authorities for creating a system of areas, divisions and units following an intention of a selected managing group. This situation brings about the risk of performing changes in structure each time a new term of office is inaugurated and whenever a newly elected rector plans realising the objectives assigned by him/her with the use of an appropriate organisational system. When analysing the structure in the selected university during the recent ten years, changes in administration area were observed. The authors noticed creating and cancelling of particular units and of independent positions and changes of organisational subordination. In the authors' opinion these modifications result from changeability of the environment, including other competitive universities, and they should be perceived positively as an adjustment to turbulent elements of the external environment. Yet simultaneously the changes in subordination of particular units to a different organisational division disturb the possibility to achieve the objectives attributed to specific vice-rectors. Analogously to the previous versions of organisational structure, the current one turns out subjected to the tasks realised by the university authorities but remains incompatible with the functioning strategy.

3.3 Relationships Between Strategy and Organisational Structure on the Example of a Public University of Technology

In case of the analysed public university tracing the changes that have taken place during the recent 25 years in the area of HEI strategy and structure leads to the following conclusions:

- In HEIs lack of coherence is observed between the strategy document and organisational structure; in the university of technology studied as a sample these two elements constitute two separate aspects not supporting each other;
- In the analysed period of time the strategy of the sample university underwent 3 transformations, while its organisational structure was changed 12 times; which implies that the organisational structure is applied as the means of a temporary

management of the organisation, and the strategy is at the same time perceived as a lasting, long-term document;

- The structure of a public university is an element subjected to changes four times more often than its strategy; this may indicate the use of organisational structure as a form of exercising power without the awareness what consequences such changes bring for the organisation;
- In spite of expanding operational objectives and providing the path for activities together with the deadlines for their realisation, evolution of the university strategic document is not supported by accordingly updated organisational structure; these two pillars of organisation management function somehow separately, not supporting each other;
- Change of organisational structure was not convergent with the date of publishing a new issue of the strategy; this clearly indicates the fact that the University authorities are not conscious of the possibility or rather necessity to support strategy realisation by a proper structure of the organisation;
- Four times the change of organisational structure is convergent with the inauguration of the academic year, simultaneously in four cases marking the commencement of a new term of office of the academic authorities; this situation reinforces the authors' conviction that term-elected authorities use the organisational structure as the element of management;
- Strategy is a static element at the university in relation to the structure, which in turn becomes a dynamic element of the organisation; thus the organisational structure does not support the realisation of the approved tasks.

Summary of the inferences drawn from the research leads to conclusions that the University authorities develop a strategy due to external conditions, in particular the legal ones, at the same time wishing to maintain the system of work positions existing so far. Organisational structure, as the element most frequently undergoing changes, is not perceived as facilitating realisation of strategy [12]. Whereas a change in the field of structure is a manifestation of power to introduce new organisational solutions in accordance with the vision of the university represented by the university authorities or by other decisive groups [10].

4 Summary

The existence of relations between strategy and structure in a HEI is not equivalent to proven relations and influence of strategy on structure in production enterprises [13]. This theory, repeatedly confirmed by scientists, sets strategy as the basic determinant of structure [12, 14]. On the basis of the quoted research results variability of one factor in relation to the other is clearly visible. In the field of higher education it is the strategy that turned out to be the element prone to demonstrate inertia, whereas organisational structure changes with a significant frequency in relation to the approved strategy. The lack of coherence between organisational structure and strategy of a HEI is clearly visible. If a structure does not support strategy, basing on Chandler's theory [13], it can be implied that lack of support for strategy by the university structure can lower

efficiency of HEI's activities. The final conclusion of the considerations brings about the suggestion that in order for a strategy in a HEI to fulfil its purpose (i.e. to lead to achievement of the set goals), that strategy should be supported by HEI organisational structure. Following the statement by Drucker, regardless of organisational differences, it is the mission that, above all other elements, should determine the strategy, and the strategy should determine the structure [15]. Otherwise the strategy becomes a dead element that does not fulfil the main task, which is to achieve the advantage over competition through the increase of efficiency and increase of confidence in acting and mobilising all resources to achieve the set goals [16–18]. The realised activities aiming at achieving the objectives on the operational level are not supported by the organisational structure. Whereas the organisational structure becomes a tool in the hands governing the university. Yet undoubtedly with the use of structure organisations' authorities do not realise the approved university strategy but instead they aim at achieving the aims elaborated by themselves. The authors of the article made the attempt to indicate the reasons behind this situation, yet not all factors determining this relations have been identified. At this stage of considerations the question about the lack of close relationship between strategy and structure in organisation should be posed to any rector managing a public university.

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Work Team, Lean Manufacturing Production and Information Systems Transform an Enterprise

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Abstract. This study, an applied research, presents results of continuous improvement strategy implementation, deployed during ten years, into electrical motors manufacturing enterprise. Strategies substantiated on work teams, lean manufacturing production system and information system. The company started with two work teams, one in production, and another in the maintenance area. Up to last days' count with 62 work teams. The evolution of the work teams started since traditional teams up to interdependent self-designed teams, comprising specialists and multidisciplinary leader. This continuous improvement philosophy impact has been reflected in the creation of high-performance standards manufacturing process, organizational culture transformation, customer satisfaction level, zero defect philosophy implementation, and 100% continuous productivity flow. New concepts and techniques were implemented during the evolution of work team strategy, having a clue support: Information and communication technology, professional training, recognition and rewards, and continuous improvement.

Keywords: Work team · Lean manufacturing system · Information system
Human factor · Lean behavior

1 Introduction

The case presented is a company searching to get out of a critical situation toward an endurable milestone. It is focused on increment efficiency through a controlled system designed by them. It is seeking to eliminate activities that don't add value to the process. The enterprise found out that, the customer establishes the price by the quantity that it is determined to pay for the product. They developed a benchmarking with other companies, in the same field, from the results, they concluded, that their impact area was manufacturing cost; the manufacturing cost was affected by labor force costs and general expenses; among general costs were consumables, transport, and tools.

A work team is an individual's ensemble interdependent into their tasks, jointly responsible for the results, with objectives aligned toward a boarder system, prepared to

confront risks, and allows to reach relevant individual and team objectives [1] (Castillo 2014). After analyze the situation, the company agreed that the strategy they could control and implement were work teams as organizational unit, supported by lean manufacturing production and information systems. They decided that this was the path they wanted to follow.

According to Aguilar [2] (2002), high and middle management, cultural change is the main challenge for the implementation of work teams. Leadership should be able to build teams and provide direction, energy, cohesion, and support toward a process of change and organizational learning [3] (Llorens 2005).

Mental change is the first change required. At the beginning, the waste was not properly defined. Greatest wastes were the only attended; they used to work in reactive improvement. A new way of thinking was essential, directed to effective waste control, emphasizing where the waste was generated, the origin point. Also, fast and effective responses were demanded. The managers were aware that the waste is “tangible”. It was expected that a lot of improvement opportunities will show up, which will impel them toward continuous improvement.

2 Description

Thus, organization leaders got together to establish the work team's formation initial strategy. They determined as necessary: (1) define initial application areas, (2) determine waiting time for results and viability show up, (3) decide work teams structure, that could be by (a) service areas (by functions), (b) machinery (by line, shift, among others), (c) products assembly (by sections, mirror teams, among others.), (4) establish first roles and responsibilities, (5) develop processes mapping, (6) provide training according to department program, (7) define implementation strategy, (8) provide strategies to involve and transform organizational support to work teams, (9) settle initial evaluation and monitor of work teams advance (meeting results, waste controls, routing production areas), (10) implement reward program, and (11) implement satisfaction survey.

The company was expecting that a lot of improvement opportunities will show up and will impulse toward continuous improvement. According to Liker [4] (2004) into administrative and manufacture processes, is possible identify eight types of waste, that doesn't add value to the processes; and all of them were selected to be follow up: rework and discard, unnecessary movements, excess inventory, overproduction, waiting, over processes, unnecessary transport and unused employee knowledge and abilities.

3 Lean Plant Journey

Work teams were formed and they were receiving training on the necessary tools to allow them to walk through the planned path. Figure 1 Engine Plant TPS Lean Journey shows the enterprise evolution by phase and techniques used.

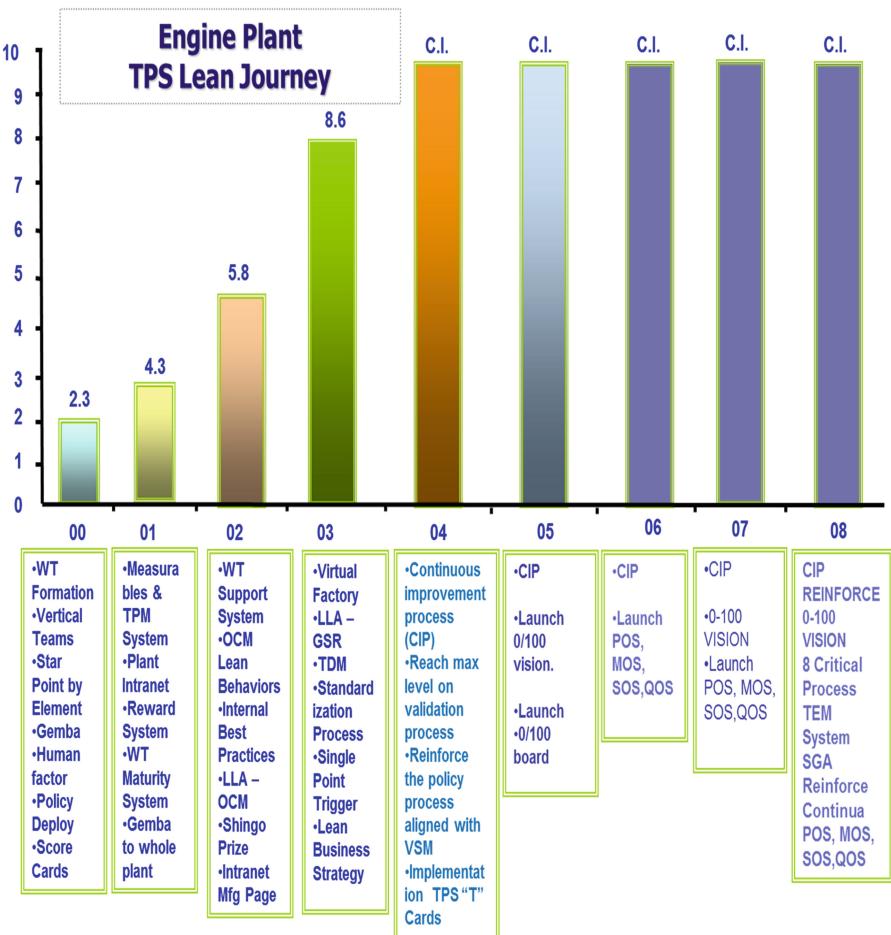


Fig. 1. Engine Plant TPS Lean Journey.

In the course of the first step, work team's transformation started. Originally their organization was vertical as traditional teams, where leaders on top and followers on bottom. During the training, the work team's advanced to a star point organization; where each member becomes a point of the star when it comes to his/her expertise area, and the rest are followers; star points are defined by elements. Also, Gemba, solve problems in real place with people involved into the process, daily, started at the time of this phase. Gemba is that management time be spent in working areas, looking to bring problems to the surface, understanding them and building organizational problem solving capability and empowering the work teams to solve problems.

The work team deployment strategy was established, scorecard by department was initiated. And the work team deployment strategy policy was set up. Generally, the process started to be focused in the human being, Human factor, it has become a key point, showing respect toward involved people, moving the whole venture forward.

During the second step, several systems were implemented, measurable objectives, total preventive maintenance system, plant intranet system, and reward system. Work Team Maturity System and Gemba covered the whole plant. The third step, Organizational Capability Metrics for Lean behavior was defined.

The company has been aware, that, due to today's competitive world, it cannot afford to waste resources, specially, those related to people, and looking to achieve the best performance development and leverage capabilities of the employees, implemented Lean Behavior. This system promotes the capability for rapid improvement and adoption to change. Also during this time Internal Best Practices, Shingo Prize and Intranet Manufacturing page were implemented. Communication and information system was starting to play its role.

Virtual factory, process standardization, single point trigger, and lean business strategy were established amid the fourth step. The information system has become a key point on the journey. Throughout the fifth step, the continuous improvement process was consolidated; the maximum level of process validation was reached. In the course of this step, the process policy aligned with Value Stream Mapping was reinforced. Besides, "T" cards on the Total Production System were implemented.

For the time of the sixth step, 0/100 Vision was established, a continuous improvement philosophy, which seeks forward to create in the manufacturing process, the highest standards and to transform the organizational culture, setting as the main goal of customer satisfaction Zero defects and 100% flow. During this period and subsequent years Continuous Improvement Process is sustained.

The seventh step set amid techniques to eliminate waste. 1. Safety Operating System, with the objective a review of the processes to evaluate health and safety. 2. Quality Operation System (QOS), including, Quality Process System (QPS), Poke Yoke and Visual factory. QOS furnishes a continuous improvement focused on defect prevention, reduction of variation, and supply chain waste reduction. QPS which objective is to illustrate the standard of every function/job where content and operative sequence is clearly defined. Poke Yoke: Error proof removal, this technique objective is to design dispositivo to prevent defects of specific problems. Visual factory consists on usage and deployment of controls, make the available immediate status of activities, standards, and deviations to everybody. The information could include: approved rates, first time thru levels, material rejection levels, customer complaints, scrap levels, process flow charts, samples, process visual aids, hazardous material, safety areas; Andon is a sample of, visual factory. 3. Delivery: Total Productive Maintenance (TPM), Fast change and Synchronous Material Flow (SMF) are indicators of this element. TPM as part of Continuous Improvement Process target at maintaining the equipment in the best conditions aimed at eliminating the eight big loses through work teams. Fast change, supply necessary bases to perform an effective execution of change models intended to reduce lost time. SMF is a process address to maintain a continuous material flow and products controlled by a fix and sequence schedule. 4. Cost, based on, Industrial Material Flow (IMF), defined as a process designed to produce continuous industrial material flow to obtain optimum conditions and to keep the operation in order. Also, includes Manufacturing Engineer (ME), his or her objective is to transform operations/workstation, taking the catalyzer role. 5. Moral and training the objective is to foment and coordinate the total participation of work team members and to be

directed toward continuous improvement; besides, to coordinate and foment work team members and necessary training. 6. Environment, focusing systems and politics toward environmental protection, taking care of each environment aspect declared by the company.

4 Work Team Evolution

Work teams were moving toward their autonomy steps according to how they were maturing. Work team's development process was performed from dependence toward independence until finally reaching interdependence. Initially, they were organized in a traditional way, the vertical organizational structure, presenting bosses and subordinates; dependency was from bottom to top, in this called low team autonomy. Work teams looking for independence worked in quality circles, up to a self-design team, reaching the interdependence, in this case, called high team autonomy.

During the first step, the enterprise was organized with two work teams: One Production work team, another Maintenance work team. The first one dedicated exclusively to operate the equipment; the second one just servicing the equipment; marking a clear division between them. In the route, to reach interdependence, the teams passed through quality circles, high performance work teams, toward freedom; then, making use of it (freedom), passed the steps of semi-autonomous work teams, self-directed work teams; until they got, the competence and capability to become self-designed teams, interdependent, in a continuous quest forward the excellence. The work teams received proper training in each level of the trail. These steps are presented on Fig. 2 Work teams' evolution.

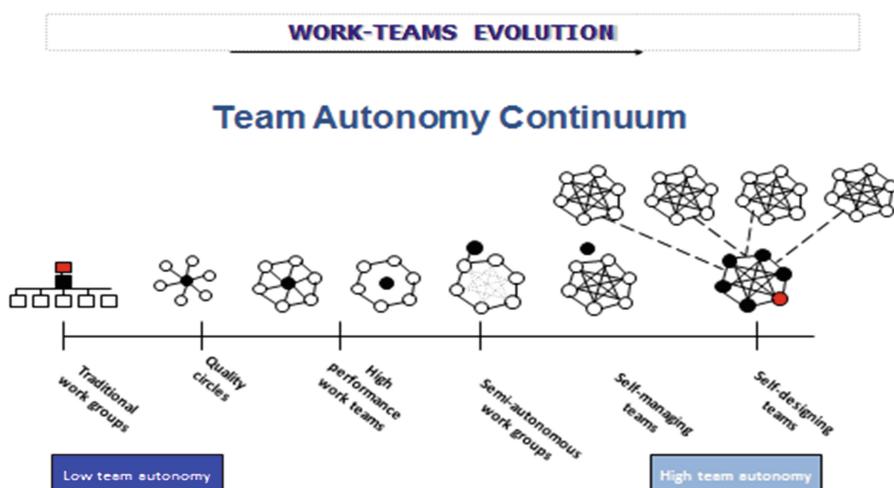


Fig. 2. Engine Plant TPS Lean Journey.

At the beginning, the enterprise had work teams spread by special skills reporting to the same supervisor. Around the second step, the manufacturing specialists and the assembly technicians with special skills were integrated into one position, and a new work team was born. The surplus labor was allocated to other operations. Additionally, new responsibilities were assigned to the new team, as safety, quality, poke yoke, visual administration, and total preventive maintenance.

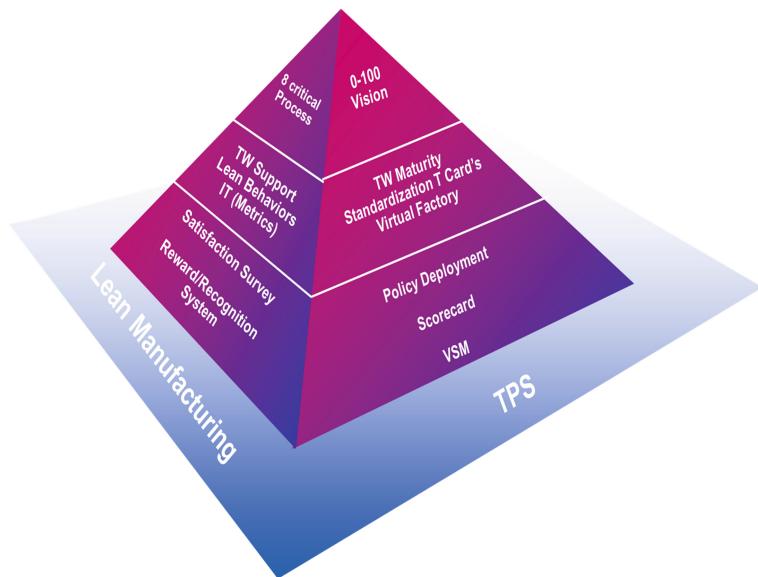
The following step was to reinforce the work teams thru star points, defining responsibilities for activities or functions inside the work team to add value and be focused on increasing efficiency in the key activities. The star points covered production, maintenance, quality, safety, delivery, cost, moral and environment. Sometime later, with the interdependent teams working, were divided into dimensions as transformation, safety, quality, delivery, costs, moral and environment with special development into areas as hydraulic, pneumatic, controls, among others. Each dimension is described in step seven of Lean Plant Journey. The work teams had been organized themselves to cover the twenty-four hours. Eventually, 62 work teams were consolidated, divided in (a) 23 teams in machined, eight in square components and 15 in round components; (b) 27 teams in motor assembly areas; (c) 12 teams in service areas, eight in maintenance and four in quality.

5 Key Factors

The key factors that had persisted over time had been divided into two big areas: First, Lean Manufacturing, which includes eight critical processes defined as work teams support, lean behavior, measurable indicators thru information and communication system in real time, satisfaction survey, awards and fringe benefits. Second, T Production System, compromise of Vision 0-100, the maturity of the work teams, T cards standardization, visual administration, deployment policy, scorecards and process value stream mapping, showed on Fig. 3 Key Factors of work team evolution.

5.1 0–100 Vision Based on Four Basic Rules

The Four Basic Rules of the 0–100 Vision. Start with one question, then the rule, the assumption, the problem signals and finally the responses related to the question. For example, *question 1*, How people are working? *rule 1*, All processes job should have specifications document that includes: content, sequence, and outcome; *assumptions 1*, Person or/and machine can perform the job specified; if the job is performed according to specifications, the product is defect-free; *problem signals 1* to show up, could be work procedure varies from a specification and/or defective products; *responses 1* would be improve training, improve process capability, and modify job specification. The second question is How jobs are connected? third question is about Physical Arrangement? fourth question: How to improve? rules, assumptions, problem signals, and responses are on Table 1. 0–100 Vision Based on Four Basic Rules.

**Fig. 3.** Key factors of work team evolution.**Table 1.** 0–100 vision based on four basic rules

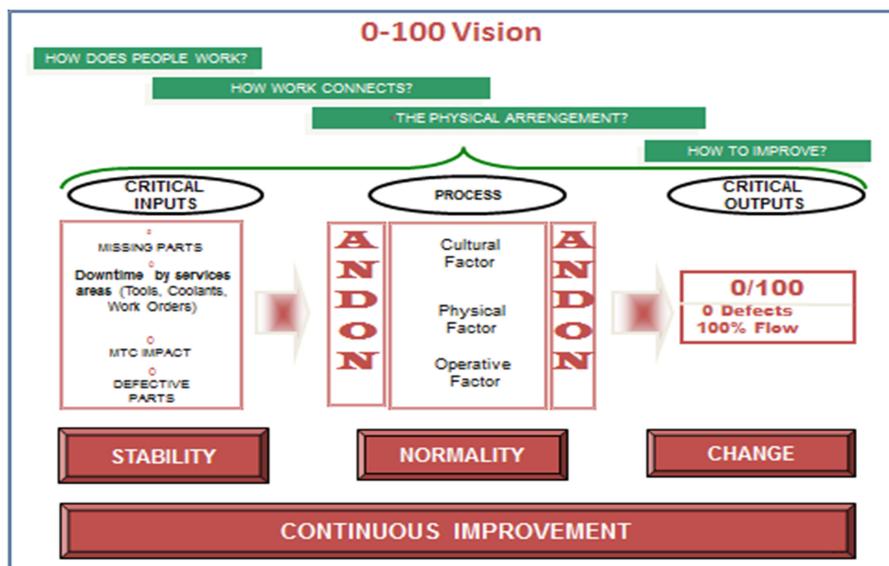
| 0–100 vision based on four basic rules | | | | | |
|--|-------------------------|--|--|--|--|
| No. | Question | Rule | Assumptions | Problem signals | Responses |
| 1 | How are people working? | All processes job should have specifications document that includes: content, sequence, timing and outcome | Person or/and a machine can perform the job as specified. If the job is performed according to specificities, the product is defect-free | Work procedure varies from a specification Defective products | Improve training Improve process capability Modify job specification |
| 2 | How are jobs connected? | Connections using clear YES/NO signals should link to every customer and supplier directly | Customer requirements should be known and define specific volume and mix The supplier has capabilities to respond the requirements | Responses to customer requirements do not keep pace with customer requirements Supplier is idle waiting for requirements | Determine real mix and demand Determine real supplier capabilities Retraining, improve or modify |

(continued)

Table 1. (continued)

0–100 vision based on four basic rules

| No. | Question | Rule | Assumptions | Problem signals | Responses |
|-----|----------------------|--|---|--|--|
| 3 | Physical Arrangement | Every product and service follows a single, simple and direct flow path | Suppliers involved in the flow path are required to follow it. Suppliers do not involve in the flow path are not required | A person or machine idle Unspecified supplier performs the job | Determine why supplier is idle, redesign flow path Determine why unspecified supplier performs job, redesign flow path |
| 4 | How to improve? | Workers at the lowest level, guided by a teacher (Sensei) to improve their own process | A specific change causes a specific, predictable improvement in productivity, quality | Actual result varies from the expected result | Determine why actual result differs from predicted Redesign the change |

**Fig. 4.** 0–100 Vision Continuous Improvement

5.2 0–100 Vision Continuous Improvement

How do people work? How does work connect? Physical arrangement? How to improve? These are questions to solve before setting 0–100 Vision Continuous Improvement. The answers to be spread, according to the point affected, on (1) critical inputs as missing parts, downtime by service areas, defective parts, as elements of process stability. The process is another point of this vision connected to normality through cultural factor, physical factor and operative factor reflected on Andon. Critical outputs are zero defects and 100% flow. Process highly intertwined to maintain continuous improvement as shown Fig. 4.

6 Eight Critical Processes

The eight critical processes are: (1) Start and closing shift confirmation, (2) 0/100 board, (3) 0/100 Reports, 0/100 Support, (4) Learning process, (5) Star point standardization, (6) Standardized work, (7) Kaizen N1, (8) Basic Administration of the

| PROCESS | TOOLS | | |
|---|--|----------------------|------------|
| 1. STARTUP / CLOSURE PREPARATION AND COORDINATION SHIFT |    | | |
| 2. 0/100 BOARD | 0-100 Board | POS QD FORMAT | CONSTRAINT |
| 3. 0-100 RESULTS / 0-100 SUPPORT | 0-100 FORMAT RESULT | 0-100 FORMAT SUPPORT | |
| 4. LEARNING PROCESS | EVERY WEEK MEETING TO ALIGN PROCESS | | |

Fig. 5. Eight Critical Processes

zone. The processes are tracked thru several reports and work team meetings. For example, for Kaizen N1, the report used is DMAIC Format. Figure 5, Eight Critical Processes presents some of these processes and the tools used.

7 Information Technology Work Team Support

The Information Technology (IT) is an enabler to identify and develop work team actions. The IT contributes to reduce pressures arising from increased workload, from results requested immediately, from multiple operations requested at the same time. Keep all the people involved at the same time. IT had become an enabler to identify and develop work team actions.

Structural and process barriers to work effectively had been removed working as a team. To sustain a successful strategy is necessary to understand the barriers faced by work teams. With this knowledge is possible to work as a bigger team, making a distinction between the relevance of the situation raised. Awareness and knowledge of what needs to change and why are vital in enabling change to occur.

Any work team need is loaded into the system, this request is sent automatically to the superintendent or manager via e-mail, they must respond back to the work team with an explanation if their request was accepted or rejected, and why, in addition, keep records of the dates assigning red or green colors. There is a logbook to track the requirements. The daily schedule is tracked in real time. Moreover, production logs, production cells, shutdown times reports are available. The system shows cost reports per unit.

Integrated Manufacturing Teams presented in Fig. 6, show how work teams are consolidated, the base are elements related to direct labor, people capable, highly

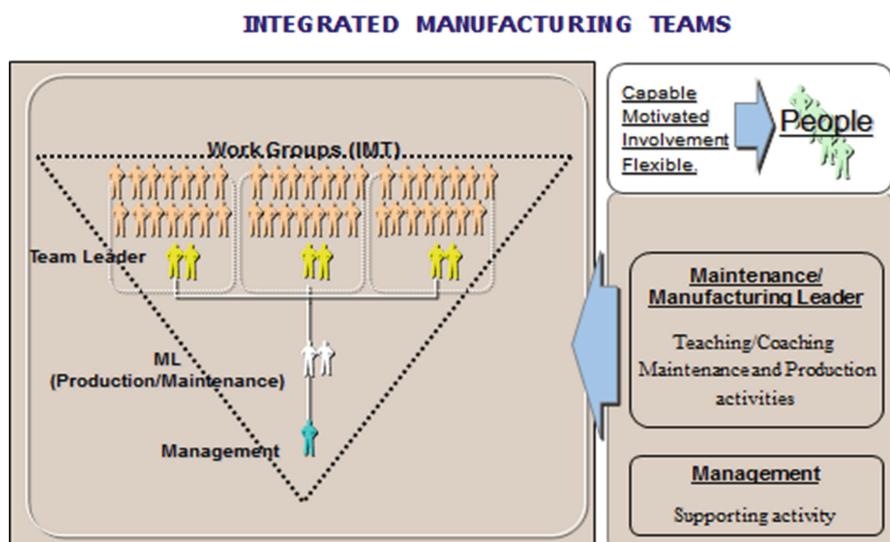


Fig. 6. Integrated Manufacturing Teams

motivated, involved in the process and flexible. Headed by the team leader, that drives them to give the best. Maintenance/manufacturing leaders are giving coaching and teaching team members. Management supports whole activity.

8 Conclusions

Work teams are essential management tools [5] (Gersick 1988). Work teams change over time would help to understand how they work effectively [5] (Gersick 1988). Although it is not clear the triggers or mechanisms to develop effectiveness into the work teams, the results show their benefit. The process of the enterprise presented was not easy, however working as a team and using technique properly enable them, to counting with them, making them part of the team, to be the best. Lean manufacturing, information systems and work teams intertwined showed to be a good strategy. The conjunction of strategies boosts the enterprise toward excellence.

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Relational Coordination in the Footwear Manufacturing Value Chain of the Province of Tungurahua, Ecuador

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Abstract. The objective of this research is to test the relational coordination model in the context of footwear value chain of the province of Tungurahua, Ecuador. For this purpose, a sample of 47 footwear producers obliged to keep accounting has been analyzed. By using a structured questionnaire, a survey has been applied for the collection of data. Pearson correlation coefficient has been used to test the relationship between relational coordination and the quality of relationships between footwear producers and clients and between footwear producers and suppliers. The relationship between relational coordination and footwear producer sales and the level of delays in suppliers' deliveries has also been analyzed. The results show that there is a significant statistical relationship between relational coordination and the quality of relationships. However, a significant statistical relationship between relational coordination and sales or suppliers delays has not been found.

Keywords: Communication · Human factors · Relational coordination
Shared knowledge · Communication · Value chain

1 Introduction

With a share of 5%, South America has the second position in APPICAPS' [1] footwear production top by continents, but no country on this continent is on the Top 15 of exporters. Brazil is the production and export leader of the continent and it is the only South American country in the worldwide Top 10 of manufacturers [2].

Ecuador is in the top five of footwear exports of the continent. In 2014, the country reached the second place with 3 million exported pairs with a value of \$58 million USD [3]. But this value is far from the value of \$1.076 million USD achieved by the leader of the region, Brazil, in the same year and it is decreasing. The Ecuadorian Institute for Promotion of Exports and Investments, PROECUADOR [4] informs us that exports of the leather and footwear sector has continually dropped since 2015, from 23.428 tons exported in 2014 to 8.160 tons in 2017. In the last year, the leather and footwear sector has registered a slight recovery of 9.43% of the exported volume, but its decline in

value (-9.48%) has continued. At a national level, the province of Tungurahua leads the footwear production with a share of 44% [5].

In the recent years, the competitiveness of Ecuador has been negatively affected by the deceleration of productivity growth along with the dependence on the exploitation of natural resources and stagnating exports diversification [6].

The manufacturing industry has an important contribution to the Gross Domestic Product (GDP) of 12.3%, but has low productivity and competitiveness levels [7]. Since the 1970s, Total Factor Productivity has explained less than one-fifth of the GDP growth in Ecuador, one of the lowest rates in Latin America [8]. The lack of coordination within the production chain is one cause of the low productivity levels.

Because of its dollarized economy, Ecuador cannot compete through currency devaluation and therefore, the best way to compete is with quality and productivity. Following the recommendation of World Bank to prioritize value chains in order to improve productivity and increase domestic value added [6], the Ecuadorian Government has included in the politics of the National Plan for the Development 2017–2021 the promotion and improvement of production chains [9].

To cope with the lack of export diversification, Ecuador needs to build local production systems with potential to be integrated in global value chains. But for this integration to occur, coordination mechanisms developed for the local actors in order to establish proper cooperation relationships are essential [10]. The negative evolution of the Ecuadorian footwear manufacturing industry in the last years, one of the highest of all economic sectors, proves that this industry needs an improvement of its competitiveness and a higher integration in global value chains. Thus, the objective of this research is to evaluate the impact of relational coordination mechanisms, based on Gittell's [11] relational coordination model, in the footwear value chain of Tungurahua Ecuador.

2 Footwear Value Chain Coordination

The concept of value chain has been first defined by Porter [12] as a “system of interdependent activities”. For Porter these activities are connected by linkages that can be a source of competitive advantage if they are optimized and well-coordinated. Because of the interdependence existing between the activities of the value chain, coordination is a requisite.

Malone and Krowston [13] define coordination as “managing dependencies between activities”. Based on this definition, value chain coordination can be defined as managing the dependencies between the activities of value chain members [14].

Another definition of coordination is the one proposed by Faraj and Xiao [15], as the integration of work in the context of task uncertainty and interdependence. These circumstances are generally met in the footwear manufacturing firms as they are part of the fashion sector, which is characterized by volatile product demand and the need for quick planning and production [16]. Additionally, work processes in fashion industries are generally highly interdependent and time sensitive [17]. The lack of coordination between the supply process, the industrialization of models and arrival of materials in the footwear sector leads to delays in the production process [16]. Therefore, good coordination of the

value chain becomes a key factor for the competitiveness of the footwear manufacturing firms and for the quality of their products. Also, the case of the footwear sector from Mexico shows that through coordination mechanisms, footwear manufacturing firms from developing countries can become part of global value chains [10].

There are a lot of factors that must be considered for the achievement of an effective coordination such as human factors, technology, strategies, rewards, profit and risks [18], relationships, shared knowledge, power and status [18, 19].

Gittell [11] has proposed a model of relational coordination in which coordination takes place through a network of relationships and communication dimensions. The relationship dimensions of Gittell's theory are shared goals, shared knowledge and mutual respect. These three dimensions are supported by frequent, accurate, timely and problem-solving communication.

Shared goals play a key role in the organizational learning and the creation of value. When participants in a work process have competing goals, they fail to understand how the other contributes to the creation of value [20]. This also leads to a lack of respect for each other's role and, consequently, they are more likely to blame each other for failures. They are also less likely to learn from the failure and use this learning from the improvement of performance. Relationships based on shared knowledge, shared goals and mutual respect create a climate of psychological safety context for people to engage in work processes and tasks.

Inefficiencies in communication with suppliers in the footwear sector have been identified as criticalities for the main supply chain processes and the consequence is a longer time-to market [16]. The lack of communication, especially for problem solving, along with the lack of shared knowledge, has been found to cause major delays in the supply chain [21].

Cameli and Gittell [20] applied the model in both intra-organizational and inter-organizational coordination in the health sector and proved that relational coordination with external providers helps hospitals to improve patient care.

3 Hypotheses

The main objective of this research is to evaluate relational coordination in the Ecuadorian footwear value chain and its impact on the quality of relationships and firms' performance. For this purpose, the relationships between footwear producers and clients and between footwear producers and suppliers have been analyzed.

There is no consensus in the literature about how to measure the quality of relationships, although several authors agree that it is a high-order construct with different related dimensions [22, 23]. The most common dimensions used to measure the quality of relationships are trust, commitment and satisfaction [22–24].

Mallada Martínez and Colom Gorgues [23] define the quality of relationships as the degree of convenience a relationship has for the stakeholders when meeting their needs. Instead, Cameli and Gittell [20] used relational coordination as a concept of high quality relationships. This conceptualization is distinct but not opposed to the concept used by Mallada Martínez and Colom Gorgues [23] and the results of previous studies show that the dimensions of the two concepts are related.

Cameli and Gittell [20] and also Prati and Parati [25] have analyzed the relationship between trust and relational coordination. Trust is influenced by the frequency and effectiveness of communication, by the predisposition of participants in a work process to share useful information and help their co-workers to solve problems [25, 26]. Inter-organizational relationships with high levels of relational coordination are characterized by a climate of mutual understanding and cooperation among organization members. Mutual respect and trust are dimensions that make up the foundation of this climate.

Communication has also been found to be related to the satisfaction of stakeholders that belong to clusters [23]. One the other hand, a satisfied stakeholder with the social results of the relationship appreciates the relationship with his partner, and, at a personal level, he likes to work with his partner, because he feels that his partner is concerned, respectful and willing to share knowledge [27]. Additionally, coordinating orders with actual consumption can increase consumer satisfaction in terms of meeting the delivery date and lowering logistic costs [28].

Based on the literature review, we propose the following hypotheses for the analysis of the relational coordination between footwear manufacturing firms and clients:

H1. *Relational coordination improves the quality of relationships between footwear producers and their clients.*

H2. *Higher levels of relational coordination between footwear producers and their clients explain higher levels of footwear sales.*

H3. *The quality of relationships between footwear producers and their clients has an impact on sales.*

Producers and suppliers are considered to be the most important actors in the value chain of the footwear sector, and the sole and heel suppliers are particularly important in the value creation [16]. Not only that the quality of a product highly depends on the quality of the raw material delivered by the suppliers, but also the lead-time of production in the footwear sector depends on the delivery time of the suppliers. These delays are caused mainly by communication problems.

The quality of the relationships between the manufacturer and the supplier is important, because it has an impact on the manufacturer's decision to have a long-term relationship with a supplier. If the relationships with the supplier is long lasting, the manufacturer can increase procurement efficiency and delivering quality and reduce transaction costs [22]. Therefore, in order to analyze relational coordination between the footwear producers and suppliers and its impact on the quality of relationships and delivery delays, we propose the following hypotheses:

H4. *Relational coordination improves the quality of relationships between footwear producers and their suppliers.*

H5. *Higher levels of relational coordination between footwear producers and suppliers explain a lower frequency of delays in their deliveries.*

H6. *The quality of relationships between footwear producers and suppliers has an impact on the frequency of deliveries' delays.*

4 Research Methodology

We performed a study among footwear manufacturing businesses from the province of Tungurahua, Ecuador. According to the Ecuadorian Internal Rent Service (SRI) [29] data base, in February 2017, there were 1437 footwear-manufacturing businesses in Tungurahua. SRI uses two typologies for defining business: natural persons and societies. Natural persons are defined as national or foreign persons who carry out an economic activity and may or may not be required to keep accounting. Instead, societies represent any entity that, having or not having a legal personality, constitutes an economic unit or an independent patrimony of its members. In February 2017, 98% of the footwear-manufacturing businesses were natural persons.

For the purpose of the research, the footwear producers declared to be natural persons obliged to keep accounting have been chosen as the population of this study. The election criterion was: because of this obligation, these businesses have organized information that allows them to better evaluate the value of their clients and suppliers. Another criterion was that these companies are better organized than businesses that are not obliged to keep accounting but less than societies. A total of 50 surveys were administrated at random in this type of organizations. We received 47 usable questionnaires with a response rate of 94%.

For the survey, a structured questionnaire was developed. The questions used for the measurement of relational coordination were adapted from Gittell [30], while the quality of relationships was measured according to Mallada Martínez and Colom Gorgues [23]. In the questionnaire, questions regarding the following aspects are included:

- The amount of *sales* in 2016
- The *communication dimensions of relational coordination (RC_Com)*: the frequency, the accuracy, the timeliness and the problem solving of the communication of the footwear producers with clients and suppliers.
- The *relationship dimensions of relational coordination (RC_Rel)*: the shared goals, shared knowledge and mutual respect between footwear producers, clients and suppliers.
- The *quality of relationships (QR)*: the trust, commitment and satisfaction of the footwear manufacturers with clients and suppliers.
- The *frequency of suppliers' delays*.

With the exception of sales, variables have been measured using a five-point Likert scale.

5 Results

The data obtained from the survey has been analyzed by using univariate techniques (frequencies and descriptive analysis) and bivariate techniques (Pearson coefficient) in order to evaluate the relationship between variables.

Before applying the Pearson coefficient, a mean score has been calculated for communication, relationships, the quality of relationships and delays. The mean of

communication includes the four communication dimensions of the relational coordination model. The mean of relationships included the three relationships dimensions of relational coordination, while in the mean of quality of relationships trust, commitment and satisfaction have been included. The mean of suppliers' delays incorporates the frequency of delays of soles and accessories suppliers, because these two type of suppliers are common for all footwear producers.

The National Institute of Statistic and Censuses (INEC) [30] classifies business according to the volume of sales: micro-businesses (up to \$100,000 USD), small businesses (\$100,001 USD to \$1,000,000 USD), medium A (\$1,000,001 USD to \$2,000,000 USD), medium B (\$2,000,001 USD to \$5,000,000 USD) and big businesses (higher than \$5,000,000 USD). According to this classification, the size of the analyzed businesses is the following: 70.2% are micro-businesses, 25.5% are small businesses, 2.1% medium B businesses and another 2.1% big businesses. The minimum amount of sales is \$1,500 USD and the maximum \$6,000,000 USD. This data explains sales' mean and standard deviation presented in Table 1.

Table 1. Media and standard deviation of the variables.

| Variables | Mean | SD |
|------------------|------------|------------|
| RC_Com_Clients | 3.86 | 0.76 |
| RC_Rel_Clients | 4.11 | 0.52 |
| QR_Clients | 3.70 | 0.70 |
| Sales | 342,398.07 | 955,454.28 |
| RC_Com_Suppliers | 3.89 | 0.69 |
| RC_Rel_Suppliers | 4.00 | 0.60 |
| QR_Suppliers | 3.61 | 0.84 |
| Delays | 4.05 | 0.84 |

Table 1 shows the mean and standard deviation of all variables. In the case of the relationship of footwear producers and their clients, the quality of relationships has the lowest mean score, of 3.70. The same situation is observed in the relationship between footwear producers and their suppliers, where the quality of relationship mean is of 3.61 (Table 2).

Table 2. Pearson correlations of the relationship between footwear manufacturers and clients.

| Variables | Pearson correlations | Sig. (2-tailed) |
|-------------------------------|----------------------|-----------------|
| RC_Com_Clients-RC_Rel_Clients | 0.50 | 0.00* |
| RC_Com_Clients-QR_Clients | 0.62 | 0.00* |
| RC_Rel_Clients-QR_Clients | 0.38 | 0.01* |
| RC_Com_Clients-Sales | 0.23 | 0.12 |
| RC_Rel_Clients-Sales | 0.10 | 0.52 |
| QR_Clients- Sales | 0.15 | 0.32 |

*p ≤ 0.05

The correlation between relational coordination and the quality of relationships is significant ($p \leq 0.05$), thus H1 is validated. However, Pearson coefficient is higher for the relationship between communication and the quality of relationships (0.62) than the correlation between the relational dimensions and QR_Clients (0.38). These results reinforce Gittell's [11] findings that relational coordination can improve client experience.

Instead, a significant correlation between relational coordination and sales and between the quality of relationships and sales has not been found. Therefore, H2 and H3 are not validated. This does not mean that relational coordination cannot have an effect on sales and it is an aspect that must be further investigated.

Additionally, a significant correlation (0.50) was found between the communication and relationship dimensions of relational coordination. This result reinforces Gittell's [11] definition of relational coordination as a reinforcing process (Table 3).

Table 3. Pearson correlations of the relationship between footwear manufacturers and suppliers.

| Variables | Pearson correlations | Sig. (2-tailed) |
|-----------------------------------|----------------------|-----------------|
| RC_Com_Suppliers-RC_Rel_Suppliers | 0.54 | 0.00* |
| RC_Com_Suppliers-QR_Suppliers | 0.45 | 0.00* |
| RC_Rel_Suppliers-QR_Suppliers | 0.52 | 0.00* |
| RC_Com_Suppliers-Delays | -0.25 | 0.09 |
| RC_Rel_Clients-Delays | -0.04 | 0.77 |
| QR_Clients-Delays | -0.04 | 0.78 |

* $p \leq 0.05$

The correlations between the same variables have been analyzed for the relationships between footwear producers and suppliers and the results are similar. H4 is validated, as there is a significant correlation between communication and the quality of relationships with the suppliers (0.45) and between the relationships dimensions of relational coordination and QR Suppliers (0.52). However, in the case of the relationships with the suppliers, Pearson coefficient is higher for the relationship dimensions of relational coordination than for communication. The results reinforce the statement of Prati and Prati [25], that relational coordination fosters a cooperative environment and interpersonal trust in organizations.

Even though previous studies have found a relationship between coordination and delays [21], in the case of the footwear sector of Tungurahua, there is no significant correlation between relational coordination and suppliers' delivery delays. The same result was obtained for the relationship between the quality of relationships and suppliers delays. But a more detailed analysis of the relationships between footwear producers and suppliers is necessary in order to determine which factors can affect the impact of relational coordination on delivery delays.

6 Conclusions

Value chains are created because generally one firm has not the sufficient resources to reach its goals. Manufacturing companies, especially small and medium businesses, need to build networks and partnerships with suppliers and clients in order to create sustainable competitiveness in the global market.

The Ecuadorian footwear sector is one of the most relevant in various provinces, especially in Tungurahua. However, in the last years, Ecuador has experienced a significant decline of its competitiveness and productivity and the footwear sector has registered one of the highest drop rates in exports. Developing countries, such as Mexico, have proven that by building business systems through coordination mechanisms, the national footwear sector can be integrated in global value chains. The strengthening of value chains is also one of the measures proposed by the World Bank to Ecuador for the improvement of productivity and it has been included among the Government policies.

In this research, the impact of relational coordination dimensions proposed by Gittell on the quality of relationships of footwear value chain from Tungurahua, Ecuador, and on footwear producers' sales and suppliers' delivery delays have been evaluated. For this purpose, an analysis of 47 footwear manufacturing firms of the province of Tungurahua has been performed using Pearson's correlation coefficient.

The results show that there is a significant correlation between relational coordination and the quality of relationships between footwear producers and their clients and suppliers. Findings of this study suggest that footwear producers must implement relational coordination mechanisms to improve the quality of relationships with their clients and suppliers. The relational coordination mechanisms may include boundary-spanners role, inclusive cross-functional meeting across and cross-functional routines that map out the flow of tasks between participants and clear up the connections between them. These mechanisms can also be supported by the implementation of an information system. It is also recommended for the footwear producers to share the information of their shoe models with their clients and providers by using a standard code system, as previous studies show that the lack of it produces deficiencies in communication [16].

Instead, there was not found any relationships between relational coordination and footwear manufacturing firms' sales or suppliers' delivery delays. The same results were obtained when analyzing the relationships between the last two variables and the quality of relationships. It is necessary to perform further research on these particular issues, as results could have been influences by characteristic factors of the Ecuadorian footwear sector that must be identified. The results could have been also influenced by the limitations of the study.

One of the limitations of the study is the difficulty to obtain data about sales. During the survey, we perceived a lack of trust in offering this data, as some firm owners believed that we could be SRI officials or related in some way with this public institution. Another limitation is that only the perspective of footwear producer has been analyzed and it is necessary to apply the survey to suppliers and clients. It is also important to analyze the levels of task and process integration of the footwear value chain of Ecuador.

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Healthcare Transformation Through Change Management Process for Innovation

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Abstract. This analytical survey-based article aims to explore options linked to the process of effective change management in a European public-sector healthcare organization. The aim of the research is to suggest collaborative innovative options combined with leadership solutions to effectively finalize corporate reformation process targeting the regions of Vaasa, Laihia and Vähäkyrö, (i.e., areas situated in the northern part of Finland). This review-based analysis offers multi-perspective approach by covering the knowledge linked to the concept of innovative healthcare business research in addition to highlighting the aspects of the ADKAR model as a prominent source to evaluate and highlight healthcare change management process by identifying the resistance points.

The findings of the paper offer extensive foresight into the change management process to pinpoint the areas that require change management process improvements to harness the public-sector healthcare process reformers to rectify the change barriers in the light of respondent's experiences as well as the Health care change management model's recommendations to strengthen quality health and social care solutions.

Keywords: Collaborative innovation · Leadership · Change management
Health care · Corporate reformation process

You are a product of your environment. (William Clement Stone)

1 Introduction

Healthcare industry has strongly diffused into the public as well as private sectors of almost any economy as compared to the normal industrial setups. The very logic to categorize it different than the rest of the service industries is the complexity within its operational setup and work design, the serious level of need to have motivated staff members and the sensitivity of its products and profits (i.e., medical treatments, reputation and good will and financial returns respectively).

This industrial sector holds significant meanings for the concept of service quality towards their internal customers (i.e., Regulators, management and staff members etc.) in addition to the external customers (Patients, their families, suppliers and competitors etc.). Furthermore, the new technological advancements, curious and more demanding

clients, growing fiscal constraints, impact of globalization, are some of the well justified justifiable reasons for the people to raise their level of expectations as well as the demand for the quality health care facilities that assures high-quality services with intense focus on efficient healthcare services.

2 Literature Review

2.1 Innovations in Healthcare

The concept of innovation is regarded as a primary component of business productivity in addition to be considered as a driving force for competitive survival (Zaltman et al. 1973; Kazmi and Naaranoja 2013b; Kazmi and Takala 2012b; Kazmi and Kinnunen 2012). According to West (1990), innovation is defined as the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, that are new to the relevant unit of adoption and designed to significantly benefit the individual, the group, or wider society. Innovation in healthcare offers viable solutions for governments to maintain cost control and ensure health care quality effectiveness. Product innovations are the most effective source for generating incremental revenues for organizational survival and profitability (Johne 1999; Kazmi and Naaranoja 2013b; Kazmi and Takala 2012a; Kazmi et al. 2014). Innovation is defined as the initiation of something new that may take place through either of the forms; creation of a significantly improved product (good or service), or a process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (UNESCO Institute for Statistics 2005). Similarly, Omachon and Einspruch (2010) defined the concept of Healthcare innovation as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs. Innovation can also be categorized through its impact on stakeholders as non-disruptive or disruptive. A non-disruptive innovation is generally referred to as incremental (Hamel 2000). Disruptive innovations, are also called radical innovations (Harvard Business Essentials 2003).

2.2 Organizational Collaboration

Collaborative capability is typically conceptualized on organizational or individual level as a set of attributes that actors employ to collaborate successfully (Ulbrich et al. 2011). According to these authors, collaborative capability of teams is characterized by two components: an attribute-based perspective that focuses on capabilities of single actors or organizations and a perspective on group dynamics that describes how teams successfully develop collaborative capability. Collaborative capability is a major contributor to an organization's competitive advantage (Tyler 2001). According to Orchard and Curran (2003), interdisciplinary care enables "a partnership between a team of health professionals and a client in a participatory, collaborative and coordinated approach, share decision-making around health issues."

According to the research literature there are three primary mechanisms underlying successful innovation through collaboration.

- ***First mechanism is referred as the ‘activation of relevant capabilities’:*** To cultivate innovations collectively, the work teams need to access their complementary capabilities. The alliance process literature offers several insights into how the partners or collaborating teams might activate their relevant capabilities (Hamel 1991; Larson 1992; Uzzi 1997; Arino and de la Torre 1998). This referred research work suggests that mutual learning, frequent interactions, and trusting relationships are likely to offer numerous benefits. However, few alliance studies suggest that when competitive tensions are reduced, partners are more likely to activate their relevant capabilities (Hamel, 1991; Khanna et al. 1998, Katila et al. 2008).
- ***Second mechanism underlying successful innovation is referred as ‘deep and broad innovation search trajectory’:*** In the innovation literature, a search trajectory is defined as a series of ‘recombination’s’ of existing knowledge, technologies, and other resources (Nelson and Winter 1982). Taken together, the innovation search literature suggests that both deep and broad search trajectories are necessary for innovation. Deep trajectories stimulate innovation at least until the limit of useful combinations is reached, while broad trajectories stimulate innovation by introducing novelty.
- ***Third mechanism underlying successful innovation is referred as ‘mobilization of diverse participants over time’:*** diverse participation is linked to innovation and firm performance in multiple contexts (Reagans and Zuckerman 2001). Here an example is a study conducted by Klein and colleagues (Klein et al. 2006) in a trauma unit further emphasizes the role of leaders in the mobilization of diverse participants. By observing the treatment of 175 patients, they found that senior leaders repeatedly delegated leadership to and took it back from junior leaders to generate reliable performance as well as to build the skills of novice team members. A similar study by Edmondson et al. (2001) was a search on hospitals that implemented new minimally invasive cardiac surgery technologies. They found that successful implementation involved an active enrolment process by which new team members were motivated to join by leaders and then subsequently engaged in practice sessions. A key lesson is that the mobilization of diverse participants requires leaders to recruit and instruct employees. Mobilization is not automatic.

2.3 Change Management

Change management takes the help of basic frameworks and mechanisms to manage any organizational change effort with the aim to maximize benefits and minimize the change impact on the targeted workforce and avoid interferences (Kotter 2011). However, the culture, internal and external pressures and reasons for resistance, differ from one organization to another (Kotter 1995). The concept of change management is a collective approach to combine various methodologies to prepare and support individuals, teams, and organizations in making organizational changes. The few among the major reasons enforcing organizational transformations are mainly; (i) the

introduction of new technological inventions and innovations, (ii) forces of the external competition, (iii) customers' demands or the (iv) changing expectations of the workforce (ITIL 1999).

3 Research Methodology

Current study is a combined research venture with the collaboration of the public-sector policy formulators (i.e., Ministry of Health, Finland and the Industrial Management, Production Department, University of Vaasa) to analyze and suggest healthcare reforms highlighting collaborative innovation and its continuous improvement thereafter for change process maturity. The localities under research focus were (i) *Vaasa*, (ii) *Laihia* and (iii) *Vähäkyrö*, situated in the northern part of Finland. The proposed collaborative innovative change process was focused and designed for the work departments, namely; (i) *Physiotherapy*, (ii) *Dental Units*, (iii) *Child and mother care*, (iv) *general physician services* at the referred targeted localities. An overall comparative analysis was done to investigate the current work situation with reference to the margin between the desired levels of behavior pattern at the selected dimensions (i.e., Care, Commitment, Confidence and creativity).

To evaluate the research conclusions, the authors have explored the maximum level of information relating to the following aspects of the OSUVA case, to match the current problem situation and the present work level with the desired level by implementing the ADKAR model (Prosci 2002, 2004, 2013) for identification of weak areas for effective change management process handling:

- Current work situation of the target locations (i.e., the knowledge related to the work conditions, work distributions and reporting hierarchical loops and channels),
- The earlier efforts by the policy formulators to enforce collaborative change initiatives. An over impact of earlier change initiatives on the employees' practical work efforts and on their emotional well-being,
- Also focused on the sensitive nature of work output required by the healthcare workers in the domain of service quality and level of responsibility that demands mentally fresh and physically fit workforce.

3.1 Sample and Data Collection

In the case study, the research methods namely; (1) *especially devised open-ended questions based questionnaires* (2) *informal interviews* and (3) *group discussions* were combined. Feedback from the selected sample size of 35 respondents representing the targeted localities- (i.e., Laihia and Vähäkyrö) was obtained. The selected sample represented the cross hierarchical levels (i.e., senior management, line management and staff etc.) as well as different operational work units (i.e., (i) *Physiotherapy units*, (ii) *Child and mother care units*, (iii) *Dentistry units* and the (iv) *general physician units* etc.). The questions used in the research inventory were prepared to cover four aspects; namely (i) care (i.e., well-being), (ii) commitment, (iii) creativity and (iv) confidence, to measure the respondent's current level of referred potential in the working

environment. The study results will then be used to evaluate and interpret the gap between the current levels of team's potential on four selected categories (i.e., Care, Commitment, confidence and creativity) as compared to the desired level. Such analysis will finally be utilized to suggest collaborative innovative management solutions for organizational sustainability and continuous improvement.

4 Results

To evaluate the feedback obtained from the target sample after the implementation of the open-ended research-based questionnaires and interviews is displayed through the following graphic representation:

Figure 1 represents the respondents capability measured through their desired level of support towards each selected dimension. According to the results the responded reported higher level of support to the selected dimensions (i.e., 92%, 83%, 84% and 93% for care, commitment, confidence and creativity levels respectively). However, respondents' practically exerted approximately the half amount of actual effort at the scale of first three dimensions (i.e., 45%, 55%, and 48% for care, commitment and confidence respectively). It is also noted that the gap exceeded the most at the creativity level (i.e., 29%).

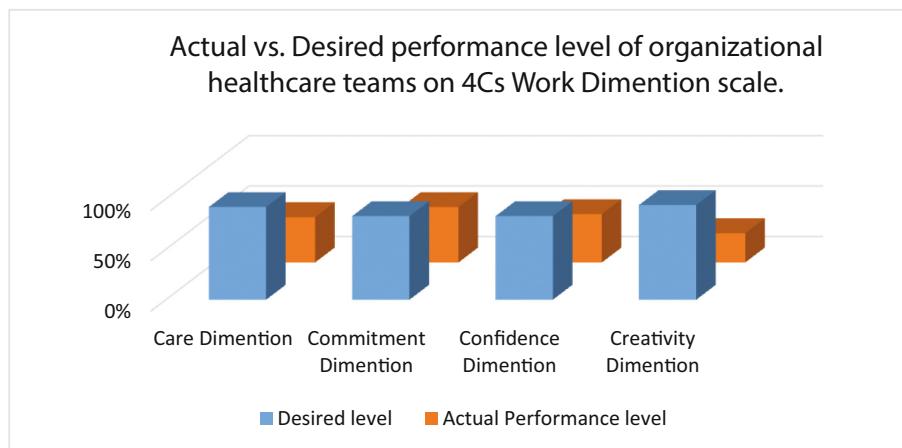


Fig. 1. Actual as compared to the desired performance level of organizational healthcare teams at selected work dimensional scale.

5 Analysis

The results of the study revealed employees discontent, mistrust, strong emotional barriers and feelings of being ignored while forming organizational innovative plans.

In addition, the case analysis revealed that fact that the target employees of the work localities are blocked at different levels of change process. For example, the

feedback analysis identified that young workers of the work localities are blocked at advanced levels of change where they fear to confront with the new knowledge and ability adaption while the senior members of the workforce are struggling at the initial levels of change process. According to them, the old ways were more comfortable and desirable options.

Consequently, the above facts justify that to streamline the process of collaborative innovation in the OSUVA case context, ADKAR model (Prosci 2002, 2004, 2013; Kazmi and Naarananoja 2013a, Kazmi and Naarananoja 2013c, d; Kazmi and Naarananoja 2014) is the relatively viable model due to the following reasons:

- (i) ADKAR (Prosci 2002, 2004, 2013) is the abbreviation of the human abilities namely; Awareness, Desire, Knowledge, Ability and Reinforcement. Hence the ADKAR model focuses on each ability to guide and streamline the change management process.
- (ii) ADKAR (Prosci 2002, 2004, 2013) model has the ability to reflect or pinpoint the level of “readiness” among the employees at each phase of the change process to support the management to devise compatible action plan to develop readiness (Prosci 2002, 2004, 2013; Kazmi and Naarananoja 2013a, c, d).
- (iii) Such capacity of the research model is especially required in the OSUVA case condition where the employees had already developed strong resistance towards the implemented change process. Furthermore, the organizational environment as well as the work practices were seen as the agents of resistance towards establishing open communication flow which is a prerequisite to promote positive change in change literature. ADKAR model (Prosci 2002, 2004, 2013) offers the option of displaying the “barrier point,” that provides the opportunity to clearly identify the nature of obstacle faced by the team member(s) at each change stage. This makes ADKAR a strong tool to help the organizations to support the change process by helping their employees to cross over each stage smoothly.

Figure 2 reflects that the ‘Awareness’ about the problem situation by the target sample is the barrier point in the change process, then one will see little or no evidence that the change is taking place unless the target sample is coached or helped to overcome this stage.



Fig. 2. Indication of point barrier at awareness stage

The Fig. 3, above displays the change process barrier point at ‘Desire’ stage. The said situation reflects that the employees have no desire to change his or her working behavior in accordance with the organizational change initiatives. This is the most obvious, yet important, observation: It reflects that the change is not happening with this person. This is what the authors of the case study had witnessed in the OSUVA

project. The majority of the employee's feedback, through the interviews and questionnaire response reflected 'Desire' the barrier point. It has also reflected that the change managers in the OSUVA project are unable to take proper and timely measures to create the desire among the case subjects to change, prior to implementing the hard change practices. Henceforth, the behavior sensitization element prior to the actual change practices implementation was found missing that has harmed the smooth transformational process.



Fig. 3. Indication of point barrier at **Desire** stage

Figure 4 above reflects the barrier point at 'Knowledge' stage, while the organizational change process. At such point the often react by admitting that they lack the necessary skills to cope with the change initiatives. Hence, it's the responsibility of the management to support the workforce through sessions of open communication and activities of knowledge enhancement techniques.



Fig. 4. Indication of point barrier at '**Knowledge**' stage

Figure 5 reflects the barrier point at 'Ability' stage, during the organizational change process. At such blockage point the employees continue to seek help from their manager or co-workers and resist independent responsibility taking in official tasks etc.



Fig. 5. Indication of point barrier at '**Ability**' stage.

ADKAR model provides the basis to comprehend that when the employees lack recognition, reward and reinforcement for change, then one should expect a decline in their enthusiasm and energy level around the change, and even in few cases employees tend to simply revert back to old ways of doing work and causing the collapse of the change process. Although, the ADKAR model doesn't provide the clear-cut solutions to support organizational continuous change process for organizational effectiveness through innovative ways but it offers opportunity to the change formulators to timely identify the obstacle hindering the organizational change process. It helps the

management to support the team members to overcome or cross the hurdle and move forward smoothly to support organizational change process efficiently and effectively (Fig. 6).



Fig. 6. Indication of point barrier at '*Reinforcement*' stage

A. Managerial Implications

The research pattern introduced in the subject case study can support the policy formulators or the change implementers to view the significance of introduced methodology and change implementation rationally by comparing the target situational factors before designing suitable organizational change plans with stage wise support process to achieve change process success, operational control as well team support.

B. Future Research Avenues

Our research effort can open following avenues for further research and testing:

- The implementation of similar change management approach in different organizations to evaluate the comparative results to strengthen the knowledge base.
- To extend the study by adding the approaches of strategic management and transformational leadership to design change supportive organizational techniques.

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Design Activates Six Values for Cities: A Report of the “Design for County” Programme

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Abstract. A new round of worldwide science and technology development and industrial change is forming a historic intersection with the economic development mode in China, meanwhile, the structure of global industry is being reshaped. As one of the core approach to China innovation development, design, needs to carry out advanced design innovation strategy, which could realise the co-creation of research institutions, design consultancies and companies. However, the unbalance regional development of creative industries is still a prominent problem. The “Design for County” project (DFC) is in order to promote the integration of the front, middle and the back end of the design innovation. The project is connecting design talents and resources in Shanghai with traditional industries in second and third class cities, which could enhance traditional enterprises’ innovation capability, activate the vitality of local market, and accelerate regional economic transformation and upgrading. Through the practice of DFC, researchers concluded six values that the project conducts for cities, including regional resources connection, industrial value promotion, creative knowledge spread, entrepreneurship opportunity, intellectual property mining and platform value.

Keywords: Creative industry · “Design for County” · Design Regional value

1 Introduction

A new round of worldwide science and technology development and industrial change is forming a historic intersection with the economic development mode in China, meanwhile, the structure of global industry is being reshaped. To face the challenge, the Prime Minister Li Keqiang indicated that the country should implement the strategy of innovation driven development, encourage entrepreneurship and innovation in all industries, and stimulate the vitality of the market. Relying on the “Internet Plus Initiative” to promote new technologies and business operations, improve the employment situation, and encourage new economic growth. Besides, the new economy is becoming more

important in optimising supply, supporting growth, absorbing employment and improving people's livelihood. According a subject report from China Industrial Design Association (CIDA), "Research on international status and trend of design driven innovation development", China needs to carry out a strategy of transcendental innovation development. They suggested to make changes in the system, so that the advanced research, experiment and innovative design can be transferred to business practice more effective than before. Also the design innovation chain should be constructed, in order to change the separative situation between the front (design requirements), middle (design process) and back end (production and commercialisation) of the creation chain, and achieve "co-innovation" among multiple elements. Finally, China should pay attention to fostering innovative talents, attracting global designers to gather in this country, while enhancing the quality of higher education, realising the pluralistic integration of design education, and popularise design knowledge to improve awareness of the people's innovation. Thus gradually set up the image of Chinese design.

Currently, with the promotion of the market and the policies, the creative industry of China has entered the transition period of integrated development. New entertainments based on the Internet have become one of the most popular lifestyles for young people, meanwhile, the integration of culture and technology, finance, and lots of traditional industries (e.g. tourism, sports and agriculture) has expanded the boundary of creative industries. However, the imbalance geographical distribution of innovation resources is still a prominent issue which is basically consistent with the uneven regional economic development in China. Overall, the development of culture and creative industries in the eastern part of China is obviously more advanced than that in the west, and showing a decreasing form from the east to the west (Zhou and Hu 1). The first and second tier cities like Beijing, Shanghai and Guangzhou have occupied the centre of the creative industry network, while the western, northeastern and central part of China are extremely lack of industrial resources. Moreover, the creative industrial distribution within the provinces are mostly cluster in the capital cities and developed cities. The creative industrial resources are constantly gathering in the central cities, which increase the current state of imbalance among regions. Thus it is necessary to optimise the industrial distribution and build a bridge for interregional industrial links.

2 History of DFC

DFC is jointly initiated by East China University of Science and Technology (ECUST) and Moma Design Company. It is a design service and achievement transformation plan led by local government, local industry and Shanghai design groups. The initial objective of this project is to encourage Shanghai design resources to serve the less developed areas with the help of the government and local industries to revive the traditional manufacturing industry. Industrial development is closely related to the accumulation of talents. The project hopes to provide opportunity for designers to return home, so that designers can continue to design works and establish their independent brands in their hometown.

DFC started in 2011, after seven years, it has established cooperation with nearly 20 cities, and built innovation centres in Baoying, Ma'anshan, Rizhao and Anshun. These centres provided services of urban planning, industrial upgrading, business incubating and talent training for the cities and the surrounding areas. During the operation of DFC, a systematic framework has been gradually formed and improved in practice, experiencing three stages, and till now became an innovation driven engine of urban development.

The first stage, was design for enterprise. The practice at this stage started with a production and research project led by ECUST and Moma Design, providing design service for the local traditional industry in Baoying (county in Jiangsu province). The local industry was composed by crystal and glass crafts processing, traditional embroidery and educational toys production. Most of the business subjects were small and medium enterprises, which were unable to realise the corporate growth and innovation. The assistance of external force was urgently needed. Thus, the team and local companies established strategic cooperation partnerships, helping them improve product innovation ability, linking external resources, and finally establishing corporate brand. However, the project cooperation did not continue to affect industrial upgrading, therefore, the second version of DFC was schemed.

The second practice was to set up local design centre with the support of local government and leading enterprises. DFC team accomplished the system in Ma'anshan (city in Anhui province) for the first time. Ma'anshan is one of the ten major steel bases in China and an important ports of the Yangtze River, moreover, it has abundance cultural heritage to be developed. Whereas the traditional industrial structure, lacking of innovation ability, is difficult to achieve sustainable development in the competition of economic transformation and upgrade. Difficulties of innovation talents attracting and hollowing of local industrial complexes are also prominent problems. The DFC team helped to establish design centre, linking with design resources in Shanghai, and aggregating design talents. The design centre offered four basic services: design consultancy, exhibition sponsorship, online platform operation and university-industry collaboration. In order to improve awareness of innovation for the enterprises, the team and the government signed a design service agreement that the government paid the design fee to encourage local firms asking for service to the design centre. The annual fee was no more than 5 million yuan.

DFC version 3 experienced a transformation from "design centre" to "innovation complex and urban innovation cluster". The "urban innovation complex" could provide comprehensive services on interregional links, industrial upgrade, entrepreneurship and design education, to show the core value of innovation for local development. The DFC team practiced this new system in Rizhao (city in Shandong province), which was a coastal underdeveloped city with backward second and third industries. The "innovation complex" has been running for three years and has become a representative of the local creative clusters, attracting a large number of innovative enterprises to enter. Also it has contributed to popularisation of innovation awareness and development of the local cultural industry.

3 DFC Activates Six Values for City

With the development of the DFC concepts, it faces with more design subjects and touches wider design fields. From city to county, DFC works in depth, expanding its function from product design to service design, affecting the local industry and even the design education. The more problems DFC solves, the deeper value it activates.

(1) Regional value

In view of the regional imbalance of innovation industry distribution and design talents, governments, enterprises and universities all strive to find approaches to build urban creative complex to import design resources from first tier cities. The complexes are based on small and medium-sized cities and radiate the surrounding areas with creative thinking. Ding Wei, the founder of the “Design for County” project deems that it has reshaped the social resources and promoted social innovation. DFC firstly focuses on the regional industrial growth in small and medium-sized cities, transforming virtual platform into physical platform, and constructing a sustainable connection between the central cities and the edge cities of industrial networks. Secondly, the project constructs innovation complex to regenerate industrial sites, which activates the “urban stock assets”. Last but not least, the innovation complex plays a leading role of the local innovation centre, attracting creative enterprises to form a creative cluster, which activates the local industry, promotes the industrial upgrade, creates new urban landmark, boosts consumption upgrade and improves the soft power of the city.

(2) Industrial value

The practice of DFC brings three changes for small and medium sized cities: design firms provide from single field of design service to comprehensive design service; their design objectives changes from offering innovation service to achieving business success and social sustainable; the design abilities transform from doing surface design works to establishing industrial vertical innovation system. The three transformation, referred to as “comprehensive design, linked value and vertical innovation”, changes the method and structure of a design centre. It integrates the resources of creative industry and paves the way for development of the industry.

(3) Cultural value

Chinese cultural and creative industry has developed quickly in recent years, the ubiquitous intellectual property (IP) covers all aspects of people's life—film and TV series, the game industry, historic culture and enterprise culture. IP has gradually formed a set of mature system. With the increase of the public's income level, the proportion of the expenditure of cultural consumption is accordingly increasing, which accelerates the development of cultural and creative industries. Therefore, the condition fully activates the value of design. However, in small and medium cities, plenty of cultural resources are not being exploited well, due to lack of innovative development approaches and effective management.

The DFC project is committed to discover the local culture, endow it with new vitality, and linking it with the cutting-edge resources of cultural and creative

industries. The cultural and creative teams are established in each “design complex” to offer innovation service for local cultural industries, including product design, supply chain management and service operation, forming a integrated development model of cultural and creative industries.

(4) Platform value

The mode of talent platform is gradually rising in recent China. In the future, “platform + designer” form will become a considerable force in Chinese design field, which will challenge the traditional design companies. From the closed state to open innovation, the value of data will be gradually magnified. As for designers, online platforms could help them find businesses from a wider scope, and arrange their work and leisure time freely. They can even try new areas of work, which is difficult when being an in-house designer. For local governments, the new model is of great help to attract design talents to return their hometown and continue design works.

DFC established an online design service platform called “51design.com” to mutually support the DFC design complexes all over the country, gathering design talents, teams and enterprises. The platform provides four services for employers and designers: connecting projects, finding suppliers, co-working and publishing design news. As the number of users grows, the boundaries of the user group are becoming increasingly blurred, from the original designer cluster to the community that has come together for creativity. This platform establishes a working platform, managing industrial resources through human centred communication. It is also a link to the supply and demand parties, which could designers and manufacturers, corporates and universities, concepts and investment.

(5) Entrepreneurial value

Nowadays it is the best time to start a business, yet the worst of the time. Entrepreneurship has received unprecedented attention in China, however it can not be avoided the high risk of starting a business. In the process of entrepreneurship, insight is significant trait, focusing on the true value could be lasting, like reducing the pressure of the surface to break through. Thus designer entrepreneurship has received concerns because designers are good at understanding user demands, and discovering potential opportunities.

When designing the design complex structure, the DFC team realised that only organising a design consultancy is not enough. The complex should provide opportunities for more individuals and teams who are eager to start businesses. Therefore, the creative incubation platform is added into the structure, and firstly put in practice in “Rizhao Industrial Design Centre”. The platform helps entrepreneurs to connect design innovation, manufacture, supply chain, marketing and investment, supplying the lack of resources of entrepreneurs in small cities.

(6) Knowledge value

In the context of the government’s support for innovation, it has received great attention. In order to popularise innovation knowledge, the DFC project established educational platform for holding variety creative activities, such as thematic events, design training courses, exhibitions and public classes. The platform is oriented to two

groups of people, the designers and the public, to carry out targeted educational activities. On the one hand, it provides support for professionals to enhance skills and enrich themselves; on the other hand, it popularises innovation to the public, and encourages more people to use design thinking to discover and solve problems.

4 Conclusion

Reviewing the seven years development of the “Design for County” project, it built connection between central cities and small and medium sized cities, transforming design resources. The team helped five cities and counties to build design centres, and established cooperative relations with over 10 cities. The project is a valid practice of regional economic transformation and upgrading from macro to micro, taking innovative development as its focus. It activates six values for local development, namely, regional resources connection, industrial value promotion, cultural value, platform value, business support and creative knowledge spread.

The project will continue to carry on, yet it still have several shortcomings. Further research needs to be done on the following issues. First, the establishment and operation of “design centre” is under the financial support of the local government. The “design centre” needs to make profit within three to five years, before the government withdrawals. Second, the theory and operation model of “Design for County” should be improved to support practice.

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Organizational Complexity and Leadership Style



What Do They Do? A Taxonomy of Team Leader Interventions in Various Meeting Scenarios

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Abstract. The purpose of this paper is to sketch a taxonomy describing various team leader interventions, as a consequence of interferences occurring at group meetings. The taxonomy is intended to serve as foundation for future research, methodology and test development. Sixteen Swedish business organisation leaders participated in the case study. The study consisted of ten fictitious scenarios, implying interferences concerning goal achievement. The participants were to propose interventions to the different situations. Based on the results, six categories of interventions were identified: *control*, *inform*, *initiate*, *await*, *support*, and *explore*. The categories corresponded to classical leadership theories. Furthermore, fictitious group scenarios seem to provide information about leadership thinking and interventional styles concerning team work. Scenarios also seem to measure something different than traditional assessment instruments do. This is in accordance with social personality theory, emphasising that personality assessments should not be decontextualised by excluding information concerning the situations in which people are acting.

Keywords: Personality · Trait theory · Five-factor model
Social personality theory · Team leadership · Intervention · Group interference
Personality test · Assessment

1 Introduction

Psychological tests, particularly personality assessments in leadership recruitment and career development, are in many cases standard procedures at today's workplaces. Typically, the participants answer a self-assessment questionnaire that measures common personality traits.

A trait is a descriptive term pertaining to personality that primarily concerns the measurable, consistent aspects of personality. In the theory, traits include persisting cognitions, emotions and behaviours that concurrently distinguish us as humans from each other [1]. Trait theory has had a major impact for many decades on personality theory and measurements, from Cattell's *sixteen-factor model* and Eysenck's *three-factor model* to the more recent *Big Five personality traits* or *five-factor model* [2, 3]. The five-factor model, widely used for personality assessments, has been repeatedly verified in surveys in North America and Western Europe [4]. The five factors in the

model are *openness to experience* (curious/cautious), *conscientiousness* (efficient/easy-going), *extraversion* (outgoing/solitary), *agreeableness* (friendly/challenging), and *neuroticism* (sensitive/stable).

Surely, these frequently administered personality assessments are valuable in miscellaneous human resource management activities, but there are matters of opinion regarding utility. Several studies have made clear that personality assessments based on trait theory only partially can predict leadership success [5]. An important discussion propels around how we best can understand the construct of personality, and the explanatory weight enduring personality traits and changing social contexts should have respectively.

While trait theory heavily relies on decontextualised traits to explain personality, social personality theory by Albert Bandura and Walter Mischel emphasises the role of environmental influences in personality [6, 7]. According to social personality theory, there are many aspects of the self which are valued or functional in different circumstances. Social worlds thus actualise different aspects of the self; for example, a person can be extrovert and talkative in one social situation, but quite the opposite in another. Identity formation is consequently an ongoing process and not something which is characterised by fixedness in time.

Given the social personality theory perspective concerning our highly conditional nature, personality assessments cast in non-conditional generalities, cannot sufficiently capture individual psychosocial functioning in diverse task domains and through all situations. Consequently, personality assessments need to capture the contextualised and multifaceted nature of human functioning. Theories have emerged focusing the psychological content of different situations and how this can be used in personality assessments and recruitment activities, e.g. the situational personality eight DIA-MONDS taxonomy [8].

Following the reasoning by Albert Bandura and Walter Mischel, the effectiveness and success of leadership is at least as dependent on flexibility and adaptation to the requirements of different situations as on personality traits. In most managerial positions the individuals' ability to act in groups and to handle different kinds of events or situations are essential. Flexibility and adaptation among leaders, are also stressed in the situational leadership theory [9]. Consequently, individuals who have a broad repertoire of situational interventions or behaviours, and who use them flexibly, have an increased likelihood to succeed in managerial positions.

Studies show that situational inventories do correlate with leadership performance [10]. Hence, fictitious scenarios, based on organisational events that might occur in a group context, where participants could choose possible response options, might be an addition to traditional personality tests.

Purpose. The purpose of this paper is to sketch a taxonomy describing team leader interventions, as a consequence of interferences that occur in group meetings. The taxonomy is intended to serve as a foundation for future research as well as for methodology and test development.

2 Method

Sixteen leaders from various Swedish business organisations participated in the case study. The study consisted of ten different meeting scenarios that in general may occur in any work group, selected from examples in managerial literature [11]. All the chosen scenarios implied an interference regarding the team work and goal achievement in the group. The combination of scenarios was selected to provoke different responses on behalf of the participants.

The participants were acting as team leader in a fictitious project group meeting. All the different scenarios implied a project group comprised of between eight and fourteen members, that collectively had all the necessary competence to sufficiently carry out the group work. Given the fictitious scenarios, the task of the case study participants was to suggest as many interventions as possible for each one of the ten meeting scenarios. Below, the scenarios are exemplified by five of the ten events/interferences that had to be addressed by the participants:

- A dominating group member. At one of the previous meetings the discussion has been dominated by one of the employees. Long monologues on behalf of the employee slow down the development of meaningful discussions. It is now in the middle of the meeting. The employee has once again talked for a longer period. What do you do?
- One member is crying. It is in the middle of the meeting. A colleague who has been silent during the first half of the meeting, makes an effort to gain control and starts to cry. No one says anything. What do you do?
- The negative group. The meeting is characterised by irritation and negativism. Each time someone has a proposal, it is questioned and considered by somebody as not feasible. No one seems satisfied with anything. The committed atmosphere of the last meeting is completely lost. What do you do?
- Subgroups develop. The group has spent a great deal of time thoroughly discussing the prerequisites for an investment decision. Some employees start a conversation that interferes with the discussion. They show no signs of ending their conversation. What are do you do?
- The group attacks. After the group has spent half the time talking about things that only indirectly affect the work, it turns to you and accuses you of being detached and quiet. What do you do?

3 Results

The participants in the case study provided all in all 327 proposals for interventions as a response to the unexpected events/interferences regarding the work and goal achievement in the fictitious work group. The number of proposals were rather evenly distributed, ranging from 22 for the scenario with least proposals to 42 for the scenario with most proposals. The proposals were extensively analysed by means of qualitative methodology [12].

An initial coding of the proposed interventions identified two main dimensions, *task-oriented* and *relation-oriented*. The former dimension aimed at continuing the work towards the goal of the meeting, while the latter intended to foster a supportive atmosphere in the group. A third dimension of interventions were neither task-oriented nor relation-oriented. These interventions were labelled *activity-oriented*.

Further coding revealed that the task-oriented dimension could be categorised into *control* and *inform* interventions, the relation-oriented dimension could be categorised into *support* and *explore* interventions, and the activity-oriented dimension could be categorised into *initiate* and *await* interventions (Fig. 1).

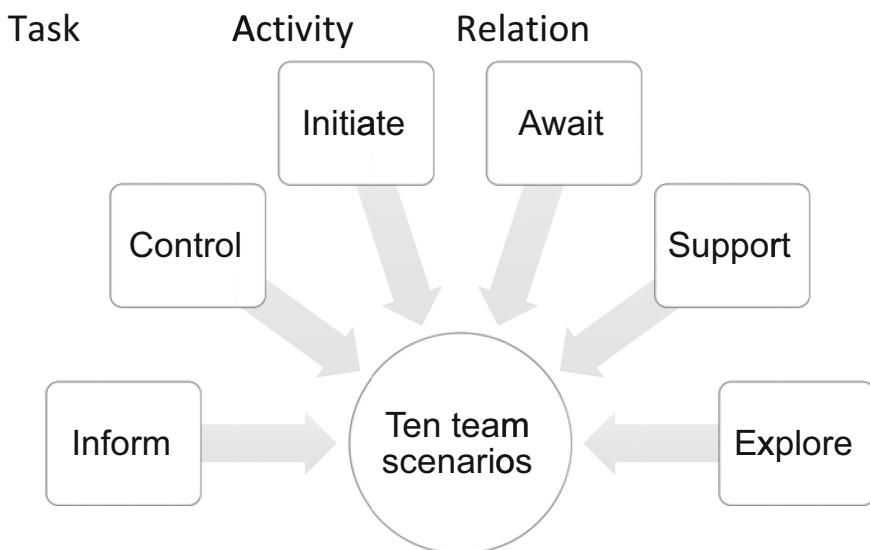


Fig. 1. The figure presents a proposed six-intervention taxonomy for team leader interventions. The interventions are grouped into three dimensions: task-oriented dimension - control and inform interventions; activity-oriented dimension - initiate and await interventions; and relation-oriented dimension - support and explore interventions.

In short, the six-intervention taxonomy implies the following group leader interventions at the meetings:

- Control - exercising authority while solving the task.
- Inform - explaining and clarifying the importance of the task.
- Initiate - launching divertive activities.
- Await - postponing action.
- Support - encouraging and comforting the group.
- Explore - inquiring in order to understand the group processes.

4 Discussion

In organisations, there are often demands on leader's ability and skill to handle different kinds of tasks and circumstances. In this paper we aim to sketch a taxonomy describing team leader interventions, as a consequence of interferences in group meetings. From the qualitative analysis three dimensions were identified. Two of the dimensions, task-orientation and relation-orientation correspond to leadership behaviour theories according to the Ohio State Leadership Studies [13]. These studies used the term initiation structure for task-orientation and consideration for relation-orientation. Based on our taxonomy the initiating structure comprised two interventions, control and inform, referring to how much a leader emphasises meeting goals and accomplishing tasks. Leaders high in initiating structure typically engage in task-related behaviours. Also consideration included two interventions, support and explore, relating to how friendly and supportive leaders are toward subordinates. Leaders high in consideration engage in behaviours that show supportiveness and concern, such as caring about their coworkers' situations and expressing appreciation for their work. Lastly, there were two types of interventions, initiate and await, that were neither initiating structure nor consideration oriented. This dimension was labelled activity-oriented.

Furthermore, three of the interventions in the taxonomy were homologous with descriptions from Lewin's classical leadership theory [14]. The control intervention was related to authoritarian leadership, the await intervention was matching laissez-faire leadership, and the support intervention was similar to democratic leadership.

It can be concluded that fictitious group scenarios do provide information about leadership thinking and intervention styles concerning group work. Research about situational inventories suggest that they measure something different than traditional tests [10]. This is also in accordance with the reasoning by Bandura that personality assessments should not be de-contextualised by excluding information concerning the situations in which people are acting [6].

In line with Bandura, we emphasise the very fact that people create and alter their environments. People explore, manipulate and influence others. The changes they produce, reflect back and affect them personally. The metaphor of water may illustrate this dynamic interplay between personal determinants and environmental influences: water with unique properties such as fluidity, viscosity and transparency, cannot be understood as a simple aggregate of oxygen and hydrogen, components that due to their interactive effects, are transformed into new phenomena [15].

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Agile Project Management and Project Success: A Literature Review

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Abstract. Agile project management (APM) has recently emerged as a new and different way of managing projects. Some experts are already voicing the opinion that APM will become the project management of the 21st century. However, so far APM has not impacted project management as much as it should have. Its focus was mainly on IT projects. The literature on APM is still in its early stages, and more research needs to be done in areas other than software development. Therefore, the present paper provides a review of the existing literature in the agile project management domain. It compares traditional to modern project management, specifically APM, and discusses the influence of project complexity factors. Further, it reviews different frameworks of project success and critical success factors. Finally, it recommends APM dimensions irrespective of project types, which potentially could impact the success of a project.

Keywords: Agile project management · Project complexity · Project success · Critical success factors

1 Introduction

The research activities in project management have significantly grown over the past decades. Projects and project management became increasingly more complex due to a more complex and faster-changing business environment. Today, more and more project managers consider performance to be the most important objective of project management [1]. The main problems in project management are planning, project implementation, cost and time overruns, and quality non-achievement. To ensure meeting expected performance, the project managers need to get a better understanding of the meaning of project success and the factors that contribute to project success. It is essential for project managers to identify critical success factors (CSF) and comprehend their potential effects. This, in fact, is not an easy thing to do as up until today there is only limited agreement among authors on critical factors and the individual influence on project success. The enormous complexity of today's projects makes it difficult to categorize and reduce the factors to a manageable amount [1].

Over the past few decades, traditional project management has more and more often reached its limitations. The traditional scope, cost, schedule control does not work in today's dynamic, requirement changing, and technology-driven environment.

By trying to adjust to these new developments, a new project management approach was introduced: agile project management (APM). It was determined that in any project that faces uncertainty, complexity, volatility, and risk, there is a place for agile practices and principles [2]. Although its focus was mainly on the software development side, APM has high potentials to also positively impact the project management for other project types.

2 Traditional vs. Modern Project Management

Traditional project management is, for example, represented by the Project Management Institute's PMBOK Guide, most elements of the IPMA Competence Baseline, as well as the ISO 10006 standard. Per Saynisch [3], the traditional project management is “based mainly on a mechanical, mono-causal, non-dynamic, linear structure and a discrete view of human nature and societies and their perceptions, knowledge, and actions”. The PMBOK guide defines the traditional project management as “a set of techniques and tools that can be applied to an activity that seeks an end product, outcomes or a service” [4]. This approach has been used for many years and decades. It is characterized by a top-down approach where all directions and tasks are established at an executive management level and then floated down within the organization. Its leadership style is based on the command, control, and hierarchy. The approach is very plan driven, where a plan is established in the very beginning of the project with little flexibility to change it later. The planning is done centrally within the organization. The traditional approach is based on a sequence of steps as explained in the PMBOK by PMI [4] and shown in Fig. 1.

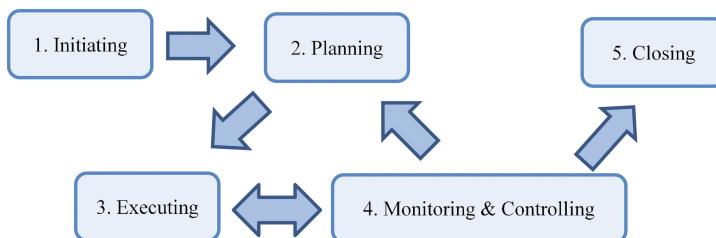


Fig. 1. The five process groups of the PMBOK project management process

Traditional project management assumes that events are predictable and that all tools and techniques are well understood. While going through the individual process steps, it is also assumed that completed phases will not be revisited. The strengths of this approach are the well-structured process and the importance of requirements. In today's project environment, however, it encounters its limitations quickly as a project rarely follows the preferred sequential flow and customers typically have difficulties to define all requirements at the beginning of the project [5]. The lack of flexibility is a disadvantage in today's fast-moving and complex project environment. The ownership

belongs only to the project manager. The remaining team members follow the project manager's instructions and focus on their tasks leaving very little opportunity to understand the "big picture" and take ownership of the project.

Modern project management approaches such as Lean and agile project management (APM) have emerged to assist in the adaption to the new business environment and improve these projects. However, the literature provides only a few well-defined and effective approaches or systematic evaluations of their results [6]. Most of the solutions are trying to establish a more flexible approach, adaptable to the contingencies of the project environment to improve project performance records [7]. One of the modern project management approaches is agile project management, which is mainly used in software development. However, the research is slowly starting to determine whether APM can be adapted for other project types.

APM is a highly iterative and incremental process, where stakeholders and developers work closely together to understand the domain, determine requirements, and prioritize functionalities [5]. Figure 2 depicts the agile development model.

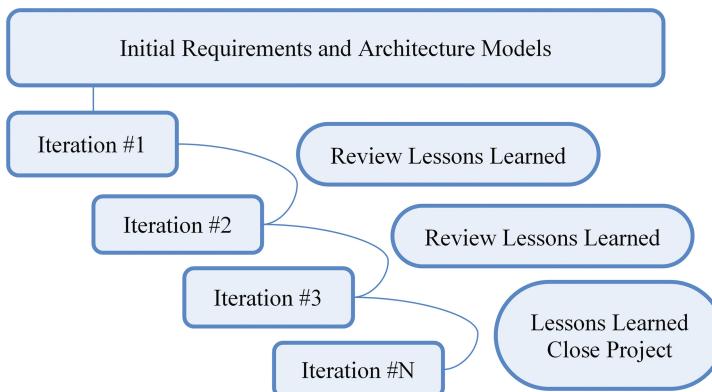


Fig. 2. The agile project life cycle model [5]

The agile approach consists of many rapid iterative planning and development cycles. This allows for constant evaluation of interim results and consequently adjusting if users and stakeholders desire them. In this way, the product gets continuously improved by the entire project team, which includes the stakeholders. This approach allows for immediate modifications of the product as previously unknown requirements get discovered. APM will be discussed further in detail in subsequent chapters of this paper.

3 Project Complexity

Modern project management approaches have proven to be useful in the new economy, which is characterized by more complex and uncertain project situations. Complex projects demand an exceptional level of project management and solely traditional

systems are not appropriate anymore for the complexity of today's projects. Williams [8] considers it necessary to have a project complexity definition to be able to cope with project management challenges. Although the term project complexity is widely used, there is no clear definition for it.

Per Baccarini [9], project complexity can be interpreted to comprise anything characterized by difficulty. A white paper on Mosaic Project Services defines four basic dimensions that affect the difficulty of managing projects [10]:

1. The size measured regarding value;
2. The degree of technical difficulty in creating the output caused by characteristics of project work and deliverables measured in the time needed to provide the deliverables;
3. The degree of uncertainty involved in the project;
4. The complexity of the relationships both within the project team and surrounding the project.

While all four factors impact the degree of project difficulty, the project manager can only influence the last two factors, reducing the degree of uncertainty and improving the relationships between stakeholders including the project team. The size and the degree of technical difficulty are predetermined and cannot be influenced by the project manager.

Although the size of the project impacts the degree of difficulty in achieving project objectives, this does not necessarily mean that large projects are complicated or complex. Over the last decade, the term "mega-projects" was further established in the literature, which isn't necessarily big projects but they are major, complex, and of high financial value. Due to their complexity (e.g., politics and stakeholder engagement), they are typically broken down into a series of smaller projects.

The technical difficulty inherent in a project is the combination of work needed to accomplish the project objectives and the characteristics of the output (product, service or result) being produced. Project duration and time pressure are common indicators for technical difficulty [10].

There is always a degree of uncertainty associated with each project. What matters is the understanding and the handling of uncertainties in project management. An appropriate project delivery strategy or also called project plan will either try to minimize unnecessary uncertainty or will go the other direction and embrace uncertainty by looking for opportunities that come with the uncertainty.

Lastly, the aspect of complexity also centers around the effectiveness of relationships within the project team as well as to other internal and external stakeholders. Factors such as team size, geographical team setup and a number of project sponsors are influencing the complexity of the project.

4 Project Success

Project success is controversially discussed in the literature. Some follow the traditional approach and consider it a unidimensional construct concerned with meeting budget, time, and quality [11–14] and others see it as a complex, multi-dimensional concept

with many more attributes than only budget, time, and quality [15–20]. There is evidence that projects do not meet their objectives and therefore, there is a need to identify the factors that positively influence the project success. Pinto and Slevin [21] summarizing it as follows: “There are few topics in the field of project management that are so frequently discussed and yet so rarely agreed upon as that of the notion of project success.”

Schultz, Slevin and Pinto [22] came up with the first systematic classification of critical success factors in the field of project management. They identified two groups of factors that impact project performance: strategic and tactical factors. The “tactical” group includes factors such as client consulting, human resource selection and personnel training whereas factors such as project mission, top management support, and project scheduling were categorized as “strategic” factors. Research has also shown that the impact of success factors can vary depending on the stage in the project lifecycle [23]. In further research, the original dimensions (time, cost, and quality) were extended by three other dimensions: (i) meeting the strategic goals of the client organization, (ii) achieving the satisfaction of the end users, and (iii) attaining satisfaction of all other stakeholders [19, 24]. Ultimately, it is important to have fully satisfied stakeholders to achieve project success [25]. It is understood that this is depending on each stakeholder’s perception. Another approach is the one from Harold Kerzner, who altered the original dimensions by including scope changes without workflow interruptions, without negative impacts to the corporate culture, and with the customer fully accepting the project results [26].

5 Critical Success Factors

From a project management perspective, critical success factors (CSF) are the characteristics, conditions, or variables with significant impact on the success of the project provided they are properly managed [27]. The CSF approach has been researched over the last thirty years. However, there is still no consensus on the criteria that determine project success [28].

Based on the literature, it can be concluded that there is a close link between the type and scope of projects and their respective critical success factors. It is therefore important when conducting an empirical study for a specific type of project that the range of factors and measures of CSF is limited. One of the most widely quoted lists of project success factors is the one from Pinto and Slevin [29]. Their list captures success factors such as clear project mission, top management support, detailed specification of implementation, competent personnel, client consultation, technical expertise, client acceptance, timely and comprehensive monitoring & control, effective communication, and the ability to handle unexpected problems. Some critics are missing the project manager and his or her leadership style and competence in this list. Management literature considers effective leadership a success factor and has demonstrated that adequate leadership style has a positive contribution to the overall project performance.

Müller and Jugdev [30] put the success factors and success criteria about dependent and independent variables as follows: “(1) Project success factors, which are the elements of a project which, when influenced, increase the likelihood of success; these are

the independent variables that make success more likely. (2) Project success criteria, which are the measures used to judge on the success or failure of a project; these are the dependent variables that measure success". It is the project manager's responsibility to identify the relevant success criteria, from them, determine adequate success factors, and choose an appropriate project management methodology to ultimately achieve project success. The success criteria determined by Alexandrova and Ivanova [23] are mainly focused on "hard" factors such as schedule, budget, project execution, and customer satisfaction. The influencing success factors on the other side are a more human resource ("soft") related such as coordination by managers, top management support, team resources, motivation, and communication. The "soft" factors are very important for the success of the project as it is people who execute the projects and not processes or systems [31].

Concluding, it can be said that the CSF approach has been established and disseminated over the past few decades. Project success criteria vary from project to project. The majority of the studies still focus mainly on the traditional "iron triangle" which are cost, quality and schedule as criteria for measuring project success. Later studies, however, concluded that other important criteria such as scope and customer satisfaction need to be considered. Project success factors that influence success criteria and project success vary widely. Based on the review literature, an attempt was made in clustering project success factors suitable for most project types as follows: management, processes, project factors, organization, human resources, and technical tasks.

6 Agile Project Management

Unlike traditional project management, which dates back to the 1950s emerging from the defense and constructions industries, the concept of agile project management (APM), which is similar to concurrent engineering, has its roots in the 1980s and was developed in the twenty-first century. However, contrary to agile manufacturing and agile software development, APM was rarely discussed in the literature. Until 2009 almost all projects that practiced the agile approach were IT projects. Consequently, most of the APM literature was focused on software development projects. Only a few projects in other areas started introducing agile practices in the last decade [32].

In 2001, a group of software developers came together discussing possible approaches to improve project results. They wanted to overcome the limitations of the traditional project management by responding faster to changes in the environment and adapting a fast-learning approach. In this meeting, the Manifesto of Agile Software Development was created, which states that the "highest priority is to satisfy the customer through the early and continuous delivery of valuable software" [5]. Methods were developed to improve the project results by focusing on short-term outcomes and allowing frequent unpredictable changes. The team productivity was intended to be increased by forming agile teams with low hierarchies, joint decisions, a brought knowledge base, and excellent communication skills. Besides the focus on the project team, the APM approach was further characterized by constantly updating the project execution, detailed planning cycles based on short-term results, and deep customer involvement [32]. Today, most innovative products are developed under uncertainties

in turbulent environments, characterized by project complexity, unpredictable activities, and changes where the traditional approaches have reached their limits and the APM approach offers better solutions and project results [33].

Agile project management (APM) is based on the following four value principles, which were established by the authors of the Agile Manifesto [34]:

- To value individuals and interactions over processes and tools.
- To value working products over comprehensive documentation.
- To value customer collaboration over contract negotiation.
- To value responding to change over following a plan.

Because of changing requirements agile methodologies shall be used for projects that exhibit high variability in tasks, in the capabilities of people, and in the technology being used [35]. Also, for projects where the value of the product or service to be delivered is very important to customers agile methodologies are very appropriate to use [36]. Organizations that are flexible and conducive to innovation can easier adapt and embrace agile methodologies than rigid organizations that are built around bureaucracy and formalization [37]. The readiness for agile methods needs to be carefully evaluated by the organization before their use can be initiated.

Further investigations into APM practices have resulted in the following set of practices, which are mostly based on inputs from Fernandez and Fernandez [38]:

- Embraces and manages change instead of avoiding it.
- Incremental change.
- Assumes simplicity and avoids complexity.
- Maximizes value.
- Considers intensive planning, design, and documentation as waste.
- Creates documentation based on value.
- Goes through iterations to break up long projects (enable and focus on the next effort).
- Empowered and motivated teams.
- Focuses on delivering working features to paying customers as soon as possible.
- Active customer participation in the implementation process.
- Rapid feedback to all stakeholders.

The reviewed literature reveals that the agile approach is more people-oriented rather than process-oriented [39]. The human factors are an integral part of the APM framework. This includes a highly knowledgeable and skilled project team, supportive top management, and deeply involved customers. Augustine, Payne, Sencindiver and Woodcock [40] prescribes six practices for managing agile projects: small organic teams, proper guidance by agile managers, simple rules, free and open access to information, light-touch management style, and adaptive leadership. The latter talks about leading an agile project team with just enough involvement to give proper guidance, but not become too rigid and leave the team as much freedom as possible. It is described as a balancing act on the edge of chaos. Besides the human factors, the organizational form and culture is also part of the APM framework. In today's projects, it is important to have a flexible and less hierarchical organization that supports the complex and fast-changing environment [41]. Another factor is the process that needs

to support a short, iterative, test-driven development and emphasize adaptability [36]. Further, the appropriate technology and tools must be available for agile project implementation.

Based on the reviewed literature, an attempt was made to define agile project management dimensions that suit most if not all projects. The following factors introduced by Chow and Cao [42] establish the basis for these dimensions:

- Organizational: management commitment, organizational environment, team environment
- People: team capability, customer involvement
- Process: project management process, project definition process
- Technical: agile software techniques, delivery strategy
- Project: project nature, project type, project schedule

To emphasize the before-mentioned importance of an adequate management style, this study also recommends a “management dimension” in the APM framework.

7 Conclusions

The presented literature review confirmed the limitations of traditional project management in today’s complex and rapidly changing business environment. The plan-driven top-down approach comes with inflexibilities to adjust for complexity and changing customer requirements. Modern project management approaches such as the discussed agile project management (APM) have started filling in the gaps created by a new business environment to improve project outcomes. APM provides sufficient flexibility to allow for an iterative planning process with constantly changing requirements and close customer involvement in the project execution. The increasing project complexity is a challenge that project teams must manage to ensure the success of the project. The original project success dimensions of time, cost, and quality were therefore extended by scope and stakeholder satisfaction. However, project success factors that influence success criteria and project success vary widely. Based on this literature review, they were clustered in main categories applicable to most projects. These clusters are management, processes, project factors, organization, human resources, and technical tasks. Consequently, the recommended agile project management dimensions were defined accordingly in six categories: management, process, project, organizational, people, and technical factors. This set of categories reflects the focal points of today’s business environment and is still general enough so that it can be applied to most project types. Concluding, this literature review has contributed to establishing a basis for further research in agile project management, project complexity and their impacts on the success outcomes of a project.

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Transforming to an Agile Enterprise – How to Handle the Challenge of Organizational Ambidexterity

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Abstract. The digital transformation is more and more penetrating our world of working. Enterprises expect more productivity and opportunities for optimized performance by increasing use and integration of innovative technologies. But – it's not only about intelligent algorithms and autonomous systems, but also about employees' autonomy. Technology can support, but not replace specific human abilities and needs. Some aspects of high relevance in this regard are for example emotion and experience, problem solving and communication skills as well as the ability for quick adaption to environmental influences. Nowadays cognition, flexibility and creativity rule. Employees and customers demand individualized solutions, suitable tools and task-oriented working methods and environments. The way people are going to do their business and work in the future is advancing from rigid value chains to dynamic value networks. This also means that the nature of cooperation is no longer a clear stable dictum, but rather more flexible, dynamic and agile with many different and changing stakeholders and within a global context. Prior to that, well-established structures dissolve, working hours and spaces are getting flexible true to the slogan: »Work whenever and wherever and with whom you want«. Non-territorial work and sharing concepts are the new normal. Designing the future of work and building an agile enterprise requires an intelligent combination of innovative working concepts, agile organizational architectures and modern technologies enabling exploitative and explorative innovation simultaneously – and it's the task of management and leadership to support these abilities. But how to get there? The study examines central characteristics and milestones in the key enabling fields and presents a transformation roadmap towards the agile enterprise.

Keywords: Agility · Assessment · Collaboration · Digitization
Industry 4.0 · Organization · Performance · Platforms · Qualifications
Technology · Transformation

1 Introduction

The rapid developments in digital technology are leading to dramatic changes of our economies and societies – and these are quite far-reaching. Everything is becoming more dynamic, volatile and different at an enormous pace. Technological progress

especially in the field of artificial intelligence and robotics, big data and business analytics, as well as augmented and virtual reality are providing a total digital connectivity and new possibilities for effectively analyzing and handling of data [1]. This way, new forms of human-machine collaboration and digital business models have become ubiquitous, and Industry 4.0 or the Industrial Internet have become the new buzzwords (Fig. 1).

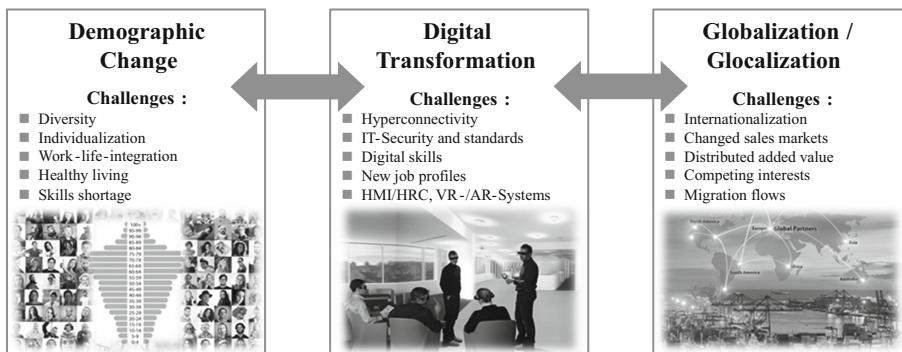


Fig. 1. The winds of change – digital transformation is setting the pace

In addition to resulting contextual potentials for more process efficiency and higher productivity, enterprises across all sectors are facing huge challenges of both, internally aroused and competition-induced pressure forcing them to act.

On the one hand the core long-term structural demographic change in Europe is ageing: the current ratio of working age population to old dependent population below four to one will, according to Eurostat projections, be replaced by a ratio of two to one by 2050. This amongst others necessitates selective measures to limit the mismatch between job offer and competencies of the available workforce [2]. Education and lifelong learning focusing digital competencies but also central human skills like complex problem solving and creativity are getting essential.

Otherwise, globalization has great impact on nearly every aspect of modern life and business. People from various countries work together in one place building one team committed to a common goal and purpose creating an international and multicultural environment [3]. Staff is increasingly getting divers, is seeking for individualized solutions and a best fit for work-life integration.

Thus, formerly established working techniques and organizational structures are already queried and in the future will heavily be transformed to an even greater extent. Clearly, the future business and working world will be a different one – and all actors involved in this process will need to help shaping it.

2 Trends in Technology and Human Qualification Needs

We all are at the dawn of the Fourth Industrial Revolution, which represents a transition to a new set of systems, bringing together digital, biological, and physical technologies in new and powerful combinations [4]. Hereby many serious movements in business and society and disruptive innovations, e.g. in the fields of civil security, healthy living, smart manufacturing, fast and open innovation and cognitive workplace environments based on the infrastructure of the digital revolution result.

An actual survey among enterprises from the ICT sector in Germany reveals that especially cognitive computing is in ascending order. Having been ranked 23rd under the label of artificial intelligence by responsible employees in German high-tech enterprises in 2016, this field of research already entered the top 10. Even more rising are digital platform solutions already placed 6th nowadays after having been new within selection in the year 2017. Industry 4.0 itself in Germany is as an “evergreen” for building up the interconnected system of systems taking advantage of the progress within the beforehand addressed developments (Fig. 2).

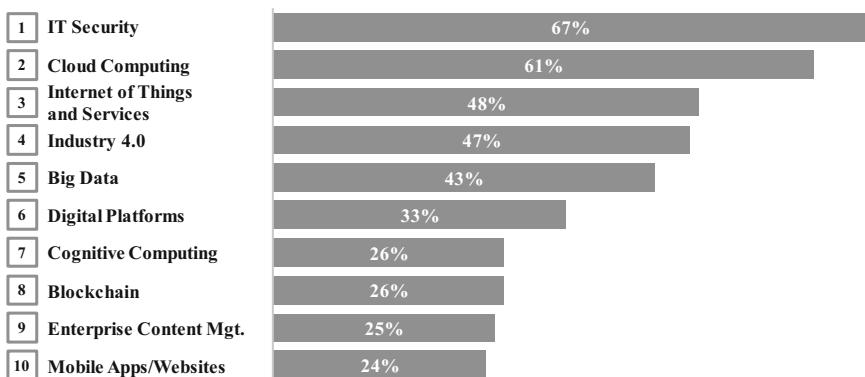


Fig. 2. High-tech trends in German ICT enterprises 2018 [5]

The rapid progress in the field of cognitive systems predominantly bases upon different approaches of artificial intelligence, sensors and robotics. Starting with simple tele-operated systems – for example WiFi robotic platforms – further milestones consist of digital assistance systems and automated systems. These three systems have in common that humans are still of high importance in terms of activating, controlling and monitoring. Looking at the future, we are heading for real autonomous systems fulfilling tasks without any human control or detailed programming.

Of course, not only machines or intelligent algorithms are going to execute tasks, but we have to state that new forms of human-machine-collaboration are going to appear and the role of humans will change. Moreover, business will change, too, especially due to digital platform solutions offering smart services and creating new value added.

Hence, technological innovations are deeply penetrating our economy, our interconnectedness and our knowledge leading to new possibilities but also challenges respective to behaviors, processes and structures in a hybrid world (Fig. 3).

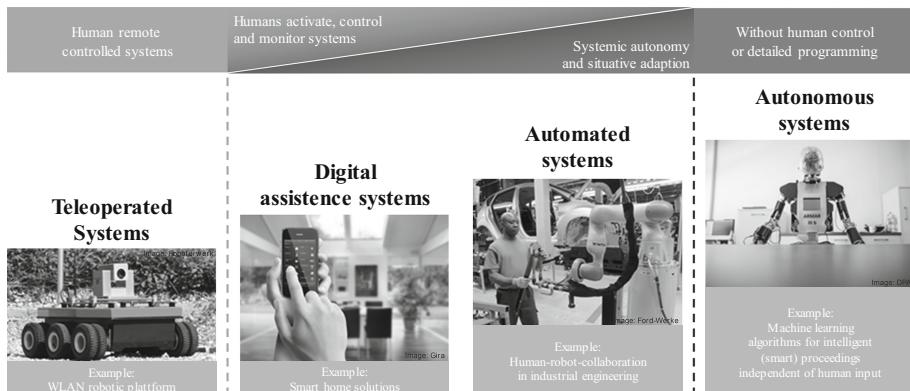


Fig. 3. Automation advance [6]

Although advances in artificial intelligence are still in the early stages of adoption, the pace of change will be at a tearing pace and lead to massive changes of the way enterprises and people are going to do their business in the future. Appropriate to the World Economic Forum report “Future of Jobs” amongst others artificial intelligence and machine learning as well as advanced robotics and autonomous transport will be omnipresent by the year 2020.

Concurrent over one third of skills (35%) considered important in today’s workforce will have changed. Asked chief human resources and strategy officers from leading global employers anticipate the following implications of the current digital shifts, specifically for employment, skills and recruitment across industries and geographies [7]:

- With regard to the overall scale of demand for various skills in 2020, more than one third (36%) of all jobs across all industries are expected to require complex problem solving as one of their core skills. By comparison, less than 1 in 20 jobs (4%) will have a core requirement for physical abilities such as physical strength or dexterity.
- With the avalanche of new products, new technologies and new ways of working, creativity will become one of the top three skills workers will need to benefit from the changes.
- Negotiation and flexibility, which are high on the list of skills for 2015, will begin to drop from the top 10 in 2020 as machines, using masses of data, begin to make decisions for us. Similarly, active listening will disappear completely from the top 10, while emotional intelligence will become one of the top skills needed by all.

Taking into account the rapid development of technologies getting smarter and generating their own consciousness as well as the estimations concerning future

working skills, it is indisputable that economies, enterprises and societies have to find new ways of organizing business and work. Enterprises expect more productivity and opportunities for optimized performance by increasing use and integration of innovative technologies. But - it's not only about intelligent algorithms and autonomous systems, but also about employees' skills and autonomy. Technology can support, but not replace specific human abilities and needs.

3 Business Development in the Digital Age

In the digital age, enterprises see themselves confronted with a variety of challenges and today's businesses have to respond to the evolving trends. Technological progress, volatile markets and global as well as inter-industrial networks are creating a radically more dynamic market environment calling for a considerably greater on-demand flexibility in resource deployment. Project business appears in a total new manner and has to be adapted in accordance to uncertainty.

To succeed enterprise leaders therefore have to decide how and to which direction they want to push their business and organization. The shift to digital innovation thus requires executing big changes in strategy, operations, and organization affecting the entire enterprise on every level of value creation. For this, it is required to answer the following questions in the three areas [8]:

- Strategy: How do we apply technologies that expand the horizons of the possible in terms of new products, services, and business models?
- Operations and processes: How do we apply digital technologies to drive innovation, leveraging new tools, platforms, and processes (such as agile) in order to turn insights into new products and services?
- Organization: How do we transform ourselves into digitally capable organizations and cultures that can bring digital innovations to market and make them work?

According to a McKinsey survey of global executives, culture is the most significant self-reported barrier to digital effectiveness highlighting functional and department silos, a fear of taking risks and difficulty forming and acting on a single view of the customer as major digital-culture deficiencies [9] (Fig. 4).

To achieve a positive influence on key performance indicators, organizational approaches to enterprise architecture therefore should not be restricted to purely technical aspects but should instead put the focus firmly on shaping and measuring culture.

Business development therefore also means that enterprises have to develop, prove and live a new business and working culture. For this purpose, ambidexterity serves as principle for success complementing well-established structures with liquid elements. In means of digital organization design, enterprises amongst others should be heading for the following characteristics: agile, customer-centric, experimental, lean, focused on operational excellence as well as empowered and accountable [9]. To get there, Fraunhofer IAO defines organizational ambidexterity as the ability of enterprises to identify relevant developments and challenges at an early stage in order to initiate appropriate measures for change in strategies, processes and structures proactively.

In order to benefit from this, holistic as well as concepts for individual cases are necessary effectively combining technical, environmental, personnel and organizational aspects (Fig. 5).

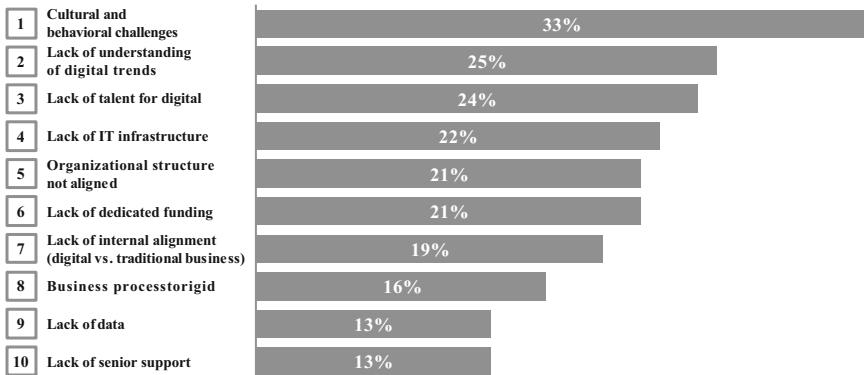


Fig. 4. Barriers to digital effectiveness [9]



Fig. 5. Key enablers for agile transformation

Comprehensive shifts in work organizations and techniques currently especially emerge in the field of knowledge work. A good example for the success of this approach are highly dynamic startups playing a key role within new digital niches.

Basically, opportunities for the transition to an agile enterprise span over the three dimensions place, time and structure containing a variety of elements and measures: In-house flexibility (e.g. temporary employment, flexible working time models), external flexibility (e.g. outsourcing or external crowdsourcing) and spatial decentralization and virtualization (e.g. co-working, mobile work or virtual teams) [10].

A recent study of Fraunhofer IAO evaluating data from 680.000 employees from more than 7.000 companies verifies that the attitude towards mobile work in general is

very positive: 25.6% of the respondents having the possibility to work mobile use this opportunity more than three days per month [11]. Interdisciplinary experts of intensify working together choosing co-working center or maker spaces as locations offering autonomy, creativity as well as modern work settings with optimal technical equipment. With the development of cognitive environments automated individualization of workspaces appropriate to personal preferences (e.g. activity-based lighting and access to relevant data) are becoming reality stimulating and motivating digital natives and leading to higher performance and wellbeing.

4 Agile Assessment for Organizational Ambidexterity

The digital transformation affects future business and work in many dimensions challenging but also offering great opportunities for enterprises. Based upon digital and even disruptive business models new products, services and markets develop, more efficient operations and processes as well as new ways of digital collaboration due to cognitive systems arise. To put digital principles into practice enterprises have to establish a capable organization to profit from these developments and make them work.

For this purpose, Fraunhofer IAO developed an agile assessment for organizational ambidexterity to support enterprises on their transformation path by identifying their current level of organizational maturity and identifying existing barriers as well as key enablers further progress. To create an enterprise specific big picture as well as suitable design approaches, techniques for organizational development and change management are bundled to answer the following key questions in the field of strategy, culture, operations, organization and qualification (Fig. 6):

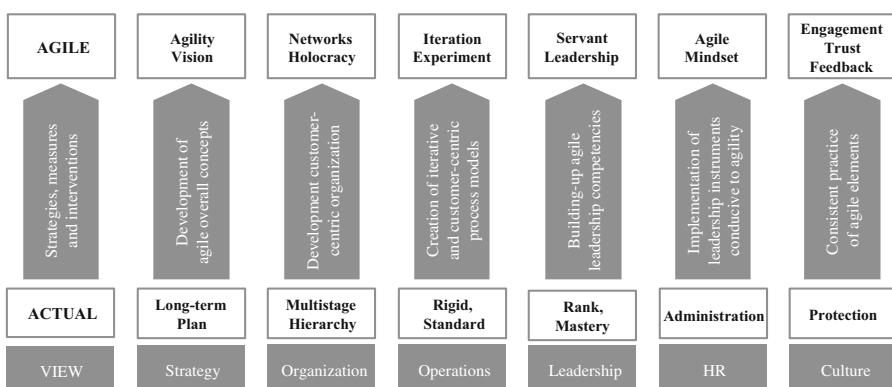


Fig. 6. Framework of the agility assessment for organizational ambidexterity

- To what extent does a vision for agility already exist? Are strategy and overall concepts in line with this vision and aims of units?
- Do established customer-centric and agile ways of working ensure adequate transformability? Do business leaders promote the transformation proactively?
- Do HR and leadership systems support employees' personal responsibility and development?
- Does organization design guarantee creativity, transparency and quick decision-making?
- Is an agile culture present in all business units to provide competitiveness in digital and globalized times?

5 Conclusions and Demand for Further Research

Organizational ambidexterity as a new research discipline and management approach constitutes a vital path in order to combine traditional and digital business for future success. The presented assessment for organizational ambidexterity as a systematic approach contributes to handle resulting challenges with the following benefits:

- Sensitivity for weak signals, rapid reactivity to changes and flexible adaption of new conditions
- Higher profitability and customer satisfaction on the basis of short-cyclic matching
- Time saving due to faster and more flexible development and execution processes
- New leeway in decision-making and scope of action
- Optimized target achievement by higher motivation of employees and team spirit.

Summing up we can conclude, that coupling cognitive as well as agile potentials enables enterprises to achieve competitiveness within the rapid change of a digital and globalized world – digital mindset matters.

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The Importance of Strategic Human Resource Development Practices Among Multinational Companies in Malaysia

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Abstract. Scholars in Human Resource Development (HRD) are debating that HRD should have bigger role that is beyond training and should strategically be linked to business planning in order for HRD to help organization implement its business strategies. However, HRD has not been regularly practiced and the inconsistent understanding of its roles has also contributed to the disparity in the HRD field. This paper aims to discuss some empirical evidences on how HRD is viewed and used according to strategic HRD model. The perceptions of 58 MNCs practitioners in Malaysia are valued to report the findings.

Keywords: Strategic Human Resource Development · People importance
MNC company

1 Introduction

The concept of human capital influences how organizations invest on its people. Employees or people are expected to demonstrate significant changes and these changes can be achieved by providing them the necessary knowledge and skills to practice the new ways. Meaning, what people knows (intellectual capital) would give competitive advantage to organization. The changes made by people are provided by HRD initiatives through training and development which aims to improve individual and organizational learning in order to influence organizational performance. Therefore, HRD has a specific and important in increasing human capital and intellectual capital of an organization. For that reason, organizations' investment in human capital are viewed from the aspect of knowledge and skills that the employees acquire during training and development which should yield returns. In this paper, we highlight how HRD has been regarded as non-strategic partner and its struggle to reserve important position in organization strategic planning. It is mysterious why HRD practitioners have not played any strategic roles. Regardless of the reasons, the old paradigm and thinking on HRD must change. In most organizations, intellectual capital is seen as critical in accomplishing its strategic goals, and HRD must take up a strategic approach

to realize this goal. Only strategic partners within the organizations that could allow HRD to play its role effectively.

Organizations in South Korea, Singapore and India for instance, invest greatly on people to produce higher quality human capital [1, 2]. Meanwhile, in Australia and New Zealand, the investment in the development of learning and development is found to be the trajectory to develop future leaders and high potential people [3]. In line with this, the emphasis on utilizing human capital (knowledge, skills and abilities) is necessary to meet business goals, subsequently responding to the nation's growth. It is essential to recognize that with regards to collective knowledge and learning outputs, the ability to develop people is relatively influenced by organization leaders or also known as multiple stakeholders. Multiple stakeholders are referred as HRD professionals, top management and line managers, owners, investors, line managers and employee including those working with HRD professionals [4]. Some scholar refers them as line managers, senior managers and owners, customers and suppliers [5]. In other words, the manipulation of actions and perceptions of these multiple stakeholders could facilitate business productivity hence improve profitability in the long run. This results in an understanding that strategic partnerships of multiple stakeholders in practicing HRD roles and their responsibility in planning for people investment is necessary for organizations' competitive advantage [6–8].

Therefore, this research attempts to answer the following questions: (1) What are the differences of people importance in current and future practices? (2) What is the effect of SHRD characteristics on current HRD practitioners' perceptions of people importance?

2 Literature Review

The diverse terms and interdisciplinary of HRD have made the field controversial and have led to debates by scholars [9–14] on issues such as how HRD should serve, outcome of utilizing HRD or attributes of HRD in offering strategic values. It is clear that lack of clarity over definitional boundaries and confusion over purposes, locations and languages of HRD have addressed the huge barrier in HRD to be well-understood in practice [11]. HRD domains became ambiguous theoretically and practically, and have resulted in overlapping with other field and body of practices [11, 15, 16]. For example, Middle East survey data from the Chartered Institute of Personnel and Development [17] indicated that three-quarter of the regions' learning and development managers believe that recruitment and selection has emerged as HR's top priorities that is well-aligned with organizational strategy compared to learning and development and others. While in Indian banks' survey, most banks have taken HRD for granted by utilizing traditional HRD approach of training as the only mechanism for employee development and they do believe that this is sufficient in providing a conducive HRD climate [18]. Nevertheless, the HRD's dilemmas on how HRD works in various focus, purposes, goals and directions can be positively viewed [19]. For instance, attempt to focus on developing people's intellectual capital to unleash human expertise for organization success has made this a strategic agenda for HRD players [4, 6, 20–22]. Eventually, renegotiating the role among practitioners and HRD specialists in a

strategic content has demanded them not only to articulate organizational values and objectives but also define which developments works well for organizational growth [23]. In order to effectively communicate the idea of HRD, practitioners or HRD players must have a strategy shaping rather than just supporting role [21, 24]. The structure indicates the means of achieving goals and objectives [15]. As a matter of fact, [25] claimed that significant relationship exist between structure and strategy. Indeed, as strategy followed by structure, the emergence of culture will influence strategic decision making. With reference to [26], they remarked that even HRD department has existed as early as 1990s in Malaysia, there are still reluctances of many organizations to name specific department as HRD. In fact, a prominent company like Petronas Malaysia uses ‘leadership’ and ‘learning and development’ term to associate their practices with HRD motives.

Given the amount of attention on the importance of HRD in strategic seat, it is important to note the issue of alignment between HRD policy and organization concern. For example, when an organization train its people, they expect employee to have knowledge and skills needed within the context of organization’s objective. This implies that any kind of HRD initiatives or strategies must be aligned to organization business strategy, and only then HRD could expand its role in shaping business strategy [5, 27, 28]. According to [24], senior management should be able to consider HRD effect on any internal and external environmental change, therefore SHRD can be truly exercised. Meaning, whoever is involve in developing strategic planning or corporate mission/goal must be able to see how HRD function influences planning.

The attempts to redefine HRD to SHRD have been done by notable scholars like [24, 28]. Training, development and learning strategies are predicted to support and influence corporate strategy of an organization. The purpose is not only meeting organization’s needs, but also helping organization to develop and grow and must greatly depend on learning culture. To institutionalize this mission into practice, SHRD must be designed and delivered within an open system [24, 29] (Fig. 1).

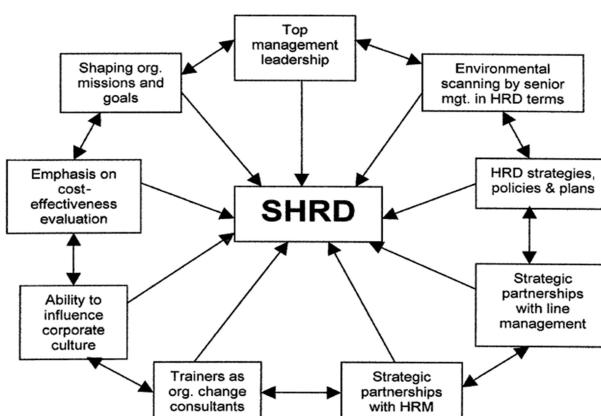


Fig. 1. HRD as an open system (source: [24, p. 286])

3 Methodology

This research was conducted at a premier multinational bank, which provides major retail and financial service within the Asia-Pacific region. It has the largest network in the country with strong foothold and is well-placed as a leading bank in Asia. 58 representatives of sub-companies were chosen as samples in this study that involved responses from top management such as head of departments, vice presidents and line managers. This group of respondents fit the criteria of HRD practitioners as mentioned by [30], as they understand the companies' direction to how people and organization should be developed. The research adopted the Investors in People (IIP) Standard instrument from [31] to measure people importance, which covers four principles to develop any potential of effective structure to outperform people in any industry. The element of employee or people development was integrated into the original construct according to the importance of investing in people development for business growth by [32]. Meanwhile, the SHRD characteristics was adopted from [24, 28] who studied the emergence of SHRD, and [33] measurement on training maturity. A five-point Likert scale was used from 1 (highly not practice) to 5 (highly practice) to measure the response on people importance, and 1 (strongly disagree) to 5 (strongly agree) for SHRD characteristics. The analysis of variance or known as ANOVA was applied to determine whether there are significant differences of tested variables. Lastly, to measure the significant effect of SHRD Practices on People Importance, the Multiple Regression analysis was used.

4 Findings

The response rate from the survey was 79% (46), and 20 of them were executives, 17 vice presidents, five directors/president and 4 head of departments. The respondents' perceptions on people importance were presented by comparing what currently been practiced and what should be practiced. There were significant differences from all the elements surveyed. This indicated that respondents have positive views on employees or people's development and growth including improving performance of their employees. Although these two elements have already been emphasized by the respondents, they still believe that they need to better practice it in the future. On the other hand, giving recognition and providing strategies, plan and policies for HRD have moderately been practiced. However, respondents do agree that these two elements should be placed into better practice in the future (Table 1).

The regression results showed the effect of SHRD characteristics on current HRD practitioners' perceptions on people importance. It is found that of all eight tested variables, only three variables were explained or effected people importance namely the (1) HRD strategies, plan and policies ($R^2 = 26.6\%$), (2) top management leadership ($R^2 = 24.1\%$), and (3) shaping organizational missions and goals ($R^2 = 19.5\%$). This implied that for instance, 26.6% of variance in people importance was explained or contributed by the HRD strategies, plan and policies (Table 2).

Table 1. Summary of mean difference on people importance

| No. | Variables | Current practice | Future practice | Sig. value |
|-----|-------------------------------------|------------------|-----------------|------------|
| 1 | Development of people | 4.268 | 4.764 | .000 |
| 2 | Enthusiasm of improving performance | 4.473 | 4.875 | .000 |
| 3 | Recognition from organization | 3.296 | 4.722 | .000 |
| 4 | HRD strategies, plan and policies | 3.250 | 4.630 | .000 |

Table 2. Summary of regression analysis on the effect of SHRD practices on people importance

| No. | Variables | R ² | F | p value |
|-----|---|----------------|--------|---------|
| 1 | Shaping organizational missions and goals | 0.195 | 10.691 | .005 |
| 2 | Top management leadership | 0.241 | 13.954 | .002 |
| 3 | Environmental scanning by senior management, specifically HRD terms | 0.081 | 3.891 | 0.51 |
| 4 | HRD strategies, plan and policies | 0.266 | 15.927 | .001 |
| 5 | Strategic partnership with line management | 0.120 | 6.024 | .017 |
| 6 | Strategic partnership with HRM | 0.099 | 4.851 | .036 |
| 7 | Trainers as organizational change | 0.084 | 17.431 | .047 |
| 8 | Ability to influence corporate culture | 0.113 | 5.578 | .023 |

5 Discussion and Conclusion

In any organization, leaders play a significant role to add value to the ability of their people to engage in any business activities. For instance, the relationship of top management, middle management and line ranks are seen significant to infuse and diffuse changes in organizations [34]. The major contributor of senior management, HRM staffs, HRD staffs and line management have been depicted as one strong tie to drive HRD to a mature state or to be called SHRD. Significant involvement of CEO, HR professional staff and other managers as HRD player is essential, otherwise, HRD could not be practiced at strategic level and linked to business strategy. Historically, HRD has been marginalized and been ignored by organizations as they failed to acknowledge HRD's contribution. Despite this controversy, practitioners and scholars continuously demand for strategies to improve its business and people as they noticed that training per se as HRD is not sufficient [35]. Our study proved that even though respondents have positive views on HRD, there is still a loophole to be addressed. The integration between organizational mission and goals with HRD structures, policies and strategies is vital and require proactive role by HRD players. It is worth to note the misunderstanding in handling HRD can jeopardize the process. [20] highlighted that the ability to convince board of directors and multiple stakeholders on HRD's contributions has improved the performance from bottom end hierarchy.

To conclude, top management and HRD practitioners' awareness and understanding on HRD is very crucial so that HRD strategies, plan and policies could be

exercised at strategic level. As mentioned by [16], to understand how people understand HRD is to know how they do and how they talk about what they do.

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Contractors' Organisational Structure Elements for Controlling Project Cost in the Construction Industry

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Abstract. Setting an organisational structure is a human-based concept that calls for all the elements making construction organisations better in management operations. This paper establishes organisation structure elements for construction project cost control practice by revealing the appropriate constructs for setting organisation structure for controlling and managing construction project cost. This paper employs the Delphi technique approach for collecting data after extracting sixteen (16) constructs from literature. A consensus was reached at the third round. Delphi experts comprised professionals practising in the construction industry. The findings reveal that organisational structure elements assist in controlling and managing of construction cost. High consensus elements include centralisation of authority, number of layers in the formation of corporate structure, patterns of communication, specialisation of members, among others. Contractors and project cost managers can, therefore, use the organisation structure constructs to establish good organisation structure for cost control practice.

Keywords: Cost control · Construction industry · Organisational philosophy
Organisational structure

1 Introduction

The modern construction projects face substantial cost overruns despite the existence of project management and other control mechanisms in the construction industry. It, therefore, calls for the issues relating to cost control practice to be relooked. Early researchers on cost control concepts looked at organisation structures as a most significant concern. But less is seen in the current cost control frameworks development. As construction projects fail to meet its cost objectives, the blame can not only be shifted to cost control theories but also organisational philosophies as a human-based approach such as corporate structure, organisational culture and the use of information and communication

tools. Corporate views are the way things are conducted within an organisation. Organisational conceptions affect construction project cost performance. Setting a regulatory structure is a human-based concept that calls for all the elements making construction organisations better in the management operations.

An appropriate organisational structure assists the project management team members or construction firms to achieve a very high project performance such as successful cost performance in the project undertaken through the gains in efficiency and effectiveness by the members of the organisation [1]. Tran and Tian [2], the intention of the establishing every organisation is to reach the mission of setting that organisation. Notwithstanding that fact, organisation that exist can either attain the level of success or failure. It means that for an organisation to achieve success, then it calls for the organisation to set out clear goals, creation of internal orders and relationship among members [1]. It is the setting of the explicit goals, developing domestic rules and relationship among members of the organisation that best described the organisational structure [1].

In the construction industry, Otim et al. [3], added that construction project cost control practice can alone be described as successful if it is achieved using the right personnel's, tools resources and also at the right time. The various stages of the cost control process can be in an integrated control structure by taking into account those working on the field, those responsible for the cost control work, and the project contractual relationships of members [4]. Abubakar [5], further show cost control system is undertaken by firstly starting with the contractor's functional organisation. Contractor's functional organisation and cost systems are the inputs of the cost control system. It then follows with the cost control process which are; estimating, project cost budgeting, planning & scheduling, cost monitoring and cost evaluation and reporting.

This paper, therefore, establishes the organisational structure elements required for the practice of cost control.

Definition of Organisational Structure

There are a lot of descriptions of corporate formation carried out by researchers [1, 2, 6, 7]. Ubani [6], explains organisational structure as the management framework implemented to oversee all the various activities of a construction project or other activities of an organisation. Underdown [7], added that organisational structure "is the formal system of task and reporting relationships that controls, coordinates, and motivates employees so that they cooperate to achieve an organisation's goals". According to Naoum [8], defines organisational structure as "a mechanism for linking and coordinating people and groups together within the framework of their roles, authority and power.

Analyzing all the definitions given for organisational structure, the researchers summarise corporate structure as a network of personnel's that guides a construction organisation to achieve its cost performance by the use of various roles, authority and power.

Elements of Organisational Structure

Greenberg [9] and Zaki et al. [1] summarised the primary structural elements organisation structure to be the following:

- a. The formal relationships with a well-defined duties and responsibilities;
- b. The hierarchical relationships between superior and subordinates within the organisation;
- c. The tasks or activities assigned to different persons and the departments;
- d. Staff members are directed to perform various functions;
- e. A set of clear policies, procedures, standards and systems of evaluation of cost performance which are framed to guide the people and their activities.

Latifi and Shooshtarian [10], points out that organisational structure has the following vital elements namely: nature of formalisation, specialisation, standardisation, centralisation, professionalism, complexity, hierarchy of authority and personnel ratios. Medeuenyi et al. [11] and Damanpour [12], also supported the fact that, organisation structure should have nature of formalisation, layers of hierarchy, level of horizontal integration, centralisation of authority, and patterns of communication as part of organisational structure. Kim [13], identified and provided a detailed explanation of the corporate structures in four different vital dimensions as; nature of formation, number of layers, level of horizontal integration and locus of decision making. Kim [13], explained them as; view of composition: the number of layers is the degree to which an organisation has many levels verses very few levels of management structure.

Organizational structure includes the nature of layers of hierarchy, centralisation of authority, and horizontal integration. It is a multi-dimensional construct in which concerns: work division especially roles or responsibilities including specialisation, differentiation or departmentalisation, centralisation or decentralisation, complexity, and communication or coordination [14]. Kariuki [14], also added that organisational structures have different attributes such as control mechanism, communication, corporate knowledge, task, prestige, governance and values.

In summary, organisational structure has the following elements:

(1) Roles and positions, (2) Formal relationships, (3) Nature of formation/number of layers, (4) Specialization/professionalism, (5) Centralization of authority or decentralization (locus of decision making), (6) Level of horizontal integration, (7) Patterns of communication, (8) Coordination among members, (9) Personnel ratios, (10) Mechanism for problem solving, (11) Accountability, (12) Organisational knowledge, (13) Set of clear policies/procedures and standards, (14) Prestige, (15) Governance and (16) Values.

Effectiveness of the Organisational Structure

Ubani [6] and Akpan and Chizea [15], further posit that for the corporate structure to be active and efficient, it has to possess the following:

The employee should be willing to change as all situations. It should give allowance for optimum delegation and room for individual creativity.

Simplicity; simple to the extent that no one is in doubt what is expected of him.

Lean staff; the leading management should be as thin staffed as is needed for prompt decision making.

Optimal span of control; the middle level management, the supervisors inclusive should not be cumbered with so many people under their direct control. At the same time, the span of control should not ridiculous be too small to miniaturise their role and importance within the structure.

Human-oriented; the structure should be seen to enhance humanism, job fulfilment and enhancement. It should be people-oriented and responsive to the environment that shelters it.

Result and Quality-oriented; the structure should indicate without any doubt that it is result and accountability oriented.

In cost control practice, Abubakar [5], spelt out the criteria for active organisational structure. These are:

Setting up the various functional units of the organisation. The different specialisations should be grouped to perform the task.

People having the right qualifications should be given the mandate to operate in the key positions.

Task that can only be performed and achieved must be given to members.

Communication should always flow from the top management team to the subordinates to be able to perform the cost control task.

There should only be one unity of command. Each department should only have one person in the senior position to link up the unity of command among members.

Instructions should be given through the lines of authority. Top management team should make a decision first, then transmits the direction to the middle level authorities then to the bottom level management team members.

The various roles and responsibilities must be well defined in the authority's positions.

The chronological order of the authorities should be well spelt out in the organigram of the organisation in a written document or plan which should show the positions of the organisation and must be passed on to all members of the organisation.

2 Research Methods

A full Delphi methodology was used to see if the constructs identified from literature applies to cost control practice for the construction industry. The verification process is as follows:

2.1 Delphi Process

Delphi survey method originated in the past decades. Delphi method is defined by Linstone and Turoff [16] as *a method for structuring a group communication process so that the process is efficient in allowing a group of individuals, as a whole to deal with a critical problem*. Delphi surveys attempts to bring out response on the question 'what' as well as what could be or what should be' [17, 18]. It is against this that the researchers choose to apply Delphi survey method in the studies. That is, what the constructs of organisational structure elements will be applicable in construction cost control practice. The Delphi process used follows that of Hallowell and Gambatese [19]

in Fig. 1 below. The various areas are: identify the research question, identify potential experts, select experts based on predetermined criteria, validate expert status and inform panelist of the study requirement, develop questionnaire using methods to minimize bias, transmit survey to specialist panel, collect and analyze round responses, evaluate consensus, report feedback and build feedback for panelists of subsequent round until consensus is achieved.

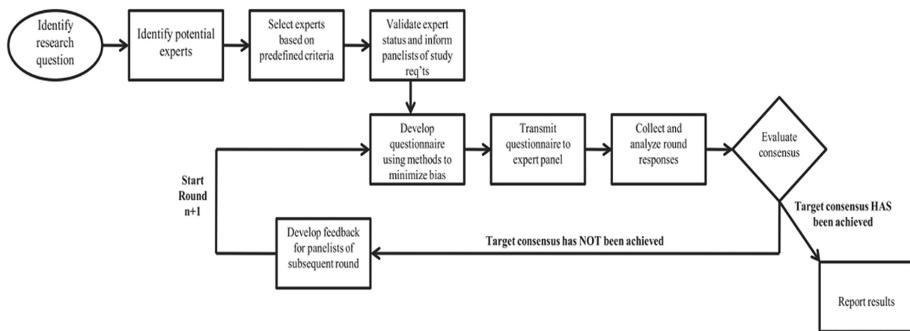


Fig. 1. Delphi process [19]

2.2 Experts for Delphi

An expert definition has been discussed in length by researchers [20–22]. It is clear from literature that an ‘experts’ knows a particular field through academic qualification and working experience in the industry of which the construction industry is of no exception [20–22]. Demonstration or acquisition of knowledge is also through forums, seminars, conferences and workshops of which there is always avenue for continuous profession development in the industry [20–22].

Veltri [23] flexible points system is set in the areas of knowledge and working experience for the expert to meet more of the criteria set. The measures include academic qualification, conferences/journal papers, years of working experience, professional body registration and professional practice, book or chapter publications, level of management position. The flexible points for selecting the experts was used for the study as suggested by Hallowell and Gambatese [19]. Experts must score a minimum score of eleven points to qualify to participate in the study [19]. The criteria are: membership of professional body, years of professional experience, conference presentation, member of a committee, chair of a committee, peer-reviewed journal article, faculty member at an accredited university, writer or editor of a book, writer of a book chapter and have academic qualification with a minimum of Bachelor’s degree [19]. Refer to Table 1 for the flexible point system. Fourteen (14) experts were used for the study as suggested by Hallowell and Gambatese [19] that experts number can be 8–12 experts.

Table 1. Flexible point system to qualify as expert [19]

| No. | Requirements | Score |
|-----|--|-----------|
| 1 | Professional body registration | 3 |
| 2 | Years of professional experience | 1 |
| 3 | Conference presentation | 0.5 |
| 4 | Member of a committee | 1 |
| 5 | Chair of a committee | 3 |
| 6 | Peer-reviewed journal article | 2 |
| 7 | Faculty member at an accredited university | 3 |
| 8 | Writer/editor of a book | 4 |
| 9 | Writer of a book chapter | 2 |
| 10 | <u>Academic degrees</u> | |
| | Doctorate | 4 |
| | Masters | 2 |
| | Bachelor | 4 |
| | Minimum score to qualify | 11 |

2.3 Rounds for the Study

The study used three rounds for the study. The round one is the identification of the sub variables from literature and two rounds from the experts. The primary purpose of round two was to use their experience, expertise and judgement to rate what you perceive to be the average negative or positive influence of the various organisational structure elements for cost control practice in the construction industry. An opportunity was given to them to change their response later after all Delphi panels have completed the second-round survey and results have been analysed. The purpose of round three was to accept the group decision, maintain their original response or to indicate a new reaction.

2.4 Delphi Analysis

The 10-points Likert scale was used to analyse the data. The levels of impact were ‘very high impact’, to ‘no impact’. The inter-quartile deviation (IQD) was used to assess the consensus criterion. If IQD of 2 of the 10-point scale, means that there is consensus [24–26]. It also indicates that IQD of 0.00 to 1.00 ($0.00 \leq \text{IQD} \geq 1.00$) is a strong consensus while IQD greater than two ($\text{IQD} > 2$) is a weak consensus. The cut off point for IQD is ($\text{IQD} \geq 2.1 \leq 3$) [24, 25].

3 Results and Discussion

3.1 Respondents Background

The respondents used were experts who have all had a minimum of five years in the Ghanaian construction industry. The respondents all met the minimum scores set to participate in the Delphi survey. Out of the fourteen experts, four respondents had

precisely the minimum of eleven count to qualify. It indicates that more knowledgeable and experience experts were used for the study which will show a positive influence on the results. The summary profiles of the experts are provided in Table 2 below.

Table 2. Experts background.

| No. | Requirements | Score | Experts background | | | | | | | | | | | | | |
|-----|--|------------|--------------------|-------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | Professional body registration | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| 2 | Years of professional experience | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 3 | Conference presentation | 0.5 | 0.5 | | | | | | 0.5 | | | | 0.5 | | | |
| 4 | Member of a committee | 1 | | | 1 | 1 | 1 | 1 | | | 1 | 1 | | | 1 | 1 |
| 5 | Chair of a committee | 3 | 3 | 3 | | | | 3 | | 3 | | | 3 | 3 | | 3 |
| 6 | Peer-reviewed journal article | 2 | | | | | 2 | | | | 2 | 2 | | | | |
| 7 | Faculty member at an accredited university | 3 | 3 | 3 | | 3 | 3 | | 3 | 3 | | | 3 | 3 | | |
| 8 | Writer/editor of a book | 4 | | | | | | | | | | | | | | |
| 9 | Writer of a book chapter | 2 | | 2 | 2 | | | 2 | | | 2 | | | | 2 | 2 |
| 10 | <u>Academic degrees</u> | | | | | | | | | | | | | | | |
| | Doctorate | 4 | | 4 | | | | | 4 | 4 | | 4 | | | 4 | |
| | Masters | 2 | 2 | | | | 2 | 2 | | | 2 | | 2 | 2 | | 2 |
| | Bachelor | 4 | | | 4 | 4 | | | | | | | | | | |
| | Minimum score to qualify | 11 | 12 | 16.5 | 11 | 12 | 12 | 12 | 12.5 | 14 | 11 | 11 | 12 | 12.5 | 11 | 12 |

3.2 Delphi Results

Out of the sixteen questions asked to ascertain the level of influence of organisational structure elements applicable in the construction industry, fourteen were agreed upon and achieved consensus by the experts scoring a median rating between seven (7) to ten (10) and IQD between zero (0) and two (2) that is $\text{IQD} \leq 2$. Ten constructs had a dominant consensus with IQD score up to one. Only two constructs were above the cut-off point by having IQD more than two. It shows that organisational elements are required for cost control practice as illustrated in Table 3 below.

Table 3. Organisational structure elements for cost control.

| S/No. | Change management constructs for cost control | Median | Mean | SD | IQD |
|-------|---|--------|------|------|------|
| 1 | Roles and positions of the departments | 8 | 7.79 | 1.42 | 0.75 |
| 2 | Formal relationship | 8 | 7.93 | 0.73 | 0.00 |
| 3 | Nature of formation/number of layers | 7 | 6.86 | 1.35 | 0.75 |
| 4 | Specialization/professionalism | 8 | 7.43 | 1.02 | 1.00 |
| 5 | Centralization of authority | 6 | 5.21 | 2.39 | 1.75 |
| 6 | Decentralization of authority | 9 | 8.57 | 1.28 | 1.00 |
| 7 | Level of horizontal integration | 7 | 6.93 | 0.92 | 1.00 |
| 8 | Patterns of communication | 7 | 7.29 | 0.99 | 1.00 |
| 9 | Easy coordination among members | 9 | 8.29 | 1.77 | 1.50 |
| 10 | Personnel ratio (e.g. core employees to supporting staff) | 6 | 5.86 | 2.63 | 2.75 |
| 11 | Mechanism for problem solving | 8 | 7.29 | 1.27 | 1.00 |
| 12 | Accountability channels in the organisation | 9 | 7.93 | 2.13 | 1.75 |
| 13 | Set of policies/procedures and standards | 8 | 7.86 | 1.35 | 0.75 |
| 14 | Organisational knowledge | 10 | 9.36 | 1.15 | 1.00 |
| 15 | Organisational prestige | 7 | 6.57 | 2.21 | 2.25 |
| 16 | Corporate governance | 7 | 7.00 | 1.71 | 2.00 |

The above results show that setting right organisational structure elements are required for the practice of cost control in the construction industry.

The reaching consensus of most constructs of organisational structure also indicate that cost control performance becomes a failure with the absence of these construct. It is support by Zaki et al. [1] and Otim et al. [3], construction firms can achieve high successful cost project performance in the construction project by the people.

Roles and positions of the departments, formal relationship, nature of formation/number of layers, specialization/professionalism, decentralization of authority, level of horizontal integration, patterns of communication, mechanism for problem solving, set of policies/procedures and standards and organisational knowledge all had a very strong consensus which agrees with works by [1, 9]. In setting a corporate structure for cost control practice the guiding policies established by the organisation to be well followed. The members in top management level must be professionals to handle cost control. There should preferably be decentralisation in the organisation than that of centralisation for the cost control practice. The various roles and lines of communication and problem-solving mechanism will all affect cost performance. These are in support with Latifi and Shooshtarian [10].

Personnel ratio (e.g. core employees to supporting staff) and Organisational prestige were dropped out. It shows that in the cost controlling process, organisational prestige is not needed in the practice of cost control. The way people see the organisation or in other words corporate image is not necessary. Probably, the experts were internal control issues for cost control than the external view of the organisation. The personnel ratio too was dropped out. The point of cost control is more technical than it requires the support of other non- professional staff. It shows that cost control practice will solely be handled by all experts of the various levels of management/authority.

4 Conclusions

The study looked the establishing organisational structure elements for cost control practice using the Delphi techniques. The study was successfully achieved by reaching a consensus among experts in the construction industry. The study shows that organisational structure elements are required in the practice of cost control of which there is less attention to that. This study has demonstrated that its incorporation in cost control practice will result to better project cost performance. Fourteen (14) sub constructs reached consensus namely: roles and positions of the departments, formal relationship, nature of formation/number of layers, specialization/professionalism, centralization of authority, decentralization of authority, level of horizontal integration, patterns of communication, easy coordination among members, mechanism for problem solving, accountability channels in the organisation, set of policies/procedures and standards, organisational knowledge and corporate governance.

This study also provides the foundation for any new organisational philosophies development needed in the controlling of construction project cost. Thus, it gives a clear direction of the organisational structure elements for project managers and contractors to consider how to set a suitable organisation structure for the practice of cost control in the construction industry.

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Effects of Personal Social Capital on Managerial Positions

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Abstract. Understanding the role of Personal Social Capital in selection and promotion of managers is important. Nevertheless, a research gap exists in evaluating the antecedents and mechanisms of the effect of Personal Social Capital on managerial positions. The aim of this study is to assess effects of three sources of Personal Social Capital on managerial positions. These are: connections with colleagues at work; connections with people who possess social capital assets such as wealth, high status, or reputation; and connections with neighbors.

2230 Israeli respondents answered a Personal Social questionnaire. Results confirm that connections with colleagues at work and with people with social capital assets directly affect managerial positions. the relationship between Personal Social Capital and connections with neighbors was found significant through the mediation of age.

Understanding the social resources that affect managerial positions is beneficial for managers and important for organizational insight into factors that affect managers.

Keywords: Managers · Personal Social Capital · Career · Managerial position · Colleagues · Assets · Neighbors

1 Introduction

The aim of this study is to evaluate the effects of personal social capital on management positions. Furthermore, it attempts to distinguish the sources and mechanics of Personal Social Capital that influence managerial promotion. Personal Social Capital in organizations is composed of personal ties inside and outside of the organization. Gibson et al. [1] researched networking and social capital. They called for future research on this field to focus on providing comprehensive tests of theories on the antecedents, mechanisms, and outcomes of the effects of social capital on organizational variables. This research addresses this research gap by focusing on the effects of personal social capital that derive from sources inside (e.g., connections with colleagues) and outside (e.g., connections with neighbors and with people who own assets) the organization. The theoretical search for personal SC antecedents, mechanisms, and outcomes makes this study significant. In addition, it makes the practical contribution of serving as a roadmap for aspirational applicants and employees seeking promotion to the

managerial level. The literature review first defines Social Capital and its organizational levels and then proceeds to an elaboration of Personal Social Capital. It then goes on to unpack the three sources of Personal Social Capital, framing them in research hypotheses.

1.1 Social Capital

Social Capital is a concept that joins social interaction and benefits perceived as a consequence of these connections [2]. Social Capital Theory is based on network theory [3], but highlights the profits (i.e., the “capital”) gained from them. Putnam [4] defined Social Capital as “networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives”. According to Putnam [4], Social Capital leads to better education, lower crime rates, as well as better physical and mental health.

In organizations, the Social Capital also exists on 3 levels: (1) the personal level of every employee [5], (2) the intra-organizational level of groups and units [6] inside the organization [7, 8] and (3) external Social Capital of the whole organization [9]. In this study, we focused on Personal Social Capital, one of the most important factors that affected promotion to a managerial level.

1.1.1 Personal Social Capital

Personal Social Capital relates to the individual’s connections with others and the benefits derived from these connections. This is the basic level of Social Capital, constituting all accumulated life relationships. These include adolescent friendships, close and distant family ties, acquaintances, as well as casual and work contacts. Therefore, employees have their own Personal Social Capital that is composed of social ties inside and outside of the organization. Inside of the organization, extensive Personal Social Capital can be derived from personality, but can also result from expertise [10], high human capital [11], and high status in the organizational hierarchy.

In this study, we chose to focus on three important sources of Personal Social Capital, connections with neighbors, which is a source outside the organizations, connections with colleagues inside the workplace, and connections with people with assets that can be inside and outside the organization.

Sources of Personal Social Capital – Connections with Colleagues. Colleagues are an important source at work. Jiang and Hu [12] found that quality of collegial relationships has a positive impact on individual subjective well-being and life satisfaction, promoting effective work-related outcomes.

Colleagues have a substantial influence on promotion [13] inside and outside the organization [14]. Employees with many and strong collegial connections are promoted as managers and function better in their managerial position [15].

Therefore, we hypothesize that:

H1 – Personal Social Capital derived from colleagues inside the organization positively affects managerial positions.

Connection to People with Assets. Another important source of Personal Social Capital is connections with people who possess power such as abundant social ties, high reputation [16], and tangible assets or wealth.

Uzzi [17] suggests that actor's personal network networks of ties are better when the person's contacts possess financial assets.

Although connections with people who own assets can be outside the organization, people with assets can also be inside the organization or interface with it.

In organizations, it is important to have connections with senior managers, supervisors [18], or key stakeholders [19]. Martin [20] states that in organizations, a good reputation is linked to high Personal Social Capital, while Young [21] points out that knowing people in key positions, who themselves have an abundance of Social Capital, is important for manager promotion. Consequently, our second hypothesis is that:

H2 – Personal Social Capital derived from contacts with people with Social Capital assets positively affects Managerial positions.

Sources of Personal Social Capital – Connections with Neighbors. Neighbors are sources of Personal Social Capital outside of the workplace. Permentier et al. [22] found that neighbors are important sources for Personal Social Capital. The healthier the neighborhood, the more connections a person will have with their neighbors. They will have a stronger voice in the public sphere.

Kerwin and Kline [23] note that previous studies of Personal Social Capital have insufficiently emphasized the importance of interaction between the individual and neighbors, a major source of Personal Social Capital.

Elder et al. [24] claim that interaction with neighbors reinforces economic success and social capital at work. Lundin et al. [25] found that good connections with neighbors affects managers in public administration.

Therefore, we hypothesize that:

H3 – Personal Social Capital derived from neighbors positively affects managerial positions.

2 Methodology

2.1 Sample and Procedure

Questionnaires were distributed online using Google Docs by third year undergraduate students to their acquaintances, friends, and family. They were instructed to approach respondents in managerial positions. Ultimately, 2230 completed questionnaires were collected, 57.3% were female and 42.7% males. Most (77.8%) were employees, with the rest independent (8.6%), currently unemployed (11.8%), and pensioner (1.8%). Their age ranged from 21 to 75. 80.5% of respondents holding managerial positions.

2.2 Instrumentation

A managerial position is defined as a job status received as a promotion due to high performance, in which the person is in charge on other employees in the organization.

The managerial position variable is dichotomic, that is, differentiates between those who are managers and those who are not.

The Personal SC questionnaire was comprised of the Personal Social Capital Scale (PSCS) of Chen et al. [26] and some demographic questions. The scale was later shortened and refined by Wang et al. [27]. The scale was constructed as a matrix of five Personal Social Capital resources (family members, relatives, neighbors, friends, and colleagues), a Likert scale consisting of 5° (from a few to a lot), and categories of possessing social assets/resources (such as political power, high reputation, etc.). Because of the questionnaire's complex nature, executing a factor analysis was very complicated. Nevertheless, a good match was found for all the variables in the hypotheses, as described below. The control variable that was used in this study was Age accounting for personal differences between employees [28].

2.3 Analysis

Exploratory Factor Analysis (EFA) was performed. After cross loading items were removed, Confirmatory Factor Analysis (CFA) was performed for convergent and discriminant validity, in which several items were removed to improve model fit. Finally, Structural Equation Modeling (SEM) was constructed to test the model's goodness-of-fit. We used SRMR, CFI, and TLI [29]. SRMR values <.06 and values >.9 for CFI and TLI [30] are considered satisfactory.

2.3.1 EFA

Several well-recognized criteria were identified for the factorability of the scale. Firstly, all items correlated at least .3 with at least one other item, suggesting reasonable factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was .71, above the recommended value of .6 while Bartlett's test of sphericity was significant ($\chi^2(28) = 6021.76$, $p < .001$). The diagonals of the anti-image correlation matrix were all >.5, supporting the inclusion of each item in the factor analysis. Finally, the loadings were all >.7 (Table 1). Given these overall indicators, factor analysis was deemed to be suitable with the 8 items. A principal-components factor analysis of the 8 items using varimax rotations was conducted. Eigen values showed that each variable loads highly onto three factors, explaining 74% of the variance. These are: people who are your neighbors (1), assets/resources (2), and colleagues/fellows (3). and the factor loading matrix for this final solution is presented in Table 1.

Cronbach's alpha examined internal consistency for the scales, showing adequate alphas of .81 for Neighbors, .76 for Assets, and .77 for Colleagues. The correlations, means, standard deviations, and α -Cronbach values between the latent variables are presented in Table 2.

2.3.2 CFA

We used R v.3.3.3 to run CFA. Items of each measure were loaded on a specific latent variable. Three items for Neighbors, three items for Assets, and two items for Colleagues (Table 1). CFA showed a good fit to the observed data. $\chi^2(17) = 293.14$, $p < .001$ ($N = 2230$), CFI = 0.95, TLI = 0.92, SRMR = 0.04. The results are summarized in Fig. 1.

Table 1. Factor loadings based on principal components analysis with varimax rotation for 8 items.

| | | 1 | 2 | 3 |
|------|---|-----|---|-----|
| TRS2 | People in your neighborhood (Among the people in each of the following six categories, how many can you trust?) | .84 | | |
| CNT2 | People in your neighborhood (With how many people in each of the following categories do you keep a routine contact?) | .84 | | |
| HLP2 | People in your neighborhood (Among people in each of the following six categories, how many will definitely help you if requested?)
(How many possess the following assets/resources?) | .78 | | |
| PWR2 | Wealth or owners of an enterprise or a company | .86 | | |
| PWR3 | Broad connections with others | .82 | | |
| PWR4 | High reputation/influential | .76 | | |
| HLP5 | Your colleagues/fellows (Among people in each of the following six categories, how many will definitely help you if requested?) | | | .88 |
| TRS5 | Your colleagues/fellows (Among the people in each of the following six categories, how many can you trust?) | | | .86 |

Note. Factor loadings <.5 are suppressed.

Table 2. Correlation matrix: means, STD, and reliability

| | Neighbors | Assets | Colleagues |
|------------|-----------|--------|------------|
| Neighbors | – | | |
| Assets | .49*** | – | |
| Colleagues | .17*** | .18*** | – |
| Mean | 9.7 | 7.2 | 5.3 |
| SD | 3.1 | 2.8 | 2.1 |
| α | .81 | .76 | .77 |

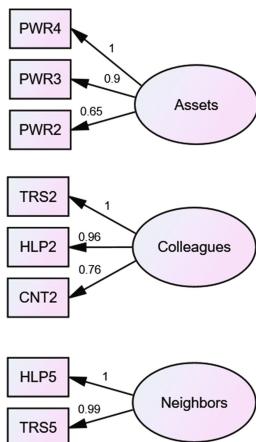
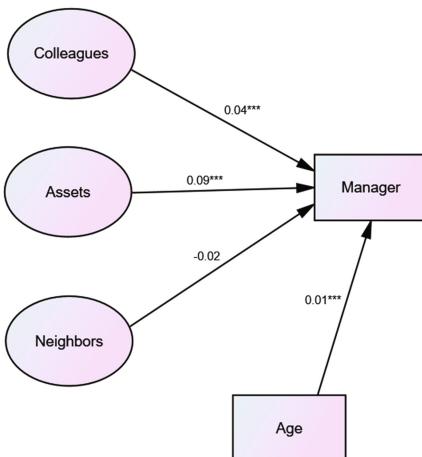
*** $p < .001$

Note: Scale α .77 for the complete scale.

2.3.3 Model Fit Results

We used R v.3.3.3 for SEM. The hypothesized model (Model A) showed a good fit with the data: $\chi^2(30) = 355.45$, $p < .001$ ($N = 2230$), CFI = 0.95, TLI = 0.92, SRMR = 0.04. Figure 2 illustrates the model and results.

H2 and H3 were supported. From Fig. 1, we observe that Colleagues ($B = .4$, $p < .001$) and Assets ($B = .09$, $p < .001$) positively affect Manager, while controlling for Age ($B = .01$, $p < .001$). However, Neighbors ($B = -.02$, $p > .05$) did not show statistical significance in affecting Manager (H1). Since Age has a positive relationship with Manager [32], in the next step we examined if the relationship of Neighbors and Manager is mediated by Age, and constructed a second model which includes the mediation.

**Fig. 1.** Summary of CFA results**Fig. 2.** SEM and coefficients

The second model (Model B) showed a good fit with the data: $\chi^2(29) = 331.6$, $p < .001$ ($N = 2230$), CFI = 0.95, TLI = 0.93, SRMR = 0.03. Figure 3 illustrates the model and results.

The relationship of Assets and Colleagues remained unchanged. The mediation effect of Age on the relationship between Neighbors and Manager was supported by the data. A Sobel Test for mediation [31] was significant ($z = 4.59$, $p < .001$). The bootstrapped Confidence Interval (CI) for Age's indirect effect ranges from 0.01–0.02 (Bootstrap sample size = 5000). This result indicates that the indirect effect of the mediators is significant, since indirect effects are statistically significant when zero does not exist in their confidence interval range [33]. It can therefore be implied that H1 was

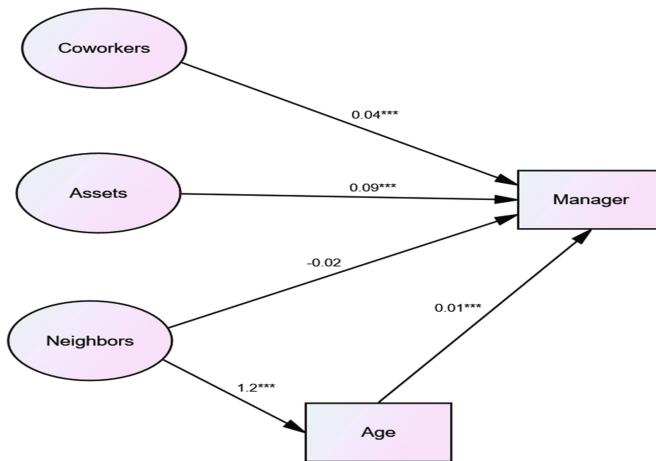


Fig. 3. SEM and coefficients for the extended model

partially supported. While a direct relationship between Neighbors and Manager was not statistically significant, such a relationship does exist with the mediation of Age.

Finally, in order to ascertain that the second model is preferred over the first, we compared the two models. Since Model A is nested under Model B, a χ^2 difference test was performed for statistical significance [34] (Table 3). A significant χ^2 difference suggests the two constructs are distinct [35].

Table 3. Difference test for statistical significance

| Model | χ^2 | Df | CFI | TLI | SRMR |
|----------|----------|----|------|------|------|
| A | 355.45 | 30 | 0.95 | 0.92 | 0.04 |
| B | 331.60 | 29 | 0.95 | 0.93 | 0.03 |
| Δ | 23.85*** | 1 | — | — | — |

From Table 3, we observe that the difference in χ^2 values of the two models is statistically significant. Since the fit indices of Model B are better, it can be concluded that Model B is a better statistical fit to the data than Model A.

3 Discussion

In this study, we deciphered the effects of Personal Social Capital on managerial positions. In segregating the sources of Personal Social Capital that affect managerial positions, a more accurate picture of the factors that influence employee promotion to management was attained. Two hypotheses were confirmed. We found a direct effect of colleagues and of people with Social Capital assets (such as reputation, wealth, or ownership of an enterprise or company along with broad connections to others) on

managerial positions. However, we did not find a direct connection between neighbors and managerial position; although an indirect one was located, with age a mediating factor in the connection between neighbors and managerial position.

The effects of connections with colleagues and people with assets on managerial position are not trivial and are as important as the effects of human capital on acceptance and promotion of managers [36]. In fact, Personal Social Capital is as or even more important, although many managers and organizations ignore its significance.

The fact that no direct connection was found between neighbors and managerial position is quite plausible. Neighbors are not directly implicated in the work sphere and organizational life. Most studies that investigated the connection between managers and neighbors encompassed managers in the municipal domain [37] or investigated managers whose clients were neighbors [25]. Hence, it is reasonable to assume that another variable mediates the connection between Personal Social Capital derived from neighbors and managerial position. Shu-Chi and Yin-Mei [11] found age as the variable that “translates” human capital into social capital. For Nyqvist et al. [32], the older the person, the higher their sense of neighborhood belonging. They will have more connections with neighbors and possess more Personal Social Capital, implicating them in an age-based mediation connection.

This research makes both theoretical and practical contributions. Social scientists have long focused on developing a theoretical framework for the complex variables involved in Social Capital, an influential concept that has impacted organizations. It was previously disassembled into three levels: Personal Social Capital, Intra-Organizational Social Capital, and External Social Capital. In this study, we continued refining Personal Social Capital in search of its sources and their relative influences. It was determined that its sources do not have the same impact. Even though Personal Social Capital consists of connections from both inside and outside the organization, the latter connections (e.g., with neighbors) are not direct influences, but are mediated by manager age. Practically, these findings are important for any employee who aspires to become a manager and to any manager who wants to be promoted. Gibson et al. [1] claim that creating Personal Social Capital must be goal-oriented. Hence, categorizing and evaluating the factors that impact managerial positions is very important and can assist in optimal resource allocation.

Nevertheless, it should be noted that Personal Social Capital has a “dark side”. Thus, appointment and promotion due to Personal Social Capital and not human capital can be perceived as unfair and, in extreme cases, even as corruption. Personal Social Capital can be attained by several activities, some wholly legitimate, although others can be the result of inappropriate behavior. Gibson et al. [1] show undesirable outcomes of Personal Social Capital for organizations such as costly turnover. The distinction between proper and improper Personal Social Capital is complicated and requires further research.

3.1 Conclusion

Personal Social Capital is not necessarily the first parameter that comes to mind when thinking about advancement to managerial positions. Nevertheless, it has a significant effect on managerial positions. This research focused on different effects of Personal

Social Capital derived from three sources. The results indicate that connections from inner organizational sources exert direct impact on managerial positions. In contrast, those derived from outside the organization (neighbors) have a partial effect. Age is a mediating factor in the connection. Thus, the older the person, the better the connectivity with neighbors and the higher the connections with managerial positions.

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To Grow or Not to Grow - The Strategic Plan for Acquisition and Integration

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Abstract. The paper provides a comparison of two growth strategies for businesses, based on case studies. Both refer to organisations that have been merged into a multinational corporation that applies multiple approaches in investment proceedings. Such acquisitions result in expansion of corporate activities, nevertheless, they produce a number of social, financial and market risks for the acquired companies. The companies mentioned are based in Germany and the production is relocated to Poland and Croatia. Some of the processes are moved to these new locations while others remain within the acquiring group. Thus social aspects seem to play a significant role.

The purpose of this paper is to analyse the effects of the different approaches used in the acquisition process and the implications they carry for the staff of both the acquirer and the target company. The paper presents the results of an investigation into strategic mergers and acquisitions of production companies in the context of multinational enterprises.

Keywords: Company's development · Acquisitions · Social aspects

1 Introduction

Nowadays, as growing globalization of the market is observed, the companies are evolving in a competitive environment. Stronger and stronger competition forces companies to develop in order to survive or grow in the future.

Growth is a process in which the company changes its size (in terms of quantity) or naturally (qualitatively).

However, the process of development during planning and implementation is accompanied by various problems related to the availability of stock, legal and organizational aspects, competition on the market and in particular social, public and cultural aspects [1].

Social, public and cultural aspects are one of the key issues to be solved while making decisions and developing strategies as well as planning acquisitions. This is due to the activity of enterprises on global markets in various fields - cultural, social, technical culture, technical advancement, social policy in a given country, mentality and employees' attitude towards changes (historical experience). It should be

remembered that behind each acquisition process there are people who are crucial to the integration process.

The social and public situations as well as the cultural aspect of the acquired company located in Germany and the influence of this company on the enterprises of the acquiring company, to which a part of production was transferred along with machinery, technology and technical concept (know how) and which are located in Poland and Croatia, are described below.

2 Methods of Development (Growth) of Companies and Strategic Plan for Acquisition and Integration

In general, two methods are used in the process of development of companies:

- Internal growth also known as organic or endogenous
- External growth through acquisitions also called exogenous.

There are also two options for development:

- Increase in production stock (organic development)
- Acquisition of assets available in other companies (external development).

2.1 Internal (Organic) Development

It involves internal development of skills and abilities, primarily through an investment policy aimed at acquiring new assets in the form of tools, machines, production lines of laboratories, investment cells. Internal growth refers to the continuous but gradual development of the company, focused on increasing existing production capacity or creating new production or commercial capacity.

This internal growth strategy allows the company to increase its market share, but at a slow pace that is controlled while adjusting the structures as well as employees' abilities and skills [2].

The development method maintains economic and financial independence, which is why it is suitable for SMEs. However, this strategy has some serious disadvantages, such as the slowness of implementation processes or the inability of the company to enter new areas of business where the competition is already present.

There are also limitations in internal resources for further development and innovation. This development is limited per se (comparison to a tree that will never reach the sky).

Advantages

- Exploitation of a known domain in order to capitalize on gained experience and know-how
- Maintenance of company identity
- Preservation of independence
- No need for reorganization or restructuring.

Disadvantages

- Vulnerability of the business in the event of change in market conditions or market maturity
- Difficulties reaching sufficient critical size
- Long learning curve.

The type of company that is predisposed to internal development

- Very small businesses and family
- SMEs not listed on the stock exchange
- Companies having opted for specialization.

2.2 External Growth

It requires developing the company's abilities and skills based on cooperation with other companies, not necessarily from the same industry and of the same character or type of activity [3, 4].

This method of development allows the company to particularly control assets that are used and operated on different markets and owned by other companies.

Advantages and disadvantages of internal and external growth connected with the type of the enterprise are presented below.

Advantages

- Quick access to new areas of business
- International development
- Exploitation of synergies or complementarities
- Increased market power
- Reduction of competition.

Disadvantages

- High capital requirements
- Problems of coordination and control of grouped activities
- Cost of physical integration of activities (reorganization)
- Psychological impact on the social climate
- Delicate cultural and managerial integration of entities.
- Difficulties in introducing humane values.

The type of company that is predisposed to external development

- Large, global or worldwide companies
- Companies having opted for diversification or vertical integration.

The following scenarios and case study focus on external development through acquisitions as the one that is more dynamic, giving access to new areas of activity, international scope, stability and capital's safety. Simultaneously, external development is followed by internal development of enterprises that belong to large global companies to which some of the activities of the acquired enterprises are transferred.

Operations of growth are accompanied automatically by many effects and consequences. It begins in the initial phase of waiting for good effects, both quantitative and qualitative, which may affect the company in all its dimensions. Scientific and research studies describe four following phases of the process [5, 6].

A. Preliminary Phase

- External company context
 - Market dynamics
 - Competition
 - Technological background
 - Needs, market expectations
 - Economic context - global, regional and local
- Strategic vision
 - Motivations
 - Problems
 - Expected results
- Organization
 - Culture
 - Structure
 - Human resources

B. Strategic Phase

- Strategic integration plan
 - Formalization of the strategy for clear economic growth
 - Defining the acquisition criteria
 - Choice of purpose
 - Creation of multidisciplinary team

C. Tactical Phase

- Transaction process
 - Contact for the purpose of the transaction and presentation of the project
 - Signing a confidentiality agreement
 - An exchange of information
 - Preparation of the final offer
 - Contract draft

D. Integration Phase

- Effective approach of integration entities
- Development and adaptation of the implementation principles of existing humanistic values to the new environment
- Organizing teams to manage the integration phase
- Choice of integration method
- Establishing a communication plan

- Harmonization of information systems (reporting system, adjustment of computer programs)
- Flow of knowledge and rules of functioning (training on valid rules and standards, production process technologies, know-how knowledge).

3 The Process of the Acquisition

3.1 Description of the Acquiring Company

The case study will be based on an example of a company operating in the electromechanical and construction equipment industries on the global market (Europe, Africa, Asia). The company was founded in the 80 s of the last century in France.

The company is not present on the stock exchange. It has a shareholding with a decisive advantage of the founder (owner). Within over forty years of operation, the company has grown several times, from a local company operating in a limited area to a significant company in Europe and world. Development (growth) was achieved through acquisitions (external growth) of enterprises with a similar nature of operations in the first phase. Late on, acquisitions extended to areas of other operations.

In the course of its development, the company has developed many principles and standards of procedures in managing subordinate (dependent) companies, as well as its own companies' quality, which have developed during subsequent acquisitions, often using the experiences and norms of the acquired companies.

3.2 Humane Values of the Group

The Group's values and philosophy explain its original management style and are the foundation of success.

The group became, after more than a few decades of existence, a significant player in its field. This success is based on a unique history and strong values. These values are, as a matter of fact, human traits; not all of them are completely achieved, but they set a motivation. In addition, they are not strictly related to the Group management mode. They are therefore a reality in the life of the Group, which is a matrix organization with a reduced number of hierarchical levels that provides all employees with greater autonomy and freedom of action.

Important aspects that determine the identity of the humanistic organization are presented below.

- Honesty and loyalty – the company is a large family in which the general interest prevails and does not conflict with individual interests.
- Honesty and trust: the group trusts employees, especially those inexperienced, and expects that this trust will be reciprocated. These features are visible in the Group, but also in all external shareholders. Trust creates a favourable climate that guarantees efficiency; this is a synonym of selective interdependence.

- Freedom and passion: the ‘Dare to do’ doctrine is synonymous with freedom of enterprise and the promotion of a sense of initiative. Freedom is possible because of the Group’s hidden trust.
- Valorisation of cultural differences: it consists of respect for everyone and for the differences. This is a strong value sometimes expressed at the expense of immediate effectiveness; language and cultural barriers are often referred to as work, the activity of the same people who seem to slow down (not of their own will). Most international groups harmonize their principles and resources, and above all their way of thinking. They believe that it is easy to extend their activities to the logic of ‘mass personalization’, but the respect for cultural differences is rarely realized in this way. Respect and trust are strongly interdependent.
- Humanistic project of the company: “The company is a human construction, created by people and for people”. It provides people with the opportunity to develop.
- Cohesion and team spirit: cooperation, sharing knowledge, experience and know-how. All forces must be multiplexed. Solidarity and loyalty result from these qualities.
- Culture change: “Change is in our genes”; Continuous improvement is a source of progress for all, and the environment requires flexibility, adaptability and responsiveness within the Group.
- A strong vision for the future: a positive spirit always focuses on the future and progress of the Group. The Group’s main goal is sustainable development. Its vision is long-term, in order to be able to modify the famous dictum about globalization that says “Think in a long term, work now”.

As one of the few global companies, it gives a lot of freedom to the managers of subordinate companies. Each company has its own budget, works in accordance with fiscal law, the labour code, management culture, and social and public aspects valid in a given country [7]. The body approving the budget and controlling all activities (finances, investments, costs, stocks, free cash flow) is the so-called ‘Holding’, which is managed by the owner and takes the final decisions. Holdings are the directors responsible for supervising subordinate companies depending on the type of business, who help to develop, solve current problems of companies and communicate current trends and development strategy as well as controllers of budgets and financial flow. The Holding has introduced two business areas for subsidiaries: the red zone, which aims to adhere to the hard rules of the Holding (budget) and the green zone, which gives the freedom to make decisions in a wide internal scope by Directors of subsidiaries.

3.3 Description of the Acquired Company

A company operating in the electromechanical and construction equipment industry with a production plant in Germany. Activity: production and sale of company’s own products, a family business, not listed on the stock exchange. The development (growth) of the company has progressed through internal development, which, however, caused a reduction in the expected development (growth) resulting from strong competition and the lack of sufficient financial resources to finance operations that would result in further

development. The company was advanced in terms of technology, modern machine park, experience of employees, good product quality ('German quality'), but it was not enough to meet the competition. The reason could be a bad sales and marketing strategy. The reason could also be, as in many so-called family businesses, the mentality and philosophy of the owner's business management, which is not very flexible and resistant to changes that cause development.

3.4 Proceedings of Process

The last phase of integration and a description of the effects of the acquisition in the further phase of the companies in the technical, technological and so important social, public and cultural context as well as the transfer of humanistic values to the group will be presented below.

After the acquisition of the company in Germany, the acquiring company introduced its own principles and value systems concerning:

- organization and management,
- strategy and financial discipline (supplies management and Free cash flow),
- reporting and control system,
- approach to human resources in a social and cultural context.

When it comes to the type of activity (scope: production, technology), the acquired company has retained its own scope of activity. In the sales area, the company gained access to the network and sales structure of the Acquiring Group.

In this phase of integration, the human (social) factor was very important. In the management, accounting and operational sectors, there has to be a significant change in the attitude of employees in order to adapt to new conditions and accept human values. In this area employees from the Holding (training, seminars) and employees of other companies belonging to the Acquiring Group were helpful, sharing their experiences on acquisitions. As for the administration and management staff, the process was quite smooth and has been aligned with the assumptions. Mutual trust was a key element of integration. Serious problems appeared among production employees. Employees had great concerns about maintaining the current production. Knowing the history of various acquisitions that took place in the acquiring company, there was a reduction or transfer of activity to other companies of the group which was associated with a reduction in employment. The situation became nervous which did not favour people's involvement in better and developmental work. Despite the company being German, based on solid German standards of work and discipline, it was difficult for people to maintain the peace and stability needed to perform production tasks. Initially, nothing indicated any changes in production. However, after two years of operation, the economy end up being decisive. The acquiring company, having in its group production companies of similar character, activity and production capacity, decided to transfer the majority of production to countries with lower cost of production (low cost country). It was Poland and Croatia - countries belonging to the EU, which did not cause customs and transport problems (close location and good road infrastructure). These two companies have already belonged to the acquiring company for many years, which is why the standards and values of the Acquiring Company were implemented in

them. However, the company has kept its identity (logo and name). Sales, R&D and service departments remained in their current location, so that the approach was not only economical but also humanistic.

After the decision to transfer production, the organization phase began. A group of people responsible for various stages and activities in the transfer process was appointed: preparation of time stages, legal arrangements and social solutions mitigating the effects of redundancies. It all took place as a secret - the meetings took place mostly outside the acquired company - to prevent disturbances among the crew in the preliminary phase of preparations. In the following phases it was unavoidable.

After informing the crew about production reduction, its scope and places of relocation, there was a technical phase consisting of:

- setting deadlines for individual stages,
- determining the scope of training and courses in the field of technology, access to technical and technological documentation,
- selection of machines, tools and equipment of transferred positions that were necessary to resume production in a different location,
- preparation of a new area of activity (production area, electrical installation and various types of retrofit) in the company taking over production, creating a layout,
- calculation of logistics costs, assembly and disassembly of machines and devices.

The most difficult stage in this case were trainings and courses of employees that are strictly responsible for production. As for the technical staff, which means the R&D departments of both companies, the cooperation proceeded essentially without significant problems slowing down the process.

Training of employees that are strictly responsible for production regarding production process technology, machinery and equipment operation, obviously, took place in the company in which the present production was taking place. In order for trainings to yield the best results, they took place during the full course of production. It was determined while planning that until complete knowledge of production and technology was mastered, production in the original plant would not be discontinued.

Several employees came to Poland and Croatia for a two-week training. And here the problems began. The main problem was the reluctance to pass on knowledge, experience in nuances relating particularly to manual assembly lines and operation of more technically advanced machines. Trained employees were treated like intruders and those who would take others' work. It also had a mental, high technical culture, advanced German technology transferred to a poorer country with an unstable and constantly developing technical economy.

A lot of work had to be done particularly by managers, who were responsible for ensuring that the training processes had a satisfactory result. Not only many conversations took place, but also motivational (financial) system was prepared and presented to trainers and trainees, and that brought the desired result.

The second important problem arose during the disassembly and preparation of machines and equipment for shipment, because it was impossible to get proper help from the crew, which sometimes intentionally caused delays in operations. Managers often had to intervene in an unconventional way (informal meetings integrating employees, exchanging crews for a more favorable to change)

The consequence of these activities was generating additional costs related to:

- extending the training time,
- motivating employees,
- extending the time of disassembly and loading.

These additional costs were difficult to plan during the planning phase.

The next stage is the assembly of machines, tools and devices, organization of production positions in the company taking over production in Poland. These operations were proceeding as planned. They consisted in familiarizing the rest of the departments and the crew with the specificity of the new production. New machines already operating in the new plant had to be used for the new production technology. Due to financial reasons, not all devices and machines have been transferred. The acquiring company had the appropriate production capacity to take over part of the production processes using its own machines. These were the assumptions made in the initial phase of the project, which reduced costs of transferring machines, while increasing the use of production capacity in the acquiring company.

After the initial production phase (so-called trial production), an audit was carried out by employees of the Quality Control Department and R&D from Germany. The products produced in Germany had the necessary certificates valid in Germany, which raised their prestige and confirmed the excellent quality.

The audit included checking the quality at individual stages of production, checking the quality of materials and components. Due to the savings, a large part of the material sub-suppliers has been changed. Documentation was kept in accordance with the requirements of certification. In this phase, the most difficulties with achieving the appropriate quality of products took place. Particularly maintaining quality standards by external subcontractors. This significantly extended the process of preparation for starting mass production. At the end, an external audit was carried out by the company granting the appropriate certificate. After successful end of the audit, serial production started.

To sum up this example: the acquisition of the company (external growth) has significantly affected the internal development of the acquiring company based on the implementation of new technologies, the introduction of new quality standards, technical culture and the expansion of the production range.

4 Conclusions

In the surrounding globalization of all the processes in the global economy, there is no doubt that growth and development is inevitable in order to face competition and new technologies as well as satisfy customers. The internationalization of companies also affects the way they are perceived by the human factor that runs these enterprises. More and more often, international companies are looking for comprehensive solutions offered by large companies which, through acquisitions, diversify their portfolio and extend the footprint. The development is facilitated by changes in the policy of nations, liberalization of economies, ease of information and capital flow. However, the growth

through acquisitions or mergers is always accompanied by humanistic aspects (cultural, social and public) which slow down the processes to a large extent if they are not taken into account and appropriately prepared in the initial phases of the acquisition strategy development.

In the global economy, growth must be accompanied by mergers and acquisitions that connect or take over enterprises operating in various cultural, political and demographic areas [8, 9]. Research and observation show that the greatest successes are achieved by those companies in which the humanistic values are followed at every stage and level.

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Understanding the Effect of Emotional Exhaustion on Tellers' Job Satisfaction in Teller-Task Activity in Ghanaian Retail Banks

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Abstract. This study explored the influencing dynamics of tellers' emotional exhaustion on their job satisfaction necessitated by the increased customer demand of direct teller service in the banking halls, as against the usage of automated teller machines in Ghana. Using a cross-sectional design, quantitative data was collected from five banks with similar institutional arrangements for teller work. Results from factor analysis identified seven factors that are indicative of the tellers' emotional exhaustion, and four factors that are indicative of their job satisfaction. Results from correlation and regression analyses showed that a rise in the tellers' emotional exhaustion reduces their satisfaction with the teller job. It is concluded that tellers become emotionally exhausted and dissatisfied with their jobs due to the absence of human resources management mechanisms that could have enabled the efficient design of the teller task and work environments that are conducive with bonded relationships between tellers' and their supervisors.

Keywords: Tellers · Teller-task activity · Emotional exhaustion
Job satisfaction · Retail banks · Ghana

1 Introduction

Banking is an important backbone to every economy. In Ghana, the sector has received massive transformation since the year 2000, in terms of policy and regulatory changes, to enhance the organizational effectiveness and competitiveness of banks. The need for the banks to be competitive in this free-market oriented industrial atmosphere also brought to the fore the need for firms to expect more from their employees, especially the frontline workers, such as the tellers, who interact with clients on a daily and regular basis. This new work demand has the potential of increasing the levels of pressure and stress accompaniment of tellers' work and the ability of bank managers to manage these employees. Statistics [1] have shown that bank tellers conduct most of a bank's routine transactions and this includes: cashing checks, accepting deposits and loan payments, and processing withdrawals, selling savings bonds, accepting payment for customers' utility bills and charge cards as well as processing necessary paperwork

for certificates of deposit. Bank tellers work for more than eight hours per day [2], and their work activities require a great deal of attention to details [1], a combination of which two acts defines the levels of their workload. An attempt to reduce the cumulative effect of such workload on tellers in order to sustain the quality of customer service delivery by banks in Ghana has resulted in several technological developments [3]. The technological innovations introduced in the operations of the banks in attempts to optimize tellers' workloads towards enhancing the quality of customer service delivery include, on-line (internet) banking services and automated teller machines (ATMs) [3].

A study [3] on customers' use of the ATM as an alternative service delivery platform for bank customers in Ghana, and serving as workload relievers for bank tellers, showed that it is underutilized. The implication of these findings is that poor customer attitude towards ATM usage in Ghana has resulted in tellers' increased customer servicing activities in the banking halls, a situation that can have consequences on their emotional exhaustion and job satisfaction. Yet, there is no evidence in the extant literature to show that this human resource issue associated with the teller-task has been explored in the Ghanaian banking environment. This study therefore, sought to identify and understand the influencing dynamics of the emotional exhaustion factors and job satisfaction factors associated with the tellers' job activities due to the increased customer demand for direct teller service in the banking halls, as against the usage of ATMs in Ghana.

2 Teller Task, Emotional Exhaustion and Job Satisfaction

The culture of long working hours and the stress it causes employees is a common feature in many firms [4], such as in the banks. Customer participation in service delivery has also been linked to perceived workload and stress, especially among bank employees. Customer participation requires service providers to spend more time with customers [5]. It has been noted by [6] that customers may not understand the service offering or their role in obtaining the service experience. Thus, the boundary-spanning role of front-line bank employees is making them susceptible to heavy workloads and inflexible work schedules [7]. The bid by firms in the financial sector to optimize employee workload and maximize employees' service delivery to customers has seen such firms undergo technological developments through the introduction and provision of internet-based customer service transactions, which task performances by employees require a stronger skills set [8], including continual interaction with customers. The technological developments in the banks has improved the quality of customer service delivery by frontline employees/tellers, these employees are prone to role stress [9]. The activities of frontline employees are characterized by continual communication, repetitive tasks, long periods of standing within small work stations, and paying a high level of attention to security [1]. Few studies have been done into work demands of bank tellers. It has been found that the work of tellers requires high memory capacity and concentration, and the tellers themselves spend over eighty percent of their work time in a standing posture, resulting in majority of them reporting postural pains in the back, legs and feet [10].

The studies above have largely focused on the health implications of workload on bank tellers and not their emotional exhaustion. Generally, the relationship between emotional exhaustion and job satisfaction has been widely researched in several work contexts. A fundamental goal of service work is to make interactions with customers warm and friendly and prevent emotional “leakage” of boredom or frustration [11]. Accordingly, customer service providers are frequently required to treat customers politely even when subjected to abuse [12]. Customer verbal aggression gives rise to emotional exhaustion [13, 14], which is the core dimension of burnout and refers to the lack of energy and depletion of emotional resources due to excessive psychological demands [15]. Physical and psychological aggression by customers was found to have a significant relationship with the emotional exhaustion of personnel caring for residents living in retirement homes [16], and with emotional exhaustion and depersonalization of hospital staff [17]. Emotional exhaustion is prevalent in human interactive jobs such as bank teller that are emotional labour in nature. Emotional labour work is viewed to be inherently dehumanizing and distressing, as opportunities for autonomy over emotional expression are constrained [18]. Emotional labour refers to the effort, planning, and control required displaying organizationally desired emotions during interpersonal transactions [19]. It is argued that the presence of emotional display rules may not necessarily have a negative impact on employees, as there may be congruence between the required emotional display and the emotions that are actually experienced [20]. However, the effort involved in regulating true emotions with those that are organizationally desired can lead to emotional exhaustion and job dissatisfaction [21, 22]. It has also been reported that a relatively small decrease in job satisfaction was accompanied by a comparatively substantial increase in burnout [23]. Thus, job satisfaction is negatively related to emotional exhaustion and is positively associated with personal accomplishment [24, 25, 26, 27, 28]. In addition, other studies have been carried out in the service sector in respect to emotional exhaustion and job satisfaction. Emotional exhaustion has been found to be negatively associated with front-line bank employees' job satisfaction [7]. This significant negative relationship indicates that front-line employees in people-oriented jobs (banks) experience elevated levels of psychological demands imposed on them and are less satisfied with their job [7].

In this study therefore, we propose the hypothesis (H) that “Tellers will experience a decrease in job satisfaction if their emotional exhaustions are high”.

3 Methodology

A cross-sectional design was adopted for the study. Guided by Miller and Brewer's sample size determination technique [29], simple random sampling was used to select two hundred and eighty (280) bank tellers across six (6) banks in Ghana. Data was collected using a questionnaire divided into four sections. The first section collected information on respondents' demography. The second and third sections measured factors constituting the bank tellers' emotional exhaustion and job satisfaction. The emotional exhaustion measurement subscale entailed eight (8) factors adapted from the Maslach Burnout Inventory subscale [30]. Reliability test for the factors yielded an overall Cronbach Alpha of 0.88. This fitted well in the Cronbach Alpha range of 0.860–0.890 recommended by

Maslach. The job satisfaction subscale entailed six (6) factors adapted from Schriesheim [31], Tsui [32] and Cohen [33]. Reliability test for the listed factors yielded an overall Cronbach Alpha of 0.740. This fits well within the Cronbach's alpha range of 0.730 and 0.780 [32, 33]. In the data collection procedure, two hundred and eighty (280) questionnaires were administered to the 280 employees sampled, and two hundred and sixty-five (265) were retrieved. After completeness checks, 250 questionnaires out of the 265 returned were found to have been fully completed and by implication, useable for data analysis. This therefore, represented a response rate of 89.29%. The collated data was analyzed both descriptively and inferentially. In the descriptive, Principal Component Analysis was conducted to identify factors that constituted the Tellers' emotional exhaustion and job satisfaction Factor predictiveness was determined using Schumacker's [34] recommendation that estimated factor loading must be 0.70 or higher. Inferential statistics was also used to test the effect of the tellers' emotional exhaustion on their job satisfactions, using both correlation and regression analyses. The analytic tool used is SPSS version 22.

4 Results Analysis

4.1 Demographic Analysis of Study Participants

The demography of the respondents was analyzed in terms of gender, age, years worked with organization, marital status and level of education. The gender distribution showed that males accounted for 130 (45.20%) while females accounted for 137 (54.80%), thus constituting a majority of respondents. The age distribution showed that a majority of respondents (62%) were between 20 to 30 years which is indicative of youthfulness. Regarding the years spent by the respondents' working in their firms, a majority of them (54.40%) had worked in their firms for periods ranging from 1 to 5 years. A majority of respondents (56.4%) were also found to be single. The respondents were highly educated with a majority of them (70%) holding University degrees.

4.2 Factor Analysis of Tellers' Emotional Exhaustion and Job Satisfaction

In order to identify factors that significantly represent the tellers' emotional exhaustion and job satisfaction in the performance of increased teller-task, factor analysis was conducted. The results obtained, in terms of the Kaiser-Meyer-Olkin (KMO) and Bartlett's test statistics are shown in Table 1 below. As it is shown in the table, the estimated Kaiser-Meyer-Olkin (KMO) value for emotional exhaustion is 0.877, while that for employee job satisfaction is 0.831, indicating that the correlation patterns for both indicators are good, as recommended by Field [35]. The estimated chi-square (χ^2) value from the Bartlett's test for the emotional exhaustion variable is: $\chi^2 = 0.009$ ($p = 0.000$), which is highly significant ($p < 0.001$). That for job satisfaction is: $\chi^2 = 0.002$ ($p = 0.000$), which is also highly significant ($p < 0.001$).

The results from both the KMO and the Bartlett's tests show that it is appropriate to factor analyze all WMSDs indicators tested, using principal component analysis.

Table 1. KMO measure of sampling adequacy and Bartlett's test result for firefighting tasks characteristics and WMSD

| Indicator | KMO measure | Bartlett's test of sphericity | | |
|----------------------|-------------|-------------------------------|----|-------|
| | | χ^2 | df | Sig. |
| Emotional exhaustion | 0.837 | 0.009 | 55 | 0.000 |
| Job satisfaction | 0.831 | 0.002 | 36 | 0.000 |

4.3 Component Analysis of Tellers' Emotional Exhaustion

In identifying the factors perceive by the tellers as contributing to their emotional exhaustion, component analysis was performed. The resulting rotated component matrix entailing the estimated factor loadings/regression values (r) for the 9 tested factors determinant of the tellers' emotional exhaustion are shown in Table 2 below.

Table 2. Rotated component matrix with regression estimates for emotional exhaustion indices

| Factors | r - values |
|---|--------------|
| Feeling emotionally drained from work | 0.800 |
| Feeling used up at end of the day | 0.800 |
| Feeling tired when woken up in the morning and having to face another day of work | 0.600 |
| Strain from working with people all day | 0.700 |
| Feeling burned out from work | 0.800 |
| Feeling frustrated by work | 0.800 |
| Feeling of working too hard on job | 0.800 |
| Feeling of being stretched beyond limit | 0.700 |

As it is observable from Table 2 above, there is only one component of the employees' emotional exhaustion, which reflects the orientation of their work. As it is shown in Table 2 above, the regression estimates for the factors depicting the employees' emotional exhaustions are as follows: Feeling emotionally drained from work ($r = 0.800$; $r^2 = 0.640$); Feeling used up at end of the day ($r = 0.800$; $r^2 = 0.640$); Working with people all day is a real strain on me ($r = 0.600$; $r^2 = 0.360$); Strain from working with people all day ($r = 0.700$; $r^2 = 0.490$); Feeling burned out from work ($r = 0.800$; $r^2 = 0.640$); Feeling frustrated by work ($r = 0.800$; $r^2 = 0.640$); Feeling of working too hard on job ($r = 0.800$; $r^2 = 0.640$); Feeling of being stretched beyond limit ($r = 0.700$; $r^2 = 0.490$).

The regression estimates for seven (7) factors associated with the tellers' emotional exhaustion influenced by their work (i.e. Feeling emotionally drained from work, Feeling used up at end of the day, Strain from working with people all day, Feeling burned out from work, Feeling frustrated by work, Feeling of working too hard on job,

and Feeling of being stretched beyond limit) are all greater than Schumacker's [34] recommendation of 0.7 and as such measure as the tellers' emotional exhaustion.

4.4 Component Analysis of Tellers' Job Satisfaction

In identifying the factors perceive as contributing to job satisfaction, component analysis was performed. The resulting rotated component matrixes (C) entailing the estimated factor loadings/regression values (r) for the six (6) tested factors determinant of the tellers' job satisfaction are shown in Table 3 below.

Table 3. Rotated component matrix with regression estimates for Job Satisfaction

| Factors | <i>r</i> | |
|---|----------|-------|
| | C 1 | C 2 |
| Nature of the work performed | 0.700 | |
| Relationship with supervisor | | 0.700 |
| Relationship with co-workers | | 0.600 |
| Job pay | 0.600 | |
| Opportunities for advancement and promotion | 0.700 | |
| Current job situation | 0.800 | |

From Table 3 above, the employees' job satisfaction is oriented in the following two (2) forms or components: job characteristics (C1) and relationship at work (C2). As it is shown in Table 3 above, the regression estimates for the factors depicting the employees' job characteristics are as follows: nature of the work performed ($r = 0.700; r^2 = 0.490$); job pay ($r = 0.600; r^2 = 0.360$); opportunities for advancement and promotion ($r = 0.700; r^2 = 0.490$); current job situation ($r = 0.800; r^2 = 0.640$). The regression estimates for three (3) factors associated with the tellers' job characteristics (i.e. nature of the work performed, opportunities for advancement and promotion and current job situation) are greater than Schumacker's [34] recommendation of 0.700 and as such measure as the tellers' job satisfaction. Similarly, the regression estimates for the factors depicting relationship at work are as follows: Relationship with supervisor ($r = 0.700; r^2 = 0.490$); Relationship with co-workers ($r = 0.600; r^2 = 0.360$). The regression estimates for one factor (i.e. Relationship with supervisor) associated with the tellers' work relationship is greater than Schumacker's [34] recommendation of 0.700 and as such measure as the tellers' job satisfaction. Thus, factors that representative of the tellers' job satisfactions are; nature of work performed, opportunities for advancement and promotion, the current job situation, and relationship with supervisors.

4.5 Relational Analysis of Tellers' Emotional Exhaustion and Job Satisfaction

In order to find out if the tellers' emotional exhaustion influence the extent to which they are satisfied with the teller job, correlation analysis was conducted. The mean (M), standard deviation (SD) and Person correlation estimates (α) for the tellers' emotional

exhaustion and job satisfaction variables are shown in Table 4 below. The Pearson correlation estimates highlighting the relationship between the three measured subscales are also shown in Table 4 above. The results show that an inverse, but very significant correlation ($\alpha = -0.322$, $p = 0.008$) exist between the tellers' emotional exhaustion and their job satisfactions. This implies that a rise in a teller's emotional exhaustion will reduce his/her satisfaction with the teller job. Therefore, the hypothesis (H) that 'increasing the tellers' emotional exhaustion will cause a decrease in their job satisfaction' is supported. In other words, the tellers' emotional exhaustion will have a significant negative effect on their job satisfaction.

Table 4. Mean, standard deviation and correlations estimates for tellers' emotional exhaustion and job satisfaction

| | M | SD | α | |
|-------------------------|-------|-------|----------|---|
| | | | 1 | 2 |
| 1. Emotional Exhaustion | 3.430 | 0.810 | – | |
| 2. Job Satisfaction | 3.390 | 0.670 | -0.322** | – |

**Very significant, $p \leq 0.01$ (2-tailed); $p \leq 0.05$ (2-tailed)

In finding out how the emotional exhaustion factors identified from the factor analysis influence factors indicative of the tellers' job satisfaction, both correlation and regression analyses were conducted to test the veracity of H . A summary of estimated Pearson correlation coefficients (α) and standardized regression coefficients (β) for the relationship between the identified emotional exhaustion factors (job characteristics-oriented) and their job satisfactions (influenced by relationship at the workplace) are shown in Table 5 below.

Table 5. Correlation estimates for Tellers' emotional exhaustion and job satisfaction factors

| Emotional exhaustion factors | Job satisfaction factors | | | | | | | |
|----------------------------------|--------------------------|---------|---|---------|-----------------------|---------|--------------------------|---------|
| | Nature of work performed | | Advancement and promotion opportunities | | Current job situation | | Relation with supervisor | |
| | α | β | α | β | α | β | α | β |
| Feel emotional drain from work | -0.189** | -0.090 | -0.160* | -0.097 | -0.320** | -0.074 | -0.169** | -0.104 |
| Feel used up at end of day | -0.156* | 0.068 | -0.148* | -0.029 | -0.376** | -0.226 | -0.122 | 0.055 |
| Strain from working all day | -0.230** | -0.035 | -0.137* | -0.016 | -0.223** | 0.135 | -0.820 | 0.092 |
| Feel of burned out from work. | -0.227** | 0.023 | -0.185** | -0.129 | -0.374** | -0.152 | -0.149* | 0.034 |
| Feel frustrated by work. | -0.314** | -0.197 | -0.149* | -0.021 | -0.400** | -0.202 | -0.230** | -0.188 |
| Feel of working too hard on job. | -0.244** | -0.087 | -0.157* | -0.061 | -0.309** | -0.021 | -0.185** | -0.097 |
| Feel of stretched beyond limit. | -0.227** | -0.038 | -0.094 | 0.050 | -0.304** | -0.070 | -0.128* | 0.018 |

** very significant, $p \leq 0.01$ (2-tailed); * significant, $p \leq 0.05$ (2-tailed)

The correlation and regression values in Table 5 above showed the existence of significant (α -values), but non-predictive (β -values) relationships between the various job characteristics indicators of the tellers' emotional exhaustions (i.e. nature of work performed, advancement and promotion opportunities, and current job situation) and the workplace relationship indicator of their job satisfactions (i.e. relation with supervisor). Correlation analysis towards understanding the associations between indicators of the tellers' emotional exhaustions and their job satisfactions, oriented by their job characteristics, which entails the nature of work performed, resulted in the following findings:

- (i) With the exception of tellers' feelings of being used up at end of the day ($\alpha = -0.227; p > 0.050$), improving the efficiency of the teller task will reduce/lessen;
 - strain experienced in their task accomplishment ($\alpha = -0.189; p < 0.010$)
 - level of burnout symptoms felt in task performances ($\alpha = -0.156; p < 0.050$)
 - frustration with the teller tasks ($\alpha = -0.230; p < 0.010$)
 - feelings of jobs requiring them to work too hard ($\alpha = -0.227; p < 0.050$)
 - feelings of being over-stretched in tasks undertakings ($\alpha = -0.314; p < 0.050$)
 - feelings of being emotionally drained in task undertakings ($\alpha = -0.244; p < 0.010$).
- (ii) With the exception of tellers' feeling stretched beyond their limits ($\alpha = -0.094; p > 0.050$), providing them opportunities for advancement and promotion will reduce/lessen;
 - level of emotional drain they experience ($\alpha = -0.160; p < 0.050$).
 - feelings of overly-used in daily task performances ($\alpha = -0.148; p < 0.050$).
 - feelings of working too hard in their task undertakings ($\alpha = -0.137; p < 0.050$).
 - strain they feel from working with people all day ($\alpha = -0.185; p > 0.050$).
 - feelings of burnout from work ($\alpha = -0.149; p > 0.050$).
 - feelings of being frustrated by their work ($\alpha = -0.157; p > 0.050$).
- (iii) Improving the tellers' prevailing job situations will reduce/lessen;
 - level of emotional drain they experience ($\alpha = -0.320; p < 0.010$).
 - feelings of being over-used in daily task performances ($\alpha = -0.376; p < 0.010$).
 - feelings of working too hard in task undertakings ($\alpha = -0.223; p < 0.010$).
 - strain they feel from working with people all day ($\alpha = -0.374; p < 0.010$).
 - feelings of burnout from work ($\alpha = -0.400; p < 0.010$).
 - feelings of being frustrated by their work ($\alpha = -0.309; p < 0.050$).
 - feelings of being stretched beyond their limits ($\alpha = -0.304; p < 0.050$).

Furthermore, correlation analysis towards understanding the associations between the factors predictive of the tellers' emotional exhaustions and their job satisfactions, oriented by their relationship at work, which entails the relationship with supervisors, resulted in the following findings:

- (i) Improving the relationships between the tellers' and their supervisors will reduce/lessen;
 - level of emotional drain they experience ($\alpha = -0.169; p < 0.010$).
 - strain they feel from working with people all day ($\alpha = -0.149; p > 0.050$).
 - feelings of burnout from work ($\alpha = -0.230; p > 0.050$).
 - feelings of being frustrated by their work ($\alpha = -0.185; p > 0.050$).
 - feelings of being stretched beyond their limits ($\alpha = -0.128; p > 0.050$).
- (ii) Improving the relationships between the tellers' and their supervisors will not reduce;
 - feelings of overly-used in daily task performances ($\alpha = -0.122; p < 0.010$).
 - feelings of working too hard in task undertakings ($\alpha = -0.820; p < 0.010$).

5 Discussion

This study sought to identify and understand the influencing dynamics of the emotional exhaustion factors and job satisfaction factors associated with the tellers' increased-customer servicing activities due to poor customer attitude towards ATM usage in Ghana. The results showed that a rise in a teller's emotional exhaustion will reduce his/her satisfaction with the teller job, implying that emotional exhaustion is negatively correlated with job satisfaction [7, 27]. Since a fundamental goal of service work is to make interactions with customers warm and friendly and prevent emotional "leakage" of boredom or frustration [11], customer service providers are frequently required to treat customers politely even when subjected to abuse [12]. Such a workplace atmosphere can be created in the banks by understanding those factors that are predictive of the tellers' emotional exhaustion and their job satisfaction, as oriented by the teller job characteristics. As it is found from this study, the creation of such work environment requires an improvement in the efficiency of the teller task.

The results have shown that, improving the efficiency of the teller task will highly reduce the strain experienced by the tellers in their task accomplishment, the level of burnout symptoms felt by the tellers in their task performances, the level of frustration associated with the teller tasks, the feelings by the tellers that their jobs require them to work too hard, the feelings by the tellers that they are being stretched beyond limit in their tasks undertakings, and the feelings by the tellers that they are being emotionally drained in their task undertakings. The results also showed that a work environment that is conducive can be created to absolve the consequences of the increased-customer servicing activities of the tellers by providing them opportunities for advancement and promotion. As it was found from the study, the provision of such opportunities will reduce the level of emotional drain they experience, reduce their feelings of being

over-used in their daily task performances, reduce their feelings of having to work too hard in their task undertakings, highly lessen the strain they feel from working with people all day, highly lessen their feelings of burnout from work, and highly lessen their feelings of being frustrated by their work.

The study has established that improving the tellers' prevailing job situations will highly reduce the level of emotional drain they experience, highly reduce their feelings of being over-used in their daily task performances, highly reduce their feelings of having to work too hard in their task undertakings, highly lessen the strain they feel from working with people all day, highly lessen their feelings of burnout from work, highly lessen their feelings of being frustrated by their work, and highly lessen their feelings of being stretched beyond their limits. Since the teller task in the banks is a representation of a human interactive job, it manifests an emotional labour type of work. Such work activity has been found to be inherently distressing, especially when opportunities for autonomy over emotional expression are constrained [8]. Thus, the prevalence of emotional exhaustion in the teller task as occasioned by the increased customer servicing activities of the tellers due to poor customer attitude towards ATM usage in Ghana, provides a work scenario demanding effort, planning, and control, all of which requires the display of organizationally desired emotions during interpersonal transactions [19] in the work environment. The display of organizationally desired emotions during interpersonal transactions, which could result in increased job satisfaction of the tellers, can be created in the work environment by improving the relationship at work.

The study has further established that, improving the relationships between the tellers' and their supervisors will highly reduce the level of emotional drain they experience, highly lessen their feelings of burnout from work, highly lessen their feelings of being frustrated by their work, highly lessen their feelings of being stretched beyond their limits, and lessen the strain they feel from working with people all day. These findings agree with Kinman's [20] argument that introducing emotional display rules may not necessarily impact on employees negatively, as there may be congruence between the required emotional display and the emotions that are actually experienced.

6 Conclusion

The study has been able to identify the influencing dynamics of the emotional exhaustion factors and job satisfaction factors that are associated with bank tellers' increased customer servicing activities due to poor customer attitude towards ATM usage in Ghana. Factors influenced by the tellers' work characteristics that are indicative of their emotional exhaustion were identified. Similarly, factors influenced by the nature of their work, the opportunities they have for advancement and promotion, their prevailing job situation, and the relationship they have with their supervisors, all of which are indicative of their job satisfaction, were also identified and their relational dynamics understood. It is therefore concluded that the situation whereby tellers become emotionally exhausted resulting in the reduction of their job satisfaction was a due to the absence of effective human resources management mechanisms that could have enabled the efficiency of the teller task, the creation of

conducive work environments that encourages good teller-supervisor relationships and opportunities for employees' advancement. Based on this conclusion, and for the banks to be able to mediate the challenges encountered by their tellers, they must use the identified emotional exhaustion and job satisfaction indices as macroergonomic guides to improve the teller work design of the tellers. This will help prevent the frustration the tellers experience in their task undertakings and help mediate their emotional exhaustion towards increase job satisfaction. In this regard therefore, it is concluded that the tellers' becoming emotionally exhausted and the reduction in their job satisfaction is a result of the absence of human resources management mechanisms that could have enabled the efficiency of the teller task, towards creating work environments that are conducive with bonded relationships between tellers and their supervisors as well as opportunities for organizational advancement.

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Regulations and Employees' Commitment to Change: Does Emotional Intelligence Matter?

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Abstract. This paper examined literature on emotional intelligence, commitment to change and the role of regulations in change management. Empirical and theoretical literature were analysed, together with secondary data from the Ghana Revenue Authority. Commitment levels of employees is a key determinant of the success of any change action. However, to achieve this success, those leading the change effort together with those affected by the change must all exhibit high levels of emotional intelligence. Drawing on institutional theory, the study found that regulations serve as both catalyst and vanguard of any change program. The study contributes to the basket of literature examining the link between institutional regulations and commitment to change, and the role of emotional intelligence in such link. Regulations play a very significant role in any change effort.

Keywords: Organizational change · Regulation · Commitment to change · Emotional intelligence · Ghana

1 Introduction

Extant literature has it that about 60–70% of change management programs fail – a statistic which has persisted for over four decades. This alarming statistic impliedly reveals that majority of organizational change initiatives are condemned to fail from the start. Considering the inevitability of regulation-triggered organizational change, the successful implementation of these forms of change rather depends on the level of employees' emotional intelligence and commitment exhibited by employees toward promoting the change program. This requires proper consultation between the change agents and employees before the inception of change efforts [1, 2].

Key essentials for the effective implementation of change are emotional intelligence and commitment levels of employees [3]. In concurrence to this, it is advanced that, “no change can occur without emotionally committed followers” [4] (p. 117). These researchers placed enormous regard on emotional intelligence and commitment as directly related. However, extant studies failed to highlight the conceptual link between the two constructs which provided a gap for the present study to focus on [5–7].

Again, regulations play crucial role in change management as they can either trigger the need for change or provide a roadmap for implementation of change program. Unfortunately, many studies on change management have largely overlooked this all-important concept [8–12]. As a result, this study sought to address the following questions: what is the relationship between emotional intelligence and employees' commitment to change? What is the role of regulations in change management?

2 Methodology

The present paper sought to meet its objectives by employing qualitative method particularly, content analysis. The approaches to content analyses include qualitative, conventional, directed, and summative content analyses [13]. The focus of the qualitative content analysis is the focus on the characteristics of language as communication, with emphasis on the content or contextual meaning of the text. Conventional content analysis is generally used with a study design whose aim is to describe a phenomenon [14]. With the help of existing theory or prior studies, researchers identify key concepts or variables [15] and discuss alongside the research questions. The summative approach to content analysis starts with identifying and quantifying certain words or content in the text with the purpose of understanding the contextual use of the words or content. This quantification is an attempt not to infer meaning but, rather, to explore usage [15]. The present paper made use of the summative approach because the authors delved into literature to understand the variables under study. Using content analysis helped to conduct in-depth analyses of existing literature on the variables. Again, it allowed for detailed analysis of theories pertaining to the objectives of this study. Secondary sources of data including journal articles, reports, and books were used. This methodology has been used in similar studies by [16, 17] to address their objectives.

3 Literature Review

3.1 Institutional Theory

Institutional theory hinges on the assumption that considerable varieties that exist among organizations can be erased and behaviors of organizations can be harmonized through regulations. Viewed as a key component of the environment which provide stability and meaning for social behavior, institution has been defined as the “regulative, normative, and cognitive structure and activities” [18]. Institutions are exemplified by law, regulations, customs, social and professional norms, culture, and ethics [19]. Institutions exercise their constraining influence on organizations and impose a uniform outlook on organizations in similar practice [20]. Hence, the emergence or alterations made to certain institutions confer their pressures on the forms and activities of organizations almost automatically.

The institutional theory posits that institutionalized activities happen because of individual (managers abiding by norms, habits, customs, and traditions both knowingly and unknowingly) organizational (support from shared political, social, cultural and

belief) and inter-organizational (pressures from government, industry alliances, and expectations also spell acceptable behaviors to organization) influences [19, 21, 22]. Another author expanded this theory by espousing the idea of "institutional entrepreneurship" [23]. He argued that organizations may behave in new ways which can, with time, change their institutional environments. By so doing, organizations themselves become change agents in their institutional environment [19].

3.2 Field Theory

The field theory provides an understanding into how regulations may necessitate organizational change [24]. This theory posits that the dynamics of the environment determine the response of organizations in respect to those environmental [25]. It is argued that the values, beliefs and objectives of an individual or organization determine which forces will be viewed as negative or positive [24]. Therefore, the combination of these forces yields the resultant effect on any prospective individual behavior. Lewin further stated that behavior is determined by those forces that are present and active in an individual in a given time and setting. The expectation of which policy regulation will succeed depends on how people's motivational needs are identified and understood, or the positive and negative psychological forces – as determined by their values – that affect their behavior relative to those regulations [26]. Management expectation of which organizational regulations will succeed will be contingent on the positive or negative psychological forces acting on the employees with regard to those regulations [27]. The success of a change effort therefore depends on how those affected would react, which in turn depends on their perceptions about the regulations of the change program relative to their job security.

3.3 The Role of Regulations in Organizational Change

Regulation has been defined to mean the set of legal instruments by which socio-economic policy objectives are achieved [28]. The coming into force of certain regulations (legal instruments) can force the need for change on organizations in the corresponding industries [29]. This is consistent with the view that organizational change can be imposed by changes in regulation and/or legal regimes [30]. In Ghana, for example, the Internal Revenue Service (established by the Internal Revenue Service Act, 1986, P.N.D.C.L. 143), the Value Added Tax (established by Value Added Tax, 1998, Act 546) and the Customs Excise and Preventive Service (established by Custom Excise and Preventive Service (Management) Law, 1993, P.N.D.C.L. 330) existed as separate corporate entities. However, the advent of the Ghana Revenue Authority Act, 2009, Act 791 compelled these detached revenue collection agencies to integrate into one entity namely the Ghana Revenue Authority. There was therefore a change in the two revenue collection agencies following the promulgation of the legal instrument (i.e. Act 791). Indeed, the transformation of the Internal Revenue Service (IRS), Value Added Tax (VAT) and the Custom Excise and Preventive Service (CEPS) into the Ghana Revenue Authority draws on the idea in institutional theory that institutions exert their constraining influence on organization, bringing to bear the fact that, the

formal change which occurred to these organizations was sanctioned by the advent of the Act 791.

Some studies have revealed that regulatory changes often trigger crisis in organizations, thereby forcing them to undergo some form of change [31, 32]. The regulatory changes could arise from internal regulations of the organization, or from changes in external regulations. Again, a corroboratory study by concluded that regulations can have revolutionary effect on an organization and its members [33].

3.4 Employees Commitment Versus Organizational Change

Employee commitment is a mindset that binds an individual to a course of action [9]. This mindset may stem from the employee's desire to support the organizational change. In relation to organizational change, employees' commitment has three components. The emotional attachment, desire and involvement to support organizational change reflect affective commitment to change, the awareness and recognition of the cost associated with resisting the change is termed as continuance commitment to change and the feeling of obligation to support the change known as normative commitment to change [9].

Despite the numerous factors that contribute to the success of organizational change initiatives [9], employees' commitment remains cardinal to the success of every organizational change effort, hence the need to institute planned efforts to obtain employees' commitment [4].

A study aimed at determining the role of employees' commitment in the success of organizational change initiatives revealed that employees' commitment in any organizational change initiative is generally of positive consequence [34]. Particularly, employees' affective commitment to change appeared to be the best predictor of successful organizational change initiative. This finding is in harmony with another study which indicated that some amount of affective commitment from employees is necessary to achieve desired performance outcome of any organizational change initiative [35].

A study conducted to determine the role of organizational leaders' and followers' commitment in organizational change initiative found that transformational leaders in organization through individual support are able to harness employees' (followers') affective commitment toward organizational change initiatives. The affective commitment of employees, in turn, leads to the success of organizational change programs. It was noted that employees' perception of leaders' commitment to organizational change has a direct relationship with employees' commitment to the organizational change. It was again found that leaders' commitment to organizational change is rightly perceived through their proper articulation of the vision behind the organizational change initiative [36]. Often time, this proper communication of the organizational change initiative clarifies employees' doubts concerning the change. This then leads to high employees' commitment which is manifested in successful organizational change implementation [36].

In a study conducted in Sweden [37], it was noted that commitment is a determinant of successful organizational change. However, it was concluded also that, commitment to change can wane as the change process unfold. It was further noted

therefore that, the dependence on training and education during the inception of the organizational change program is insufficient. They emphasized that, organizational change has to be continually supported owing to the complex nature of human behavior (employees) [37].

From the examined literature above, there appears to be a positive relationship between employees' commitment to change and the successful implementation of the organizational change. Drawing on Lewin's field theory, it can be inferred that, employees' negative perceptions of organizational change may lead to resistance to the organizational change initiative. This resistance can be a silent one which consequently leads to the failure of organizational change initiatives. Employees will support any organizational initiatives which are perceived positively.

3.5 Emotional Intelligence and Employees Commitment to Change: Conceptualizing the Link

Emotional intelligence has been defined as the ability to be conscious of one's own emotions as well as that of others and to manage the emotions in self and others [38]. With a like understanding, the term has been described as an array of emotional, social and personal abilities and skills that impact individual's ability to deal with challenges and cope with environmental pressures and demands in effective ways [39]. The concept of emotional intelligence therefore has intra-personal (or personal) and inter-personal (or social) references. The personal reference implies the competence to be aware of and control ones' own emotions whereas the social reference is the ability to understand others and the skill to harness the general environment.

Undoubtedly, emotion (both negative and positive) affects behavior, with positive emotions yielding favorable behaviors and vice versa [40]. Employees' perceptions of threat that may accompany less-understood organizational change initiatives can result in declined employees' commitment to change. This may lead to failures in the implementation of change initiatives [41]. Hence, it can be argued that emotional intelligence is indispensable to employees' commitment to change.

Studies abound to confirm the observation above. One of such studies aimed at understanding the relationship between emotional intelligence and employees' commitment [42]. The authors observed that the predictor variable (emotional intelligence) related positively to all the three components of employees' commitment. This observation was also corroborated by other authors who all indicated in their studies that the performance of employees at work improved when commitment and emotional intelligence were high [43–45].

These findings can be explained by Lewin's field theory which essentially holds that, environmental dynamics are appraised by individuals to ascertain whether they present threats or otherwise to their beliefs and objectives. When these environmental dynamics (such as change initiatives) are perceived to offend employees' objectives there is the possibility of arousing negative emotions which lead to declined employees' commitment. On the other hand, when dynamics within the environment are understood as capable of promoting one's objectives, this is likely to arouse positive emotions which lead to high employee commitment.

3.6 Conceptual Framework

Changes in regulations (in the forms of government legislations, professional standards and ethics, customs and socio-cultural norms) may exert their influence on organizations to undergo change. However, the success rate of the organizational change also depends on the level of commitment employees exhibit toward the change initiative. This level of commitment is also informed by the level of emotional intelligence exhibited by employees. This central idea to the present paper is represented in the framework (Fig. 1).

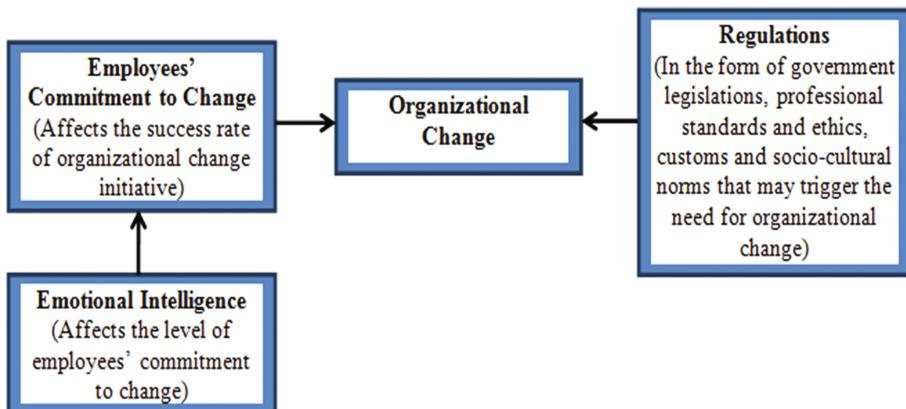


Fig. 1. Conceptualisation of the link among employees' commitment to change, organizational change, regulations and emotional intelligence.

4 Conclusion and Recommendations

Of the many factors that necessitate the need for organizational change, regulatory regime may be the paramount [33]. Examination of previous studies suggests that regulation can be a catalyst and a vanguard for organizational change. This observation draws on the institutional theory, which posits that regulations (institution) exert their constraining influence on organizations and may force a change. For example, regulatory changes (mostly un-foretold) can be extremely devastating – sometimes forcing some organizations to merge and some large organizations acquire the smaller ones. The event of this regulatory-borne organizational change requires commitment from managers and subordinates alike. It was however observed that the emotional state of employees could facilitate the levels of commitment expended on the organizational change initiatives. Hence, an organization needs emotionally intelligent employees to execute change programs of any kind. Conclusively, examination of the extant literature revealed a direct relationship between employees' commitment and emotional intelligence [40].

The authors therefore, recommend four approaches critical to the success of change programs by organizations. First is by making emotional intelligence training a critical

component of every form of organizational culture. In the long-run, this can equip employees with the emotional management skills needed for superior performance. Secondly, by ensuring that change agents themselves are emotionally intelligent. Emotionally intelligent agents are more likely to be empathetic and can draw more support for the change initiative. Thirdly, the need for effective communication about the organizational change initiative is important. As change programs are associated with emotional and commitment issues alike, misinformation may exacerbate negative perceptions about organizational change initiatives. Fourthly, effective policy regulation which is meant to control events of organizational change programs can be instituted and made widely known. This will provide behavioral roadmap for organizational change initiatives which will more likely lead to a wider acceptance even before they become necessary.

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Constraints to the Successful Implementation of Building Projects in Technical Universities in Ghana

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Abstract. Constraints to the implementation of projects are characterised in varies nature within the construction sector in Ghana. These constraints have associated results which affect most building projects within the corridors of public universities in Ghana to be delayed, and in some cases, projects get abandoned. The prime aim of this study is to determine the fundamental constraints to the successful implementation of building projects among public universities in Ghana. The study was exploratory and adopted existing literature of similar themes via desktop. Findings from the study revealed that budgetary control, effective communication, leadership mechanisms and effect stakeholder management are critical features that depict the successful implementation of a project. The study concludes that for a project to be successful with minimised constraints in its implementation, the budget of a project must be controlled, communication must be free from barriers, and leadership mechanisms must address employees' challenges, and needs of stakeholders must be integrated into the project. Therefore a significant level of consideration must be provided to decrease implementation constraints.

Keywords: Constraints · Building · Successful · Projects · Implementation Universities · Ghana

1 Introduction

Ghana as a nation located in the sub-Saharan Africa and its building construction industry is faced with numerous management challenges both technical and non-technical. First and foremost, there is a dearth of empirical studies on the success or otherwise of project management in Ghana, thus leaving no documentation on the best practices in that field. Secondly, whilst projects in general have their challenges regarding implementation and consequently success, development projects in particular are plagued by a unique set of problems and challenges. Improving the capabilities of building projects in the construction industry improves the project management activities of organisations and the construction sector [1]. Though project management has a comprehensive set of literature, the knowledge areas and its' concepts have been

continuously evolving. One area that has gained considerable attention in the constructions industry is the challenges that constrain a successful implementation of building projects [2]. The study on the constraints to a project's success is often considered as one of the important ways to improve the effectiveness of project delivery [3].

Constraints to successful implementation of projects are various limitations that hinder successful delivery of projects. These constraints are however characterized and differ in nature within the construction sector in Ghana [4]. These constraints have associated results which affect most building projects within the corridors of public universities in Ghana to be delayed, and in some cases, projects get abandoned. The study of project success constraints is thus considered to be a means to improve the effectiveness of projects [3–5]. Although lists of variables of constraints to a successful project implementation have been identified over a period by different researchers, there is no general agreement [3]. On the other hand, with rapid changes that are taking place in the construction industry, findings have become obsolete and unable to reflect on the current developments in the industry [5]. Thus, this study critically analyses the various constraints to the successful implementation of projects in Ghana.

2 Literature Review

2.1 The Ghanaian Construction Industry

The building sector is a collection of firms with closely related activities involved in the development of real estates, building, private and public infrastructure [6]. According to the authors, the construction industry in Ghana could be divided into two very broad categories: general building construction and engineered construction. Ofori [7] thus asserts that many construction contractors in Ghana focus on one of these categories, or even specialise within one of them. Muhwezi [2] also provided a third group as the speciality trade contractor, who works as a sub-contractor for prime contractors responsible for the construction of the entire project. Similarly, Ahadzie et al. [6] contend that the construction industry in Ghana has traditionally consisted of three primary participants: the owner (or customer); the designer/engineer, and the contractor. The authors opine that construction process is initiated in a series of activities by the owner who hires an architect/engineering firm to design the project and places the project out for bid to contractors (competitive building process) and the contractors perform the actual construction work. Ofori [7] also asserts that the Ghanaian construction industry deals with all economic activities that aim at creation, renovation, repairs or extension of fixed assets in the form of buildings, land improvement of an engineering nature and other such engineering construction such as roads, bridges, railways, ports, dams, etc.

The construction industry, which is going through a period of rapid and unparalleled change, is one of the most significant sectors of the Ghanaian economy. The Ghanaian construction industry, for instance, was valued at over GH₵ 3,900 million Ghana cedis (through the end products it creates) in 2010, constituting about 9% GDP by the Ghana Statistical Service [8] and therefore has the potential to influence the

country's GDP more than any other service industry. Ofori [1] also argues that the construction sector produces long-term, unique, and complex building projects and infrastructure. This includes the provision of new structures as well as additions, alterations, and repairs to existing ones. Ahadzie et al. [6] also maintain that primary services such as the provision of houses, factories, offices, schools, roads, and bridges are only a few of the products of the construction industry in Ghana. These facilities are needed for the other sectors of the economy such as education, health, commercial and business activities, housing needs and so on to thrive. Hence, the industry has often been regarded as an essential and highly visible contributor to the process of economic growth in Ghana.

According to, Danso [9] civil engineering firms in Ghana undertake some of the projects mentioned above which involve significant engineering design features like bridges, roads, railways and dams, whilst the building construction companies also handle projects such as the construction of schools, hospitals, health centres, hotels, offices, etc. The author further states that the Ghanaian building construction companies consist of a lot of firms of various sizes which are registered and categorised by the Ministry of Water Resources, Works and Housing (MWRW&H) as D1K1, D2K2, D3K3 and D4K4. According to [7], the D1K1 class of contractors is the large firms, whereas D2K2 construction companies are medium and D3K3 and D4K4 are small businesses. These categorizations are done based on factors such as annual turnover, equipment holding, and personnel. Ofori et al. [10] also explain that the large firms are further grouped as Financial Class 1, capable of undertaking projects of any value; Class 2 (the medium companies) capable of undertaking projects costing US\$500,000 or GH¢750,000.00, while the small businesses (Financial Class 3) are capable of undertaking projects that value up to US\$200,000 or GH¢ 300,000.00 and Class 4 to undertake projects up to US\$75,000 or GH¢112,500.00.

Despite the industry's significant contribution to economic growth, Ofori argues that its development and efficiency is relatively low in Ghana compared to other sectors. The productivity of the construction industry in Ghana is one of the lowest and; its degree of high technology utilisation is not comparable with that of other sectors [1]. Ahadzie [11] maintains that since the Ghanaian construction industry is alive and functioning, one could claim that there is some form of agenda driving it, and so the author advocated the establishment of a Construction Industry Development Agenda (CIDA) to facilitate this drive. CIDA will not just be a mere form of ad-hoc, haphazard or latent vision but a diligently prepared and systematic framework with empirical legitimacy for driving decision making in the practice of the industry [11]. Ahadzie further intimated that this agenda should also provide support for continued national economic and social development by providing increased values in investment as well as environmental responsibility in the delivery process and the viability and competitiveness of domestic construction capacity. In effect, the author opined that CIDA should aim at developing very detailed and pragmatic long term plans from which local contractors, in particular, can derive the greatest benefit towards national growth and development.

According to Ofori, there are indeed many crucial issues that have to be addressed in the Ghana Construction Industry such as, its philosophy in the national developmental agenda, its pedigree locally and the potential for the international market, its

vision towards internationalisation, and its vision in the efficient exploitation of natural and human resources [1]. Also its response in using the industry for poverty alleviation, its response to global concerns about sustainable development, its future direction towards training and development, and performance measurement and improvement must all be considered. Ahadzie contended that these issues (among others) are not evidently defined and addressed in Ghana even though it is clear that the challenges ahead demand such painstaking exercise for the benefit of the industry [11].

2.2 Construction Project Success Factors

Project success is an abstract concept and thus Chan opines that determining whether a project is successful is subjective and extremely complex [12]. The author therefore explained that project success can only be defined in relation to the objectives or goals of setting up the particular project. Tabish also agree that defining project success must include the project success criteria/measures [13]. The authors suggested that project success must have two major components: issues dealing with project itself (time, cost, performance) and issues dealing with the client (use, satisfaction, effectiveness). "Success factors" was defined by Han et al. [14] as all factors that influence, constitute and determine the success of a project. Yong and Mustaffa also defined success factors as those management system inputs that result directly or indirectly in the success of a project [5].

Similarly, Silva et al. contend that project success (PS), project management success (PMS) and project performance (PP) can occasionally be a bit perplexing [15]. The authors further explained that the confusion arises because these words have been used in literature by researchers in different ways. Yong and Mustaffa also argued that project performance is often referred to as project management success. The authors further explained that project success on the other hand is measurable only after a project is completed, while the project performance is measurable during the execution of a project [5]. Other researchers [3, 13, 16, 17] all consider project success as a measure of the overall objectives of a project; and project management success, as a measure of time, cost and quality of a project.

In addition Garbharran et al. argue that the concept of construction project success corresponds to the measure of efficiency and effectiveness [17]. According to Silva et al., efficiency measures relates to time, budget and specifications of a project. On the other hand, effectiveness measures or is related to the attainment of the objectives of a project, satisfaction of users and the use of the project [15]. Additionally, Amade et al. contend that the use of different key concepts or words for project success depends on when it is measured and on which criteria it is being applied. Success factors are further classified under two main categories; one being hard and objective, tangible and measurable while the other being soft, subjective, intangible and less measurable [18].

Literature in project management usually refers to two approaches to the study of project success. According to Tabish [13], one approach is the success factors of projects. These success factors are independent variables that result in project success. The authors further explained that, a project success criterion is the other approach to the study of success factors of projects. These success criteria are the dependent variables that measure the success of a project. Additional to the aforementioned

approaches, Han et al. [14] reviewed the notions of project success and proposed another conceptual framework for improving the success of projects by identifying the linkages that exist between project success factors and project success criteria as a third approach to the study of project success factors. The summary of literature reviewed by the authors suggests that few studies in the research area exist. As a result, studies of this nature in the context of construction projects will be instrumental to the development of the knowledge domain of project management [14].

3 Methodology

To achieve the aim of the study, exploratory technique was adopted using existing literature of similar themes via desktop. The study undertook a critical literature review of the various constraints to a successful project implementation. An empirical review on the findings of various studies on the constraints to a project success was critically reviewed. Here, due to the paucity of literature on the Ghanaian construction industry, a general literature on the constraints to a project success was reviewed. This was subsequently followed by a review of literature on the various constraints to a project success in the Ghanaian building industry. Literature was mainly obtained from journals. In addition, literature was obtained from online research repositories such as Emerald Insight, Google Scholar, Taylor and Francis, Science Direct, EBSCO.

4 Findings and Discussion

4.1 Constraints to the Successful Implementation of Building Projects

Constraints to a successful implementation of building projects are those factors or occurrences that limit the smooth or proper implementation of building projects. According to Ofori, these constraints can be inhibitors or barriers that negatively affect a successful implementation of a project [1]. A review of literature has revealed that various constraints affect the success of a project. These constraints are discussed below.

Many factors have been attributed to the poor implementation of building projects in developing countries. Generally, Garbharran et al. [17] argue that factors such as government policies, insufficient funds, withdrawal by donors, shortage of foreign exchange, inappropriate contract conditions, political priorities, poverty, socio-cultural conditions, corruption, low institutional and human capacity and occurrence of unexpected events such as war, drought are considered to be the major factors behind the poor performance of projects in developing countries. Similarly, Amade et al. [18] assert that most of the special constraints to the success of projects in developing countries are related to the environment, which can generally be attributed to the turbulence (the tendency of unpredictability) and rapid change in the project environment; and severe scarcity of resources in those countries. The authors further argued that these prevailing external factors are making the planning and generally

management of project extremely challenging for the poorly trained highly constrained project managers in those countries.

Muhwezi reported that the main reason for project failure (in developed countries) is not the absence of general resources or financial resources, but the lack of project management capability [2]. Further, Chan [12] indicated that in the developed countries external conditions such as market and politics are less important for the success of projects. Again, according to Voropajev, lack of institutional capacity and trained personnel is also another main reason why projects fail in developing countries. In addition to lack of institutional capacity and trained project management professionals, the nature of project management in itself is a challenge for many project managers in developing countries [19]. According to Amade et al., the principles of project management are contrary to what the managers in developing countries are accustomed to do and trained for [18]. The same conclusion was reached based on similar study done on project management in Africa [20].

Ogunde et al. [21] also argued that the way projects are set up and implemented in developing countries is another important reason for failure of projects in these countries. Hashim et al. [22] corroborated this by arguing that this is mainly applicable to the so called “development projects. In such projects, Andersen maintained that it is common to see lack of involvement and consultation of users and the tendency of some donors to finance only what they wanted or perceived to be important for the recipient rather than based on need of the users. Muhwezi also indicated that most of the reasons for failure of projects and their poor management in developing countries can be associated with the failure to consider the specific context of developing countries and critically adopt the project management methodologies to the context of developing countries [2].

Andersen [23] argued that the changing construction environment is also influenced by other factors, which are interrelated and inter dependent. According to the authors, examples of such factors are: Globalisation of the marketplace where many industries are facing a lot of pressure. In addition, tariff barriers are virtually falling, and labor has become more mobile, thus making skilled labor scarce. Further, due to productivity improvements and advantages in economies of scale, some foreign firms are capable of competing with local firms on price, quality and delivery. In addition, project complexity has increased due to the extent of scope and fragmented parties around the world having to communicate with one another for efficient project execution. The complexity of the projects is reflected by the large number of specialists who contribute to the decision-making process.

The next challenge to project management is the need to achieve quick results with the given resources. This factor places severe time pressure on the entire project team. Rapid changes to project scope to expand benefits have also been another challenge to project management. Some scope changes take place very rapidly before even realizing the benefits of the changes. Andersen [23] further argued that new procurement practices are a major challenge to effective implementation of project management. The emergence of new procurement practices changes the way the team members are interrelated. For example, procurement schemes such as Public Private Partnership Initiative (PPPI) have impacted construction project management. Such schemes bring the government and the private sector firms together in large-scale infrastructure

projects in which very high-quality standards, tight schedules and cost targets are aimed at. With the government's greater involvement in standardizing contractual procedures for PPPI schemes, the commitments of all parties have become clearer and more visible.

Client sophistication is another factor affecting effective implementation of project management. This has become a major driver for productivity improvements in construction. Clients demand higher quality end products and services at a lower price. This has created a buyers' market whereby firms compete for projects at lower margins and hence demand better project management practices to enforce tighter control on the project's activities. Andersen [23] further states that in facing up to the above challenges, the current project management practices have many limitations to efficiently deal with these demands.

4.2 Constraints to the Successful Implementation of Building Projects in Ghana

There is strong evidence of inconsistent performance in Ghanaian construction projects and the trend is growing rapidly. A major constraint to the successful application of building projects in the Ghanaian construction industry is the growing rate of delays in project delivery [25]. Amoatey et al. identified the causes of failures in Ghanaian building projects as: poor financing, poor contract management, changes in site conditions and shortages in materials [26]. Ansah also classified the constraints to a successful implementation of building projects as those related to project participants and extraneous factors. Client-related causes of project failures and delays identified include: variation orders, slow decision-making and cash flow problems while contractor-related delays include financial difficulties, material management problems, planning and scheduling problems, inadequate site inspection, equipment management problems and shortage of manpower. Extraneous causes of project delays and failures identified were inclement weather, Acts of God, labor disputes and strikes [27].

Ansah [27] also conducted a survey to identify the significant factors contributing to project failures in Ghana groundwater construction projects. The authors identified the factors as monthly payment difficulties from agencies, poor contractor management, material procurement, poor technical performance, and escalation of material prices. Frimpong et al. [28] also analyzed the constraints to a successful application of building projects in the Ghanaian construction industry. The authors identified 10 most important causes of failure. The causes included: contractor's improper planning, contractor's poor site management, inadequate client's finance and payments for completed work, lack of communication between parties, inadequate contractor experience, labor supply, equipment availability and failure, problems with subcontractors, shortage in material, and mistakes during the construction stage.

Similarly, Fugar et al. [29] investigated the causes of failures of building construction projects in Ghana and reported similar findings. All major stakeholders asserted that the top ten most important factors that cause failures in construction projects in Ghana are: delay in honoring payment certificates, difficulty in accessing bank credit, shortage of materials, underestimation of the cost of project, poor supervision, fluctuation of prices/rising cost of materials, underestimation of complexity of

project, underestimation of time for completion of projects by contractors, poor professional management, and poor site management. Fobi also found that the constraints to a successful application of building projects in the Ghanaian construction industry could be attributed to poor finance and payment arrangements, poor contract management, material shortages, inaccurate estimations and overall price fluctuations [30].

The analysis above shows that there has been a substantial and sustained interest on the constraints to the success of building projects. The information available as reviewed above is diverse and widespread. Despite the necessity for such research, little work has been described in the literature concerning public projects especially in the Ghanaian context. The previously proposed factors contributing to construction failures are frequently observed in many studies. As has been observed, it is knowable that various studies and researches had been conducted on this subject matter beforehand. Most of them focused on explaining the causes, which would be accommodating to guide practitioners to identify possible measures for mitigating against failures in construction project. Failures in construction projects raises the displeasure to all the parties involved and the main role of the project manager is to make sure that the projects are completed within the budgeted time and cost. Despite many recommendations being introduced after researches and studies being done, projects failure: delays and cost overrun are still the major problem in constructions industry up to day.

5 Implications of the Study

The analysis and discussions above has practical implications to the building industry, particularly in Ghana. The results mean that for a project to be successful; delays must be minimized or reduced. To reduce delay in construction, proper project planning and scheduling, developing appropriate communication system linked to all functional groups, ensuring availability of resources, hiring a competent project manager and utilization of appropriate construction methods, incentive offer for early project completion and emphasizing on the availability of resources are needed.

6 Conclusion

The study concludes that for a project to be successful with minimised constraints in its implementation, the budget of a project must be controlled, communication must be free from barriers, and leadership mechanisms must address employees' challenges, and needs of stakeholders must be integrated into the project. Therefore a significant level of consideration must be provided to decrease implementation constraints.

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Impact of Agility on Enterprise Performance in SMEs of Pakistan

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Abstract. The study has focused towards agile enterprises and the main focus is on studying the SMEs of Pakistan. Agile systems are the need of the modern era as the business environments are changing with the increasing trends of competitiveness, therefore, it is important for the firms to understand the importance of agile systems. The agile systems forms the agile enterprises and those enterprises are the ones that gain competitive advantage in the market. The existing paper is focused on literature and secondary data which will help readers and scholars in analyzing the impact of agility in the performances of SMEs in Pakistan.

Keywords: Agility · Agility enterprises · SMEs

1 Introduction

The importance of agile management system has gained a lot of importance as supported by the detailed literature elaborated further in this paper. The industry practitioners and managers of the SMEs need to understand the importance of agile manufacturing system relevant to their country. The concepts and their applications in the similar markets could be related, hence, the study conducted by Kumar et al. [1] in Indian enterprises explains that the results of applying agile systems would help the policy makers in implementing the agile manufacturing concepts in SMEs. They also suggested that future studies shall help the SMEs in understanding of further concepts of agile manufacturing and would also help in growing the SMEs. The study relevant to different country would contribute better to the understanding of the managers and the practitioners in implementing the agile systems in SMEs.

Another study was conducted in agile systems in the Pakistan's Fan Industry and they believe that further investigations shall be done for enhanced level of understanding of the concept. The study also pointed out the fact that only fan industry has been studied, whereas, it shall be expanded to other industries as well. The important finding was that there was a significant relationship of the agile systems on the creation of agile manufacturing enterprises for an increased performance [2]. Furthermore, in the western context; it is being narrated that the use of IT has affected the performance of SMEs and as a more developed market, they are in a better view of the agile systems [3].

Therefore, the overall purpose of this study is to explore the role of agility on the performance of enterprises in the SMEs of Pakistan; firstly, narrating the concepts and then explaining the agility in context of both countries.

2 Agility

As stated by Dove [4], an intense four month long workshop was held at Lehigh University, it was the founding grounds for giving birth to the concept of agile enterprise. The workshop included fifteen representatives from various industries of United States, whereas, one person was from government and there were four people who remained in the workshop as contributing facilitators. This workshop was funded by the government of USA. The main aim behind originating these terms was that the Japanese had already introduced lean manufacturing and as a result of that the intent of US's researchers was to identify a successor to lean. This is how they developed the concept of agile and agile enterprise.

The representatives of the industry said that their organizations have witnessed a lot of changes in the past and that too at a rapid pace. This gave the evidence that the change is becoming a new trend and is caused at a rapid pace too, hence, it became evident that only those businesses could survive that have the ability to change rapidly and also adopt an unexpected change. Therefore, agility was defined as "the ability of an organization to thrive in a continuously changing and unpredictable business environment" [5]. The second most important part after the change is the competency of applying that change. The changes are caused rapidly in various fields such as, market trends, production processes, business practices, product technology, person's skills, threat of a new entrant etc., it also depends upon the company that how quickly they could adopt these changes and apply the new trends within their businesses. After this, the research again explains agility briefly as, the ability to manage and apply the knowledge effectively. This makes the explanation more difficult as the level of effectively needs to be dig out but this definition is the researcher's illumination rather than the first one [5].

3 Agile Enterprises

All the concepts of relevance with agile were initially originated in Lehigh University in 1991 as suggested by [5]. The Meta concept of agile enterprise was introduced by numerous scholars [6]. The theme in the case of agile enterprise is to identify and then apply the available opportunities in the market by using the vital assets of the firm, referred as knowledge [7]. Agility usually helps the firms in remaining successful by generating revenues in a competitive business environment setup [8, 9]. There are certain aspects on which the organizational agility depends, such as; knowledge, experience, inventiveness of the people and the information that is being available to those inventive people. The agile enterprise involves the customers in creating value as it stimulates the social capital of the firm [6]. The concept of agile management was quoted by numerous authors, [7, 10–15]. All the researchers and scholars came up with

different explanations of agile enterprises as they viewed it from certain angles of themselves. Nonetheless, there was one thing common in all the findings, they suggested an agile enterprise shall apply the same methods, concepts and characteristics as are of the lean management [10, 16].

The researchers supports the argument of lean management here because agile enterprises don't have large inventories but still they have to fulfill the needs of the customers [6]. Once we have defined agile and agile enterprises as well, it is important to know the functions or features that makes an organization agile. As suggested [17]; brightness, flexibility, intelligence and shrewdness are the classifications that can make an organization agile. There shall be four subtypes of agilities in the agile enterprises, those subtypes are; social, entrepreneurial, technological and financial as suggested by the resources and types of enterprise agility [18]. These subtypes of agility and the features of an agile enterprise are also represented in the Fig. 1 of this paper.

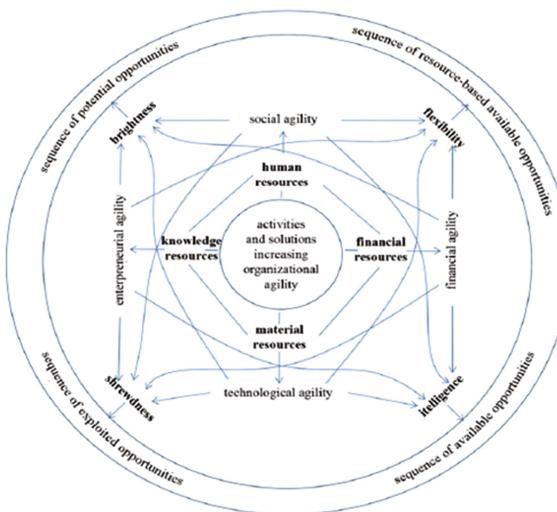


Fig. 1. It explains the resources and types of agility [18]

4 SMEs Sector in Pakistan and Familiarity with Agile Methods

The research of Khan et al. [19] studied the performance of SMEs in Pakistan and investigated the SME sector as well. The SME sector is of huge importance for Pakistan as they contribute to a huge level of 40% in the GDP with providing significant employment opportunities with a share of 25% in the export. For the development and promotion of SMEs, government set up a government institution in 1988 for the support of SMEs with the name of SMEDA (Small and Medium Enterprises Development Authority). They are meant to provide support to the SMEs in Pakistan. According to the economic survey of Pakistan, Pakistan is an agriculture intensive

country and SMEs are providing jobs to 82% of those people that are not being employed in agriculture sector. SMEs are in large numbers especially in the larger cities like; Lahore, Faisalabad, Sialkot, Karachi, Hyderabad, Gujranwala and to some extent in the Azad Kashmir as well. An approximate number of SMEs in the country is approximately 3.2 Million [19].

There are different agile methods which are being used such as, Dynamic Systems Development Method (DSDM), Crystal Clear, Extreme Programming (XP), Scrum, Adaptive Software Development (ASD) and Feature Driven Development (FDD). The existing research isn't relevant with the methods of agile but the research needs to give a bird eye view of these. The main agile methods which are used to a major extent in Pakistan are Scrum, FDD and XP, the Fig. 2 further narrates this.

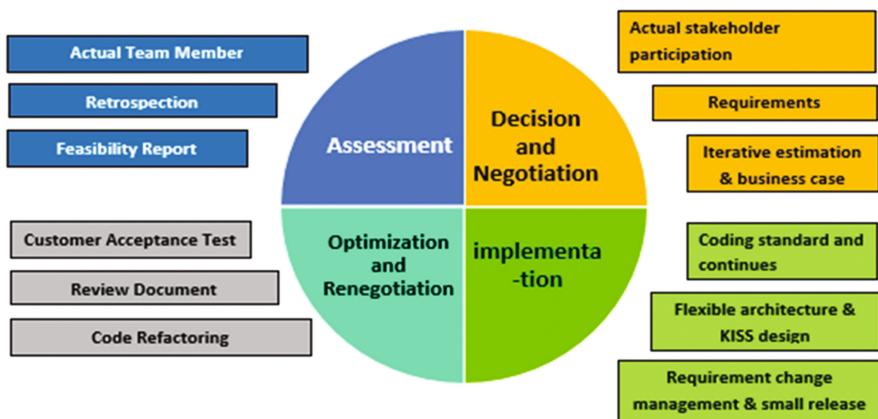


Fig. 2. Proposed Agile method [20]

5 Agile Framework for SMEs of Pakistan

One of the booming industry for Pakistan is the Information Technology with niche of software development and therefore, there are many SMEs working in this sector. As stated by Sarfraz et al. [20], the IT industry has seen a rapid growth and in many nations they have also identified their competitive advantage. Most of the countries have developed policies and made their IT sector as much as enable for deriving maximum benefits [21]. Pakistan's IT industry is also on the boom and seen a rapid growth in the recent years. The study is conducted by the researchers located in Pakistan, therefore, this study is also relevant with the context of Pakistan. There are numerous software houses in Pakistan that work on the basis of outsourcing for large firms located abroad. Hence, the agile method in this case, as supported by the study as well is more about adding value to the customers through regular collaboration and a frequent feedback resulting in achieving the competitive advantage for the IT firm [22]. The main focus of agility is to satisfy the customer as early as possible and deliverance of the software. Another added feature of the agile development and agile processes is that it welcomes changes at any time and still carries on the development process.

Agile also focuses on technical excellence which in result also enhances the design of the software [23]. The agile method proposed by the researchers in the Pakistan's context is as follow in Fig. 3.

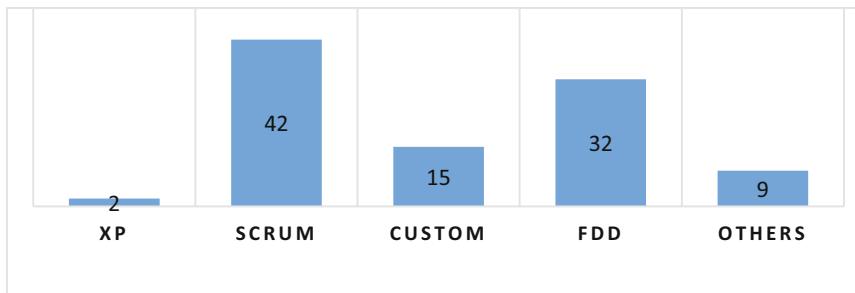


Fig. 3. The ratio of using agile methods by IT sectors firms in Pakistan's SMEs [19]

It has been shown in the last decade that agile methods have proved out to be beneficial for the IT industry and software development teams for delivering the software in time with maintaining high quality with satisfying all the stakeholders. The above mentioned framework is developed to overcome the barriers faced during the outsourcing, such as, communication, coordination and quality. The researchers [20], believes that the adoption of the above proposed framework would help the SMEs in IT to enhance the productivity, minimized gaps in communication, and developing quality products.

6 Agile Manufacturing Enterprises Framework in SMEs of Pakistan

The literature is quite rich with context to agility and agile manufacturing enterprises for large firms but it is imperative that the same literature in the case of SMEs just falls behind. This scarcity of research is surprising as the SMEs are an important source of economic activity for any country and that too with the concept of agile enterprises [24, 25]. The unavailability of the related literature is surprising as well because the agile manufacturing is a widely researched topic and then 99% of the companies in Europe are SMEs. The number of SMEs in Europe is 23 million with an employee base of 75 million on an approximate basis [25]. Moreover, the SMEs are referred as the engines of the European economies [25]. The large firms can often handle complex situations and take risks but the SMEs are in a position to make the processes simple as they are vulnerable for handling any sort of risks [26].

The features of business environment, people management, organizational culture, collaboration and cooperation, adaptability, flexibility and technology are recognized as key points for influencing the success of agile methods in SMEs [27]. The researchers studying the concepts of agile and its application in SMEs have also suggested the challenges for the SMEs in implementing the agile methods. The major challenges that

arises are such as, lack of resources, size of investment, bargaining power regard to the changes required in processes, layout and investments in the field of training and development for the employees [28–30]. Sharif et al. [2] have identified AMEs (Agile Manufacturing Enterprises) in SMEs. They have developed a criteria of the agile manufacturing and the SMEs that are following those criteria are referred as AMEs in the SMEs of Pakistan. The framework is shown below in the Fig. 4 of this paper.

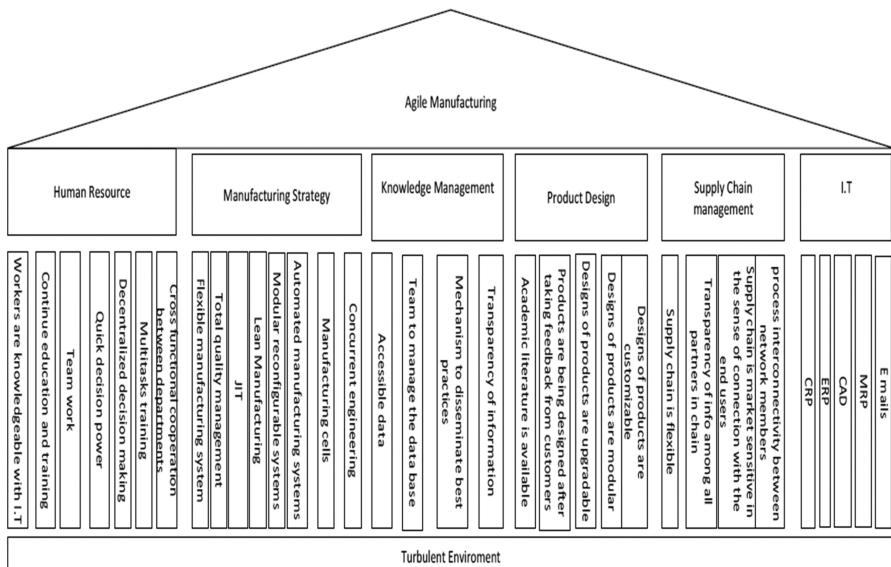


Fig. 4. Agile framework in Pakistan's SMEs [2]

The research shows that 29% of the SMEs are AMEs, 19% apply those techniques often, 19% rarely and 33% had never applied those techniques as they are not AMEs in any case represented in Fig. 5.

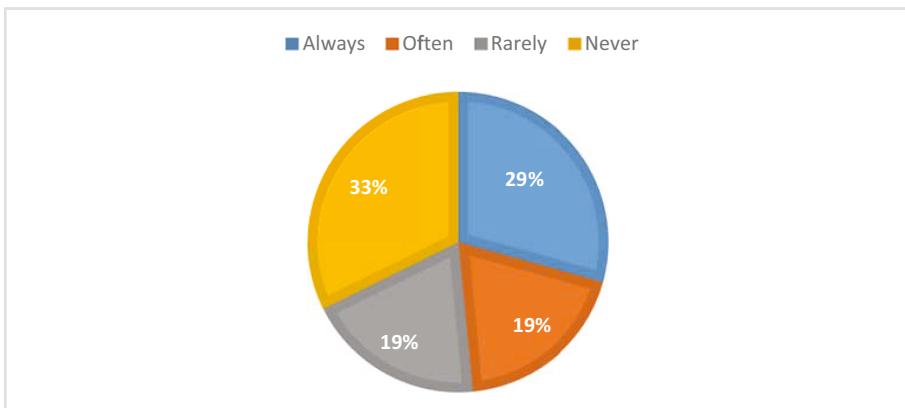


Fig. 5. Application of the Agile Techniques by the SMEs in Pakistan [2]

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Effects of Workplace Stress on Managers of Textile Industries of Developing Countries: A Case Study from Pakistan

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Abstract. The Textile Industry is the biggest manufacturing Industry at Pakistan that has great notoriety in global businesses. Alike lots of other organizations, job stress has become a major concern in textile organizations as well. The goal of this study is to identify effects of stress among managers belonging to lower and middle level of textile sector organizations. In this cross-sectional study, information was gathered from 125 participants. Exploratory factor analysis was deployed and five components, namely: Physical, Psychological, Behavioral, Performance, and Physiological were identified as the areas where stress is impacting the managers of textile industry. ‘Internal Consistency’ for the components is around 0.7 through beyond 0.8 whereas ‘Total Variance Explained’ by the components is above 72% with ‘Physical’ being more significant. In order to affluence the circumstances, organizations are obliged to deploy interventions for prevention and control of the job stress among their employees in order to assure their wellbeing.

Keywords: Workplace stress · Effects · Textile industry · Managers
Organizations

1 Introduction

Pakistan’s textile manufacturing is the biggest industry of the manufacturing sector, a major sector of the country. It manages employment for 49 million employees of the state and hence is the most important job providing area in the planned industrial domain. Having the production of around 12 million cotton bails/year, Pakistan is the fourth largest cotton producer in Asia and third in so far as spinning capability is concerned. It is the eighth chief exporters of textiles and clothing in Asia [1].

Alike lots of other organizations, in textile competing companies too, production and quality are needed to be enhanced for which ideal utilization of the resources is to be ensured. At the same time, in increasing the quality and the production, the anxiety of the top management, placed enormous burden on the managers that eventually origins work stress. Job stress or occupational stress or simply workplace stress has become a major concern for the stakeholders as predominance of the state is growing progressively and the stakeholders are individuals, organizations, employees,

employers, societies, countries and nations. Efficient utilization of the capital is vital in achieving the utmost for the companies but crucial when comes to the human capital. Henceforth wellness of the individuals working in the companies is an immense issue for all the employers. Furthermore, fixing stress interrelated problems is imperative as the man is a fundamental essential in manipulating implementations within the entities and also for the protections of all the items belonging to them. Resoluteness of the HR is strongly linked with the job stress [2, 3] The present research work is aimed at identifying probable consequences of the workplace stress. Inspection of the literature, on the matter, revealed that stress is a reality and bound to happen too but controllable at the same time.

2 Literature Review

Studies on the occupational stress are plentiful where emphasis has been seen on almost all the sectors of human involvement besides most of the socio-professional categories with major prominence on sports, medical services and teaching [4–7]. Its prevalence in industrialized countries has been well established. It was estimated in Europe, on average, as 22% in 2005 while 21% in 2010. Though, these estimations varied from one country to another [4]. However, in developing countries, work in this area is limited despite the presence of plentiful employees. The shortage of dependable and particular data appropriate for stakeholders to execute prevention policy in the workplaces is quite obvious [8].

Occupational stress has been taken as a valid wellness affair for the employers in addition to the employees. Stressed operational situations result in bad medical effects, for instance stomach disorder, anxiety, “cerebral pain”, in addition to “cardiovascular” illness [9]. Furthermore, it is the principal cause of above 50% of all malaises. Yet, it has not been figured out genuinely. It is required that right meditation ought to be given for its conclusion as it has affected the entire functioning of the entities while philosophy behind relationship between causes, effects and management of stress hasn't yet been properly understood [3, 10]. It is therefore basic to endeavor for value addition in the management process of workplace stress.

The inspection of the literature revealed that weak persons are more susceptible to the stress. More or less 91.5 million working days are wasted for the reason of stress-related ill-health in Europe every year [11] hereafter it is an acclaimed barrier in realization of the organizational objectives. Negative impacts of the stress taper efficacy, condense capacity of accomplishment, decline enthusiasm, and extend inflexibility of commencement. They also result in nonexistence of care for organization and co-workers besides worn out commitment [12]. It is found that technological and organizational changes increase stress which ultimately enhances ailment. Downscaling, realization of novel equipments and process innovations are such examples [13]. Uneven societal environs, non-existence of support from fellow employees and want of family amiable policies besides difficult to deal with deadlines, want of self-rule, poor internal communication and unsafe physical working environment originates stresses [5, 11, 12, 14]. In addition, stress took place when legal disputes prejudice company policies in place of achievement. For the professionals and the qualified workforce,

workplace politics is seen to be common and hurtful [15, 16]. Working in a huge nonflexible setup where managers assume reduced power in taking decisions consequences in higher levels of job stress. Autocratic attitude of bosses in managing the organizational affairs increases job turn outs; higher non-attendance; and scarceness of eagerness in subordinates. In case of in-house auditors, it is found that want of persuasive internal communication, disgraceful procedures, and apparently incessant filing are amazingly up setting [7, 15–18].

3 Method

The study was carried out in four steps: In the first and second steps, an investigative hypothetical and methodological base was aimed at. For the purpose, widespread published and unpublished record and reports on the subject, that is, work related stress focusing on its possible sources, impacts and interventions to overcome were studied. In the third step, the most discovered impacts of stress were looked into followed by spotlighting on the identification of components of the stress impacts in the survey population. Finally, within the fourth step, investigation methodology was elaborated, starting from definition of the investigation area along with markers needed to draft the research instrument, data collection from the managers of the textile sector companies, and examination of the statistics gathered.

3.1 Survey Participants

At random, one hundred and twenty five managers, belonging to four diverse textile organizations, were nominated for information gathering. For the purpose, the individuals from major areas of textile sector, plainly: fiber and cloth manufacturing, home textiles/apparel, and socks fabrication fit for being the subjects of the investigation. Personals, without gender discrimination yet functioning as managers were eligible to participate in the study. Ascertain of managers' stress stage, being the point of the research, middle and lower management level personals were chosen for the poll. They were further divided in 2 clusters: one consisting of assistant managers, managers, and senior managers and the other of foremen and supervisors. All of them were belonging to the HR, Finance, Technical/Production, Admin, etc.

3.2 Opinion Poll

With the aim of reaching intention of study, a random sampling opinion poll had been used where information was collected by using a self-designed questionnaire which consists of some questions regarding personal information of the respondent, like matrimonial status, sexual category, section in the company, and number of years in the company, appointment in the company and remuneration, in conjunction with the 42 item statements to identify work stress effects. Prepared specialists informed the subjects about the stimulus at the back of study, before managing it. They also told them about the essence of the survey and how it must to be completed. The specialists were available to answer the inquiries, when the questionnaires were filled by the

respondents. At the same time, surveys were checked for any missing information and the subjects were requested to provide the information in case missing. With the intention of playing down the facts inclination and also to affirm that they will not veil sensitive information, the questionnaire was without identity of the respondent. Moreover, it was assured to the subjects that the research team will not reveal their opinions to anybody or any establishment.

3.3 Instrument

The stress effects in the population under study were identified by a self-designed well thought-out opinion poll: items of which had been included as per the extent of the study besides observations of the workplace environments, interviews and focus group discussions in the companies under study. Prior to this, inspection of the available printed and unprinted record was made. Apart from the demographic variables, there were 42 items in all, to identify the effects of workplace stress. The participants, of the study, were to share their opinions by reacting to singular declarations. For the purpose, the “5-point likert-type scale” was employed against every variable. Examples of the declarations are, *I lack physical energy*, *I often suffer from anxiety* and *Usually, I am unable to do all the things in a day that I must do*. To register their opinion, study participants had to choose a single point out of the range, 1 through 5, where *no stress* was represented by 1 and high by 5 and the preferences were 5 for *always*, 4 for *often*, 3 for *sometimes*, 2 for *seldom*, and 1 for *never*. Having the Cronbach’s alpha value as 0.924, the instrument was found highly reliable. All in all there were 42 variables to cover the information related with impacts of stress on employees of textile organizations.

3.4 Statistical Procedures

The study was aimed at identifying the effects of stress (or variables) from the information gathered and in order to reach the destination of the study, exploratory factors analysis was used. The components were extracted by using PCA and rotated using “*Oblimin with Kaiser Normalization*”. Appropriateness of the EFA for the analysis was checked by deploying “*Bartlett test of sphericity*” besides “*KMO measure of sampling adequacy*”. After the identification of the components, their internal consistency was fixed on by measuring the *Cronbach alpha* coefficients [21]. For the assessment, SPSS 23 [19] was employed.

4 Results and Discussion

4.1 Measures of Appropriateness

The assessment, of the information obtained, had been begun with figuring out the appropriateness of data to carry on with EFA. For the purpose, “Bartlett test of sphericity” besides “KMO measure of sampling adequacy” was implemented. The outcomes of these measures are shown in Table 1 where KMO value can be seen as

0.940, an acceptable measurement. Also value of “*Bartlett's test*” is zero; a perfect one being less than 0.05. Afterwards, the suitability of data for EFA set established.

Table 1. Suitability measures

| | | |
|-------------------------------------|--------------------|----------|
| KMO measure of sampling sufficiency | | 0.940 |
| Bartlett's test of sphericity | Approx. Chi-Square | 5265.636 |
| | Degree of freedom | 231 |
| | Significance value | 0.000 |

4.2 Principle Component Analysis

PCA was deployed in the EFA of the information gathered through opinion poll. Table 2 depicts the results of the PCA. Subsequent to rotating component matrix using “*Oblimin with Kaiser Normalization*” method, 5 factors were identified altogether respective names of which are shown in the table as well. A total of 16 items loaded onto five components and these excludes the items having loadings less than 0.30 or having cross loadings. The obtained components along with the item statements have been described in the detail below.

Component 1st Physical: Four variables loaded at component 1 loaded heavily, two closer to 0.80 and the third above 0.70, see Table 3. As every variable relates to the physical impact of stress, the component is named as *Physical*. More than half of the total variance explained, to be specific 35.976%, is described by this component. The component mean and standard deviation values (Table 2) are 2.366 (on a 5-point scale) and 0.81 in that order.

Component 2nd Psychological: Four variables loaded onto this component and each relates to the psychological impact of the stress on the individuals, see Table 3. One item loaded heavily, explicitly 0.920. As all the items exhibit psychological impact on the employees, the component is named as *Psychological*.

Component 3rd Behavioral: The Component 3 has been extracted from the loading of only two items, see Table 2. The items relate to impact on the behaviors of the employees. As shown in Table 2, mean and standard deviation of this component are 2.86 and 0.89 respectively. A variance of 6.459% is described by the component.

Component 4th Performance: The Component 4 was extracted from the loading of three items, see Table 2. All of them have significant loadings, with two near 0.80. The component is named as *Performance* as all of the items commonly attribute to the stress impact on the performance the employees.

Component 5th Physiological: The Component 5 was extracted from the loading of three items, see Table 2. All of them have significant loadings, with two above 0.80. The component is named as *Physiological* as all of the items commonly refer to the physiological impact.

Table 2. Stress components

| Statements | Components loadings | | | | |
|--|---------------------|-----------------|-----------------|-----------------|-----------------|
| | 1 st | 2 nd | 3 rd | 4 th | 5 th |
| I have felt tired | .793 | | | | |
| I get tension or muscle spasms/pains in my face, jaw, neck, chest, head, lower back or shoulders | .792 | | | | |
| My body feels tense all over | .713 | | | | |
| I lack physical energy | .694 | | | | |
| I often suffer from anger/hostility | | .920 | | | |
| I often suffer from anxiety | | .764 | | | |
| I get myself in the process of viewing the issues in my rest time | | .711 | | | |
| I suffer from frequent depression | | .669 | | | |
| I am having the trend of eating, talking, walking and driving hurriedly | | | .882 | | |
| My desire for food has been distorted; either I eat excessively or have lost my hunger | | | .810 | | |
| Usually, I am unable to execute each and every thing in a day that I have to accomplish | | | | .798 | |
| Often, I am unable to complete the task as per schedule | | | | .787 | |
| Often, the quality of my output is not up to the mark | | | | .720 | |
| I have panic attacks | | | | | .840 |
| I have found myself trembling | | | | | .808 |
| I suffer from indigestion or nausea | | | | | .742 |

Table 3. Internal consistency, components variance, mean, and standard deviation

| Sr. | Factors/Components | Number of items | Component mean | Component variance explained | Component standard deviation | Value of Cronbach's Alpha |
|-----|--------------------|-----------------|----------------|------------------------------|------------------------------|---------------------------|
| 1 | Physical | 4 | 2.366 | 35.964 | 0.81 | 0.857 |
| 2 | Psychological | 4 | 2.308 | 10.977 | 0.827 | 0.816 |
| 3 | Behavioral | 2 | 2.86 | 9.168 | 0.89 | 0.707 |
| 4 | Performance | 3 | 2.504 | 8.798 | 0.78 | 0.744 |
| 5 | Physiological | 3 | 1.629 | 6.652 | 0.647 | 0.747 |

4.3 Reliability

Table 3 depicts the *cronbach alpha coefficient* values of all the components and a quite significant value of internal consistency can be seen against first, second and third components, that is, in excess of 0.80. The value of fourth component is well beyond 0.70 which represents good reliability levels and distinctive evenness [20]. It is evident that all the *cronbach alpha coefficient* values are in accordance with the values available in the literature [21].

4.4 Inter-component Correlations

The inter-correlations of the components are shown in Table 4. It is quite evident from the table that most of them none of the correlations is beyond 0.5 which is the obligation and shows that each component investigates distinct aspects.

Table 4. Inter-component Correlation

| Number of components | 1 st | 2 nd | 3 rd | 4 th | 5 th |
|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1 st | 1.000 | .330 | -.229 | .326 | .220 |
| 2 nd | .330 | 1.000 | -.248 | .265 | .316 |
| 3 rd | -.229 | -.248 | 1.000 | -.182 | -.056 |
| 4 th | .326 | .265 | -.182 | 1.000 | .144 |
| 5 th | .220 | .316 | -.056 | .144 | 1.000 |

5 Conclusion and Recommendations

Present article was aimed at identifying the stress effects in the managers working in the textile companies. For the purpose, data on a researcher made questionnaire was collected from 125 managers of different textile organizations at Pakistan. The respondents were from all the departments of the organizations, namely HR, Finance, Technical, and Administration of the major areas of the textile sector, i.e., spinning, weaving, garments, and home textiles. PCA, a component drawing out technique under EFA, revealed 5 components concerning the effects of stress. The identified components explained above 72% variance of the total variance explained. The factors are *Physical*, *Psychological*, *Behavioral*, *Performance*, and *Physiological*. The levels of the perceived stress identified from the same sample [22] depicts that the job stress inter-related affairs of the companies are not at all favorable not only for the managers working over there but also for their subordinates. It ultimately impacts the organizational performance badly and hence wants some preventing and controlling mechanism. The components of stress among this sample identified earlier [23] may be a starting place in formulating stress management interventions strategies. The successful implementation of the interventions will protect human resources from the bad impacts of the stress which will ultimately boost the organizational performance.

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Investigating Human Resource Roles in Research-Based University: An Evidence from Malaysia

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Abstract. The literature on human resources (HR) in Higher Educational Institutions (HEIs) has often discussed the challenges faced by universities due to the impact of globalization and internationalization. There are a lot of discussions and debates on how the HR department should play its role. Several metaphors have been used to describe the role of the HR department, such as partner, creator, facilitator, business partner, strategic partner, change agent, employee champion, and administrative expert. In this paper, we discussed empirical evidence from research-based university (RU). The study assesses 119 HR practitioners' response from five universities that participated in a survey.

Keywords: HR roles · HEIs · Research-based universities

1 Introduction

In the world of “ranking and rating”, it is very challenging for the higher educational institutions (HEIs) to remain competitive and sustainable in the education market while at the same time making sure that the university contributes tremendously to the country and its community through dissemination of knowledge and R&D. Human resource (HR) is one that cannot to be missed when we discuss sustainability of an organization. According to Lo [1], it is challenging to relate sustainability with the HEIs. However, it is something worth reviewing and discussing, especially the contribution of HR professionals in the organization. In addition to the above, it is believed that HR can help in the sustainability initiatives through its support of culture change in the organization, through its integration of HR strategy and corporate strategy of the organization, HR's effectiveness in managing its functions, and last but not least through human resource development interventions. Therefore, it is important to investigate the role played by the HR department in supporting the university in its sustainability efforts. This paper attempts to investigate:

- (1) to what extent HR practitioners played their role in RU in Malaysia?
- (2) to what extent HR roles influence sustainability initiatives in RU in Malaysia?

2 Literature Review

Sustainability in Research-Based University

One cannot run from the fact that to be sustainable, we need some financial back up or strength. Nevertheless, sustainability is not only about financial stability. Rimanoczy and Pearson [2] described a sustainable organization as “one that achieves economic profit, maintains environmental quality and contributes to increase social equity” (p. 14). Whereas, in HEIs context, Comm and Mathaisel [3] refers to sustainability as “the strategic deployment of resources to allow the university to continue to economically thrive and focus on core mission” (p. 137). This research however, uses the definition by Soyka [4] who described sustainable organizations as “mission-driven, aware and responsive to societal and stakeholders’ interests, responsible and ethical, dedicated to excellence, driven to meet or exceed customer expectations, and disciplined, focused and skillful” (p. 18). What is notable about this definition is that it acknowledges different aspects and roles of HEIs. Based on the definition by Soyka [4], this research explored HEIs sustainability other than the non-financial aspect.

Many years ago when Comm and Mathaisel [3] wrote their article on sustainability, they mentioned that part of being sustainable by HEIs is thinking strategically on administration in terms of number of students, staff and resources needed to run the institutions. Their statement had however overlooked other requirements that required the institutions to conduct research and do commercialization based on the output of the research. In addition to that, collaboration with the industry and community has also become the yardstick to measuring Key Performance Indicators (KPI) of a university. Ferrer-Balas et al. [5] listed five characteristics of a sustainable university. First, learning in a sustainable university must focus on the critical thinking aspect. Thus, learning that takes place in a sustainable university should be in the form of transformative learning that can help the graduates face the sustainability challenges in the real world. Secondly, inter- and transdisciplinary research must take place in a sustainable university. Third, students must be prepared to face the real challenges out there that are associated with society. Fourth, resources in the university should be fully utilized through collaboration of experts in the university. Finally, they believed that change must take place and those who are committed to sustainability effort should be rewarded. Based on their research using FLA (framework-level-actors) analysis in seven universities in various countries, they found that partnerships and projects with the community are an important element in the success of organizational sustainability initiatives for a HEI. In addition to the above, “trans- and interdisciplinary” (p. 312) is one of the strategies of becoming a sustainable institution. They also found that focus should be given to giving incentives for those who promote change towards sustainability. So, how to make sure that sustainability efforts are achieved? It is believed it will be successful by change.

We conclude that sustainability effort in HEIs is part of organizational change. This is because in ensuring its sustainability, an organization needs to improve its structure, processes, technology and the HR policy that governs its human resources [6]. It is believed that the larger university (measured by the number of students), the more difficult they are to change (Ferrer-Balas et al. [5]).

The HR Roles

In the early days, HR was seen as the shield to an organization, "...HR to be valued for what it prevented from happening – union drives, strikes, staffing vacancies, Fair Labor Standards Act violations – rather than for what it caused to happen". According to Ehrlich [7], things have however changed when organizations started to believe that their performance was depended on the employees, and that employees will perform better if they are treated well by the management. According to Meshoulan and Baird [8], employees have become important due to "Increasing complexity, changing technology, high level of competition, and the need for flexibility" (p. 485), and this explains why HR needs to adapt to the changing needs of an organization. There are several other reasons why the transformation took place in the HR function.

Yeung and Brockbank [9] listed a few factors that contributed to the changing of HR functions: "...pressures to reduce costs, higher expectations of customers, the constant drive to meet global competitive challenges, and opportunities offered by advancements in information technology" (p. 1). Tyson [10] explained the factors that brought about changes in HR department: first, the need for HR professionals to become strategic players; second, technological advances that have led to changes in the way the HR function is delivered; and third, the need for HR to change due to the increasing demand for outsourcing of administrative HR functions. Mothershell et al. [11] showed that several factors have contributed to the transformation of HR departments in the State of Michigan. One of the most important factors is the demand for HR departments to focus on the business, the employees and the line managers' needs.

Devanna et al. [12] believed that success in achieving organizational objectives depends on how well the HR department delivers its functions. Consistent with that claim, they believed the role of HR can be divided into three levels: strategic, managerial and operational. HR functions exist at every level of organizational activity to support the organization. They agreed that all HR functions that support managerial and operational activities in the organization are important. However, according to Devanna et al. [12], those activities do not explain and do not represent the effectiveness of HR department. For them, what makes the most difference in the organization are those HR functions at the strategic level.

Brockbank [13] divided the role of HR into four categories: operationally reactive, operationally proactive, strategically reactive and strategically proactive. Operationally reactive HR will only focus on administrative functions such as carrying out administrative work, recruitment of new staff, benefits management and providing training to employees. This is the most fundamental role played by HR departments. Strategically reactive refers to when the HR department adapts the business strategy into their department's agenda. The HR department creates programs that suits the needs of the organization, such as inculcating an organizational culture suitable for the organization's direction, or being the catalyst for change in the organization. A HR department is said to play a strategically proactive role when it creates strategy for the future and an environment that promotes creativity and innovation. Both operational and strategic tasks are equally important in helping companies gain competitive advantage, as HR department is expected to be involved in many areas of the organization.

Another scholar who profoundly discusses the role of HR is Ulrich, who defined HR as business partner, strategic partner, change agent, employee champion, and administrative expert to explain the different roles played by HR. The term business partner is interchangeably used with strategic partner in many articles. Without an in-depth understanding of the field, readers could easily be confused by thinking that both terms have the same meaning. Ulrich [14] believes that being a strategic partner is only one of the roles that should be played by HR manager. To be a business partner, a HR manager must play four roles, namely strategic partner, change agent, administrative expert and employee champion. In a more recent discussion, Bandarouk et al. [15] refined in detail the competencies needed for each role and suggested new categories based on the needs of an organization. Jackson [16] however, viewed HR function in HEIs as being less advanced compared to other public and private sectors. Sarip and Royo [17] have made the same claim in their research, where despite HR practitioners considering themselves playing the strategic role, administrative expert role is still dominant compared to employee champion and change agent role. Therefore, there is a need to study this claim especially when there is very little study on the role played by HR in HEIs. Thus, the third research question in this part of the study is what are the roles played by HR practitioners in RU in Malaysia? HR roles by Ulrich [14] are used to guide the researcher in measuring the roles played by HR practitioners. The four roles that are measured in this research are business partner, strategic partner, change agent, employee champion, and administrative expert.

According to Ulrich [14], administrative expert is the role most played by HR manager. As administrative experts, HR practitioners should be able to find new ways to improve their work processes from time to increase efficiency and reduce costs. Yeung and Brockbank [8] have however argued that HR departments are becoming less effective when they are only occupied with administrative tasks. As employee champion, a HR department acts as the intermediary between management and employees. According to Ulrich, this position is crucial because the level of employees' commitment is always a reaction to whether their needs are being met. The third role described by Ulrich [14] is change agent. Ulrich stated that "being a change agent is clearly part of the value-added role of HR professionals as business partners" (p. 31). The fourth role that must be fulfilled by HR is strategic partner. Ulrich [14] suggested that for HR to be a strategic partner, it must be able to help the organization achieve the target it has set. According to Truss [18], "Strategic roles have generally been viewed as focusing on activities that will have long-term implications, such as the development of integrated HR strategies, involvement in organizational strategic decision making, and managing organizational change" (p. 1072).

3 Methodology

HR practitioners in Malaysia have been identified as the population of this study. Under the Public Service Commission of Malaysia, the HR practitioners are officers who fall under the Administrative and Support Scheme. They were chosen as the population in this study due to the requirement of the research questions, which required a group of people who play a HR role in the organization. They are the people who can best

provide information and expectation on HR roles. According to Huberman and Miles [19], “A role is a complex of expectations and behaviors that make up what you do, and should do, as a certain type of actor in a setting...” (p. 122). Therefore, the option to use HR practitioners within that service scheme that responsible for the HR functions in their respective department as variables is hoped to provide valid and reliable responses for this research. A total of 152 questionnaire were distributed based on proportionate sampling from the total population of 251. The instrument to measure HR roles were adapted from Human Resource Role-Assessment Survey, for example in Change Agent roles, participants were asked to rate their response from Strongly Disagree (1) to Strongly Agree (5) on item “HR participates in shaping culture change to meet the institution’s sustainability transformation challenges”. Likewise, the similar Likert scale was used to measure sustainable initiatives in RU. We adapt questions from the Sustainable Assessment Questionnaire (SAQ) for Colleges and Universities [20] and Shriberg [21]. SPSS version 16.0 was used for data analysis. Sections related to the role played by HR practitioners in HEIs was assessed using descriptive statistics of frequency and percentage. To measure the impact of HR roles on sustainability initiatives, this study used Multiple Regression analysis.

4 Findings and Discussion

The respondents for this study are HR practitioners currently attached to various departments and faculties in RU in Malaysia. Returned surveys from 119 HR practitioners yielded a 78% response rate. 63% of the respondents are female and the majority (66%) of the respondents aged between 26 and 40 years old.

4.1 The Roles of HR Practitioners in Research University Setting

Overall, it shows that all roles are played equally by HR practitioners in RU in Malaysia. HR practitioners in RU believe that they played all HR roles in supporting the sustainability of their universities. This can be seen from the mean score for each HR roles. The least played role is the Employee Champion while the most played role is the Change Agent. These findings contradicted the statement made by Jackson in 2001 when HR was viewed as being less advanced in public sector (in this context, RU is the public sector). The finding also gives a different perspective from Sarip and Royo [17] whose research identified Administrative Champion as the most dominating. This result may indicate that there is development in the functions of HR in RU in Malaysia (Table 1).

Table 1. HR Roles in RU in Malaysia.

| HR roles | Mean |
|-----------------------|-------------|
| Change Agent | 3.87 |
| Strategic Partner | 3.85 |
| Administrative Expert | 3.83 |
| Employee Champion | 3.82 |
| Overall mean | 3.78 |

4.2 The Relationship Between HR Roles and Sustainability Practices

HR professionals were asked the seven dimensions of sustainability. The results are tabulated in Table 2. The findings show that the level of sustainability initiatives in all RUs are at the high level of mean, which is 3.79. Outreach and service initiative (3.91) is the highest rated initiative by HR practitioners in Malaysia. The second best initiative is research and scholarship and the lowest initiative perceived by the HR practitioner is student opportunities.

Table 2. Sustainability initiatives.

| Sustainability initiatives | Mean |
|--------------------------------------|-------------|
| Curriculum | 3.81 |
| Research and scholarship | 3.88 |
| Operations | 3.77 |
| Staff development and rewards | 3.69 |
| Outreach and service | 3.91 |
| Student opportunities | 3.64 |
| Administration, mission and planning | 3.83 |
| Overall mean | 3.79 |

Based on the regression analysis, the results show that HR roles are not good variables. HR roles only influence 24% towards sustainable initiatives. Thus, we can assume that there are other factors that influence the sustainability initiatives in RU in Malaysia. In addition to the above, Strategic Partner role seems to have a negative relationship with the sustainability initiatives in RU. The only HR role that has more influence on the sustainability initiatives is Change Agent role. This explained the reason why Change Agent is the only role that has positive correlation with all the sustainability initiatives. Details analysis is presented below (Tables 3, 4 and 5):

Table 3. Regression model

| Model | R | R square | Adjusted R square | Std. error of the estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .489 ^a | .239 | .184 | .32043 |

^aPredictors: (constant), Change Agent (CA), Administrative Expert (AE), Employee Champion (EC), Strategic Partner (SP)

Table 4. Anova analysis

| Model | Sum of squares | df | Mean square | F | Sig. |
|-------|----------------|----|-------------|-------|--------------------|
| 1 | Regression | 4 | .451 | 4.309 | 0.004 ^b |
| | Residual | 56 | .103 | | |
| | Total | 60 | | | |

^aDependent variable: Sustainability initiatives^bPredictors: (constant), CA, AE, EC, SP**Table 5.** Coefficients

| Model | Unstandardized coefficients | | Beta | t | Sig. | 95% confidence interval for B | |
|-------|-----------------------------|------------|------|-------|------|-------------------------------|-------------|
| | B | Std. error | | | | Lower bound | Upper bound |
| 1 | (Constant) | 2.605 | .297 | 8.773 | .000 | 2.010 | 3.200 |
| | SP | -.041 | .151 | -.269 | .789 | -.343 | .262 |
| | AE | .044 | .152 | .286 | .776 | -.262 | .349 |
| | EC | .053 | .135 | .396 | .694 | -.217 | .324 |
| | CA | .250 | .178 | 1.401 | .167 | -.107 | .607 |

^aDependent variable: Sustainability initiatives

5 Conclusion

Together, these results provide important insight into the strategic human resource management among the RU in Malaysia. HR practitioners in RU in Malaysia claimed that they played the strategic role but have minimal influence on the sustainability initiatives at all RU. Therefore, it can be concluded that this study proved that not all strategic moves such as sustainability initiatives are influenced by the role played by HR practitioners especially from the context of research universities in Malaysia despite many authors and researchers claimed that HR should play strategic role in supporting any strategic moves by the organizations.

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Predictive Analytics for Leadership Assessment

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Abstract. This paper reports on an exploratory study utilizing data mining techniques to predict leadership constructs based on game play data. The learning objective of the game is (1) to become aware of devilish dilemmas during crisis situations, and (2) to understand ones' leadership style in dealing with these dilemmas. Do player's act like a *People person*, as an *Administrator*, or more like a *Figurehead*. We evaluate several data mining techniques to predict scoring on these 'classes'. Our data set consists of 21600 instances. This data was captured over the last 4 years over the course of numerous training sessions for professionals in crisis management organizations in the Netherlands. We found that some algorithms perform significantly better than others in terms of predicting scoring on our test data. Our aim is to develop robust predictive models on the basis of which learning instructions could be given to the trainees during game play to increase their learning journey. However, we conclude that fit for purpose predictive models depend on domain knowledge in the specific field of application.

Keywords: Game based learning · Stealth assessment
Human behavior modelling and analytics · Crisis management

1 Introduction

This paper reports on a study utilizing data mining techniques to predict leadership constructs based on game play data. The learning objective of the game is (1) to become aware of devilish dilemmas during crisis situations, and (2) to understand ones' leadership style in dealing with these dilemmas. The game is designed for crisis management professionals active in public crisis management organizations [1]. The game simulation fits the Dutch context and is played over a thousand of times for the last couple of years by mayors and their advising teams. After playing the game, players receive personalized feedback in terms of a leadership construct that breaks down into three dimensions. These dimensions indicate players' judgment and decision making style. Do player's act (relatively more) like a *People person*, as an *Administrator*, or more like a *Figurehead*.

We designed and developed this game based learning solution for training purposes (See Fig. 1). The game represents the essential real world elements in the form of

dilemmas that occur during a crisis from the crisis manager point of view. Each dilemma requires a decision to take, while the context is characterized by time-criticality, uncertainty, ambiguity, and conflicting advises. Player decisions are never right or wrong but reflect ‘natural’ biases expressed in terms of the leadership construct. The feedback players receive after game play show if they functioned more like a *People person*, *Administrator*, or *Figurehead* during the crisis (Fig. 2). Note that these leadership dimensions are relevant to the Dutch context but in general indicate (a) an external orientation towards the community/municipality (*People person*), (b) an orientation in making sure that internal and external organization procedures are followed (*Administrator*), and (c) taking a prominent role in the media (*Figurehead*). The responsible crisis manager needs to find a balance between these sometimes ‘conflicting’ dimensions. In other words, optimizing on one of the dimensions e.g. *People person* may decrease scoring on one of the other dimensions.

Currently, this game based learning solution is embedded in a training program [2] to train Dutch mayors and their crisis management teams, and contains about 20 crisis management scenarios. The training is operational since 2012. In the debriefing phase of the training individual game results are plenary discussed among peers/trainees. During this social learning phase argumentation pro and con for each situational dilemma are shared between peers and implications of yes or no decisions are discussed. In principle, there is no right or wrong answer nor an optimal competency profile in terms scores on the *People person*, *Administrator* and *Figurehead* dimensions. It largely depends on the (in-hindsight) argumentation explaining decision choices.



Fig. 1. Single player turn based narrative game.

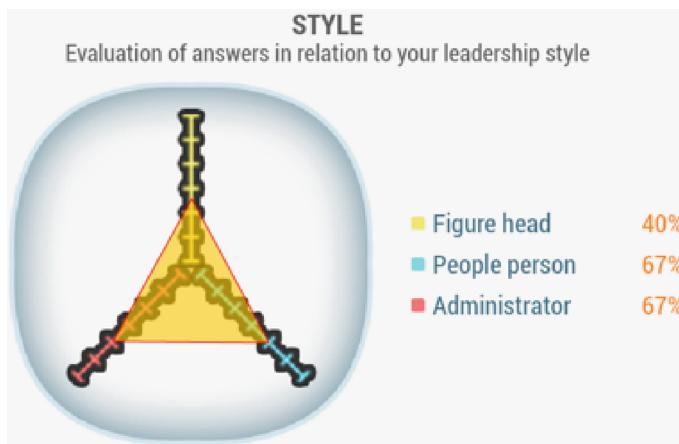


Fig. 2. Feedback in terms of a simple leadership model.

2 Conceptual Assessment Framework CAF-Model

The Conceptual Assessment Framework CAF-Model [3] was used to map the operationalization of latent traits (student model) to the operationalization of assessment tasks (task model) (see Fig. 3). CAF is part of the Evidence-Centered Design method applied for assessment design. The mapping in CAF results in a so-called evidence model. The evidence model quantifies the leadership construct based on observable in-game player actions. The simplest deterministic evidence model is based on a single player action that linearly increases or decreases a relative score on one or more of the leadership dimensions. For example, dealing with a dilemma requires a decision that the player must take; IF a yes decision is made THEN the scoring on *People person* is increased by 1 and the scoring on *Administrator* is decreased by 2. More complex non-linear or probabilistic evidence models can be top-down defined as well, for example, using Bayes nets that depends on various combinations of available observed variables [4] (Fig. 4).

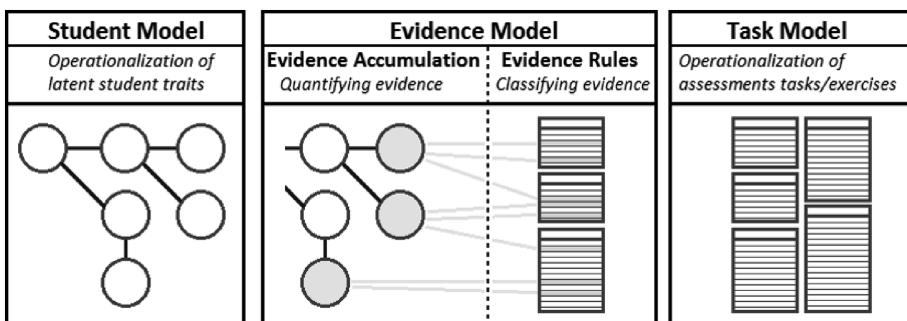


Fig. 3. Conceptual Assessment Framework CAF-Model [taken from 3]

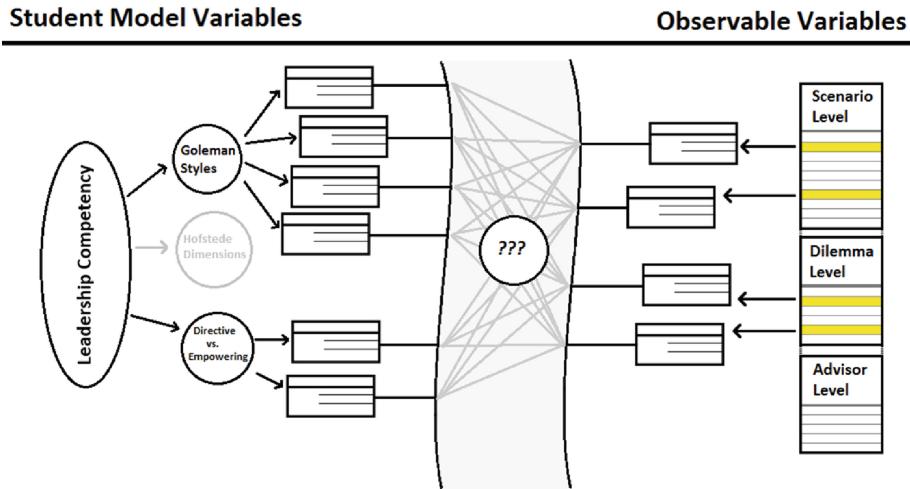


Fig. 4. Linking student model variables to observable variables

3 Predicting Human Behavior

The evidence model we implemented for training feedback purposes is based on yes/no decisions that the player has to take for each dilemma that needs to be solved. This evidence model is defined with a domain expert who was able to argue what the effect of a yes/no decision is on the three leadership dimensions, thereby ensuring a certain level of fidelity, accuracy and validity of the evidence model.

In this explorative study, we are interested in utilizing data mining techniques to predict the scoring on these leadership dimensions. If we could predict player behavior on-the-fly, then we are able to recommend didactical suggestions to the player to maximize learning during training [5]. It is beyond the scope of this paper to discuss data mining and predictive analytics extensively. The key in predictive analytics [6] is to create a model from the available set of observed variables to predict an outcome (class). For illustration purposes suppose the class is *Figurehead* that we discretized in two categories; *low* and *high* scoring on this dimension.

Can we now find a model based on in-game observed variables that predicts a scoring on the *Figurehead* dimension for each of the two categories *low* and *high*? Such a model is derived via a learning algorithm. There is a variety of learning algorithms based on different methods, for example, decision tree based methods, rule based methods, neural networks, Bayesian belief networks, et cetera [7]. Depending on the method used the algorithm will learn specific patterns that map the observable variables ('predictors') to the class for which you know the class answer. The model captures these relationships for a 'training data set' and can then be used to get predictions on a 'new data set' for which you do not know the class answer. We split our data set in a 'training set' to learn the predictive model (via induction) and apply the model on a 'test set' (via deduction).

We used the Waikato Environment for Knowledge Analysis (WEKA) [8] toolbox and several embedded machine learning techniques to predict the class *Figurehead*. We used cross validation to define the training and test data set. Basically, the total data set is divided in 10 parts, and every part is the test set in a 10 times run.

Our gameplay dataset consists of 2700 played games and each game has 8 dilemmas. Thus, our total dilemma set is $8 \times 2700 = 21600$ instances. Our data log file contains 80 observable attributes per instance from which we extracted 27 meaningful instances that we used for this analysis (see Fig. 5).

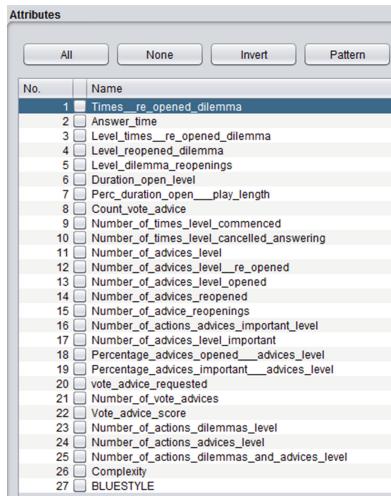


Fig. 5. The 27 selected observable variables

In addition, we selected 10 learning algorithms in the WEKA tool (see Table 1).

Table 1. Overview of the classifiers

| Classifier | Type of classifier |
|--------------|--|
| ZeroR | Baseline classifier; Predicts majority category in the class attribute |
| OneR | Baseline classifier; Same as above but on one of the attributes |
| BayesNet | Bayesian based |
| NaiveBayes | Bayesian based |
| SMO | Support vector classifier John Platt |
| Logistic | Multinomial logistic regression |
| IBk | K-nearest neighbours classifier |
| KStar | An Instance-based Learner Using an Entropic Distance Measure |
| J48 | Decision tree based |
| RandomForest | Random decision tree based |

WEKA was configured as such that we predict the scoring on the *Figurehead* dimension to examine which model predicts better than the others (See Fig. 6 for the results).

| Dataset: | | | | | | | | | | | |
|--|---------------------------------------|---|---|-------------------------------------|-------------------------------------|---|---|--|--|--|--|
| 'dilemma_analytics.all.v.' (100) | | | | | | | | | | | |
| Datasets: | | | | | | | | | | | |
| DatasetSize: 10 | | | | | | | | | | | |
| Confidence: 0.05 (two tailed) | | | | | | | | | | | |
| Sorted by: | | | | | | | | | | | |
| Date: 9/11/17 11:18 AM | | | | | | | | | | | |
| Dataset: | | | | | | | | | | | |
| (1) rules.ZeroR *(2) rules.OneR *(3) bayes.Bayes *(4) bayes.Naive *(5) functions.S *(6) functions.I *(7) lazy.IBk ~*(8) lazy.KStar *(9) trees.J48 *(10) trees.RandomForest | | | | | | | | | | | |
| 'dilemma_analytics.all.v.' (100) | | | | | | | | | | | |
| 64.50(0.50) * | 64.50(0.50) * | 66.63(3.03) * | 66.63(3.03) * | 66.98(4.00) * | 66.98(4.00) * | 64.18(2.64) * | 66.51(3.15) * | 66.44(3.08) * | 71.80(2.78) * | 69.39(2.74) * | |
| 'dilemma_analytics.all.v.' (100) | 'dilemma_analytics.all.v.' (100) | 64.51(0.11) * | 64.51(0.11) * | 61.03(1.46) * | 61.03(1.46) * | 60.44(0.42) * | 61.03(1.46) * | 60.44(0.42) * | 61.03(1.46) * | 61.03(1.46) * | |
| 'dilemma_analytics.all.v.' (100) | 'dilemma_analytics.all.v.' (100) | 65.96(0.06) * | 65.90(0.10) * | 72.91(1.10) * | 62.03(1.68) * | 65.90(0.10) * | 67.03(0.80) * | 76.19(1.40) * | 76.41(1.42) * | 76.13(1.06) * | |
| 'dilemma_analytics.all.v.' (100) | 'dilemma_analytics.all.v.' (100) | 65.87(0.02) * | 65.87(0.02) * | 72.87(0.80) * | 62.27(1.02) * | 65.87(0.04) * | 67.58(0.64) * | 80.10(0.93) * | 79.80(0.95) * | 76.86(0.87) * | |
| (4/*) *(0/3/1) *(3/1/0) *(0/0/4) *(0/4/0) *(3/1/0) *(3/1/0) *(4/0/0) *(4/0/0) | | | | | | | | | | | |
| Key: | | | | | | | | | | | |
| (1) rules.ZeroR ~* 4895854146887784 | (2) rules.OneR ~* 4849427003147861443 | (3) bayes.BayesNet ~* D ~Q bayes.net.search.local.TAN -- -S BAYES -E bayes.net.estimate.SimpleEstimator -- -A 0.5' 746037443258775954 | (4) bayes.NaiveBayes ~* 5995281205786977655 | (5) functions.S ~* 4595836367861936 | (6) functions.I ~* 4595836367861936 | (7) lazy.IBk ~* 0.05 -M 0 -V -1 -W 1 -K *functions.supportVector.PolyKernel -E 1.0 -C 2500071" -calibrator *\functions.Logistic -B 1.0E-8 -M 1 -num-decimal-places 4" * | (8) lazy.KStar ~* 0.05 -M 0 -V -1 -W 1 -K *functions.supportVector.PolyKernel -E 1.0 -C 2500071" -calibrator *\functions.Logistic -B 1.0E-8 -M 1 -num-decimal-places 4" * | (9) trees.J48 ~* C 0.25 -M 1 -V 0.001 -P 12 -N 0 -I 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (10) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (11) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (12) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 |

Fig. 6. Results of the predictions for each model

The first line depicts the results (accuracy) for 10% of the training data set, the second line 30%, the third line 50% and the last line 100% set size (Note that the same lines are shown in Fig. 7).

Using ZeroR as a classifier model leads to a correct prediction of *Figurehead* on the test data set of 65,87%. ZeroR (ZeroRules) is the simplest classifier that only uses the predefined categories in the class viz. *low* and *high*. ZeroR is able to predict correct scoring in these categories in 65,87% of the time. Normally, ZeroR is used as a baseline to compare the performance of the other algorithms against it. As Fig. 6 shows, some algorithms find models that predict significantly worse (e.g. Naïve Bayes 62,27%) or significantly better (e.g. Random Forest 81,83%) scoring on *Figurehead* for the test set data. Random Forest increases its correct prediction on *Figurehead* by 15% compared to ZeroR. On the other hand, Random Forest is based on a more complex method – using multiple decision trees, including various observable attributes – to create a predictive model based on the training data set. Thus, it takes more time to learn the model, and need more time to use the model to predict the scores.

| Dataset: | | | | | | | | | | | |
|---|---------------------------------------|---|---|-------------------------------------|-------------------------------------|---|---|--|--|--|--|
| 'dilemma_analytics.all.v.' (1000) | | | | | | | | | | | |
| Datasets: | | | | | | | | | | | |
| DatasetSize: 10 | | | | | | | | | | | |
| Confidence: 0.05 (two tailed) | | | | | | | | | | | |
| Sorted by: | | | | | | | | | | | |
| Date: 9/11/17 11:20 AM | | | | | | | | | | | |
| Dataset: | | | | | | | | | | | |
| (1) trees.RandomForest *(2) rules.ZeroR *(3) rules.OneR *(4) bayes.Bayes *(5) bayes.Naive *(6) functions.S *(7) lazy.IBk ~*(8) lazy.KStar *(9) trees.J48 *(10) trees.RandomForest | | | | | | | | | | | |
| 'dilemma_analytics.all.v.' (1000) | | | | | | | | | | | |
| 69.38(1.74) * | 64.50(0.80) * | 64.46(0.60) * | 64.46(0.60) * | 66.83(3.03) * | 66.83(3.03) * | 60.44(2.71) * | 62.98(4.00) * | 64.18(2.64) * | 66.51(3.15) * | 66.44(3.08) * | |
| 'dilemma_analytics.all.v.' (1000) | 'dilemma_analytics.all.v.' (1000) | 64.15(0.11) * | 62.05(1.46) * | 61.18(2.03) * | 61.18(2.03) * | 64.09(0.62) * | 67.03(0.80) * | 67.03(0.80) * | 67.03(0.80) * | 67.03(0.80) * | |
| 'dilemma_analytics.all.v.' (1000) | 'dilemma_analytics.all.v.' (1000) | 65.96(0.06) * | 65.90(0.10) * | 72.91(1.10) * | 62.03(1.68) * | 65.90(0.10) * | 67.03(0.80) * | 76.19(1.40) * | 76.41(1.42) * | 76.13(1.06) * | |
| 'dilemma_analytics.all.v.' (1000) | 'dilemma_analytics.all.v.' (1000) | 65.87(0.02) * | 65.87(0.02) * | 72.87(0.80) * | 62.27(1.02) * | 65.87(0.04) * | 67.58(0.64) * | 80.10(0.93) * | 79.80(0.95) * | 76.86(0.87) * | |
| (4/*) *(0/0/4) *(0/0/4) *(0/0/4) *(0/0/4) *(0/0/4) *(0/0/4) *(0/0/4) *(0/0/4) | | | | | | | | | | | |
| Key: | | | | | | | | | | | |
| (1) rules.ZeroR ~* 4895854146887784 | (2) rules.OneR ~* 4849427003147861443 | (3) bayes.BayesNet ~* D ~Q bayes.net.search.local.TAN -- -S BAYES -E bayes.net.estimate.SimpleEstimator -- -A 0.5' 746037443258775954 | (4) bayes.NaiveBayes ~* 5995281205786977655 | (5) functions.S ~* 4595836367861936 | (6) functions.I ~* 4595836367861936 | (7) lazy.IBk ~* 0.05 -M 0 -V -1 -W 1 -K *functions.supportVector.PolyKernel -E 1.0 -C 2500071" -calibrator *\functions.Logistic -B 1.0E-8 -M 1 -num-decimal-places 4" * | (8) lazy.KStar ~* 0.05 -M 0 -V -1 -W 1 -K *functions.supportVector.PolyKernel -E 1.0 -C 2500071" -calibrator *\functions.Logistic -B 1.0E-8 -M 1 -num-decimal-places 4" * | (9) trees.J48 ~* C 0.25 -M 1 -V 0.001 -P 12 -N 0 -I 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (10) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (11) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 | (12) trees.RandomForest ~* P 100 -I 100 -num-splits 1 -K 0 -M 1.0 -V 0.001 -B 1" 1116839470751428698 |

Fig. 7. Influence of size of the data set (10%, 30%, 50% and 100%)

As Fig. 7 shows, Random Forest also performs significantly better against all other solutions. Note that a ‘v’ indicates significantly better and a ‘*’ significantly worse. However, Random Forest does not perform better compared to J48 for small data set sizes.

Table 2. Compare various classes

| Prediction results: correct predicted (percentage) | | | |
|--|----------------|---------------|--------------------------|
| Student variable | ZeroR baseline | Random forest | Difference from baseline |
| Figure Head 3B model (Yellow) | 66% | 82% | 16% |
| People Person 3B model (Blue) | 72% | 82% | 10% |
| Administrator 3B model (Red) | 63% | 79% | 16% |
| Dilemma duration open | 26% | 89% | 63% |
| Number of actions in dilemma | 20% | 70% | 50% |
| Perceived complexity of dilemma | 43% | 79% | 36% |
| Level answer | 50% | 76% | 26% |

In addition (see Table 2), we examined how Random Forest compares against ZeroR with respect to the other two leadership dimensions ‘*People person*’ and ‘*Administrator*’, and what happens when an observable variable is also the predicted class, such as ‘Dilemma duration open’ (how long it takes before a decision is made), ‘Number of actions in dilemma’ (how much actions are taken during solving a dilemma), et cetera.

4 Conclusion

This paper was about using data mining techniques for predictive modelling. We did some experimentations with the WEKA toolbox and used a data set coming from a game based learning solution that is used to train mayors in crisis management leadership. We showed that several data mining techniques – based on various methods – resulted in different predictive performances. It was found that some models based on the available in-game observable variables resulted in significant better predictions as compared to the baseline. In particular, Random Forest, which is based on decision trees performed overall best. For this specific game, data set, selection of observable variables and leadership model construct, Random Forest could be used as classifier.

From a didactical point of view, we advocate a learning by doing approach [9] for game based training. Ideally, players explore and experience the complete dilemma space as well as decision alternatives on the leadership model dimensions (*People person*, *Administrator*, *Figurehead*). Therefore, it would be interesting to monitor and predict playing behavior in real-time on-the-fly, and during gameplay suggest alternative course of actions to the player/trainee. These ‘instructive recommendations’ may speed up the learning journey.

In conclusion, we learned that a variety of experts are needed to examine this type of data. The learning architect and trainer need to indicate what they want to know. The game developer needs to implement the data models to capture the set of meaningful predictors, the data analytics experts needs to understand the learning goals and game play constructs and available observable variables to come up with meaningful classifiers. In sum, fit for purpose predictions depend heavily on domain knowledge in the specific field of application [10, 11].

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Risk Based Thinking – New Approach for Modern Enterprises’ Management

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Abstract. The current business environment has been constantly changing, dependable on different conditions and requirements. The dynamics of business changes are the result of globalization, market development and other factors. Positive development and business sustainability requires responding to opportunities, but with limited potential threats, which occur with those changes. A natural feedback to negative impacts reduction (or even increasing opportunities) in enterprise management in this environment is a new approach implementation. Risk-Based Thinking (RBT) appears as a basis platform of all management systems (ISO 9001, ISO 140001, ISO 45001, ISO 27001, etc.). Information security was the first management system, where RBT was implementing as a part of the management system. Industry 4.0 requires a change in human-machine-environment area, resulting from the ability to flexibly response to customer and stakeholder demands. Reliability of information, limitation human mistakes limitation in the process, data protection and knowledge in Smart factory is not possible without the creation of effective preventive tools resulting from risk analysis. Current methods and tools for risks identification and its assessment require the development of new system logic processes based on mutual relations. RBT creates a risk management framework, as a part of the management approaches is one of the basic pillars for managing the Smart factory. The aim of the paper is to introduce the new approach of modern management thinking affected by changes made in new revision of ISO 9001. Through a new “Global Risk-Based Management” (GRBM) we try to suggest on the necessity of managements integration using RBT (Risk Register), and possibility to design an effective Risk Map to manage the external and internal risks in a modern enterprise.

Keywords: Risk management · Management system · Risk based thinking

1 Introduction

The International Organization of Standardization (ISO) with headquarter in Geneva (Switzerland) is responsible for the elaboration and issuing of international standards for different domains. During last few decades, it possible to notice that a major changed were adopting to management systems, especially if we talk about Quality management system (QMS). In 1987 was the first edition of 9001 published, which has undergone an impressive career worldwide. Since then, this standard was revising several times, thus bringing improvements resulting from experience gained in its implementation by more

organizations worldwide. Sometimes the review was limited to some clarification of definitions and language, other times, as in year 2000, changes were substantial and led to a revolution in the implementation and operation of management systems. This is also the case for the revision from 2015, when on September 15, 2015; ISO published the third version, substantially changed from the previous one. Probably the most significant changes were implementing, when ISO adopted new, so call High Level Structure - HLS order to facilitate different system integration [1]. Important element of HLS, that new standard ISO 9001:2015 started use was new approach called Risk-Based Thinking (RBT). In this case, the risk becomes a fundamental attribute of the whole planning and management processes and (according to definition “the effect of uncertainty on an expected result”) is not limited only to negative possibilities. Article 6.1.1 of the new ISO 9001:2015 defines “desirable and undesirable consequences”. In other words, it is possible to define the risk in the management process also as a positive risk, as a combination of probability and consequences desires, which means the risk levels of opportunity (degree of opportunity). It is important to accept this thinking in relation to the ability of the organization to meet legislative requirements, as well as their own in order to enhancement the customer satisfaction. The basis for the establishment the proposed methodology for RBT management tools is standard ISO 31000 and its support published as ISO/IEC 31010 (Risk assessment techniques).

2 Evolution of ISO 9001

In 1987, the International Organization for Standardization (ISO) adopted a set of ISO from 9000 to 9004 standards, signed by the 72 most industrialized countries of the world [2], based on British Standard BS 5750. The standards became guidance for creating and defining the rules for managing activities that affect the quality of the product. Standards were non-mandatory, but if organizations decided to accept them, then they had fulfilled their requirements. The biggest support of ISO 9000–9004 was the terminological standard ISO 8402.

A small revision of ISO 9000 was introduced in 1994. The QMS was already a tool for managing processes in the organization. At the same time, greater emphasis was placed on the use the process approach, which resulted in the revision of the ISO 9001 standards. In 2000 was the first revision of ISO 9000–9004 standards completed, where the number of standards was reduced significantly and new series of ISO 900X was published. Only one standard with requirements was presented and called as an ISO 9001. The supporting standards, as ISO 9000 and ISO 9004 were also published. ISO 9000 has replaced the old terminological standard ISO 8402. In 2008, the ISO 9001 standard was updated again. The new version of ISO 9001 was released in September 2015 and changes made in ISO 9001:2015 are more significant than those produced during the 2008 revision are. The historical evolution of ISO 9001 is shown in the following Fig. 1.

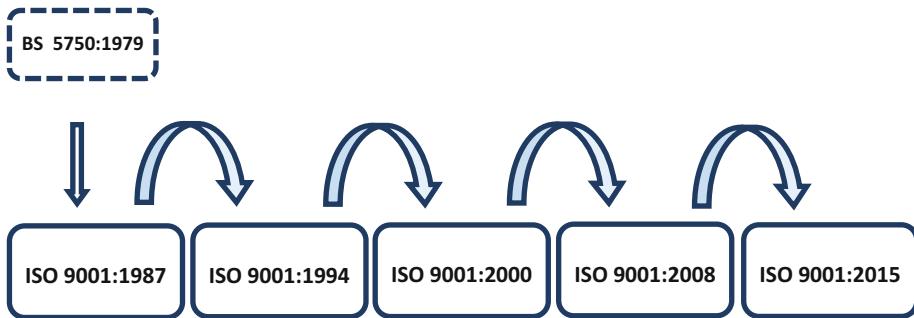


Fig. 1. Historical evolution of ISO 9001

On first view are clearly seen changes in structure of ISO 9001:2015, where the number of *Chapters* expanded from 8 to 10 but other main changes were also adopted as *Risk – Based Thinking approach*, *Context of the organization*, *Focus on Input and Output*, *Engagement to interested Parties* as well as the *Terminology*.

High Level Structure (HLS)

As a result of the new arrangement in ten clauses, ISO 9001:2015 has the same unambiguous structure as all standardized management systems, known as a “High Level Structure” (HLS), conducted from 10 chapters. This has made the integration of various management systems much simpler. If, for example, an organization wishes to implement ISO 14001 in addition to ISO 9001, the parts that cover the same topic in the standards can be seen easily.

Focus on Input and Output

There is more emphasis in ISO 9001:2015 on measuring and properly assessing the input and output of processes [3–6]. According to ISO 9001:2015, organization must closely monitor which articles, information and specifications are involved in the production process. Organization must also clearly check whether good products or services come out of the production process (see Fig. 2).

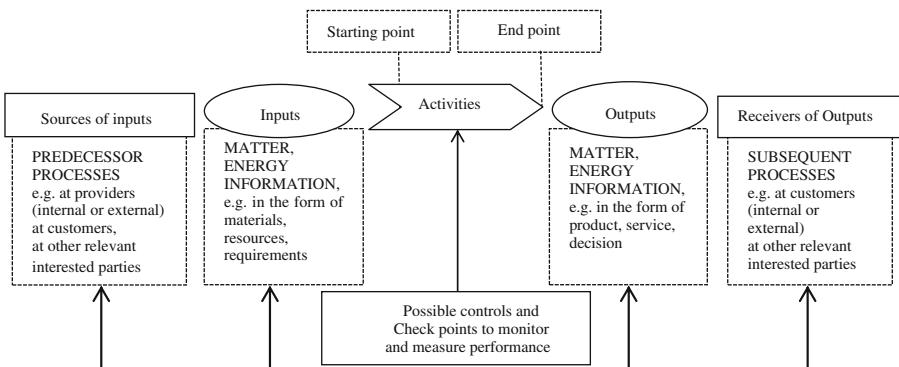


Fig. 2. Schematic representation of the elements of a single process [6, 7]

Risk-Based Thinking (RBT)

RBT has a very important place in ISO 9001:2015. Organization is now strongly encouraged as an organization to use risk analysis in order to decide which challenges organization sees in the management of business processes. Formal risk analysis, familiar to many organizations via FMEA or HACCP techniques and others, is now standard for everyone [8]. To emphasize their dominance, the concept of “risk” occurs forty-eight times in ISO 9001:2015, compared with only three times in ISO 9001:2008. The addition of RBT has made the “preventive measures” of ISO 9001:2008 redundant. These preventive measures no longer appear in ISO 9001:2015.

Engagement of Interested Parties

ISO 9001:2015 requires an organization to construct its QMS from the specific context within which it is active. This means, among other things, that, as an organization have to take into account the needs and expectations of interested parties and that organization evaluates and deals with internal and external strategic questions. In ISO 9001:2008, customers were named often as being the only interested party. This concept was extending in ISO 9001:2015. Suppliers, personnel, shareholders, legislative bodies, society, internal customers, etc., are now included as interested parties, in addition to customers. Organization has to be aware of the importance of these interested parties’ (changing) requirements and standards, and anticipate them in the features of its products and services.

Terminology

The standard includes new terms such as products and services, documented information, improvement, context of the organization, risk (closely related to ISO 31000 management) change in defining a new concept of process environment and post-delivery activity. Except above-mentioned changes, a steady trend that followed in 2015 was to improve this standard, reduce descriptive requirements (e.g. existence of certain mandatory documentation) in favour of those of performance and to support improving the effectiveness of implemented management systems. In a way the required documentation, consisting of a quality manual and twenty procedures (edition 1987) was simplified to one manual and six procedures (edition 2000) respectively not explicitly requiring the existence of a mandatory documentation (edition 2015). However, this does not mean that existing documents will be erased. It indicates to keep existing documents in the future, and to be supplemented where necessary, regarding new requirements.

3 Risk - Based Thinking as New Approach in Organization

ISO 9001:2015 incorporates term RBT in its requirements for the establishment, implementation, maintenance and continual improvement of the quality management system. This additional requirement in new version of standard is logical requirement in a way of achieve a proactive approach to management system.

ISO 9000:2015 states that risk is related to potential events, and that it is typically expressed because of the likelihood and consequence of such an event [6]. This is a good time to emphasize a few notions about risk. Risk in ISO 9001:2015 is general, that is, it is a concept that can be applied anywhere in an organization, including planning (Clause 6.0), i.e., the setting of objectives as it is defined in ISO 31000.

Risk can be described as a potential event that can be expressed in terms of consequence, impact, or severity of the impact and its related likelihood. Risk appears in the normative parts of ISO 9001 eight times, and RBT appears once. Risk and RBT appear many times more when we study the informative portions of the standard, e.g., the introductory sections and the appendix. Planning actions to address risks and opportunities can include avoiding risk, eliminating the risk source, changing the likelihood or consequences (likelihood and impact), sharing the risk, retaining risk by informed decision and even taking risk in order to pursue an opportunity. When planning actions to address risks, it is again imperative quality professionals must consider the context of their organization.

An important aspect of checking the effectiveness of actions to address risk is having the right data available to make informed decisions [9]. By improving risk data aggregation capabilities, organizations can strengthen the capability and the status of the risk function to make judgments. This leads to gains in efficiency, reduced probability of business losses, enhanced strategic decision-making and ultimately increased profitability. Instant access to risk assessments, audit reports, customer complaints, non-conformance and document notification confirmations give management the ability to understand the organization management system, carry out trend analysis and demonstrate control of “culture of compliance” [3, 9–11].

Risk management, as systematic process coming back to the top management level of the organization “packaged” into a holistic understanding of the context and factors potentially affecting successful and sustainable management [12–14]. Management systems went through a philosophical change, which does not change their meaning, but makes problems visible from different perspective.

Understanding the systemic nature of the real world and an integrated approach to determining and defining HLS-based management systems are necessary requirements for the ability to effectively solve problems of the organization (Decision Making) [15].

System troubleshooting on the RBT basis is generally possible to break into 11 steps:

Step 1: Defining and generalizing the needs. Problem analysis, i.e. “The environment and its impacts on business objectives”.

Step 2: Clear identification of threats within the context of the organization.

Step 3: Considering the situation, analysis of constraints, management shortcomings, risk assessment.

Step 4: Studying and understanding the interaction between the context of organization and other elements of the system (technology, human, environment, etc.)

Step 5: More detailed analysis of causes, their interrelationships and their impact on the value of risk.

Step 6: Considering the risk management measures.

Step 7: Presenting the proposed solution to parties involved.

Step 8: Considering of the effectiveness of the presented measures, their impact on risk and opportunities.

Step 9: Implementing the proposed measures.

Step 10: Evaluating the effectiveness and efficiency of measures implemented.

Step 11: Observing and managing the changes (return to Step 1).

4 Application RBT in SMART Factory

SMART factory is a connection between physical and virtual environments through Cyber-Physical Systems. The result is an integration of the technical environment with the business environment [16].

Modular structure of the “Smart Factory” (SF) consists of the following elements:

- Cybernetic-Physical System (CPS),
- material processes,
- Internet of Things (IoT),
- communication links.

As a result of such a combination, a virtual and real technical environment with the use of state-of-the-art communication technologies, a more humorous work environment is ensured, the customer’s satisfaction is ensured by delivering a product that meets tailor-made requirements and taking into account changing conditions throughout its lifecycle. The use of machinery is guaranteed within a global optimization by its self-diagnostics, self-reparability and its ability of self-configuration according to external requirements. The essence of the “Smart Enterprise” system functioning is a dynamic decision making to meet the goals within core business.

When building SF, it is necessary to take into account at least the following three critical elements, namely:

- bad specification of “Core Business” requirements and insufficient methodical management of their implementation into decision making modules and criteria,
- underestimation of the risk assessment with regard to the internal and external environment of the business environment, management without risk factors,
- predictive maintenance vs. full automation without knowledge of so-called leading indicators of machine condition, lack of methodology for prioritization and mutual combination compared with critical parameters defined as a “Cascade Model” of process approach based on established business objectives.

The proposed methodology for support of RBT approach is based on basic philosophy (algorithm) of risk assessment and experience achieved within the solution of department research team as a partner of 7RP Integrisk project [17].

In a company it is important to identify possible areas of losses, which might have influence on given corporate objectives [8, 18]. We can to specify them, as follows:

- Legal requirements:
 - Occupation health and safety (OH&S)
 - Environmental protection
- Customer requirements:
 - Production quality
 - Machinery downtime or reduced production throughput
- Financial requirements:
 - Maintenance costs (expensive repair bill)
- Public requirements:
 - Corporate image (damage to the brand, business impact)

Table 1. Categorization of objectives and level of losses (effects)

| Objective specification | Level of effects | | | | |
|-------------------------|--|--|---|--|---|
| | Negligible | Minor | Moderate | Major | Extreme |
| OH&S | No impact on human | Minor injury | Injury or partial harm of health | Serious injury significant damage to health | Serious injury or death of several people |
| Quality | Product defect has not impact on the product quality | Product defect must be additionally removed | Occurrence of bigger amount of errors on the product | Product defect requires repeated production (satisfaction of the customer can be endangered) | Product defect requires the change of design, risk of losing customer |
| Environment | No damage | Small leaks | Possible leaks of smaller extent, measures are a part of the technology | Risk of large leaks, the effects require higher costs and time for remedy | Serious damage, long-term pollution |
| Downtime | No or only small interruptions | Possible short-time interruption (e.g. for 1 h as a maximum) | The repair does not require more than 8 h | Possible longer downtime, recovery requires time up to 24 h | Interruption of operation requires repair lasting more than 24 h |
| Image | Image damage is unlikely | Possible single disputes | Maintenance requires effort | Serious damage to reputation | The public does not agree with further operation of the organization |
| Repair cost | Repair costs are minimum | Repair costs are planned (budget) | Repair costs can exceed the budget | Repair costs seriously jeopardize the budget | Repair costs jeopardize the existence |

The basic principle for management decision making is to identify the frame and understand the nature of their business through the mentioned area specification (Organization and its context – Chap. 4 of ISO structure of Management Systems based on HLS).

Each of these areas can be categorized, for example, into five levels of losses (see Table 1) which combined with the likelihood creates the basis for the Risk Matrix.

Based on established criteria (level of effects – from 1st to 5th) and setting out the categories of probability of nonconformity rise, then the structure of the methodology for assessing the risks jeopardizing the company's objectives described in Multi-criterial Risk Matrix - see Table 2.

This second step requires identifying threats or hazards affecting business objectives of organization and estimates the size of the risk.

Table 2. Multicriterial Risk Matrix (MRM)

The procedure of application of this methodology in Table 2 requires the analysis of all identified processes – resulting from mutual systems elements interactions of the (e.g. based on the Map of processes according HLS requirements) so that each process could be considered from the point of view of the potential effect on objectives of the organization [7, 17, 18]. Criteria for evaluation of processes criticality can be set as follows:

- Critical Process - ref. A: process to which a risk level H - High (red marked area; the value from 60 to 100) and S – Serious (yellow – marked area, the value from 30 to 56) can be assigned;
- Middle criticality process - ref. B: process to which risk level M – Middle (green – marked area; value from 10 to 29) risk is assigned;
- Low criticality process - ref. C: process, risk level for the processes L – Low (blue – marked area; value from 1 to 9).

The result is an identification of processes with A - High, B - Middle and C - Low criticality and the next step is analysis of the elements of processes using the principle of deviation 4M: M-Man, M-Machine, M-Material, and M-Method, which can have major impact on process criticality.

Table 3. 4M probability level identification

| Man | L_{MN} | Method | L_{MD} | Machine | L_{MC} | Material | L_{ML} |
|--|----------|---|----------|---|----------|---|----------|
| Deliberate errors until sabotage | +2 | The methods used are inappropriate, do not cover all options, they do not ensure that the process is under control | +2 | Dangerous surroundings threatening improper equipment | +2 | Inappropriate material with possible hidden errors without any input control | +2 |
| Multiple unintentional errors | +1 | Inconsistent methods increasing the system/process variability | +1 | Possible - less serious threat to the operator, the need for extensive and expensive corrective actions | +1 | Material that has undergone simplified entry control | +1 |
| Acceptable error rate | 0 | In practice empirically validated methods, standard procedures | 0 | Safe machinery with a standard error rate and acceptable threat | 0 | Appropriate material verified by adequate statistical control | 0 |
| Extremely low error rate | -1 | Sophisticated methods containing an early warning system against potential misconduct | -1 | Safe device with diagnostic systems to prevent failures and accidents | -1 | Proper material, checked by 100% automated check | -1 |
| Almost zero error rate, effective error prevention | -2 | Effective and efficient methods of system capable of timely identification of possible misconduct, threat or self-repairing systems | -2 | Device with redundant system of diagnostics aimed at system error prevention | -2 | Cooperation with the supplier, long-term satisfaction with quality (6σ quality of delivery) | -2 |

For the effective risk management, the identification of a critical element in the process (or elements) is very important because it is not the same if from the point of view of risk reduction some measures for improvement of the human activity are taken or if more effective strategy of maintenance to reduce machine failures is required. To ensure that the methodology for the risk of processes assessment, as shown in Table 3, would also consider the elements of the process, it is possible to modify the risk matrix MRM by extension of likelihood by 4M that requires assignment of other parameters (scales) for the overall assessment. Very similar is possible to define elements and to quantify probability of their influence on the Risk value for external organization threats (e.g. environment, earthquake, flood, landslide, etc.).

The proposed methodology requires a structured approach to the breakdown of the elements of the external and internal environments of the organization. These objectives must be defined and categorized (severity of consequences). For this reason, the procedural approach as an MS element must have a specific form and description to the extent that it is possible to define the elements of the system - organization regarding their management [19].

When building this holistic model – MRM+4M (see Formula (1)) in the criteria 4M, the criteria Man a Method were used for correction of the probability value (P_{Hi}). This formula represents possible compensation of people mistakes using correct methods and procedures. Consequence correction (C_{Hi}) was applied for Machine a Material evaluation. In this case, it is possible apply compensation, where it is possible to expect, that the high quality machines (intelligent machine and CPS) eliminates using of poor material. Depending on the organization's management level, this correction for Machine and Material can also be applied for the probability correction (P_{Hi}).

This MRM+4M (GRBM) model described in mathematical formulas, is follows:

$$R_{O_i} = P_{Hi} \times C_{Hi}. \quad (1)$$

While $C_{Li} <O_{i\min}, O_{i\max}>$ - where O_i are the objectives for each of the consequences - impact on business, then:

$$P_{Hi} = \begin{cases} 10, & \text{if } P_{Li} + L_{MN} + L_{MD} \geq 10 \\ 1, & \text{if } P_{Li} + L_{MN} + L_{MD} \leq 1 \\ P_{Li} + L_{MN} + L_{MD} \text{ than} & \end{cases} \quad (2)$$

$$C_{Hi} = \begin{cases} 10, & \text{if } C_{Li} + L_{MC} + L_{ML} \geq 10 \\ 1, & \text{if } C_{Li} + L_{MC} + L_{ML} \leq 1 \\ C_{Li} + L_{MC} + L_{ML} \text{ than} & \end{cases} \quad (3)$$

Where:

O_i objective, $i = (1, 2, 3, \dots n)$,

C_{Li} attributed value estimating in define scale the level of effect (consequence, Table 2), concerning all impair number from 1 to 9,

P_{Li} attributed value estimating in define scale the level of probability (see Table 2), concerning all impair number from 1 to 9,

P_{Hi} probabilities correction according 4M criteria, described in Table 3,
 C_{Hi} measure of consequence (level of effect) corrected by 4M criteria described in Table 3.

The degree of uncertainty in Formula (1) depends on the extent of the described processes, the elements of the system and the accuracy of the expression of their interrelationships. GRBM model helps to state useful tool for RBT application, but also creates the possibility to assess all influences (elements) in organization through hierachal structure, which have significant effect on their objectives. Risk map based on GRBM can be then very easy created as an effective and on time decision-making tool – see Fig. 3.

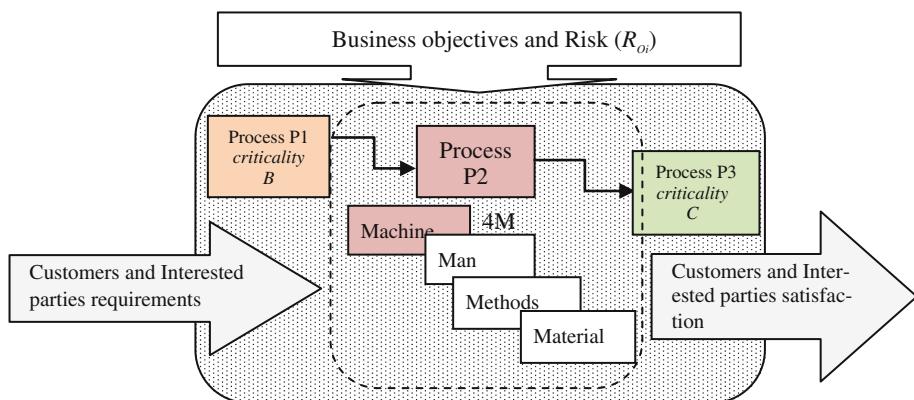


Fig. 3. Risk map based on GRBM

5 Conclusion

As it is evident from the article, the most recent revisions of management systems complemented by the perception of risk have been continuously running since 2013. Their aim is to modify the standards in such a way that they would have a similar structure to make them easier to integrate. The content of standards will be unified but specific requirements will be different and the focus on risks and opportunities will be highlighted. In this way, the correlation between the management systems will be achieved to ensure effective and efficient manufacture, supply of products and provision of services according to customer requirements. By changes of individual standards, unification of form and approach of management in these standards and by application of a uniform method based on the risk management these uncertainties can be avoided and thus to achieve success in organizations of any nature.

Functionality of GRBM methodology asked for verification. It was applied in present state in automotive plant. However, for full application in Smart factory there is necessary to create communication frame and relationship between 4M elements and processes, of course reliable data collection using qualitative or quantitative methods and analysis of potential failures (e.g. FMECA, HRA, FTA, etc.) [8].

The aim of GRBM model is through application of RBT proactively manage the risks from the bottom, its means e.g. from component to the machine (also another elements of 4M), from the sub-processes to the process, from the processes to the business objectives of the company.

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Risk Management in a Changing World

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Abstract. Each human activity carries a range of risks, which include in its classification intermediate steps to identify them. As the economy is affected by global competition and globalization requirements of current policies, it is exposed to many risks and problems, which ultimately lead to investment failure or failure to achieve the desired results.

Risk management as a science is based on the realistic analysis of economic phenomena, and as a shroud of the art of standard modeling. It is the scientific approach or approach to dealing with pure risk by anticipating possible losses to the investment by designing and implementing procedures that reduce the possibility of loss or minimize the financial impact of losses to the minimum. Risk management identifies and measures manages the risks to which the financial institution is exposed, for the sake of caution and control, neutralizing or minimizing the impact thereof. Therefore, risk management is a process of measuring and evaluating risks and developing strategies to manage them so as not to negatively affect the rates of stability and economic balance, as well as the rates of growth and economic development.

Keywords: Financial risk · Risk management · Financial liberalization
Interdependence · Information and communication revolution

1 Introduction

In light of the globalization of financial markets as a global phenomenon and global caused by the main reason is the accelerated liberalization of the global financial markets and the removal of restrictions that limit the activity of financial institutions, and the transfer of capital benefiting from the information and communication revolution and advanced technology. Which led to the emergence of financial risks as a modern phenomenon of economies, where the financial innovations and increased integration of global financial markets, the emergence of many of the crises that hit the global economies. This instability is explained by the imbalance between the flows in kind and the financial flows in global economies. The aim here is to seek opportunities to maximize returns and minimize risks, meet challenges in risk management, deregulation and liberalization of economic transactions of all kinds.

It is difficult to analyze the philosophy of risk, but through examination and rational analysis we can determine the mechanisms of these risks according to a set of foundations, the most important:

First Basis: Risk study is rationalized in an unexpected, uncertain and disorganized world. Note, description and evaluation should be included, and then a classification of the risks and systems to be considered.

Second basis is that the risk is a condition that may be the result of an unknown and unexpected reflex for a long period of time.

So, we find that all definitions of risk are generally consistent with the definition of the concept of risk: "Risk is an event that affects the enterprise and creates the possibility of loss due to uncertainties of future results that may be contrary to the results achieved by the investor when investing in it".

The objective of these definitions is to determine the exposure of the institution to uncertainty, which requires substantial knowledge of the institution, and market in which it participates, and the legal, social, political and cultural environment within which it exists. It also requires proper understanding of the organization's strategic and operational objectives.

This includes vital factors to ensure that the organization succeeds in the opportunities and threats associated with achieving those objectives, while identifying the associated changes to manage the various risks that it may face.

2 Risk Management

Risk management as a science is based on the realistic analysis of economic phenomena, and as a shroud of the art of standard modeling. It is the scientific approach or approach to dealing with pure risk by anticipating possible losses to the investment by designing and implementing procedures that reduce the possibility of loss or minimize the financial impact of losses to the minimum. Risk management identifies and measures and to manage the risks to which the financial institution is exposed, for the sake of caution and control, neutralizing or minimizing the impact thereof. Therefore, risk management is a process of measuring and evaluating risks and developing strategies for managing them. These strategies include risk transfer, avoiding, minimizing negative impacts and accepting certain risk outcomes.

Any potential event or circumstance can have adverse effects on the institution in terms of its existence or sources. There may also be an impact on the community and the surrounding environment, prompting the two facilitators to formulate advance plans for each potential risk that could affect the institution to deal with its possible consequences [1].

In addition to the effects of risk management, financial management plays an essential role as it represents an integrated and comprehensive system to create the appropriate environment and tools to anticipate, examine, quantify and quantify potential risks to the business, assets and revenues of the financial institution. And to develop appropriate plans for what can be done to avoid these risks and to control them and control them to mitigate their effects if their sources cannot be eliminated.

Financial risk management deals with the relationship between the return on investment and the risk associated with this investment. The objective is to seek to employ this relationship by maximizing the value of investment and achieving the greatest return possible with minimal risk.

The financial risk management includes the actions taken by the institution in an attempt to change the form of the relationship between the expected return and the degree of risk associated with achieving this expected return, in order to maximize the value of the asset that generates the return [2, 3].

The integrated financial risk management system is based on three main phases:

- Identify the risks that can be exposed.
- Measure the level of risk and possible loss of its occurrence.
- Use appropriate methods or tools to minimize or avoid losses.

3 Risk Management Steps

Besides, risk management uses methods of financial analysis. It requires some steps, including the following:

- (1) *Risk identification* is exposed to various risks of interest. And to identify the source of the cause of the danger or the cause itself, which allows the search results [4].
- (2) *Identify the risks to the financial institution* which are identified by:
 - Goal-based identification
 - Selection based on the scenario analysis process to create different scenarios as alternatives to achieve the established goal.
 - Determination based on classification by detailing all potential sources of risk.
- (3) *Monitoring*: The ability of the management to monitor these risks according to appropriate criteria and to take the best decision to maximize the return and raise the economic efficiency of the financial institution in exchange for risk control [5].
- (4) *Assessment*: The risks to financial institutions are assessed in terms of their severity in the loss and probability of occurrence, and depends mainly on identifying and measuring the various aspects of the risk-taking activity, as well as ensuring the integrity of internal controls and organizational and administrative processes [6]. The difficulty of risk assessment lies in determining the rate of occurrence as statistical information on past incidents is not always available. It is also difficult to assess the severity of the results in the case of intangible assets.
- (5) *The ability to measure these risks continuously through the appropriate information systems*.
- (6) *Review the institution for all possible risks*.

4 Risk Management Departments

The classification of risk on the basis of a traditionally or newly-derived source allows the possibility of dividing risk management into two parts: *Traditional risk management (tangible risk)*: In fact, conventional risk management focuses on risks arising from physical or legal causes (such as natural disasters or fires, accidents, litigation) as

well as financial risk management that focuses on those risks that can be managed using financial instruments.

Modern Risk Management (Intangible Risks): Intangible risk management is defined as a new type of risk, which is likely to occur but is ignored by the institution because of the lack of recognition capacity, such as the known risk that occurs when incomplete knowledge is applied, and the risks of relationships. All these risks directly reduce workers' productivity in knowledge and reduce the effectiveness of spending, profit, service, quality, reputation and quality of gains.

5 Financial Risk Management Tools

Three major risk management strategies can be identified [7]. The strategy is to keep the level of risk as it is. The institution can adopt this strategy when the level of risk is low so as not to justify the expected cost of its management. This strategy includes the risk acceptance policy that can be followed by the institution, and no action is taken to address it [8]. And a strategy with calculated risk: to determine the levels of risk that can be tolerated, as the institution cannot bear more than it. The Foundation will confront these risks by taking all appropriate measures to reduce them to this acceptable level. This strategy includes several risk reduction policies, such as diversification and change in operational and financial leverage [9]. Finely the strategy covers the entire risk: it means neutralizing the source of risk for the institution, ie, minimizing the risk to zero. In this strategy, the institution follows full risk transfer policies such as full coverage or risk insurance using financial engineering tools, transferring financial risk to third parties through insurance contracts.

6 Methods of Dealing with Risks

In risk management, the practices and policies of institutions vary from the most important techniques used in dealing with risk by institutions is to resort to:

Avoiding risk: The unwillingness of individuals and institutions to assume greater risk means satisfied with the potential returns under the least risk, which is somewhat low. With all the increased risks the possible returns increased. Although avoiding risk minimizes risk, it deprives the investor of several opportunities because of fear of loss, as well as the difficulty of preventing specific risks. This is why risk avoidance is a negative way of dealing with it. Economic development depends on how to deal with risks positively, making this method inappropriate in dealing with many risks.

Risk Mitigation: For this approach, the financial institution in its risk mitigation policy identifies the threats that it may face and the various risks that may cause it to be lost to limit them, and to mitigate them, including the risk of default in the event of loans, interest rates.

Risk transfer: Institutions rely on the purchase of insurance as a means of transferring risk. Insurance companies take risks on behalf of institutions that do not want to take this risk for a price [10]. This strategy combines avoidance and transfer. This is

known as risk sharing or the adoption of a precautionary principle that reflects risk transfer while sacrificing the profit potential of insurance.

7 How to Manage Some Types of Financial Risk

Due to the changes and developments in the field of finance and the changing economic environment due to the high intensity of competition and technological development and the increase in the volume of financial transactions led to the diversification of financial risks and the degree of risk from one financial institution to another and the variety of means and tools to manage these risks and the need for follow-up Full understanding by regulatory bodies of these developments and the need for large-scale financial institutions.

Credit risk management: The most important financial risks facing financial institutions are the credit risk resulting from transactions with customers and institutions, which are classified into different types that can be measured by advanced indicators that allow the institution to accurately identify and forecast them in the future, which helps them to control or reduce them in the event of inability to overcome them [11].

Credit risk can be measured according to a set of criteria that allow for precise identification of these risks, and the development of indicators and data to measure them to help choose the optimal method of management and control, and then to reduce them to the lowest levels [12].

- Ratio of short-term loans to total assets.
- Ratio of non-performing loans to total loans.
- Ratio of provision for loan losses to total loans.
- Ratio of loan losses to total loans.
- Data on the distribution of the loan portfolio to sectors of economic activity quarterly.
- Quality indicators of assets approved by the financial institution according to the warning system are determined monthly.
- Data on the compatibility of existing collateral with the facilities granted to determine the number of provisions, which can be calculated by dividing the present value of the collateral against the total facilities granted.
- Reports on specific credit situations that require determination of their status to ensure regularity of repayment, and identification of the causes of irregular debt default.

The evaluation of the institution's policies, applications and procedures for granting credit, investment and portfolio management is crucial, as the financial process makes sure of the lending and investment process, which is based on the organization's management standards, and manages the credit process to determine how credit is made at various levels. This policy includes the general standards and guidelines that credit instruments must adhere to avoid credit risk [13].

Credit management generally focuses on two ways in which credit analysis is used to determine or minimize risk to the lowest levels: The discriminating method, which is

based on the idea of evaluating clients by taking a general idea of their personality and social status and their credibility, determining the objective of the request for credit, the type of activity funded and the nature of the collateral provided, The credit management focuses on studying the customer's ability and willingness to pay the loan with interest on maturity and by standing on the solvency of him. And the pilot method, after confirming the borrower's personal and financial solvency and the collaterals provided with the credit size, a point or weight for each scale is given to matching the weights set by the credit management department.

Risk analysis and pre-forecasting allows credit management to control and manage it in order to protect the assets and profits of the institution and minimize loss to the lowest levels. This depends on identifying the type of risk, measuring it and working on the preparation of procedures to control it. Risk management is based on three fundamental principles: at:

- Electives: Any selection of at least a number of bad-risk debts.
 - Put an end to the risks: This is by type and class of loan.
 - Diversity: This avoids the concentration of loans to specific customers. Through credit risk analysis, these risks can be assessed in the financial institution or banks by two methods [14]:
- (1) Method of financial ratios: Banks adopt this technique before granting loans. They analyze the current and future financial position of the borrowing institution, its level of profitability, its ability to generate cash flows sufficient to conduct its operations and fulfill its future obligations by moving from the accounting budget to the financial budget. A brief picture reflecting the most critical financial positions such as financial ratios applied in exploitation loans and investment loans.

The rates of the loans of exploitation: The Bank depends on the requests for financing exploitation activities, including:

- Financial balance ratios: Working capital and treasury accounts are calculated.
- Rotation ratios: It consists of three ratios: inventory turnover, customer turnover speed and resource turnover.
- General liquidity ratio.

Investment loan ratios: When the bank grants loans to finance investments, it calculates the rates of these loans [15]:

- Self-financing.
- Self-financing/investment debt for.
- Ratio of indebtedness.
- Financial assessment of the investment project, by calculating the net present value VAN, the internal rate of return TRI... [16]

- (2) The method of punctuation or loan is a “method adopted by banks to predict the size of the risk of non-payment, depends on statistical analysis, and allows to give a point or weight to each borrower to determine the risk for the bank” [17].

“Used by financial institutions to be able to “assess the financial suitability” of their clients before granting them a loan or foreseeing the deficits that could affect the organizations that deal with them [18].

Country risk management: It is essential that banks have all the necessary policies and procedures to identify and warn against the risks of countries, especially in the field of international lending and investment activities, as well as to maintain appropriate precautions against such risks [19].

Market risk management: The financial institution must adhere to the application of strict standards of measurement and effective control of market risk, with emphasis on the existence of quantitative and qualitative measures to manage market risk, as well as effective internal control, especially in the field of foreign exchange, by specifying a certain period during which the bank should act on financial assets, And this duration corresponds to the quality of assets [20].

Interest rate risk management: The objective of interest rate hedging is to minimize the non-valuation of the assets of the enterprise and to reduce income due to unacceptable changes in interest rates [21]. As “the choice of the appropriate means of coverage relates to the effectiveness of the desired and the costs resulting from it.” This process necessitates the availability of a system that enables the institution to control interest rate risk. Such measures should be met by obtaining adequate and timely information to assess the level of interest rate risk, taking into account the maturity period and type Currency in each transaction. We distinguish two types of interest rate hedging techniques: closed coverage and operational coverage [22].

Liquidity risk management: Liquidity is used to judge the liquidity risk of any financial institution. The purpose of liquidity management is to be able to meet all the obligations and transactions of the institution. The high liquidity management system should include several elements, including [23]:

- A good information management system.
- Centralized liquidity control.
- Analyze net funding required in light of different and alternative scenarios.
- Diversity of funding sources.

Supervisors should be aware of the bank’s management of its assets and liabilities, as well as of off-budget banks, while ensuring that this method provides sufficient liquidity for the Bank to meet all its contractual obligations.

Operational risk management: This type of risk leads to direct and indirect losses in the organization because it is due to internal control errors, bad governance, ... [24]. This leads to the need to provide a system of internal control that is comprehensive and appropriate to the nature and size of the activity of the institution to verify that the transactions are in the context of policies and strategies developed, and to apply this system effectively, to increase the efficiency of workers in the framework of training, And accurate knowledge of the client’s potential and ability to meet his obligations towards the enterprise ensures a higher level of transactions in the financial sector [25].

Exchange risk management: The institution is in a dangerous position against the exchange rate when dealing in a foreign currency different from its local currency (reference currency) where there are two possibilities [26]:

1. Coverage: Allows the institution to hedge against exchange rate risk with current knowledge, ie, currently available information, and to ensure that future flows of foreign exchange are secured. Current exchange rate forecasts are proposed through means of coverage.
2. The possibility of non-coverage: is the result of a decision not to cover, and depends on the failure of the institution to cover:
 - Future real-time price forecasts differ from guaranteed forward exchange rates, leading to the prediction of future spot exchange rates and arbitration to avoid risk without being covered.
 - Changes in exchange rates affect the inflation rate between two countries. Since the purchasing power parity theory is not actually achieved, the real exchange risk can be covered.

The main objective of hedging exchange rate risk is to protect it against unexpected changes in the exchange rate [27].

8 The Role of Financial Risk Management in the Prevention of Financial Crises

The financial crisis in its concept expresses a sharp and sudden disruption in the economic pace and some economic balances, followed by a collapse in a number of financial institutions that extend its effects to other sectors and thus have a direct impact on the economic system [28, 29].

Pauchant and Douville defined the financial crisis as “*a confusing situation facing the organization or the system as a whole.*”

There are many theories of the emergence of financial crises and vary concerning a type of these crises and also vary in intensity and impact and timescale. According to the Minsk theory, the cause of financial crises is the fragility of the financial sector, which affects the economy as a whole.

As a further explanation of the financial crisis, the game theory of coordination between agents in the financial markets. While mathematical models are used to analyze currency crises such as the Paul Krugman model. With various financial crises in the global economy different, several factors may increase the severity and impact of those crises that cause the frustration of investors because of the lack of options to deal with economic problems [30].

- The effect of infection: the transmission of financial crises from a country and its spread in other countries such as changes in currency prices or the collapse of stock markets. A crisis in more than one state at the same time resulting in the spread of infection, in addition to the problems suffered by the economies in which the crisis is high [31].

- Incompatibility between the volume of assets and the size of obligations of financial institutions: The risk to institutions of their assets is not commensurate with the risk of default and bankruptcy [32].

The various factors that lead to financial crises can be summarized as causing economic breakdowns [33].

The increase in interest rates that have a significant impact on investment through the low supply of money.

The high level of uncertainty on the level of the financial market resulting in the inability of financial institutions and from the collapse of financial markets because of the inability of borrowers to pay the value of loans are reduced and affect investment. The banking sector's deficit affects financial markets due to the central role played by banks in the economy [35].

9 Conclusion

In light of the current developments in globalization and its changes in the economies of countries, and their role in the development of financial markets and their impact on financial transactions involving risk, this led to the study of various possible means of risk management, and the various factors affecting their behavior.

The most important negative effects of financial risks are those of the high economic crises, which have a significant impact on the local economies in which they originate, and even their negative impact on other non-emerging and affected economies.

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Inspiring European Small and Medium Enterprise (SME) Sector by Inserting Effective Business Transfer Process

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Abstract. In Europe, Small and Medium Enterprises (SME) are key economic driver in terms of GDP, employment as well as the overall societal uplift. However, the critical point in the SME sectoral survival and success is linked to the effectiveness of the business transfer process handling by the new entrepreneurs. Hence, this paper pursues the effectiveness and authentication of a training program supported through a newly established tool to educated the new entrepreneurs to effectively handle business transfer process and ensure business growth and survival. A survey method was implemented to collect data from Finland, a pilot partner in the second phase of a European Union project focusing on seven selected European countries. The study data was evaluated and analyzed by employing structured questionnaires and implementing several descriptive statistical methods to obtain authentic analytical findings. The study results revealed that in SMEs where resources and capabilities are scarce, new entrepreneurs get effective assistance through the newly established tool to ensure smooth business transfer process for the survival and sustainability of Finnish Small and Medium Enterprises.

Keywords: Small and Medium Enterprises (SME) · Economic driver · Business transfer process (BTP) · Descriptive statistical methods

1 Introduction

The BTP 2 pilot training sessions in Finland were conducted in accordance with an overall work program execution within 03 target countries (i.e., Finland, Portugal and Poland). The referred countries were simultaneously involved in the BTP2 partnership process to formulate a collaborative source model. The main aim of the said BTP 2 training model, through its evaluation process and feedback is to further provide adaptation to support and refine the BTP2 curriculum and screening tool to cater the ever changing SME business transfer process needs and demands for the global outreach. This study offers in-depth insight on training effectiveness through multidimensional process assessment.

The focused dimensions or the evaluation levels in the current study are as follows (Table 1):

A rigorous evaluative process, covering all four levels/ dimensions took place during the execution of the pilot training sessions in Finland. The key methodological

Table 1. Four levels covered in the BTP2 study

| Dimensions/Levels area of evaluation |
|--|
| Level 1: Participation level |
| Level 2: Feedback from the ‘Trainees’ on curriculum content and methods; delivery etc. |
| Level 3: Feedback from the ‘Trainers’ on training process |
| Level 4: Training process effectiveness for the trainee (use of knowledge and skill on the job assessed by the individual Transfer Plans) |

tools applied for the evaluation were the especially formulated and newly designed standard questionnaires, keen monitoring of the training sessions as well as the formal and informal contacts with the pedagogical team (trainers, coordinators and business transfer experts) as well as the course participants. The new knowledge obtained from the team involved in the pilot execution (i.e., Vaasa University, Finland), was either during the execution of the training sessions or while the training process evaluation, in the form of participant’s comments and feedback, highlighting the work trends in the targeted location hence vital to be regarded as relevant information for the improvement and up gradation of the BTP2 training curriculum, online platform and screening tool in future (Kazmi and Naaranoja 2014a; Kazmi et al. 2012; Kazmi et al. 2013).

2 Literature Review

2.1 Concept of Entrepreneurship and Small and Medium Enterprises

According to the OECD-Eurostat Entrepreneurship Indicators Program, the entrepreneurs are defined as the individuals (business owners) who are involved in generating value, through either the creation or the expansion of an economic activity, by introducing and exploiting new Products, business processes or the markets’, Ahmad and Seymour (2008). There are three broad criterions to interpret SMEs:

- (1) Micro-entities are the companies with the staff strength up to 10 employees;
- (2) Small firms are the ones having 50 workers, whilst
- (3) Medium-sized enterprises are identified as the ones having the employee strength up to 250

However, in general, SMEs are also defined as firms with either the revenue limit up to €10–50 million or the balance sheet totaling up to €10–43 million. In addition, according to the European Commission, in their July 2011 statement there would be an open consultation on the definition of SMEs in 2012. A research work conducted by Hadjimanolis and Dickson (2000), in Cyprus, justified the process of business transfer process linked strongly with the concept of business innovation due to being the source of generating the ideas and opportunities for change (Kazmi and Naaranoja 2013a, b) that occurs as a result (The resultant outcome is also called ‘development response’ by the successor, which can either be a family member, external manager or the purchaser.

2.2 Business Transfer and Survival

The field of Family Business expands upon intensive research to offer owners, consultants, and academics a new holistic way to view family business. For the success of Family Business expansion through business transfer process, all the seven clusters in a map – Governance, Performance, Social and Economic Impact, Strategy, Family Dynamics, Family Business Roles, and Succession; are highly significant to determine the process direction (Baù et al. 2013).

According to one of the statements by the Netherlands Ministry of Economic Affairs (2003) on the capacity of business survival after going through the transfer process, it was assessed that the chances of a successful transfer is directly related to the similarities between the skills and style of the business transferor (i.e., Old business owner) and the business transferees (i.e., new entrepreneurs). According to the research investigations conducted by Kets de Vries (1993) in the area of business survival in USA, after being exposed to the business transfer process, it was revealed that only 30% of the firms survive into the second generation of family ownership, while only 15% into the third. In addition, the inability of an owner-manager to ‘let go’ of the business is a serious hindrance for an effective business succession process (Sharma et al. 2001).

3 Research Methodology

The logic behind the study is to assess and report effectiveness of training so that the findings can be used to improve the business transfer curriculum and screening tool in accordance with the local needs and demands to increase its outreach globally. Following the above direction, a collaborative framework was agreed upon for BTP 2 process evaluation aiming to cover the multiple dimensional evaluation process (i.e., Level 1 to 4) and for each, similar execution plans for the decisions/actions, the needed resources, and the timeframes for implementation (e.g. at the end of each training module, at the end of the pilot training, etc.). Similar to the other partners in the BTP2 pilot trainings process; i.e., Poland and Portugal, Finland used the similar plan of Pilot trainings process execution through the application of standard research questionnaires at the end of each training module.

3.1 Sample and Data Collection

For trainee selection, initially around 100 prospective trainers were contacted through Ostrobothnian entrepreneur association, In addition, established collaboration with a local project management team, which is working in the similar field (i.e., Entrepreneurial development and support) from the mentors' point of action. It is pertinent to mention, that due to time restraint, social connections were employed to search and select 11 study respondents (i.e., selection of Trainees and trainers) for BTP 2 pilot training(s).

4 Results

Arrangements were made to utilize the services of the best in house trainers (Trainers/Professors) having the related academic as well as professional background in the subject area (i.e., Business transfer process). It is important to share that the selection of the best available resource persons was done to ensure the quality of training facility. However, the study researchers faced hardships in engaging the selected trainers/Teachers due to their busy and tight schedules.

Training process was evaluated primarily by assessing trainee reactions, i.e., their satisfaction with the training and their opinions about its usability on the job/practical situation. In addition, the training process was executed and evaluated with the keen coordination of the trainers, a specialized body (i.e., Levon Institute) and some local business transfer experts who have offered their insight and expert reviews on the especially designed training materials, the contents and the usability of the screening tool. The process of BTP2 Pilot process in Finland was implemented in a way to consciously judge and assess the degree of relevance of the curriculum and the suitability of the methodological approach for the training process delivery, to enhance the interest levels of the trainees.

BTP2 Pilot training course in Finland finally was done with the help of seven participants, on average; in addition, most of the training modules showed a high level of attendance. However, number of participants is not linked to the satisfaction of the trainees. There could have been twice as many participants, if there were more time to plan and arrange the training program. The statistical information provided for the evaluation level was collected through attendance lists, duly signed by the participants at the end of each training session. Overall, 11 face-to-face sessions (7 training modules, 1 opening session and 1 closing session), were planned from May 8th 2012 to September 29th 2012. The participants in BTP 2 Finland were mostly experts, who are working as mentors in business transfers. There was only one participant, who was a full time entrepreneur in a family owned business. Trainees' Feedback analysis on curriculum and methods of delivery method used for evaluation was assessment of the forms/questionnaires completed by the participants at the end of each training module (i.e., the only exception was the inauguration and the closing sessions). Henceforth, there were seven evaluation questionnaires completed at the end of each training module, namely, Law, Finances, Business Analysis, Marketing, Soft Skills, Human Resources Management and Communication & Negotiation and one final evaluation questionnaire. The evaluation questionnaires were the source to measure the trainees' approaches, the overall quality of the curriculum presented in the training sessions, methods of presentation, and the overall training environment.

An additional purpose of the evaluation questionnaire/form was to measure participants' interest in terms of course relevance, their suggestions regarding the editing, improvements etc. gathered during the process of training. Such data can then be used for the quality enhancement and refinement of the overall BTP training process.

1. Module 1 – law

This training module had the attendance of seven participants. Overall the participant's evaluation for this module was very positive – The training objectives were 100% achieved and the content of the training was perceived, by the participants, as consistent with the training objectives.

During the module it was observed that the technical nature of the course material is seen as a challenge by the study trainees due to being non-technical. Hence the trainer had to choose the most appropriate material to offer in day to day language to make it comprehensive to the study sample. Furthermore, for the course, a bulk of material was available which was reported as not relevant to the business transfer.

2. Module 2 – finance

This training module had the attendance of seven participants. The participants showed a lot of interest in the information and content of the course provided during the module's proceedings.

The trainer was experienced expert, who is himself the author of publication concerning the business transfer in family business and already had experience from business transfer aspect in more than hundred companies. According to the evaluation made by the trainer, the material was not directly connected to the business transfer process, but in practice the trainer connected it to the subject. One challenge was, that the course material could only be used as reference material since in Finland (like maybe in other countries too) there are country specific laws concerning the subject of finance.

3. Module 3 – business analysis

Full level of participation was seen in the course (i.e., seven). All participants were seen deeply involved in the concepts and contents of the module due to having the key relevance with their business interest.

Good rapport was developed between the participants and the trainer. The learning materials were fully utilized during the course. The feedback analysis of the course participants reflected the following trend:

- Lower ratings are seen in the areas; Objectives of the training – For both; 1 and 2 objectives (i.e., Clarity on the instructions and the objectives of the training). In total, 03 out of 07 participants reported the same.
- Instructor's performance – Few of the participants showed dissatisfaction over items 3, 6, 7 and 10. This trend is however not showing weakness of the course curriculum but hinting towards the instructor's strength. The trend was seen in 4 responses out of 7.
- Learning material: The low scores were seen in the item numbers 13, 14 or 15. 07 out of 07 participants shown low ratings for any of the above items, if not in all. According to above referred items the training lacked some potential to excite participants in terms of making them think more creatively or as the source of new knowledge base.

The reason behind the above referred weak areas might be because there is already enough similar resource bases available in the Finnish environment. There are ample of organizations and e-resources available from where the similar knowledge is accessible without going through the formal training settings and allocating time for face to face sessions. Actually, we are currently living in the era of global networking and ever changing knowledge requirements but individually people find it hard to allocate time for formal meetings and face to face interactions. However, just similar to the other pilot partner countries i.e., Portugal and Poland, here in Finland also, full care was ensured towards the handling and planning for the content choice as well as the learning material for the training sessions.

4. Module 4 – marketing

Marketing module had seen the full participant attendance with keen interest in Finland (i.e. 7 participants). The participants shared their experiences and obtain new knowledge from the trainer(s). Henceforth it was an interesting session all over. The training objectives and the instructor performance were fully achieved. Most of the participants agreed with the module duration, yet some concerns were raised regarding the need for further monitoring during the implementation stage of the module.

However, the participants mainly focused on relating their experiences and asked the instructor's guidance and experiences on those exposures with local point of concern and its practical application. Though the session has been rated as an interesting experience however, some grey areas or the low ground were noted which are as follows:

- Objectives of the training – For both of the 1 and 2 objectives (i.e., Clarity on the instructions and the objectives of the training), In total, 04 out of the 07 participants reported the above.
- Instructor's performance – Few of the participants showed dissatisfaction over items 3, 6, and 7. Here again, this trend is however not showing the weakness of the course curriculum but towards the instructor's strength or otherwise for conducting the session. The trend was seen in 5 responses out of 7.
- Learning material: The low scores were seen in the item numbers 11, 12, 13, 1, 18. 05 out of 07 participants shown low ratings for any of the above items, if not in all. According to above referred items the training lacked some potential to excite participants in terms of making them think more creatively or as the source of new knowledge base.

The trainers' reaction to the low ratings in training material was, that they offered more material for the participants. This was marketing audit –check list, which could be used in business transfer situation. Anyway, it is important to know how the marketing is conducted in a firm which is transferred.

5. Module 5 – soft skills

This training module was amongst the one that got participant's full attention through not only seeing the full participant's attendance (i.e. 7 participants) but also through having the impact in the form of exchanges of case studies and innovative ideas. The

participants rated this module very interesting and informative. Only 02 participants out of 07 reported low scores for training objectives and instructor's performance.

The learning materials were fully adapted to the national context and were able to fully support the knowledge transfer. Overall, the participants showed no specific problems in comprehending the intended scope of the course.

6. Module 6 – human resources management

This training module had the full attendance of 7 participants. The objectives and instructor's performance were fully achieved for the HRM module.

The learning and information could use some further improvement concerning the practical application of the contents to the transfer process and the way these (the contents) could lead to new creative approaches. The learning materials also got interest of the participants. However, some lower ratings were seen in the Instructors and learning part but that marginal and insignificant. Overall the course had seen good exposure of knowledge with the local environmental related case studies.

7. Module 7 – communication & negotiation

This training module had the attendance of 4–5 participants in the module, which lasted 2 days. There were fewer participants, but the participants were most satisfied. Overall the participant's evaluation for this module was very positive – The training objectives were 100% achieved and the content of the training was perceived, by the participants, as consistent with the training objectives.

Training material of the module was not in a very practical level from the trainees' point of view and therefore the trainer made some more material for the participants for the second day of the module. Also one of the participants brought material for the next day. The first material concerned consulting styles and communication in business transfer. Most of the participants were mentors in business transfer and the material was very practical for them. The other material concerned negotiations. Level 3 evaluation of the BTP 2 was on the basis of the feedback provided by the trainers through the evaluation questionnaire, completed at the end of each of the training modules (i.e., like the other pilot countries – e.g., Portugal and Poland opening and closing modules were not included in this evaluation process). The evaluation process was focused towards the objectivity and the quality of the process that will include mainly the structure, the overall content, method, the material and the process of delivery. Overall, there were 7 evaluation questionnaires given to each trainer at the end of his/her training module: Law, Finances, Business Analysis, Marketing, Soft Skills, Human Resources Management and Communication & Negotiation. The evaluation questionnaires measured the trainers' feelings about the objectives of the training, learning materials (manuals), organization and screening tool, learning platform and general issues such as improvement measures and other comments regarding the development of the training. The fourth and final level of evaluation in the study was linked to the overall training process effectiveness for the trainee (use of knowledge and skill on the job assessed by the individual Transfer Plans. This was evacuated through the trainee feedback in the form of filled forms at the end of each session and reflected through the Figs. 1, 2, 3, 4, 5, 6 and 7 above.

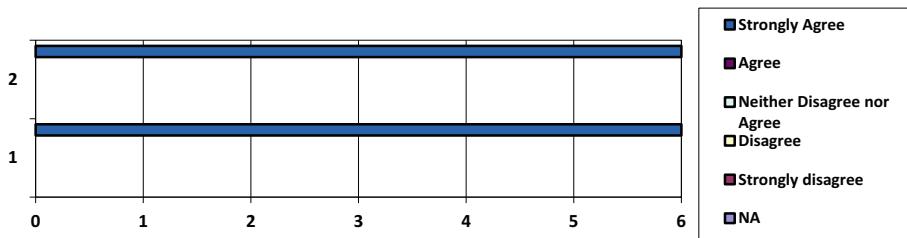


Fig. 1. Reflection of results linked to the training objectivity linked to the law module

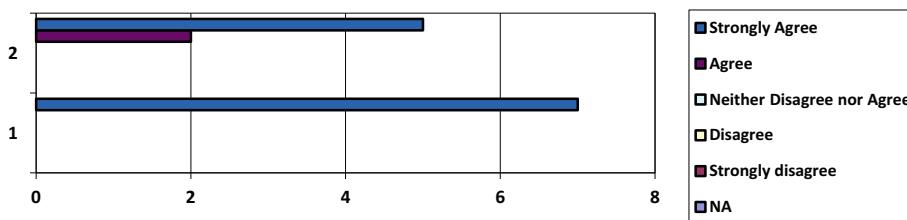


Fig. 2. Reflection of results linked to the training objectivity linked to the finance module

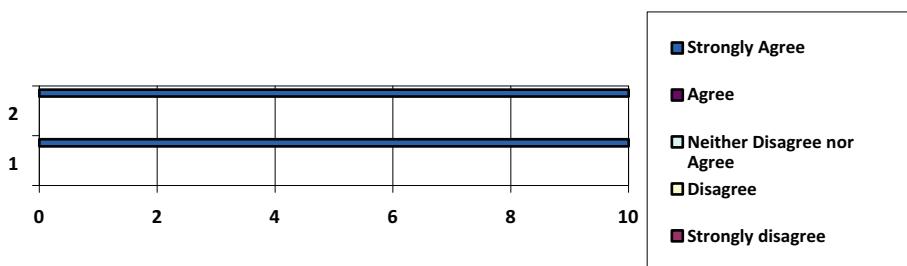


Fig. 3. Reflection of results linked to the training objectivity linked to the business analysis module

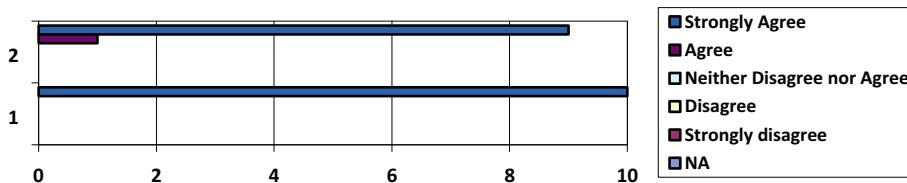


Fig. 4. Reflection of results linked to the training objectivity linked to the marketing module

The concluding session of the BTP2 Pilot training course in Finland offered insight on the following areas:

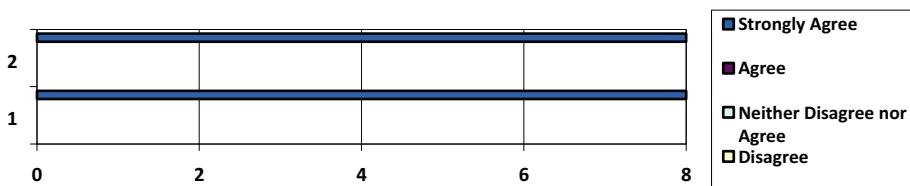


Fig. 5. Reflection of results linked to the training objectivity linked to the soft skills module

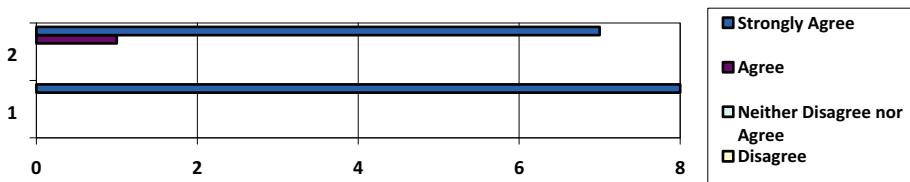


Fig. 6. Reflection of results linked to the training objectivity linked to the human resources management module

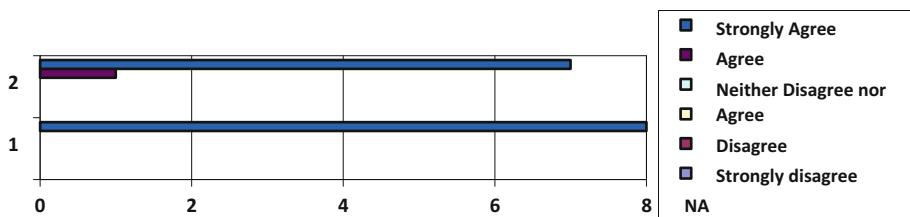


Fig. 7. Reflection of results linked to the training objectivity linked to the communication & negotiation module

- Trainers' selection: Overall, in shortest possible time and with minimum resources, the study conductors managed to arrange the trainers of good repute within their area of study.
- The target trainees: With the collaboration of Levón Institute, that step also got finalized ease.
- The methodology used: The methodology used to conduct the training sessions with the help of all classroom study equipments made the training a successful and attractive venture.
- The business transfer plan – The overall impact of the BT Plan was appreciated by the trainers and the trainees for having all the necessary ingredients of being a very good testing and training tool since based on ICT so be able to offer effective data management as well (Kazmi 2012; Kazmi and Naaranoja 2014b).
- The dimension of the participant's group: With the group having the size of 7 participants, was a good basis for offering the exchange of knowledge and transfer of know-how amongst the target population.

The main suggestions regarding what should be improved in the upcoming BTP were:

- Proper time planning and session organization is required, e,
- More time for program organization and trainer selection,
- The suggestions also included the requirement of study material with the specific reference to the local environment (Finland),

However, it was an interesting fact to note that trainees considered the course selection very relevant and interesting. Upon asking, they have not suggested any new module to be included in the current subjects list.

A - Future Research Avenues

- (1) More European countries be included in the study to have cross exposure and evaluations to ascertain the authenticity of the study tool.
- (2) The current BTP program be revised after few years to judge the market demands and new trends in the SME scenario.

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Barriers to University Mergers - Comparative Analysis of Universities in Europe

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Abstract. The importance of mergers in the sector of higher education is increasing in many countries. Public universities are involved in the consolidation process for their ability to: implement public policy, promote national and international rankings, rationalize the science and education network, and strengthen economies of scale.

The barriers to mergers can be divided according to different criteria. Known typologies include: the type of barrier, the source of the constraint, their relationship with the fusion stages and so on. Barrier analysis can be started from a more general perspective and based on the experience gained from business mergers and then move on to the constraints specific to university mergers and analyze the methods of overcoming them.

The aim of this article is to identify the key barriers to conducting strategic university mergers. The article discusses the complexity of the consolidation process and the barriers to mergers in higher education.

Keywords: University mergers · Barriers to mergers · University management
Strategic management

1 Introduction

Universities are increasingly subject to consolidation processes, both in the private and public sectors. Over the past decades, the number of mergers between universities in the world has increased [1]. Consolidation of public universities seems to be one of the most widely used methods of reforming the higher education and science sector in the world. The merger of private universities is most often made on the basis of business decisions and takes the form of concentration or strategic diversification [2]. Very few university merger processes were of bottom-up nature, without central help. Probably one of the negative effects of the lack of strategic university mergers in Poland is the gradual decline of leading Polish universities to lower places in international rankings. However, on the other hand, we need to consider the value of the consolidations themselves in the science and higher education sector.

According to the president of the European University Association, Rolf Tarracha, it is worth considering the consolidation of the university, as it means that at least initially the university may be scientifically weaker than the best university it belongs

to. The reasons for “strategic for the learning system” of consolidation should be analyzed before the start of the process and at its initial stage.

The barriers to mergers can be divided according to different criteria. Known typologies include: the type of barrier, the source of the constraint, their relationship with the fusion stages, and so on. Barrier analysis can be started from a more general perspective and based on the experience gained from business mergers, and then move on to the constraints specific to university mergers and analyze the methods of overcoming them.

The aim of this article is to identify the key barriers to conducting strategic university mergers. The article discusses the complexity of the consolidation process and the barriers to mergers in higher education. The research methodology was based on qualitative research - case studies of seven universities in Europe.

2 Concepts of Consolidation, Mergers and Acquisitions

The concepts related to joining organizations use the terms: mergers and acquisitions, consolidation processes, buyouts, acquisitions [3]. Usually, the terms mergers, acquisitions and buyouts refer to the organizational level, whereas consolidation may refer to both the organization and the larger system, e.g. higher education.

In the scientific literature, the merger is understood as the combination of two or more economic entities into a new organism, as a consequence of the agreement between these organizations. The acquisition can be defined as the purchase of one economic entity by another, where the acquired organization merges into the structure of the parent organization or functions as a dependent organization [4]. Thus, two basic types of consolidation of legal entities are mergers or acquisitions. The concept of mergers and acquisitions (M&A) is most common in English bibliography.

Following G. Harman and V.L. Meek and L.C.J. Goedegebuure university merger can be defined as a combination of two or more organizations (universities, institutes, post-secondary schools, hospitals). All management control is passed into one managerial body, one manager, and all assets and liabilities are transferred to one of the organizations or to the one created as a result of the merger [5]. L. Delgado and G. Leon propose an even simpler definition based on the criterion of identity, according to them the university merger is: “two or more partners merging to create one institution that can preserve the name and status of one of them or become a completely new legal entity [6, 7].

Mergers between universities take place in waves, as in other sectors. However, the very consolidation processes of universities have a very long history. There are several hundred mergers on the university consolidation list in the USA, and the oldest ones are dated to the first half of the 19th century [8]. The merger waves are influenced by many factors related to: changes in demand for education, transformation of public policies, dissemination of management practices and creation of new regulations regarding higher education. The waves of university mergers in the private sector are taking place under the influence of market changes. Public entities are influenced by changes in public policies that create incentives or even consolidation orders [9, 10]. In public higher education, global mergers began in the 1980s and lasted until the 1990s in many countries [11]. In the 21st century, consolidation of both public and private

higher schools took place. The distribution of merger waves was national in nature because it was closely related to public policy of different countries in the area of science and higher education. The motifs of merger waves in the 1980s and 1990s were most often associated with [1]:

- rationalization of higher education and science networks,
- restructuring of the higher education system [12],
- optimization of the costs of the university's activity and the entire system (economies of scale) [13, 14].

The last wave of mergers, which began in various countries at the beginning of the 21st century is mainly caused by the desire to:

- enter the “world university league” by the best universities from a given country [15, 16],
- create scientific excellence and “islands of excellence” in universities [17],
- occupy the highest places in international rankings [10].

Among private universities, the waves of mergers were influenced by the implosion of the sector, caused by a rapid reduced demand for paid higher education services (deprivatization) [18]. In Central and Eastern Europe, there is a process of weakening of the higher education sector due to the shrinking demand for education in this field.

3 Barriers to University Mergers and the Success of Consolidation

Barriers to mergers may contribute to their failure [19], they may also slow down the integration process of merging organizations, which is not always negative. According to the President of the European University Association, Rolf Tarrach, before consolidation of the universities it is worth considering the issue thoroughly, because it means that the consolidated university may be scientifically weaker than the best of merged organization, at least at the beginning [20]. The reasons for consolidation which “strategic for the science system” should be analyzed before the start of the process and at its initial stage. One has to be careful not to succumb to “fashion for consolidation”, which results in a wave of mergers that may or may not be have substantial justification [21]. However, if synergy effect is assumed and there is a will to consolidate the university, then it is necessary to reduce the barriers and errors that may lead to failure.

Linking the classification of merger barriers with the stage of their implementation allows to see certain challenges appearing at various stages. The legal and organizational barriers that we face in the preparatory phase are related to the planning period of the merger process. Among such barriers in the preparation phase, we can indicate the lack of provisions generating forms and methods of mergers and examples of appropriate organizational solutions, and thus, organizations must themselves look for good ways to implement acquisitions. The regulations also do not provide rules for merger techniques, e.g. managerial or leveraged buyouts. Barriers may also result from unstructured ownership of an organization or from an incorrect estimation of the value of an organization's assets.

In this phase there are also socio-political barriers, these are external or internal factors - associated with the acquiring or acquired company. These barriers include the employees' concerns about functioning in the "new" organization, as well as the distrust of managers, owners and all staff towards the other institution involved in the acquisition. It is the management that is responsible for convincing employees about the necessity of the merger and the potential benefits of the process. Although, naturally, this also depends on the staff's readiness for change or the duration of solutions over time, it is easier if the strategy develops gradually and the plan is implemented on a stable basis. It is crucial that employees know the expected benefits and understand their impact on the sustainability of employment, as well as on remuneration. The trust of the staff to the managers and the solutions they propose also matter.

Another group of barriers to the same phase of preparation are capital and financial barriers. They result, for example, from overstating the value of the acquired enterprise or its unfavorable situation and the need to cover its debt. The value of the organization may be too high and may not reflect the price of its assets. The organization's poor financial condition means that it should not become the merger partner. The barrier may be too high expectations for the assumed merger program, e.g. the proposed conversion ratio of shares (share acquisition ratio). The situation is not facilitated by the lack of a sufficient, convenient and inexpensive loan system in the case of a merger. The financial factors in this phase are very important. Actually, they determine the decision making, the form and motives of the acquisition [22].

4 Case Studies – Research Conclusions

The presented research results are of pilot nature and serve the initial response to key problems regarding barriers to mergers among universities. The research methodology used is of a qualitative nature and is based on a comparative analysis of 7 case studies of mergers between universities. Conducting comparative studies, based on a comparative analysis of case studies, serves a better understanding of the dynamics of merger processes between universities and is a starting point for further research of an explanatory nature.

Merger barriers characteristic for universities should take into account the division into private and public universities, while at the same time capturing the limitations specific to the university sector in general. General division of barriers may refer to experiences drawn from the business sectors and public organizations. Thus, seven types of university merger barriers can be distinguished, which may be of an internal organizational nature or occur in the environment:

- legal,
- organizational,
- social,
- psychological,
- political,
- cultural,
- financial.

Ordering the types of barriers by the key stages of consolidation seems to be a useful approach seems to be. An attempt of such a classification is provided in the Table 1.

The diagnosis of university consolidation barriers contributes to the search for ways to overcome them. The most important source of limiting all consolidation barriers is prior cooperation of the universities. The greater the degree of involvement in cooperation, the longer its duration and the importance of the effects obtained, the greater the chances of a successful merger. This means that universities operating in strategic alliances and important consortia got to know each other better, trust each other and combine their organizational solutions. Of course, the earlier close cooperation of the universities does not guarantee the success of the merger, but it significantly increases its probability. Legal barriers to mergers are related to the limited possibilities of combining different types of universities. Legal barriers may also arise in the case of agreements related to the merger of universities, especially when international mergers would be involved and we would deal with regulations coming from different legal systems. Legal barriers can be eliminated both at the level of legal regulations and solutions at the university level. Macro-level solutions can allow considerable flexibility in the development of university mergers, both in the public and private sectors, including openness to cross-sectoral mergers. The law regarding the creation, liquidation and merging of universities could be simplified by parliamentary decisions as well. Most universities also have limitations in terms of academic leadership and management, and they lack experience in mergers, due diligence, business negotiations and restructuring. Resistance from stakeholders who think they can lose on change should not be neglected. The methods of limiting the negative effects of organizational barriers can be as follows:

- using previous experience in cooperation between universities (e.g. university strategic alliances, consortia, joint-ventures and others),
- creating effective organizational systems and solutions that support the implementation of strategic goals and fulfill the university mission,
- transfer and adaptation of organizational solutions from the best universities in the world,
- implementation of proven solutions from various management areas (process and project management, quality management, financial management, intellectual capital management, HR and marketing management),
- systematic organizational and competence improvement of academic managers,
- strengthening employees' involvement in the process of connections through: trainings, incentive systems and organizational improvement [2],
- departure from a bureaucratic and conservative culture towards the culture of entrepreneurship and innovation,
- using business experiences of mergers and specialist consultancy services,
- implementation of change management methods,
- using mergers to carry out restructuring processes.

Table 1. University consolidation barriers in relation to implementation stages.

| Merger barriers | Strategy stage | Implementation stage | Integration stage |
|-----------------|--|--|--|
| Legal | 1. Difficulties with Merging public and private institutions
2. Legal limitations for international mergers
3. Little legal experience in the area of implementation of public university mergers | 1. Complexity of merger agreements
2. Legal limitations for agreements between public entities | 1. Consequences of transforming derivative entities (e.g., spin-off)
2. Legal consequences of conversions related to the labor code, commercial law and public procurement law |
| Organizational | 1. Poor strategic planning
2. Low level of systems and management culture
3. Low organizational flexibility
4. Petrified organizational structure
5. Lack of experience in managing change
6. Limited managerial and leadership competences | 1. Lack of experience in due diligence and conversion
2. Management and organizational competences
3. Lack of experience in negotiations
4. Mobilization of resistance before the final agreement | 1. The superficiality of the strategy
2. Destabilization of organizational structures and systems
3. Little experience in restructuring
4. Increased resistance to change
5. Striving to limit the integration process |
| Social | 1. Concerns of employees and students
2. Founders' objections
3. Affiliation of managers to the academic environment | 1. Distrust between partners
2. Forming coalitions to block the conversion
3. Negotiation tensions | 1. Coalitions of resisting stakeholders
2. Social interpretation of the merger as the liquidation of the university |
| Psychological | 1. Attachment of the founders to the university
2. Limiting the authority of the managers of one of the universities
3. Stakeholders' caution | 1. Win-loser perception
2. Emotions accompanying negotiations | 1. People who lose on the change move to the opposition side
2. Strengthening negative emotions |
| Political | 1. The necessity of political decisions for public universities | 1. Entanglement of negotiations in the political game | 1. Permanent entanglement of the merger into local or central policy |

(continued)

Table 1. (continued)

| Merger barriers | Strategy stage | Implementation stage | Integration stage |
|-----------------|---|---|--|
| | | 2. Tensions between stakeholders | 2. Integration weakened by political coalitions |
| Cultural | 1. Conservatism of academic cultures
2. Slow process of cultural and identity integration
3. Confusion of values and cultures | 1. Values and culture that make negotiations difficult
2. Hiding information in due diligence | 1. The emergence of subcultures and countercultures
2. Consolidation of the break of values and cultures in the consolidated university |
| Financial | 1. Capital constraints in planning merger strategies
2. Limited financial stimulation from the center | 1. <i>Cash-flow</i> problems related with financing the merger
2. Limitations in the design of joint accounting and accountability | 1. Underestimation of consolidation costs
2. Lower and slower financial effects of the merger |

Source: own elaboration on the basis of conducted research.

The next group of obstacles is of a social character and stems from distrust between universities, stakeholder concerns [23], the conservatism of the academic community, the formation of coalitions against change, and the possible negative perception of mergers as the liquidation of one of the universities [24]. Overcoming these obstacles is possible thanks to: the earlier capital of trust from cooperation between the merging universities, openness to dialogue, possibilities of mediation and support of negotiations, development of communication as well as giving merger the identity and meaning in social perception (sensemaking) [25, 26].

Cultural limitations of university mergers take place on three levels, specifically: conditions of the culture of society, organizational culture and organizational identity [27]. A low level of cultural capital and a configuration of values based on a high distance of power and hierarchy can significantly hinder consolidation processes and strengthen mistrust. Distrust leads to concealing information, cultural confusion and disturbances in the negotiation and integration process. Conservative, traditional academic culture is not conducive to radical changes and rapid integration of universities [28]. In addition, organizational culture changes much slower compared to strategy or structure. The best way to overcome cultural barriers is to build long-term trust in the form of tightening ties of cooperation and communication long before the merger. A substitute for the cooperation process may be the use of diverse communication, negotiation and mediation methods.

The last group of obstacles concerns universities to a much lesser extent than enterprises. Financial barriers to mergers are related to: lack of sufficient capital to

conduct the merger, limited financial stimulation by the authorities, problems with the design of a combined accounting system and cash-flow, as well as: underestimation of integration costs and merger savings lower than expected (or, which is worse, with their lack).

5 Conclusion

University mergers are an increasingly widespread phenomenon around the world. Consolidations of private universities are carried out on market principles, most often as an initiative of the universities themselves or their founders. Mergers between public universities are sometimes carried out as a bottom-up initiative of the universities themselves, but more and more often as an active implementation of public policy in the sector of science and higher education. According to the researchers, systemic transformation means abandoning the elite and smaller education systems in favor of fewer, but also versatile and larger, organizations often consisting of several campuses [11].

Strategic consolidations of universities can have an impact on the creation of adequate resources to implement the most innovative scientific projects. It is about the development of concentration logic concerning both outstanding researchers and adequate equipment and financing of projects. It is also important that strategic mergers do not lead to the creation of a research monopoly of one center in a given discipline in the country. In the long run such a quasi-monopoly could reduce efficiency. The oligopolistic or possibly duopolistic structure with a small number of national research centers in a given discipline seems to be the most expedient. The effect of strategic mergers may also be a stronger development of the research mission and deepening the scientific specialization of research universities. Consolidations are also generally accompanied by restructuring, which may introduce mechanisms to strengthen scientific development.

Summing up, in case of unsuccessful mergers and acquisitions the following are declared as the reasons of failure:

- attitude of the management of the acquired organization and cultural differences - 85%,
- lack of integration plans - 80%,
- lack of knowledge about the industry or the organization being taken over - 45%,
- poor management of the acquired organization - 45%,
- no previous experience in the field of acquisitions - 30%.

In the case of universities, similar problems can be indicated. The reasons related to organizational culture and attitudes of people (socio-psychological) are crucial [13]. Lack of effective management tools, both at the strategic and operational level is very important. Lack of knowledge about the acquired organization and poor management are also important reasons for the failures of the university mergers. Similarly, the risk of failure increases in the absence of previous experience in organizational fusions. An important difference is the lack of knowledge of the industry, because university mergers occur basically, in the vast majority, within one sector. Applying experience

from business sectors should reduce the negative effects of various barriers to university consolidation.

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Cross-Cultural Decision Making



Crystal Cube: Multidisciplinary Approach to Disruptive Events Prediction

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Abstract. The goal of Crystal Cube is to create an automated capability for the prediction of disruptive events. In this paper we present initial prediction results on six prediction categories previously shown to be of interest in the literature. In particular, we compare the performance of static classification models, often used in previous work for these prediction tasks, with a gated recurrent unit sequence model that has the ability to retain information over long periods of time for the classification of sequence data. Our results show that the sequence model is comparable in performance to the best performing static model (the random forest), and that more work is needed to classify highly dynamic prediction categories with high probability.

Keywords: Prediction · Disruptive events · Gated recurrent unit
Feature selection · Multi-model analysis

1 Introduction

The goal of Crystal Cube is to create an automated capability for the prediction of disruptive events. The disruptive events we want to predict are wide-ranging and include armed conflict, insurgency, overthrow of dictators, economic collapse, failed states, and novel attacks on the US and other countries. Such a capability has broad interest to decision makers and leaders across a wide variety of domains including business, military and politics.

The ultimate goal of Crystal Cube is to predict a broad variety of types of disruptive events with high spatiotemporal resolution and maximum lead time. In this paper, we describe our initial approach and preliminary results. We develop models to predict six classes of events previously shown to be of interest by the research community: Domestic Political Crisis, Insurgency, International Crisis, Rebellion, Ethnic/Religious Violence, and Irregular Leadership Change. We describe these categories in detail in Sect. 3.1. In this initial work, we train models to predict each category of disruptive event on a country-month basis one month in advance.

One challenge in building predictive models for disruptive event prediction is that of input data design. Specifically, to train a classifier to predict the occurrence of disruptive events, a key decision is what features will be given to the model and at what time-lags. This decision becomes more challenging as the number of available input features grows. Previous studies have addressed this issue by one of two methods: either the features are chosen by some feature selection method [1], or the features are chosen based on an expert opinion of the important features for the given prediction category [2, 3]. Although these decisions address the issues of which features to include, the question of what time-lags to include in the feature set is often handled heuristically, with several months of lagged data being common.

One way to address the challenge of a decision on time-lags is to use a sequence modeling approach that is capable of retaining important information over time to help make decisions later in the sequence. Hidden Markov, linear state-space models that allow information to be passed over time through the incorporation of discrete valued hidden variables, have been used previously in event prediction [4]. More recently, recurrent neural networks and their extensions, gated recurrent units and long short-term memory units, have been gaining traction in sequence modeling problems due to their ability to retain hidden state information in a continuous valued memory variable. However, to the best of our knowledge, such models have yet to be applied to disruptive event prediction.

In this paper, we compare five different classification methods for predicting disruptive events: logistic regression, linear and radial basis function support vector machines, random forests, and gated recurrent units (GRU). GRU is a type of non-linear sequence model and, to the best of our knowledge, it has not been applied before to the problem of prediction of disruptive events. The paper is organized as follows: Sect. 2 describes the related work, Sect. 3 talks about the methods employed, including a description of the data we are using, Sect. 4 describes the results, and Sect. 5 contains our conclusions.

2 Related Work

Our work is related to other projects attempting to predict disruptive events. The Integrated Crises Early Warning System Project (ICEWS) uses the ICEWS coded event database augmented with macro-structural variables from various data sources like the World Bank to predict five of the six disruptive event categories that we predict in this paper. The ICEWS prediction categories include Domestic Political Crisis, Insurgency, International Crisis, Rebellion, and Ethnic/Religious Violence. The ICEWS data as well as the ground truth are available online [5].

Several prediction approaches have been applied to the ICEWS prediction categories. Montgomery et al. [2] used ensemble Bayesian model averaging (EBMA) to fuse the forecasts of multiple classifiers. Arva et al. [1] compared the performance of classification models using inputs derived from the ICEWS event database against another coded event database called the Global Database of Events, Language and Tone (GDELT). They found that the inputs derived from GDELT provided as good or better performance than those from ICEWS. They additionally found that a combination of macro-structural

variables and a subset of coded-event variables selected through a Bayesian model averaging approach, as opposed to all of the available input variables, was sufficient for accurate prediction. Neither of these studies considered sequential prediction models.

Beger et al. [3] developed a prediction model for Irregular Leadership Change, a category not considered in the ICEWS project. They developed an ensemble-based, split-population duration model for the prediction problem. Each model within their ensemble was trained for a specific “theme” (e.g. public discontent or leadership characteristics). Each thematic model was a split-population duration regression that can be thought of as consisting of two components: a probability estimate of a country belonging to either an “at-risk of failure” class vs. “not at-risk of failure” and then a regression conditional on this first estimate. Features for each theme were hand-selected from three different types of data sources: macro-structural, ICEWS coded event, and finally spatial variables for neighboring countries.

Qiao et al. [4] developed a hidden Markov model (HMM) approach for predicting a custom truth category of social unrest events that they derived by looking for spikes of activity in the GDELT event database. HMMs are a sequential model; however, they have been shown to provide lower performance for classification tasks than discriminative methods [16] like the GRU that we consider here.

3 Methods

3.1 Data Sources and Data Preprocessing

Crystal Cube uses open data sources to derive two types of input feature variables: global coded event data and social and economic meta variables or indicators. The difference in these two types of input variables and their utility for prediction of disruptive events is described in detail in [3].

The coded event features are extracted from the Global Database of Events, Language, and Tone (GDELT) [6]. GDELT is an open database that automatically documents societal activities around the world by applying natural language processing to contemporary news articles. Each entry into GDELT represents a unique news event and GDELT provides basic contextual information about an event, and assigns it a code from the Conflict and Mediation Event Observations Event and Actor Codebook (CAMEO) [7]. CAMEO codes provide sensible categories to understand the nature of events. Crystal Cube uses as feature counts of events assigned to distinct CAMEO codes (e.g. 1122: accuse of human rights violations) lagged by one, two, and three months.

Social and economic features are derived from the World Development Indicators (WDI) [8] and Worldwide Governance Indicators (WGI) [9] that are compiled by the World Bank. The WDI data set includes over 1,000 indicators that estimate the level of development a country experiences year-to-year from a variety of perspectives. Examples of WDI include labor force participation rate by age, educational attainment by social class, amount of foreign aid received by a country, and national CO₂ emissions. WDI indicator values are available from 1960 through 2016. The WGI data set includes a small set of aggregates of expert opinions that describe the state of governance within a country in a given year. WGI estimates are split across six dimensions: Control of Corruption,

Government Effectiveness, Political Stability and Absence of Violence/Terror, Regulatory Quality, Rule of Law, and Voice and Accountability. WGI indicator values are available for 1996, 1998, 2000, and 2002–2015.

The input data were preprocessed to generate monthly counts for different CAMEO codes and to fill in missing values. GDELT events were obtained from the GDELT 1.0 “reduced” event dataset. This is a preprocessed dataset which collapses the full GDELT database on “DATE+ACTOR1+ACTOR2+EVENTCODE” resulting in a single entry per event code per actor per day. These entries were then aggregated into monthly event code counts for each country by summing the number of events that occurred during the month with the country as either the source or target of the event. The GDELT reduced event dataset contains all events from January 1, 1979 through February 17, 2014. The WDI dataset had a large number of missing values. We removed WDI indicators containing 1000 or more missing values, and inferred missing values for the rest of the features by copying the most recent entry for that country.

As an additional set of features, we used a subset of the variables provided in the replication dataset of Beger et al. [3]. The features that we included were those derived from ICEWS and those related to leadership characteristics within the country, (e.g., leader age and months in power).

We predict six categories of events that we call prediction categories or truth categories. The first five categories are derived from the “Events of Interest” ground truth dataset developed by the ICEWS project [5]. The five ICEWS prediction categories are: Domestic Political Crisis (an in-country political opposition to government not amounting to an insurgency or a rebellion), Insurgency (a coordinated effort to overthrow a government), International Crisis (escalating tensions between states/significant deployment of armed forces by one state in another’s territory), Rebellion (seeking independence from a government with ongoing organized, violent actions against it), and Ethnic/Religious Violence (violence between ethnic or religious groups that is not necessarily related to a government). If analysts concluded that one or more of these events occurred in a country over a specific timespan, they indicated it in the data on a month-by-month basis. Our sixth prediction category is Irregular Leadership Change; we derived this data from the truth set provided in [3]. The period over which we have ground truth for these six categories is March 2001 through March 2014.

3.2 Feature Selection

In total, we derive 1160 input features from the data sources described in Sect. 3.1. In order to find a smaller set of features useful for predicting the truth categories, we perform feature selection by evaluating the information gain [14] and mutual information [15] between each input feature and each output category. Information gain and mutual information both provide a measure of the degree to which one random variable provides in predicting another, and are thus often used for feature selection. We perform feature selection for two reasons: previous studies have shown that a much smaller set of features is sufficient for disruptive event prediction [1], and additionally, some of our prediction models will not converge with such a large set of features.

For each of the six prediction categories, we computed the information gain, mutual information and the number of missing values. We removed all variables containing 1000 or more missing values, all the variables that had information gain and mutual information smaller than a certain threshold. For most of the categories the threshold of 0.03 was used for both information gain and mutual information. However, for Domestic Political Crisis and Irregular Leadership Change such a threshold would have resulted in no features being chosen. As such, thresholds 0.01 and 0.0002 were used for those two categories, respectively. The highest information gain for any feature was 0.004 for Irregular Leadership Change, making it evident that this would be the most difficult category to predict. Feature selection resulted in choosing 151 variables as inputs for Domestic Political Crisis (DPC), 118 as inputs for Ethnic/Religious Violence (ERV), 100 as inputs for Insurgency (INS), 135 as inputs for Rebellion (REB), 173 as inputs for International Conflict (IC), and 44 as inputs for Irregular Leadership Change (ILC).

3.3 Prediction Models

We compare five different prediction models: logistic regression, linear support vector machine (SVM), radial basis function support vector machine (RBF SVM), random forest (RF), and non-linear gated recurrent unit sequence model (GRU).

Logistic regression, support vector machine, and random forest are static classifiers that compute a prediction at time t based only on the features at that time. Such static classifiers have been used previously for disruptive event prediction [1, 2], and are described in detail in the texts [12, 13]. We focus our description in this section on the GRU model for disruptive event prediction.

The GRU is a sequential model designed for the prediction of sequence data. Figure 1 shows that, in contrast to static classification models, sequence classification models allow information from previous iterations to influence the predictions at the current time step through the transfer of latent variables. We believe that this ability to transmit information between time-steps is critical for the prediction of disruptive events as events can be influenced by sequences of previous events that occur over long-evolving time periods.

The GRU is defined by the following quantities that are computed at each time step as described in [11]: a memory unit $\mathbf{h}_t \in R^{d_h \times 1}$, a candidate memory unit $\tilde{\mathbf{h}}_t \in R^{d_h \times 1}$, an update gating unit $\mathbf{z}_t \in [0, 1]^{d_h \times 1}$, a reset gating unit $\mathbf{r}_t \in [0, 1]^{d_h \times 1}$, and the input $\mathbf{x}_t \in R^{d_x \times 1}$. The following equations govern the interactions of these quantities:

$$\mathbf{h}_t = \mathbf{z}_t \odot \mathbf{h}_{t-1} + (1 - \mathbf{z}_t) \odot \tilde{\mathbf{h}}_t \quad (1)$$

$$\tilde{\mathbf{h}}_t = \tanh\left(W^{(h,x)}\mathbf{x}_t + \mathbf{r}_t \odot U^{(h,h)}\mathbf{h}_{t-1}\right) \quad (2)$$

$$\mathbf{r}_t = \sigma\left(W^{(r,x)}\mathbf{x}_t + U^{(r,h)}\mathbf{h}_{t-1}\right) \quad (3)$$

$$\mathbf{z}_t = \sigma\left(W^{(z,x)}\mathbf{x}_t + U^{(z,h)}\mathbf{h}_{t-1}\right) \quad (4)$$

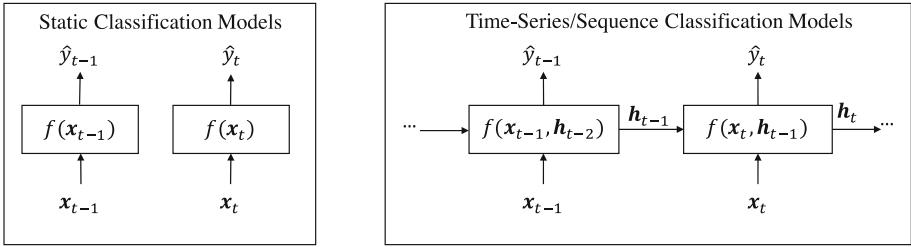


Fig. 1. Static classification models including logistic regression and support vector machines, make a prediction for time $t + 1$ based only on the features provided at time t . Time-series classification models make the decision for time $t + 1$ based on the features at time t and a hidden variable, h_t , that carries information from previous time periods.

where \odot is the element-wise matrix product, $\tanh(\cdot)$ is the element-wise hyperbolic tangent function, and $\sigma(\cdot)$ is the element-wise sigmoid function. The interaction between the memory units and the gating functions control how current and past information is stored and transferred and allow the GRU to retain information over long time periods. See Cho et al. [10] or Chung et al. [11] for more details. Finally, the prediction for time t is computed as a function of the current memory:

$$\hat{y}_t = \sigma(u^T h_t + b) \quad (5)$$

4 Results

For each method (logit, linear SVM, RBF SVM, RF, GRU), we train six different prediction models, one for each prediction category (DPC, ERV, IC, INS, REB, ILC). The training data consists of the data from all 158 countries in our dataset from March 2001 – December 2011, and we test on data from January 2012 – March 2014. For each method, the input data for month t , model k consists of the features selected in our feature selection for the k^{th} prediction class as described in Sect. 3.2. Additionally, we train all the models with all the features to compare the results with and without feature selection.

Table 1 contains the area under the curve (AUC) for each of the machine learning methods for each of the six classes of events that we are predicting. All the methods have the results for the selected set of features. Only GRU, RFs, and linear SVM have results for all the features because logistic regression and RBF SVM failed to converge when using all the features.

The receiver operating characteristic (ROC) curve for each model is presented in Fig. 2, with AUCs also printed in the legend. For the GRU, RF, and linear SVM, we plot only the better of the selected features/all features results based on which feature type gave the higher AUC for a given prediction category. From Table 1, we can see that this is the all features model for the GRU and RF and the selected features model for the linear SVM.

The RF and GRU are the best performing methods in terms of AUC. RFs perform the best in 4 out of 6 prediction categories, GRU performs the best in 1 out of 6 categories and in one category the AUC obtained by RFs and GRU is exactly the same (better than any other method). RFs consistently perform the best when all features are used. For the GRU the message is mixed (for 4 categories they perform better with all features, for one category they perform better with selected features, and for one category they perform the same). Linear SVM, RBF SVM and Logit perform the best when the feature selection is performed (they even sometimes fail to converge when all features are used).

Another trend that is notable in the results of Fig. 2 and Table 1 is that there is clear differentiation in how predictable the various truth categories are, with ethnic/religious violence, insurgency, and rebellion being highly predictable by some method, and domestic political crisis, international conflict, and irregular leadership change being moderately predictable by some method.

Figure 3 shows the ground truth for Nigeria and Pakistan, respectively for each of the six prediction categories. ERV, INS and REB, often stay at one level for a long time. DPC and IC are much more dynamic. The category that is the most difficult to predict is ILC as it encodes events that spike for only a single month.

Table 1. AUC for all prediction categories, all prediction models, and selected vs. all features. All features results are not available for the RBF support vector machine and the logit as these models failed to converge.

| | Domestic Political Crisis | Ethnic Religious Violence | International Conflict | Insurgency | Rebellion | Irregular Leadership Change |
|--------------------------|---------------------------|---------------------------|------------------------|------------|-----------|-----------------------------|
| All Features | | | | | | |
| GRU | 0.82 | 0.98 | 0.86 | 0.97 | 0.99 | 0.79 |
| Lin SVM | 0.74 | 0.81 | 0.74 | 0.90 | 0.88 | 0.54 |
| Random Forest | 0.86 | 0.97 | 0.89 | 0.98 | 0.99 | 0.83 |
| Selected Features | | | | | | |
| GRU | 0.80 | 0.98 | 0.89 | 0.93 | 0.93 | 0.76 |
| Lin SVM | 0.73 | 0.95 | 0.77 | 0.93 | 0.88 | 0.38 |
| Random Forest | 0.87 | 0.96 | 0.92 | 0.98 | 0.98 | 0.64 |
| RBF SVM | 0.74 | 0.83 | 0.89 | 0.94 | 0.94 | 0.52 |
| Logistic Regression | 0.78 | 0.95 | 0.75 | 0.93 | 0.90 | 0.72 |

Our models do not use the country name as one of the inputs. They also don't use lagged versions of the truth categories DPC, ERV, IC, INS, REB or ILC. If they did, we could get a higher AUC for relatively stable categories such as ERV, INS and REB (Fig. 4).

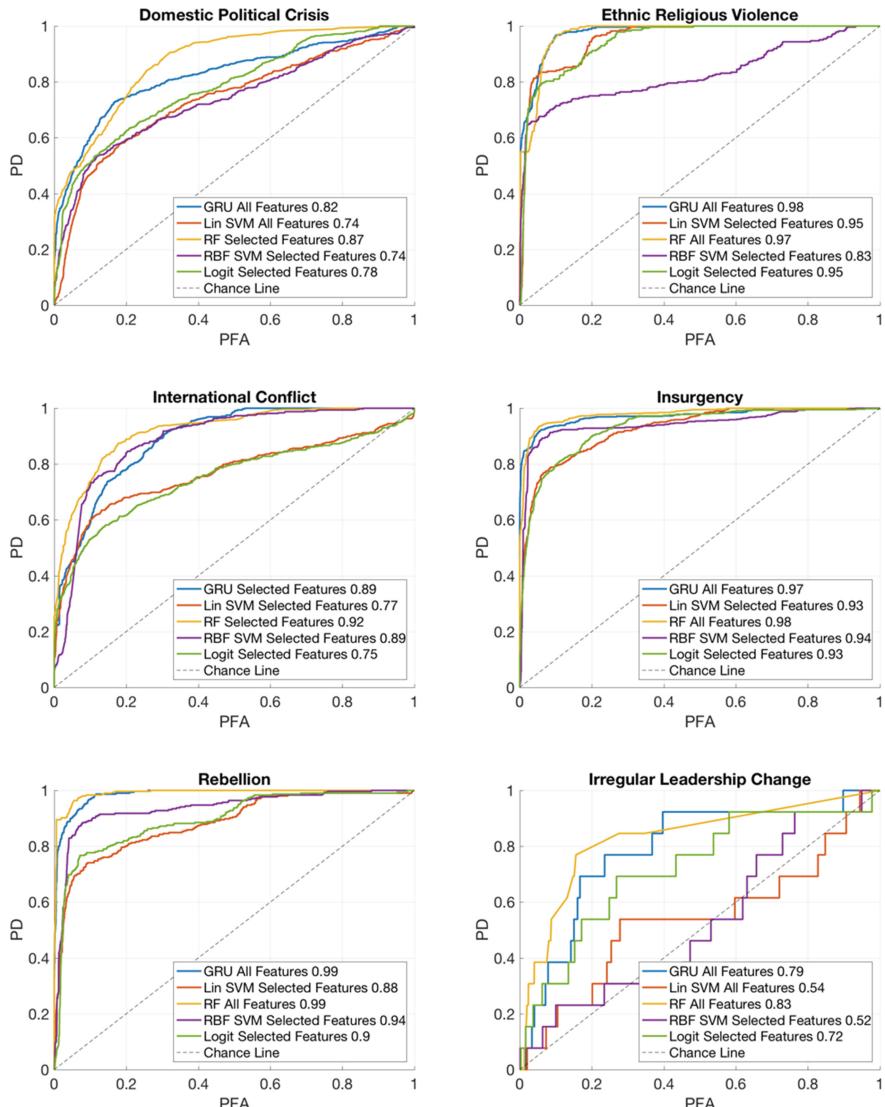


Fig. 2. ROC curves on the test data (Jan 2012 – March 2014) for the six different prediction categories. AUC values for each prediction model are printed in the legends for the model class.

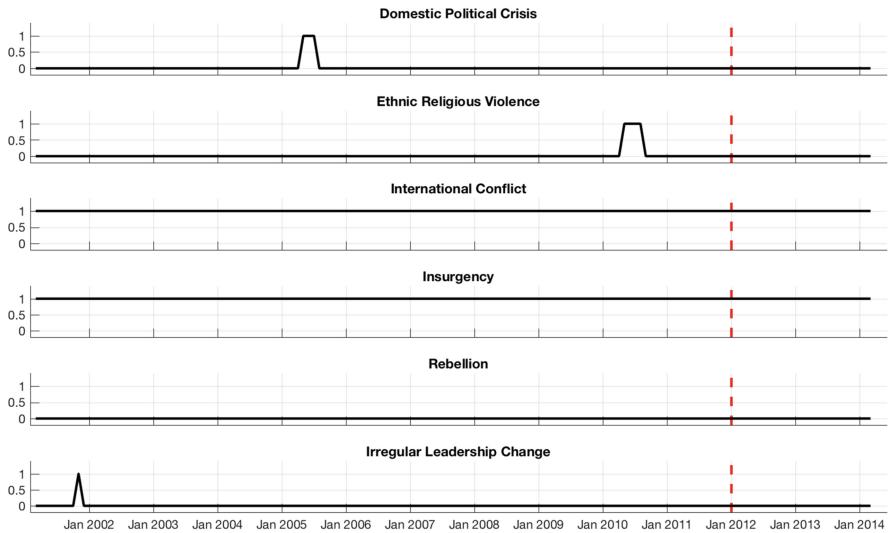


Fig. 3. Plot of the ground truth for Afghanistan. A zero indicates that the event did not occur in the given month and a one indicates that it did. The red horizontal line delineates the training period from the test period.

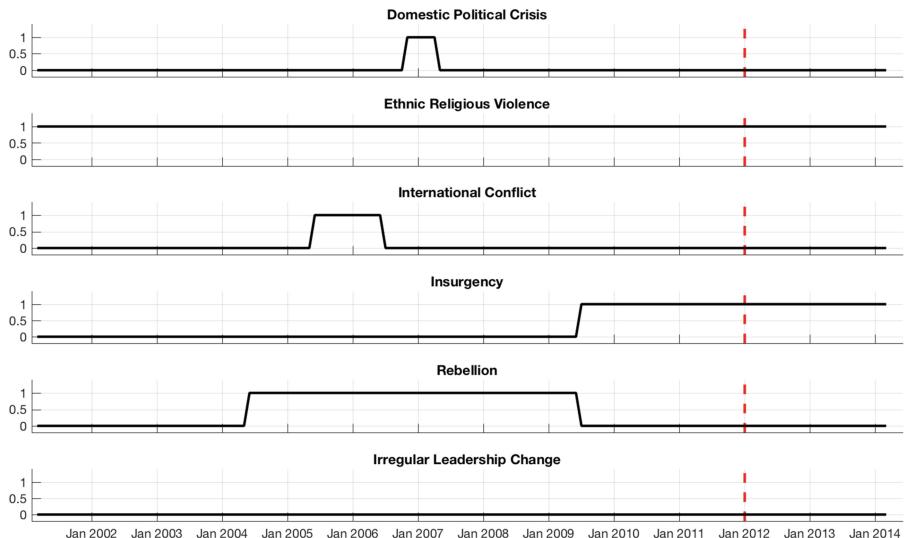


Fig. 4. Plot of the ground truth for Nigeria. A zero indicates that the event did not occur in the given month and a one indicates that it did. The red horizontal line delineates the training period from the test period.

5 Conclusions

Prediction of disruptive international political and security events is of great importance for several reasons. Economists and investment professionals would benefit from knowledge of what might happen in many regions in order to forecast how markets might react. Foreign policy makers might look to prediction in understanding how they might better engage with other nations and how U.S. policy might be adjusted. Furthermore, national security decision makers could be better informed in their decision process with foresight into the events in other nations. The deployment of military force, the enforcement of sanctions, and the preparation of market and currency disruption could better be prepared for if prior knowledge were more precisely understood.

This paper describes our initial approach and preliminary results for predicting six categories of disruptive events in the world (DPC, ERV, IC, INS, REB, ILC). Five methods (logit, linear SVM, RBF SVM, RF, GRU) were used to train the models to predict those disruptive events. RFs and GRUs were consistently better than other methods. In our future work we are planning to concentrate on predicting the categories that are the most difficult to predict (ILC, DPC, IC) due to their dynamic nature in individual countries. One approach could be to concentrate on predicting the change from the current status instead of predicting the value of the category for the next month.

The predictions were made at the country-level, and one month in advance. In the future we are planning to perform predictions at a higher spatiotemporal level (city or province) and more than a single month in advance.

In the present approach we used several open source data sets: GDELT, WDI and WGI. In the future we are also planning to use social media (e.g., Twitter) data sets in order to produce additional features for the prediction classifiers. We hope that these social media-based features will provide new and discriminative information for prediction that can complement our current input data sources.

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Cross-cultural Difference and Cognitive Biases as Causes of Gap of Mindset Toward Safety Between Approach Based on Hazard Detection and that Based on Firm Safety Confirmation

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Abstract. Japanese or eastern countries' attitude toward safety was reviewed from mindset toward safety, approach for addressing safety, and attitude toward investing for safety. This was compared with that of U.S. or western countries. It was assumed that such a difference leads to a major gap between the safety approach based on hazard detection and that based on firm safety confirmation. An attempt was made to explain why the gap arises from the standpoint of cross-cultural difference, cognitive biases, and the relationship between scarcity and slack. Based on the discussion, we demonstrated that we should recognize and accept cross-cultural difference, cognitive biases, and the risk of the state with less slack for safety due to scarcity (especially, economic one). The attitude toward safety in line with such properties should be modified to control the unacceptable risk to a minimum so that we can further enhance safety and cut off the vicious circle of repetition of similar disasters, collisions, or crashes.

Keywords: Attitude toward safety · Cross-cultural difference · Cognitive bias · Safety myth · Absolute safety · Acceptable risk · Learn from failure · Imbalance between safety and efficiency · Scarcity and slack relation

1 Introduction

The mindset toward safety is different among a variety of cultures [1, 2]. Recognizing and accepting the difference is important in a society where globalization is rapidly in progress. People from one culture thinks that they should pay much and stay at an expensive and safe hotel to actively protect own life, while people from other culture regards that others definitely protect their own life and the mindset toward safety is passive. There is apparently a gap of mindset toward safety among a variety of cultures.

Generally, it is difficult to secure and ensure safety completely as Tokyo Electric Power Company (TEPCO) and Japanese government speculated before Fukushima Daiichi disaster. In other words, before Fukushima Daiichi disaster, Japanese people, in particular, TEPCO and central government seem to be ruled by the mindset toward absolute safety and safety myth that systems such as nuclear power plants are completely safe and without defects. Safety must be practically defined as a state without an

unacceptable risk, that is, a state under which a risk is reduced to an acceptable level. To realize safety in the framework of this definition and suppress vicious circles of repetition of similar crashes or disasters, it is necessary to understand cross-cultural- and cognitive bias-based factors that are behind the mindset (attitude) toward safety.

After Fukushima Daiichi disaster, the mass media criticized the safety myth that had never existed in Japan, and made a great fuss about the collapse of safety myth. It is irrational to have expected that the safety myth had existed in the world. This must stem from the culture that is peculiar to Japan and human's irrational judgment and decision. By contrast, other countries such as US and western countries did not believe in such a safety myth at all. Generally, the attitude toward safety in US and European countries is based on the concept that systems are never completely safe. International safety standards are established based on such a way of thinking. According to this safety standard, safety is not an absolute state that systems are completely safe but a state without an unacceptable risk, that is, a state under which unacceptable risk is reduced to an acceptable level. In short, safety represents the state with the risks of disasters, collisions, or crashes suppressed to a minimum. This does not mean that the risks are absolutely zero. This leads to the concept of normal accident proposed by Perrow [3].

This study attempted to explore and explain the reason why the gap of safety approaches (approach based on hazard detection and that based on firm safety confirmation) occurs from the viewpoints of cross-cultural difference, cognitive biases such as imbalance between safety and economy, ignorance of uncertainty combined with availability and optimistic bias, and the relationship between economic scarcity and safety slack [4]. First, the cross-cultural difference was reviewed from mindset toward safety, approach for addressing safety, and attitude toward investing for safety. Second, it was discussed how cognitive biases affected the gap of safety approaches. Third, the concept of scarcity and slack relation was used to explain the gap of safety approaches. We discussed how cross-cultural difference, cognitive biases, and the state with less slack for safety due to scarcity (especially, economic one) should be recognized to modify the attitude toward safety in line with such properties and promote learning from similar disasters, collisions, or crashes, and preparing for the future safety.

2 Cross-Cultural Difference of Mindset Toward Safety

Traditional (old) Japanese or eastern countries' attitude or mindset toward safety is compared with that of US or western countries according to the following three categories Sects. 2.1, 2.2 and 2.3. Here, it must be noted that the difference below is not necessarily completely universal. In other words, the difference means that there are many cases where the properties or characteristics dominantly apply to each group, while there are exceptional cases where some population of the groups does not obey to the properties or characteristic identified for the group.

2.1 Mindset Toward Prevention of Disasters, Collisions, or Crashes

One group such as Japan or eastern countries regards that they can make efforts and take some effective countermeasures so that disasters, collisions, or crashes never happen. When a disaster or crash occurs (a plane crashes or a chemical plant explodes), findings are summarized by board of investigation and conclusions are drawn. This is kind of ritual of reassurance that what we learn from a disaster or crash can help us prevent another disaster or crash [5]. In spite of this, similar crashes or disasters are repeated like a vicious circle [6–8]. Although it goes without saying that the genuine or root cause should be identified to disconnect such a vicious circle and this should precede a ritual to a disaster or crash, Japanese organizations generally place great importance on a ritual. The identification of root cause is unconsciously left once one got trapped into such a vicious circle. The press conference apology by top organizational managers is prioritized, and the elucidation of root cause is finally neglected. Japanese organizations or government seemed to believe in absolute safety and safety myth that systems such as nuclear power plants are completely safe and without defects at least before Fukushima Daiichi disaster.

On the other hand, other groups such as US or western countries base the prevention of disasters, or crashes on the following thought or philosophy. Even if we make efforts and take some effective countermeasures, it is possible that disasters, collisions, or crashes happen depending on the technology level as Perrows [3, 9–11] and Gladwell [12] suggest. They never behave as if they believe in safety myth.

While Japan or eastern countries, in general, tends to attach importance to the frequency of disaster, collision, or crashes, US or western countries emphasize not the frequency but the impact, damage, or severity of disasters, collisions, or crashes. While Japan or other eastern countries emphasize a kind of ritual of reassurance that what we learn from a disaster or crash can help us prevent another disaster or crash and believe in absolute safety and safety myth that systems such as nuclear power plants are absolutely safe, US or other western countries place importance on the identification of genuine or root cause based on the principle that disasters, collisions, or crashes happens even if we make efforts to enhance the technological level. Although the press conference apology by top organizational managers is prioritized, and the elucidation of root cause is finally neglected in Japan or eastern countries, US or other western countries find no meaning in such a press conference apology, and regard information closure on the root cause of disasters or crashes as most important. Such a way of thinking that place importance on spiritualism or ritual is represented by the following proverbs: Danger past and God forgotten. Once on shore, we pay no more. Once it's past the throat, one forgets the heat.

Eventually, such a way of thinking (absolute safety or safety myth) inhibits learning from failures, which is most important for enhancing safety management according to Syed [13]. Mindset toward safety of Japan or eastern countries seems to be based on spiritualism. Overconfidence to spiritualism inhibits scientific approaches. Therefore, relying too much on spiritualism does not make people adopt a technological development on the basis of the way of thinking that even if we are able to take some effective countermeasures, it is possible that disasters, collisions, or crashes happen depending on the technology level. Overconfidence of spiritualism becomes an

inhibiting factor of adopting a scientific approach and enhancing a technological level of safety management.

2.2 Approach for Addressing Safety: Human Factors- or Technology-Based Approaches

In some safety culture, the root cause of disasters, collisions, or crashes is mainly attributed to human errors. It must be noted, however, that human errors are not a root cause and the mechanism or psychology behind human errors must be identified. Such a way of thinking regards that construction of safety management system, education and training, strengthening regulation enables one to secure and ensure safety. Such a safety culture assumes that safety is advanced according to the following procedure: Aiming at safety from the perspectives of human factors, and strengthening regulation every time disasters, collisions, or crashes occur.

By contrast, the following approach is dominant in US or western countries. The prevention of disasters, collisions, or crashes is eventually attributed to technological issues. Of course, it goes without saying that the problem of human errors is included in the technical issues. Such a safety culture assumes that construction of safety management system, education and training, strengthening regulation does not necessarily enable one to secure and ensure safety. They regard that we should pay more emphasis on the technological issues than human factors-related issues. This type of safety culture assumes that safety is advanced according to the following procedure: Safety enhancement of equipments and the development and enhancement of technological countermeasures that disasters, collisions, or crashes do not lead to critical ones with much damage.

2.3 Attitude Toward Investing for Safety and Pursuing Latent or Potential Risk Factors

There exists a safety culture that assumes that safety can be achieved without investing money. In such a safety culture, it is difficult to invest money for securing and ensuring safety. One only attempts to deal with visible hazards at a minimum cost. One never pays attention to invisible and latent hazards that potentially lead to disasters, collisions, and crashes. Therefore, the technologies for dealing with latent hazards are not developed and fostered.

US or western countries, on the other hand, recognize that it costs to achieve safety. They recognize that investment is necessary for securing and ensuring safety. They attempt to deal with not only visible hazards but also invisible and latent hazards that potentially lead to disasters, collisions, and crashes. Therefore, they judge that the development of technologies for dealing with latent hazards should be sustained and fostered.

3 Two Approaches Toward Safety

There exist two approaches toward safety: an approach based on hazard (risk of incident) detection and that based on firm safety confirmation (see Fig. 1). The approach based on hazard (risk of incident) detection regards no detection of hazard (risk of incident) or failure of monitoring system as normal, and does not attempt to actively and firmly confirm safety. There are many cases where the risk of incident exists in the system latently and damage the system not presently but later. Therefore, this is not enough to enhance safety. US or western countries adopt an approach based on safety confirmation. They don't regard no detection of hazard as safe, and don't judge that the system is safe until the safety is completely and firmly confirmed. It costs more in the latter than in the former, and it goes without saying that the latter is more desirable than the former.

The causes of the gap between two safety approaches will be discussed below.

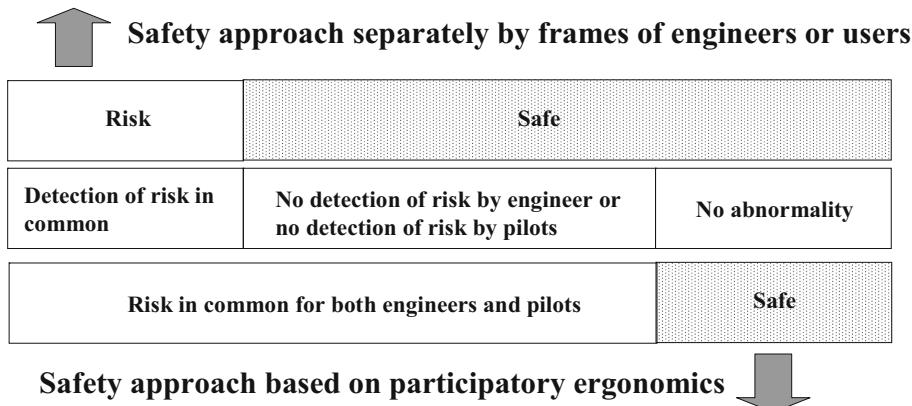


Fig. 1. Two safety approaches: safety approach based on hazard (risk of incident) detection and that based on safety confirmation.

4 Reason for the Gap of Approaches Toward Safety (an Approach Based on Hazard Detection and that Based on Firm Safety Confirmation)

Generally, Japan tends to adopt a safety approach based on hazard (risk of incident) detection. No detection of hazard induces an availability bias and makes us see and observe the situation from a fixed frame. This keeps us from trying to look at the situation from a variety of frames. As well as availability bias and framing effect, it is speculated that confirmation bias and normalcy bias work for such an approach.

Cognitive biases causes our irrational behavior, and it is possible that our distorted and irrational behavior becomes a trigger of critical disasters, crashes, or collisions [14].

We usually can spend our daily life or jobs without experiencing danger, failure, or major incident. If such a state continues for a long time, we misunderstand that we can continue spending without such events. We tend to regard no detection of hazard (risk of incident) or failure as normal because of our irrational mind, that is, normalcy bias. This further leads to availability bias, confirmation bias, optimistic bias, and normalcy bias [15–19]. Cognitive bias such as availability bias, confirmation bias, and normalcy bias unconsciously makes us become oriented to the safety approach based on hazard detection. This will be examined in more detail below.

4.1 Ignorance of Uncertainty When Combined with Availability and Optimistic Biases

First, our experiment is briefly summarized to show how uncertainty affects our decision making. The following decision making (DM) problem is based on Ellsberg's paradox. An urn contains 90 balls of which 30 balls are red. The other 60 are black or yellow, but the number of each is unknown. The participants are required to draw one ball at random from this urn. The following decision making is considered, and the participants are required to choose one from the following alternatives I and II.

(Decision Making 1)

Alternative I: Receive \$X if a red ball is drawn.

Alternative II: Receive \$X if a black ball is drawn.

The participants are also required to choose one from the following alternatives III and IV.

(Decision Making 2)

Alternative III: Receive \$X if a red or yellow ball is drawn.

Alternative IV: Receive \$X if a yellow or black ball is drawn.

Using such DM situation, it is generally demonstrated that we tend to avoid uncertainty (uncertainty aversion).

In Decision Making 1, the preference of Alternative I is obtained as a function of y (the number of black balls) for the values of $X = \$5, \$10, \$100$, and $\$200$. In our experiment, unlike traditional economic studies, the participant was not required to choose from two alternatives. The preference was evaluated by each participant using a numerical value from 0 to 100. The result is demonstrated in Fig. 2. With the decrease of uncertainty, the preference for Alternative I changed. As shown in Fig. 2, one tends to choose Alternative I when the uncertainty was 100%. With the mitigation of uncertainty, in particular, when the number of black balls y was more than 30, one ignores the uncertain state and tends to choose Alternative II. In this way, one tends to regard a still uncertain state as certain, although one tends to be aversive to uncertainty. Optimistically and without taking a mindset of uncertainty aversion, one adopts the hazard detection safety approach. In short, one sometimes regards uncertainty as certain (with no risk of hazard) due to an optimistic bias, and takes such a mindset toward safety. Usually, an abnormal situation, which leads to disasters, collision, or crashes, rarely happens. Therefore, normalcy bias works, and one tends to regard no detection of hazard as safe. There are many cognitive biases behind this approach toward safety.

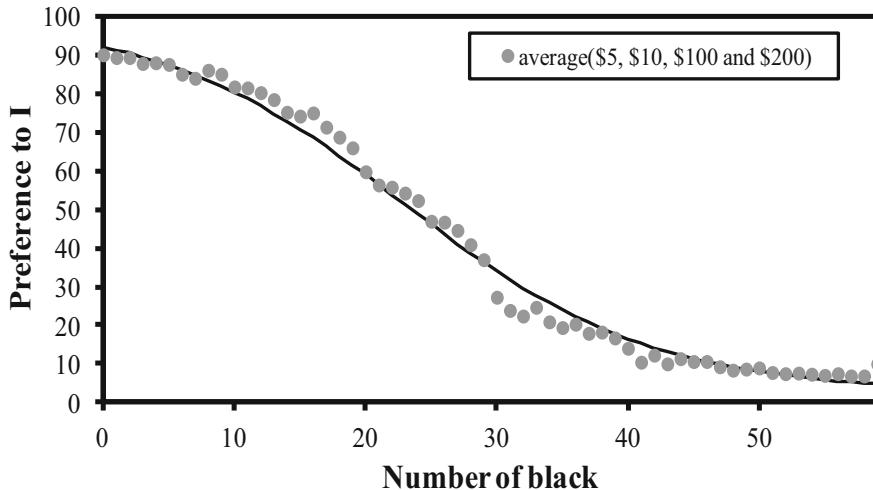


Fig. 2. Preference to Alternative I as a function of mitigation of uncertainty (increase of number of black) and its modeling by logistic regression model (Decision making 1).

It must be also noted that each of the safety approach is not necessarily strictly applicable to a specific population, although Japan or eastern countries, and US or western countries are said to obey to the former and the latter approach, respectively. The shift between two safety approaches occurs according to the situation.

No detection of hazards do not necessarily mean that the system or plant is safe with certainty. One needs to confirm whether no detection of hazard is caused by the safe operation or functioning of the system or plant. This procedure costs us and requires us time consuming efforts. Therefore, due to cognitive biases such as availability bias, confirmation bias, normalcy bias, framing effect, and optimistic bias, one sometimes regards uncertainty whether the system or plant is safe or not as certain (with no risk of hazard) and safe, and takes such a mindset toward safety.

4.2 Imbalance Between Safety and Efficiency (Economy) [20]

Although it is well recognized that safety must be more important than efficiency as far as we always behave rationally, we frequently encounter a situation under which efficiency is paid more and more attention than safety. Thaler [21], Thaler and Sunstein [22], Thaler [23], Shiller [24], and Kahneman [18] showed that we do not always behave rationally as Econ does, and named this as anomaly in economics. Such an anomaly (irrational behavior) occurs even in safety-related problems, and sometimes triggers critical crashes, collisions, or disasters [25–33]. Therefore, it is valuable to discuss why one cannot satisfy both efficiency and safety on the basis of human's irrational property. Murata and Moriwaka [20] attempted to explain the reason why the collapse of proper balance between safety and efficiency occurs using mental accounting, loss aversion, and discount of safety.

We tend to behave using multiple mental accounts for different kinds of resources [21–23]. For example, we use different monthly budgets (mental accounts) for grocery shopping and eating out at restaurants. Although we constrain one kind of purchase when its budget has run out of its mental accounts, we do not constrain the other kind of purchase when it does not run out of its mental accounts. It must be noted that both consumptions come from the same monthly income. Similarly, we tend to spend less money at the market when paying with cash than with credit card, even though both cash and credit card come from the same economic resource. Decisions on purchase or consumption are affected by the mental account that comes to mind when deciding whether to consume their resources. We behave as if two purchase behaviors come from two different mental accounts.

Mental accounting represents our irrational behavior that divides our money into different mental accounts, although rational behavior never classifies our money into different mental accounts. Therefore, it can be assumed that there are mainly two different mental accounts, that is, mental account for investing and making a profit and that for investing to maintain safety in an organizational or managerial activity. Such an irrational behavior (separation of investment or money into two different mental accounts) can be a trigger of an imbalanced state that places more importance on economy or efficiency than on safety. In other word, it is likely that we unconsciously place more importance on the efficiency or profit than on the safety due to mental accounting, although we superficially recognize that the safety and the efficiency or profit must be simultaneously satisfied. Such an imbalance leads to an attitude that one is unwillingness to invest for safety and continue investing fund and developing technologies for enhancing safety.

Loss aversion [28] is also well-known as our irrational behavior. We generally feel more disappointed when we loose, for example, \$100 than when we gain the same amount. Therefore, we tend to be averse to economic or monetary loss especially when we are constantly under an economically tough situation, which collapses the balance between profit or efficiency and safety [20]. Such a property of loss aversion forces us to avoid investment for safety that does not directly make a profit. We might regard investment for making a profit as a gain and investment for safety that does not make a profit as a loss. This must, as mentioned above, be more dominant to a population that adopts the safety approach based on hazard detection.

Discount of safety is also regarded as a cause of imbalance of safety and profit or efficiency. As well as the time discount of economic (monetary) items, it is pointed out that the value of safety is also discounted [20, 33]. Especially under scarce and uncertain situations, we generally cannot afford to worry about and pay attention to the future safety. So, we tend to discount the future value of safety. We tend to discount safety to a larger extent when the perceived risk on safety is lower than when the perceived risk on safety is higher. This shows that magnitude effect [34] holds even in the discount phenomenon of safety. Magnitude effect suggests that the lower perceived risk is, the more safety is discounted, which might induce the imbalance between safety and efficiency. We don't place importance on the future safety, and tend to optimistically misunderstand that we can do properly without taking into account future safety and be unwilling to invest for safety. The imbalance between safety and economy makes us perceive the risk on safety lower and procrastinate to take safety

countermeasures, and thus becomes a trigger to pursue efficiency or profit by sacrificing safety. Irrational mental accounting (separate accounts for making a profit and for assuring and enhancing safety) tends to produce different accounts for profit and safety pursuit. Under a managerially difficult situation, we unconsciously tend to place more emphasis on a profit mental account, and avoid investing money on safety. We sometimes get loss aversive, in particular, in pursuit of profit. This, together with mental accounting, further makes us place less importance on safety, feel less risky even if the risk is higher than that we actually feel, and discount future safety. This causes the imbalance between efficiency and safety, and forces us to adopt the safety approach based on hazard detection that doesn't cost much.

4.3 Scarcity and Slack Relation

In developing countries that are suffering from economic scarcity and behind an up-to-date (cutting-edge) safety management technology or organizations suffering from scarcity in fund or time due to economic reasons, they are not willing to invest for safety assurance or enhancement and improve safety management technology. Especially, they are not positive and active for taking countermeasures for safety inhibiting factors with low occurrence probability. This must be caused by the lack in slack for securing safety as pointed out by Mullinathan and Shafer [4].

This lack in slack for safety, together with concentration due to scarcity, induces tunneling for safety. This leads to the following property unwilling to invest for safety. Although they ostensibly recognize the importance of safety management, they never actively invest for safety and attempt to develop safety technologies. The theoretical framework that scarcity leads to less slack is summarized in Figs. 3 and 4.

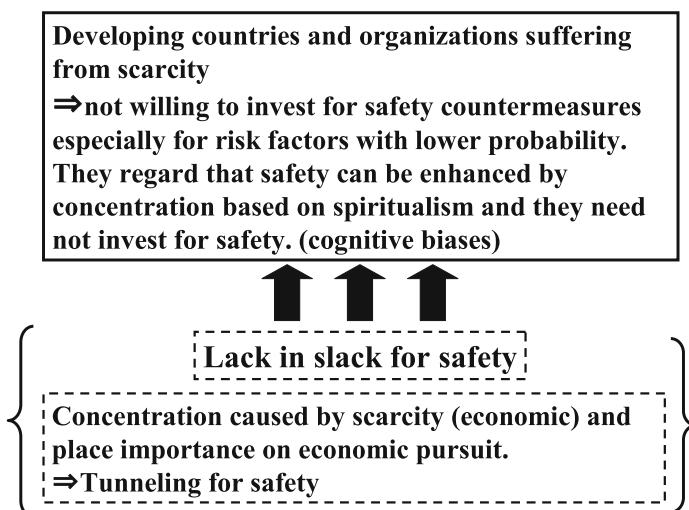


Fig. 3. Explanation of attitude unwilling to invest for safety using the concept of scarcity and slack relation -1-. Disadvantages of scarcity that leads to less concentration and tunneling.

Multi tasking or scarce state

- Concentration on one thing induces tunneling for other things.
- Cognitive processing ability of not only a concentrated task but also other tasks is degraded.
- All tasks cannot be appropriately executed due to limitation of cognitive resources. Therefore, we cannot help making a tradeoff among tasks.
- we cannot worry about and plan the future.

⇒No (or Insufficient) slack

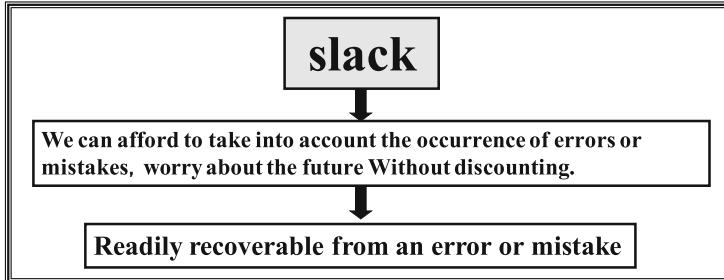


Fig. 4. Explanation of attitude unwilling to invest for safety using the concept of scarcity and slack relation -2-. Advantage of slack that permits us to readily recover from an error or mistake.

5 Discussion

Cross-cultural differences in mindset toward safety, attribution of disasters, collisions, or crashes to human factors or technological issues, and attitude toward investing for safety seem to be contributing factors to the safety management approach based on hazard detection that regard such a state of no detection of hazard as safe and don't actively and firmly confirm that no detection of hazard is inevitably and completely ascertaining safety. It has been pointed out that adopting safety management approach based on hazard detection is ruled by a variety of cognitive biases such as availability bias, confirmation bias, normalcy bias, outcome bias, optimistic bias, and framing effect. Although we tend to avoid uncertainty, such cognitive biases might work for the mitigation of uncertainty on safety. In other words, although no detection of hazard does not necessarily mean that the situation can be assured to be completely safe, and it is uncertain whether such a situation is safe or not, cognitive biases and cross-cultural differences mentioned in Sects. 2.1, 2.2 and 2.3 force us to misunderstand that no detection of hazard can be regarded as safe in spite of the situation being uncertain on its safety. The ignorance or mitigation of safety uncertainty (Sect. 4.1) makes us to readily adopt a safety management approach solely based on no detection of hazards or risks, although this does not necessarily guarantee safety. It seems that mitigation of uncertainty on safety seems to strongly work for adopting an outcome-based safety management strategy, especially when this phenomenon is combined with a variety of cognitive biases.

Moreover, as mentioned in Sects. 2.2 and 2.3, unwillingness to investing for safety will induce the imbalance between safety and economy (efficiency), and unconsciously choose an insufficient strategy that is based on efficiency enhancement and place much importance on not safety but efficiency (Sect. 4.2). Such a situation cannot tolerate tough and critical situations and robustly and flexibly deal with unexpected situations. Such a situation inhibits the enhanced technological development for securing safety and dealing with emergencies that potentially induce disasters, collisions, or crashes.

The hazard detection safety approach inhibits learning from failures (Sayed, 2014), recognizing cross-cultural difference that might potentially lead to unsafe behavior, and deleting cognitive biases that might become a critical factors of disasters, collisions, or crashes. Only paying attention to visible hazards or risks, and not turning one's eye to invisible and potential hazards (or risks) disturbs constructing appropriate safety management strategy (safety approach based on firm safety confirmation).

Unwillingness of investment for future safety and taking safety approach based on hazard detection shall be further explained using scarcity theory [4]. As shown in the theoretical framework of Figs. 3 and 4, scarcity induces less slack, and eventually one concentrate on economic activities, and tunneling of safety activities (exploring potential hazard) occurs.

Mullinathan and Shafer [4] showed that scarcity-slack relation is similar to the upper relationship between workload and performance in Fig. 5. Insight into scarcity-slack explanation of Mullinathan and Shafer [4] tells us that we must revise the inverted U-shaped relationship as the relationship between workload and not performance but concentration or motivation (see the lower of Fig. 5). The easy and difficult workloads correspond to the situation with less slack due to scarcity. Under the easy workload condition, we tend to avoid and get away from scarcity and be lack in feeling of tension, and thus cannot concentrate on the task. Under the difficult workload condition, we tend to suffer from scarcity, be nervous (tense), and concentrate excessively. Both workload conditions readily lead to an error or mistake, and cannot create a situation of moderate concentration or high motivation. On the other hand, the moderate workload condition makes us refrain from scarcity and have enough slack. So, it makes us concentrate on the task, and also don't make us feel tense. The moderate workload condition corresponds to the design based on ergonomics, and affords to permit an error or mistake, because only this condition does not suffer from the scarcity problem (the lack in slack) (see Fig. 6). In other words, ergonomics design attempts to design a man-machine system so that there is enough slack and no scarcity. Keeping a workload level moderate leads to a state with less scarcity and enough slack. The motivation to exerting cognitive efforts and solve the problem is low and the slack to heighten motivation is less due to scarcity under low and high workload condition. As the adaptability cannot be increased under low and high workload conditions, the task cannot be processed with flexibility. Therefore, it is impossible to cope with an error caused by less or excessive concentration.

The scarcity and less slack condition makes us blind to a variety of safety activities such as investment for safety, and eventually safety approach based on hazard detection is introduced (safety approach is not advanced so that we can further enhance safety).

The theoretical framework which explains the factors that affect the gap of approaches toward safety (an approach based on hazard detection and that based on firm safety confirmation) is summarized in Fig. 7.

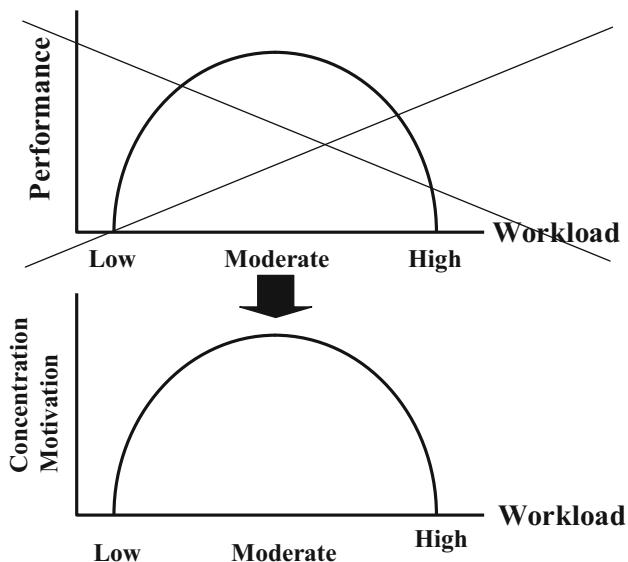


Fig. 5. Schematic representation of original and revised inverted U-shaped relationships between workload and performance using the concept of scarcity and slack relation.

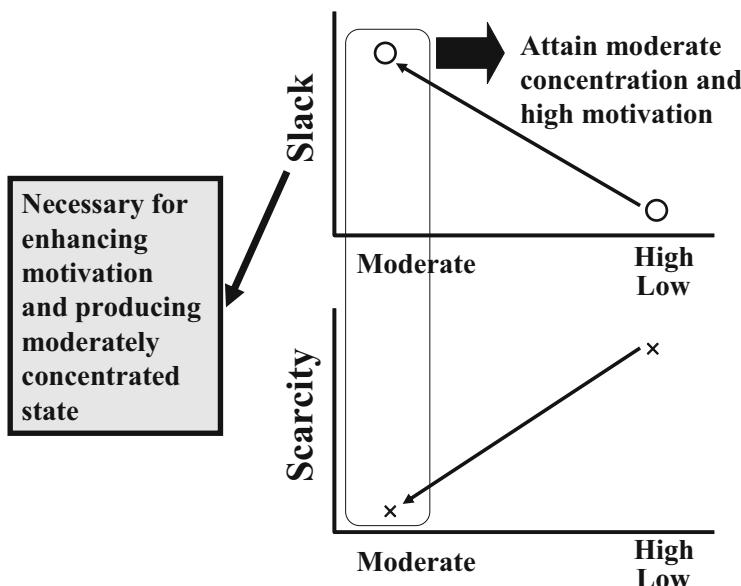


Fig. 6. Revised inverted U-shaped relationship between workload and concentration or motivation using the relationship between scarcity and slack. Less scarcity and enough slack lead to mindset toward investing for safety and enhancing the development of safety and its management technology.

Cross-cultural difference

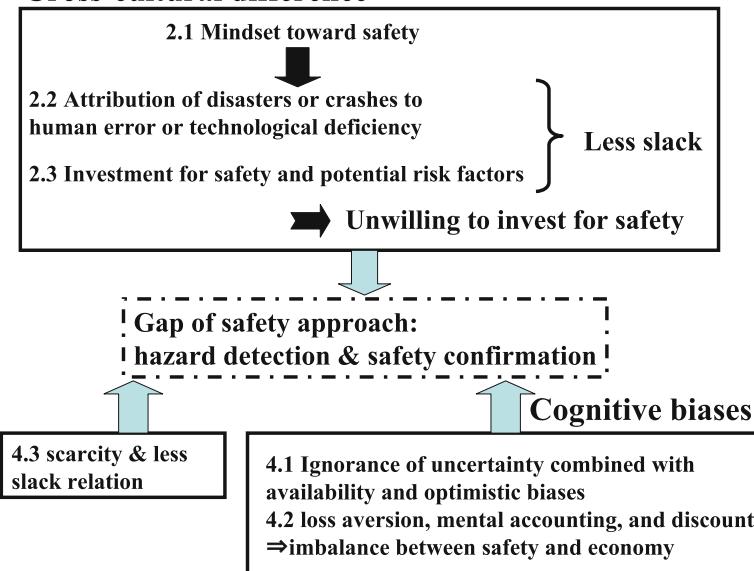


Fig. 7. Summary of the study.

6 Conclusions

This study attempted to explain the reason for the gap between two safety approaches that is based on hazard detection or firm safety confirmation from the viewpoints of cross-cultural difference, cognitive biases such as imbalance between safety and economy, ignorance of uncertainty combined with availability and optimistic bias, and scarcity and slack explanation.

First, Japanese or eastern countries' attitude toward safety was reviewed from mindset toward safety, approach for addressing safety, and attitude toward investing for safety. This was compared with that of US or western countries. It was suggested that such a difference leads to the difference of safety approaches that is based on hazard detection or firm safety confirmation.

Second, the reason of the difference of safety approaches was discussed from the standpoints of cross-cultural difference, the concept of cognitive biases such as imbalance between safety and economy, ignorance of uncertainty combined with availability and optimistic bias, and scarcity and slack explanation.

Cross-cultural difference, a variety of cognitive biases, and lack in slack due to scarcity might inhibit learning from similar disasters, collisions, or crashes, and preparing for the future safety. This study suggested that the cross-cultural difference, the cognitive biases, and the state with less slack for safety due to scarcity (especially, economic one) must be recognized. The mindset toward safety must be modified in line with such properties so that we can further enhance safety and cut off the vicious circle of repetition of similar disasters, collisions, or crashes.

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Characteristics of Problem Consciousness of Indonesian Returnee Nurses Who Experienced Intercultural Exchange in Foreign Countries

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Abstract. The purpose of this study was to reveal the problems recognized by Indonesian nurses after returning to work in Indonesian health and medical facilities after work experience in nursing or nursing care work in Japan.

The Root Cause Analysis (RCA) with the theme of “Issues of my own workplace” was conducted on three people including two Indonesian nurses and one Japanese nurse as a facilitator. The issue tree as the result of RCA was an analysis subject. As a result, a series of eight events emerged in the issue tree. Four root causes were extracted. Problem consciousness emerged when subjects became culturally aware of the difference in standards between their home country and Japan which was then identified as cultural awareness.

Keywords: Intercultural exchange · Problem consciousness
Japanese–Indonesian nurses · Root Cause Analysis

1 Introduction

Japan has been receiving foreign nurses since the 2008 Economic Partnership Agreement (EPA). In 2017, over a thousand foreign nursing students studied in Japan. However, only 14.5% of them could pass the national nursing exam, and the others were forced to go home. This is not because of their nursing skills, but rather their level of Japanese and the cultural differences between Japan and their homeland. We revealed eight factors which actually caused them to answer incorrectly on questions which over 70% of Japanese test-takers could answer correctly: 1. The lack of special knowledge about nursing, 2. The difference of the way of thinking about the role of nurses, 3. Diseases which are rare in their country, 4. The laws of Japan, 5. Welfare services and facilities in Japan, 6. Welfare equipment which has not yet been introduced in their country, 7. The lack of Japanese language skill, and 8. Misunderstanding words. Examples of the difference of the way of thinking about the role of nurses are as

follows: They cannot answer correctly about the appropriate temperature of foot-bath care because foot-bath is not included in care plan in Indonesia, and they can't answer correctly about the cautions of dietary advice, which is not a role of nurses in Indonesia. Since in Indonesia, most nurses work at a hospital, they don't experience coordinated actions of home care and hospital care. Consequently, they cannot imagine continuous nursing plans. An auxiliary is an example of patient welfare which isn't seen in Indonesia. Since doctors and nurses in Indonesia do not think about making patients being on their own, they don't suggest that patients use auxiliaries [1].

Thus, when foreign nurses work in a culturally different environment, they not only have to improve their language skills, but also have to understand differences of the role of nurses, values of nursing, culture and customs, social situations, and the medical system of each of the two countries. On the other hand, we wondered if nurses who became accustomed to Japanese culture and customs felt strange with those differences when they returned to their country. We wondered if they could get back their original values smoothly. What kind of problem consciousness do Indonesian nurses have when they return to Indonesia after being influenced by Japanese values through clinical experience in Japan?

2 Aim of the Study

The purpose of this study was to reveal the problems recognized by Indonesian nurses with nursing or nursing care work experience in Japan upon their return to work in Indonesian health and medical facilities.

3 Methods

1. Research subject: Two Indonesian nurses from Bali who worked in a hospital or nursing facility in Japan
2. Data Collection method: The Root Cause Analysis (RCA) with the theme of "Issues of my own workplace" was conducted on three people including two Indonesian nurses and one Japanese nurse as a facilitator. RCA is an incident and accident analysis method standardized in the United States. It is a method to consider 'Why it happened' and 'What can be done in the future' logically. A specific procedure is shown in Fig. 1. Target cards are made by logically inverting each sentence of tasks. Then, a target tree is made by arranging target cards, and it draws a portrayal of ideal organization. The issue tree and the target tree of RCA were analysis subjects.
3. Analytical method:
 - ① We looked at a series of events and named each category in the issue tree.
 - ② We focused on the relationship between each category and determined the root cause.
 - ③ In the issue tree, we focused on the points where values are expressed and considered the characteristics of problem recognition of the research subject.

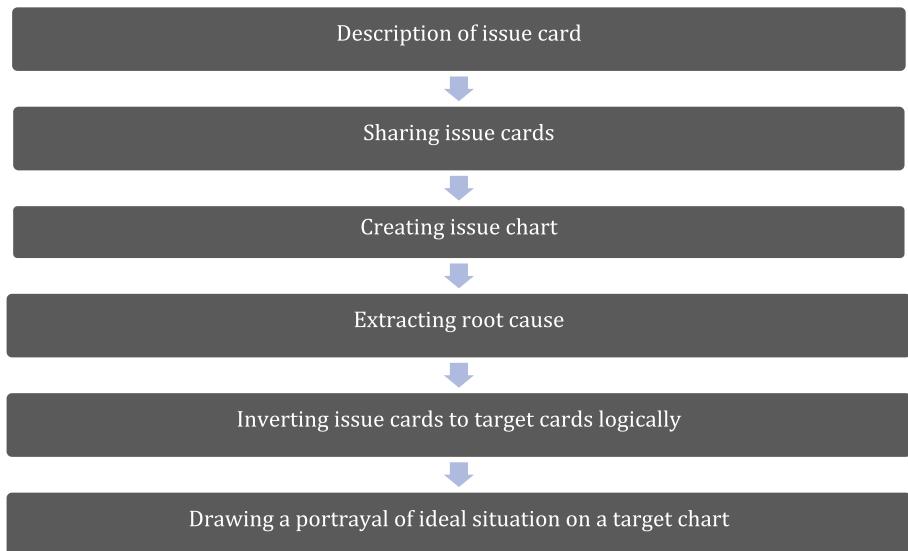


Fig. 1. The flow of RCA

4 Results

4.1 The Issue Tree and the Root Cause

Those subjects recognized as tasks are shown in the issue chart in Fig. 2. In the chart, root cause is shown with **【RC】** attached. Each event flows from bottom to top. The upper row is the category name.

1. Issue tree

A series of eight events emerged in the issue tree as follows: 1. Complex organization management unique to Bali, 2. Excessive cost savings by management, 3. Communication problems between staff made by employment relationships, 4. Lack of human resources, 5. Low awareness of Japanese working customs, 6. A difference in attitude about service, 7. Lack of concrete action of Japanese style service, 8. The roles of nursing expected in Japan but not in Bali.

2. Root causes

Four root causes extracted in the issue tree were as follows: 1. Management style unique to Bali, 2. Lack of reliable human resources, 3. Balinese temperament, 4. Lack of understanding of Japanese ways of service.

4.2 Target Tree

The target tree is shown in Fig. 3. The ideal status is made up of eight events: 1. Utilizing Bali-like style to create smooth organizational management, 2. Creating fair

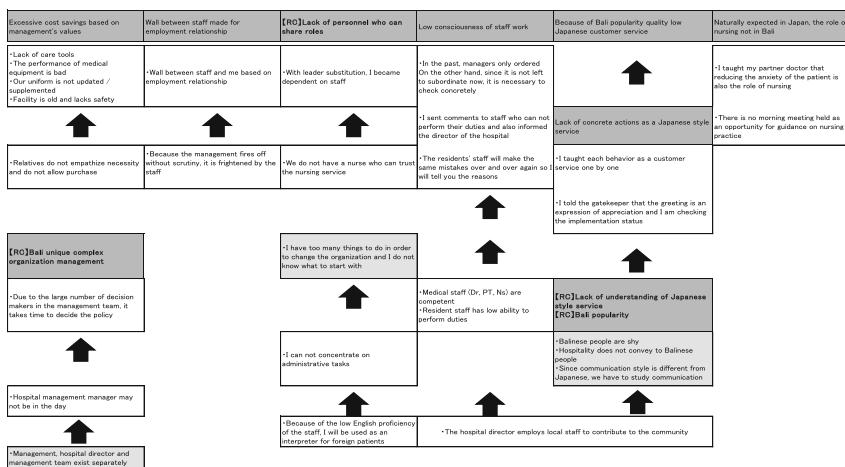


Fig. 2. Issue chart

and sound management, 3. Creating partnership in employment relations, 4. Training human resources so that nurses can trust them and request roles from them, 5. Raising Japanese style awareness of fulfilling responsibilities, 6. Establishing Japanese service spirit, 7. Providing learning opportunities for concrete actions of Japanese style services, 8. Performing the role of nursing using common practices of Japan.

5 Discussion

5.1 Characteristics of Task Recognition

A series of eight events emerged in the issue tree. Indonesian nurses recognized a difference as an issue by comparing their past experience of management and services in Japan with the current state of these issues in Indonesia. When they talked about this difference, they were angry. A state in which the organization is operated in a Japanese style was drawn as a goal. Problem consciousness refers to the consciousness that tries to relate subjectively to problems existing in society. From this, it is thought that their indignation was a manifestation of problem consciousness. Under the issue tree, it was pointed out that it is impossible to act like a Japanese, understanding the temperament of Balinese people. In the target tree, while aiming to make full use of the characteristics of Balinese, it aimed to bring it closer to Japanese style. It seemed like a conflict between “an ideal Japanese style of value standard” and the value standard of their home country. Regarding the management of the organization of their home country, they extracted tasks according to Japanese standards while understanding the circumstances of Indonesia. And while making full use of the originality of their home country, they targeted the ideal state of Japanese style. From the above, it seems that they used Japanese values as their own standard of value by a deep intercultural experience when they worked in Japan. It was suggested that nurses adapted to foreign

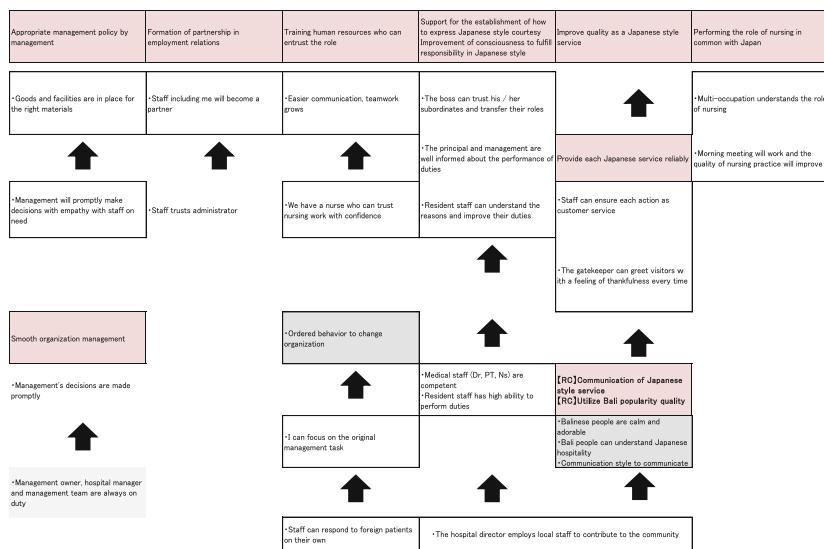


Fig. 3. Target tree

cultures have a characteristic of having a problem consciousness based on their own culture's and different culture's values.

5.2 Problem Conscious as Cultural Awareness

In the research, the nurses used Japan's values as their own value criteria and seemed to be analyzing the current state of their home country as a different culture. This behavior is thought to be an example of "cultural awareness" that they realize their own culture. Cultural awareness is considered to be the most important point in order to acquire intercultural competence [2].

Intercultural competence in healthcare is a continuing process, a pathway of efforts by healthcare providers to gain the ability to work effectively while respecting the client's culture. It contains concepts of cultural awareness, cultural knowledge, cultural skill, and cultural encounters [3].

Currently in Japan, nurses are increasingly required to cultivate intercultural competence as the country is heading for multicultural coexistence. This time, the Indonesian nurses adapted to the values of the different culture by the deep intercultural exchange experience. As a result, they took on the values of the recipient country as their own value criteria. Then based on both value criteria, they became aware of a problem consciousness. From the above, it was suggested that nurses adapted to different cultures were able to become "culturally aware" and to acquire some degree of intercultural competence.

6 Conclusion

Indonesian returnee nurses who had intercultural exchange in Japan had deep experiences and values from working abroad, and recognized the problems with the current nursing system in their home country. The problem consciousness that they acquired is one type of cultural awareness, and it suggests that they attained some degree of intercultural competence.

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Hiding Behind the Words of Others: Does Redundant Word Choice Reflect Suppressed Individuality When Tweeting in the First Person Singular?

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Abstract. We analyze naturally occurring social media data that derive from Twitter messages posted over a 24-h period in immediate reaction to the Paris terrorist attacks in November 2015. We separately examine patterns for tweets with first-person singular pronouns (I) and first-person plural pronouns (WE), the corresponding variations in valence, arousal, proportion of words in various LIWC categories, and diversity of word choices within those categories. Negatively valenced word choices revealed greater mean differences between I and WE than did positively valenced words. Novel was that tweets with I exhibited a more uniform distribution of word choices and greater linguistic alignment, for most of the LIWC categories and for both positively and negatively valenced word choices, relative to tweets in WE. Greater diversity differences associated with pronoun choice when valence is negative than when it is positive suggest less self-disclosure when tweeting with first-person singular than plural pronouns.

Keywords: Social media · Linguistic alignment · Pronoun choice
Valence · Self-disclosure

1 Introduction

Language is the primary medium for human social interactions. With the advancement of technology and new methods to generate and analyze data, investigations into spontaneous language production have become useful for understanding how people's word choices in their daily interactions reflect who they are as well as what they are doing [1]. Communication by Social Media, which is now one of the most common internet-based activities [2], has become a prolific source of text to analyze. Specifically, the platform Twitter, in which conversations or "tweets" are posted publicly, is one of the largest available repositories of naturally occurring language [3]. As a

microblog, Twitter provides a social network structure and an avenue for the flow of information, where users can tweet updates and “follow” other users so that other users’ tweets are updated in his or her feed [4] (i.e. generating a compilation of all the tweets from users the individual follows). Moreover, Twitter’s format encourages users to disclose personal details about their daily life, share and seek information [5] communicate with many other users who are not necessarily confined to a narrow group of “friends” [6]. Online communication can be triggered spontaneously, or be elicited by specific events [7], such as catastrophic world events (e.g. terrorist attacks) [8].

Using Twitter data as a corpus from which to investigate conversational characteristics of users has already proven itself to be a valuable scientific endeavor [8]. For example, previous research has revealed differences in patterns of word choice among users responding to the Charlie Hebdo terrorist attack in Paris in 2015 [8]. Indeed, we know that word choice and in particular pronoun choice, can be revealing about an individual’s emotional state; across multiple studies research has shown that increased use of first-person singular (I) is associated with increases in negatively valenced word choice [8] as well as negative affective states [1, 9].

While previous work has focused on the counts and proportion of words within different categories [10, 11] as well as the pattern of word choices that co-occur with particular pronouns [8], little work has addressed how diversity/uniformity of word choice varies with pronoun choice. Generally, research has shown that social exchanges reflect a pattern of accommodation in communication, whereby users in remote as well as face-to-face conversations tend to converge to one another’s communicative behavior [3]. This coordination among speakers occurs at a variety of linguistic levels including word choice, syntactic structures, utterance length, pitch and gesture [3]. In one case, analyses of communication accommodation (also called linguistic alignment) among Twitter users, revealed convergence, such that users chose words from the same categories as defined by the Linguistic Inquiry Word Count (LIWC) [12]. While the research showed significant alignment among users (i.e. conversations between individuals contained approximately equal number of words from the same category (e.g., Article) even though those numbers were atypical relative to a baseline) [12], their measure of alignment did not consider the frequency of specific word choices. Instead, alignment focused only on the number of word forms that belong to a particular category. Further, categories included in the LIWC-based analyses were limited to “non-topical style dimensions” having few to no content words that are free to vary across topics. For example, analysis on the prevalence of particular *positive emotion* (e.g., love, nice, sweet) and *negative emotion* (e.g., hurt, ugly, nasty) words as well as *cognitive processes* (e.g., cause, know, ought) or *social process* (e.g., mate, talk, they) words were not a priority. Thus, alignment focused primarily on counts of non-content words with only secondary attention to sentiment.

In the present study we describe social dynamics within a virtual group formed in response to a particular global crisis. We analyze naturally occurring social media data that derive from Twitter messages in immediate reaction to the Paris terrorist attacks in November 2015. Our Twitter corpus is defined by the hashtags users append to their tweets thereby dramatically restricting the topic domain. Our primary measure of behavior in this virtual group context is based on variation in (content) word choice. In our previous work, we have documented patterns based on an entropy based measure

of lexical diversity in virtual groups that respond to a real life event [8, 13] as well as in more permanent groups who share a goal or interest that persists over time [14]. Our method differs from most current approaches that describe patterns of vocabulary usage with respect to deviations of a group mean frequency from a baseline mean.

Frequency is typically based on number of instances of a word from a particular category without regard to whether one word occurs multiple times or multiple words occur only once. For example, ongoing emotional distress (viz., depression) has been documented to increase the incidence of first-person singular pronouns (I) as well as the prevalence of negatively valenced words in essays by depressed writers relative to those without distress [15]. Similarly, analyses of diary entries associated with coping with the 2001 NYC attack show that changes in word frequency over a two-week period were most dramatic in those who often used critical terms (e.g., Osama, World Trade Center) in their writing and were thus characterized as most preoccupied with the event [16]. Additionally, diary entries exhibited a shift in pronoun choice, such that the use of the first-person plural pronouns (WE) dramatically increased and correspondingly the use of first-person singular pronouns (I) decreased [16]. This shift from the use of first-person singular pronouns to first-person plural pronouns suggests a change in focus from attending to themselves to thinking about friends, family and others within their group [1]. Indeed, this shift is consistent with the idea that the use of first-person singular pronouns is related to the independent or individualist self and the use of first-person plural pronouns is related to the interdependent or collectivist self [17–19]. Moreover, the mere presence of pronouns is associated with differences in word choice. Specifically, the use of more strongly valenced words increases with pronouns, relative to when pronouns are absent [8], which denotes greater emotion. Interestingly concreteness, which is often interpreted as a measure of psychological distance [20], also varies along with pronoun choice, where first-person plural pronouns tend to accompany less concrete word choices, than first-person singular word choices [8]. However, these previous analyses were based on mean token frequency and failed to consider diversity in word choice among those who discuss the same event. Reduced lexical diversity when the topic is held constant can signal communication coordination and linguistic alignment among speakers and can thus be revealing about social identity in the context of a group [21, 22].

One factor that is likely to influence the potential for alignment is the tendency to talk about oneself (self-disclosure) because the degree of self-disclosure tends to be associated with degree of interaction in support seeking posts [23]. In the present study, we link self-disclosure to lexical diversity with the understanding that the tendency for linguistic alignment and reduced diversity varies systematically depending on pronoun choice and the corresponding perspectives of the self (i.e. I, individualist self vs. WE, collectivist self). Thus, the current study analyzes tweets in terms of the uniformity or diversity of word choice as it co-varies with pronoun choice when immediately responding to a terrorist attack.

Some have reported an increase in the use of the first-person plural when responding to a terrorist attack, interpreting it as a need to be part of a group in the face of an outgroup threat [24]. However, these findings are over an extended window of time (sometimes a two-week period), which may allow for the development of an online collectivist community, whereas a more restricted window of time may not.

Moreover, the greater use of I in association with more negative affective states or of WE in association with more positive affective states, would be consistent with previous research in which responses to a catastrophic event exhibited a brief drop in the total number of *positive emotion* words [16] as well as a tendency for negatively valenced and *negative emotion* words when using first-person singular pronouns [1, 8, 9, 15]. Thus, we expect to replicate the pattern of greater or more negatively valenced word choices and less positively valenced word choices when tweeting in the pronoun I relative, to tweeting in the pronoun WE.

To our knowledge, this is the first study that will address linguistic alignment based on first-person pronoun choice (i.e. is there a difference in uniformity of concomitant word choice when tweeting in I vs. WE). We extend analyses of linguistic alignment by examining word choice uniformity (lexical diversity), rather than LIWC category usage based on counts. We analyze LIWC word categories to see whether linguistic alignment generalizes across categories of content words and how that may vary with pronoun choice in response to a terrorist attack. Using a measure of lexical diversity rather than word count, we examine reduced lexical diversity and greater alignment of word choice for tweets with the pronoun I relative to WE. If this is a general case of alignment then we hypothesize that this pattern should be evident for both positively valenced and negatively valenced word choices, as well as for word choices in the LIWC categories. If the pressure of self-disclosure also plays a role, because attention to the self is exaggerated when using the I pronoun [1], lexical diversity based on our entropy measure of alignment may be reduced more among words whose valence is negative than whose valence is positive.

2 Data Collection and Analysis

The data we collected consisted of all the tweets that contained at least one of 14 hashtags pertaining to the November 2015 Paris attacks collected via Twitter streaming API. We then defined a subset category of hashtags so that our final data set always contained at least one hashtag that pertained to Paris (see Table 1). The corpus consisted of 43,851 tweets were shared in one day immediately following the Paris attacks.

Table 1. Examples of some of the hashtags in our tweet collection

| | | |
|-------------------|-------------------|----------------|
| #franceattack | #IStandWithFrance | #Paris |
| #franceshooting | #IStandWithParis | #ParisAttack |
| #FranceSolidarity | #PrayersForParis | #PeaceForParis |

To determine whether lexical variation and linguistic alignment is associated with pronoun choice in our data, we classified tweets with the relevant hashtags as to whether first-person singular pronouns (I, me, my, mine) were present or whether first-person plural pronouns (we, our, ours, us) were present. Two sets of data pertaining to the November Paris attacks were then developed based on pronoun choice: the I set and the WE set. Separating tweets that use first-person singular pronouns (I) and tweets

with first-person plural pronouns (WE) allowed us to differentiate between the collectivist self and individualist self [17–19, 25], and are henceforth designated as I and WE. Moreover, based on an extension of Pan et al., [23] tweets in I that presumably reflect the individualist self and tweets in WE, that presumably reflect the collectivist self, differ with respect to the potential for self-disclosure. In order to ascertain whether pronoun choice was systematic within an individual, for each user ID, we tracked the number of tweets in the corpus that contained an I pronoun and the number of tweets that contained a WE pronoun. We determined that 1% of tweeters were affiliated with both groups and 99% were affiliated with only one.

Each of the two sets of data (I and WE) was pre-processed as follows: We first removed stop-words (non-content words such as the, a etc.) from the tweets, and then converted all words to their lower-case equivalents and stemmed them so that inflected forms (terrorist, terrorists) would be counted together. Then for all words with valences more extreme than 25% (viz., 25% most positive and 25% most negative) in Warriner and Kuperman [26], we calculated the frequencies with which each word appeared in each pronoun set (I, WE). We then retrieved the valence (the pleasantness of a given word) and arousal scores (intensity of evoked emotion, e.g., terrified > grief) of extreme words. We calculated weighted means for arousal (and valence) for each word using the following formula: multiplying the arousal (valence) of a word by the number of times that word appeared in the corpus and dividing by sum of the frequencies of all words. Means are summarized in Table 2 and I and WE word clouds with font size proportional to relative token count are depicted in Fig. 1.

Table 2. Weighted valence and arousal means and valence entropy

| Pronoun | Polarity | Valence | Arousal | Entropy | CI |
|---------|----------|---------|---------|---------|---------------|
| I | NEG | 2.36 | 5.89 | 5.019 | 5.0186–5.0195 |
| WE | NEG | 2.52 | 5.67 | 6.193 | 6.1929–6.1940 |
| I | POS | 7.06 | 4.31 | 5.374 | 5.3737–5.3743 |
| WE | POS | 7.10 | 4.22 | 6.114 | 6.1140–6.1146 |

To examine the variation in the types of word choices for each data set (I and WE), we analyzed the type and token counts of words associated with the different categories in the LIWC data base [10], with the requirement that the cumulative frequency (the sum of the number of times each word appeared) in each LIWC category exceeded 1000. This resulted in the further analysis of the following LIWC categories: *affiliation* (e.g., help, friend, encourage), *anger* (e.g., hate, kill, annoyed), *cognitive processes* (e.g., know, wish, thought), *death* (e.g., kill, war, murder), *drives* (e.g., friend, win, attack), *family* (e.g. daughter, dad, aunt), *insight* (e.g., think, know, believe), *power* (e.g., strong, superior, bully), *positive emotion* (e.g., love, safe, support), *negative emotion* (e.g., attack, terror, suffer), *religion* (e.g., pray, jihad, soul), *risk* (e.g., safety, danger, threat), *sadness* (e.g., tragedy, cry, sad), and *social processes* (talk, give, sympathy). There was a total of 7373 tweets that included a variant of the I pronoun and 6440 tweets that included a variant of the WE pronoun; more tweets that use I fails to replicate previous studies collected in response to crises events. However, our time

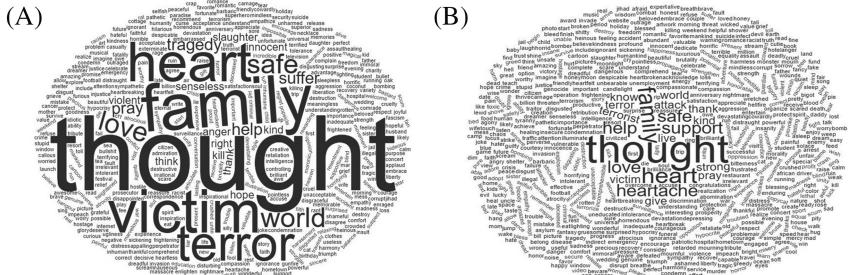


Fig. 1. (A) word cloud showing the most common words that occurred with first-person singular pronouns (I), (B) word cloud showing the most common words that occurred with first-person plural pronouns (WE)

window is limited to 24-h, which may be too short to capture the development of an online collectivist community and may also have consequences for the types of effects we can detect. LIWC category percentages were computed by dividing the total frequency of words in each category for each pronoun (I and WE) by the total number of tweets that included either the I pronoun or the WE pronoun (See Fig. 2 for LIWC percentages).

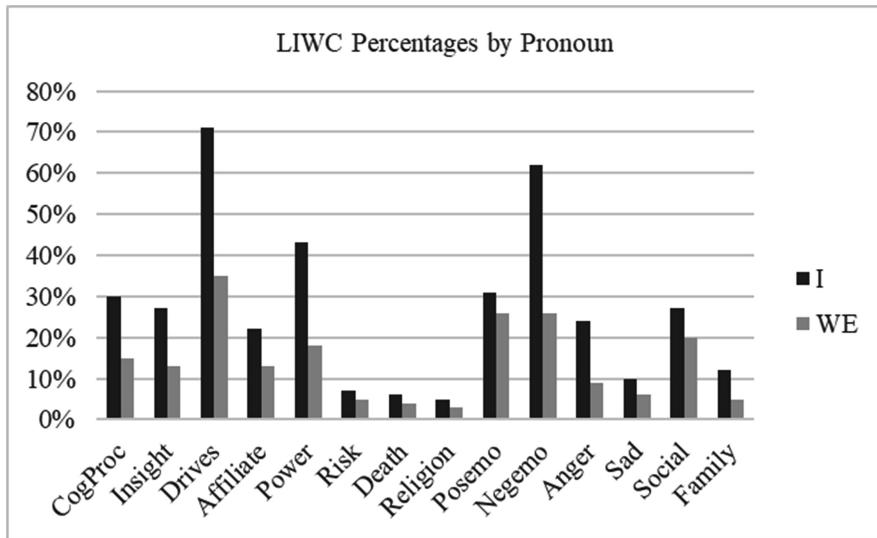


Fig. 2. LIWC percentages

To ascertain the lexical redundancy (or reduced word choice variation) of the extremely valenced words as well as the words in the LIWC categories for tweets in each pronoun, we calculated entropy. The concept of entropy is derived from

information theory [27]. Entropy is defined as a unit-less measure of uncertainty such that the more unpredictable the pattern is, for example here, in terms of number of different words and the frequency of each, the higher the entropy. We calculated entropy separately for words with the 25% most extreme negative and positive values so that we could compare variation in word choice in tweets with I and WE pronouns for valence. Lesser variation as revealed by greater alignment would be consistent with greater mutual influence; greater variation when positive could be symptomatic of more independence between tweeters. The criterion for entropy analyses of a LIWC category for each pronoun set required that at least 100 different words appear within a category. This resulted in the inclusion of the following LIWC categories: *cognitive processes, drives, power, positive emotion, negative emotion*. Again, lesser variation amongst the individual categories suggests greater shared influence (linguistic alignment) and greater variation would signal greater independence (less linguistic alignment). Greater differences between negative and positive valence for tweets associated with I than with WE would be consistent with a role for self-disclosure.

We determined entropy scores by summing the total number of extremely valenced words and dividing the number of occurrences for each word by the total number of emotionally valenced words to get relative frequency. Those numbers were logged and then we calculated the product of relative frequency by its log and changed its sign. Because entropy is sensitive to unequal sample sizes, we used the ChaoJust adjustment which takes into account this sample issue. In the end, low entropy scores indicate greater redundancy and higher scores indicate less redundancy. Entropy scores on words with extreme valence are listed in Table 2. This same process was used for calculating entropy among the words in each of the included LIWC categories (see Table 3 for LIWC entropy scores).

Table 3. LIWC token and type count, entropy scores, and CIs

| LIWC category | Token (Type) count | | Percentage | | Entropy | |
|---------------------|--------------------|------------|------------|-----|----------------------|----------------------|
| | I | WE | I | WE | I (CI) | WE (CI) |
| Cognitive processes | 4108 (64) | 2110 (56) | 30% | 15% | 2.34 (2.3375–2.3396) | 3.14 (3.1350–3.1388) |
| Drives | 9820 (117) | 4835 (137) | 71% | 35% | 3.86 (3.8632–3.8637) | 4.99 (4.9867–4.9878) |
| Power | 5876 (50) | 2509 (58) | 43% | 18% | 2.86 (2.8613–2.8621) | 4.07 (4.0678–4.0693) |
| Positive emotion | 4266 (120) | 3546 (120) | 31% | 26% | 4.44 (4.397–4.441) | 4.65 (4.6486–4.6502) |
| Negative emotion | 8585 (154) | 3594 (140) | 62% | 26% | 4.38 (4.3820–4.3829) | 5.49 (5.4858–5.4870) |
| Social processes | 3784 (64) | 2762 (51) | 27% | 20% | 3.00 (2.9991–3.001) | 3.86 (3.8593–3.8608) |

3 Results

3.1 Valence and Arousal and Entropy

Mean valence and arousal scores were calculated for each of the sets of data associated with the November Paris attack corpora. We further divided each data set based on polarity, such that negative words and positive words were in separate analyses. As valence scores depart from a score of 1.00, they become more positive. As arousal scores depart from 1.00 emotions become more intense. Mean valence and arousal scores for each pronoun are summarized in Table 2 and word clouds for each pronoun based on relative frequency for co-occurring word choices are depicted in Fig. 1. Greater uniformity in font size is consistent with higher entropy and greater lexical diversity.

Mean negative valence for tweets with I (2.36) was more negative than WE (2.52), which replicates our previous findings [8]. In contrast, mean positive valence for tweets with I (7.06) was slightly less positive than WE (7.10). In summary, tweeting in I was associated with more negatively valenced word choices and less positively valenced word choices than tweeting in WE. Results support the pattern of greater negativity or negative emotional states when communicating with first-person singular than plural pronouns [16]. Valence influenced the degree of arousal for word choices such that negatively valenced arousal was consistently greater than positively valenced arousal, irrespective of corresponding pronoun choice. Moreover, regardless of valence, mean arousal scores indicated that words that co-occurred with I (Negative arousal 5.89; Positive arousal 4.31) tended to be more extreme in arousal than words that co-occurred with WE (Negative arousal 5.67; Positive arousal 4.22), suggesting greater emotional intensity when tweeting in I. In summary, tweets using I tended to be more extreme in valence as well as in emotional intensity (arousal) than tweets using WE. Additionally, negatively valenced words showed greater differences between I and WE and bigger differences in arousal than did positively valenced words.

Entropy scores capture diversity of word choice and were determined by summing the total number of extremely valenced words and dividing the number of occurrences for each word by the total number of emotionally valenced words to get relative frequency. Those numbers were logged and then the product of relative frequency by its log was calculated, followed by a change in its sign. In the end, low entropy scores indicate greater redundancy (more alignment) and higher scores indicate less redundancy (less alignment). Valence entropy scores are listed in Table 2.

Regardless of valence, corresponding word choices for tweets in I exhibited lower entropy scores, than tweets in WE (I NEG 5.019, I POS 5.374; WE NEG 6.193, WE POS 6.114), suggesting greater linguistic alignment. Valence entropy differences for tweets in I, also showed more redundancy and greater linguistic alignment for negatively valenced word choices than positively valenced word choices. This asymmetry is consistent with a disinclination for self-disclosure. In contrast valence entropy differences for tweets in WE revealed a relatively weak albeit opposite pattern where less redundancy and less linguistic alignment was associated with positively valenced word choices than negatively valenced word choices.

In summary and consistent with the tendency to hide behind the words of others, tweeting in I, and presumably tweeting as the individualist self, is associated with greater linguistic alignment and a disinclination for self-disclosure relative to tweeting in WE and presumably as the collectivist self. Further, valence entropy differences varied with pronoun choice, such that negatively valenced word choices that occurred with I were more uniform and exhibited greater linguistic alignment, relative to positively valenced word choices that occurred with I. With respect to word choices for WE, negatively valenced word choices were only slightly more diverse and exhibited less linguistic alignment overall, relative to positively valenced word choices.

3.2 LIWC and Entropy

For each pronoun set (I, WE), we examined the proportion of accompanying word choices within each category from the LIWC in which the total number of occurrences exceeded 1000 (Percentages by pronoun are listed in Fig. 2.). The categories meeting this requirement were *affiliation*, *anger*, *cognitive processes*, *death*, *drives*, *family*, *insight*, *power*, *positive emotion*, *negative emotion*, *religion*, *risk*, *sadness*, and *social processes*.

For all eligible categories, there was a greater percentage of words that co-occurred with tweets in I relative to tweets in WE. The greatest differences can be seen between I and WE in the following categories: *cognitive processes* (I 30%; WE 15%), *insight* (a sub category of *cognitive processes*; I 27%; WE 13%), *drives* (I 71%; WE 35%), *affiliation* (a sub category of *drives*; I 22%; WE 13%), *power* (a sub category of *drives*; I 43%; WE 18%), *negative emotion* (a sub category of *psychological processes*; I 62%; WE 26%), *anger* (a sub category of *negative emotion*; I 24%; WE 9%), *sadness* (a sub category of *negative emotion*; I 10%; WE 6%), and *family* (a sub category of *social processes*; I 12%; WE 5%). Larger differences in the proportion of *negative emotion*, *anger*, and *sadness* words with regard to I and WE, replicate previously reports that negative affective states are often more strongly associated with the use of first-person singular pronouns [16] and when people respond to negative events they tend to use more negative emotion words [28].

We compared entropy analyses by pronoun for the same LIWC categories. These analyses are less influenced by different number of tweets in I and WE than those based on counts. Less variation and the tendency for greater linguistic alignment in I suggests less self-disclosure. Entropy scores for the LIWC categories and CIs are listed in Table 3. Of particular relevance to an interpretation that incorporates self-disclosure are the pronounced differences for *negative emotion* and *drives*.

In summary, all categories exhibited greater linguistic alignment for I tweets than WE tweets despite more tweets in I than WE. Here, we emphasize that the systematic reduction in lexical diversity between I and WE present for *negative emotion* words was weaker for *positive emotion* words. This finding is consistent with a stronger disinclination for self-disclosure for tweets in I, especially when emotions are negative [23]. Unanticipated was that words classifiable as *drives* also exhibited disproportionately more tweets in I than WE along with greater linguistic alignment. We speculate that in short time frames such as our 24-h window for data collection, *drive* word choices could be less diverse than WE, but with more time for the emergence of a

collective, word choice associated with WE might be most amenable to a pattern of decreased lexical diversity.

4 Summary and Future Directions

In this report, we investigate spontaneous responses to a catastrophic event via tweets posted over a period of 24-h following the event. Building from our previous work on tweets produced by a massive-scale network that were associated with a catastrophic event, we extend our focus beyond means for word ratings on the psychological indicators of valence and arousal. Here, we introduce entropy measures to capture linguistic alignment as a function of pronoun use and consider differences in valence with pronoun choice as an indicator of self-disclosure. With respect to means, tweeting in I relative to WE was associated with the use of more emotionally intense negatively valenced words, a greater percentage of *negative emotion* words, *anger*, words and *sadness* words, fewer positively valenced word choices and greater linguistic alignment. Results support the greater inclination to use negativity or negative emotional states when using first-person singular than when using first-person plural pronouns [16].

In general, tweeting in I was more common than tweeting in WE and resulted in slightly higher frequencies of usage for words across many LIWC categories. Not only was tweeting in I associated with more emotionally intense negatively valenced, *negative emotion*, and *drives* word choices, but it also accompanied more redundant vocabulary (reduced lexical diversity) than did tweeting in WE. As a rule, reduced diversity can be a marker for greater linguistic alignment, which is characteristic of more intense or sustained social interaction. This pattern is consistent with the literature linking use of I pronouns to greater potential for interaction with others [23]. The tendency to use more *drive* words and more uniform *drive* word choices when tweeting in I suggests that at short time frames *drive* word choices can be more uniform than WE. Whether at longer time frames, with the emergence of a collective mentality, patterns would change so that word choice associated with WE would show the greater convergence is worthy of future study.

Furthermore, first-person singular pronouns are consistent with an individualist perspective, including attention on the self [1] and in the context of a crisis event, feelings of vulnerability may accompany attention on the self and lead to a disinclination to self-disclose in tweet interactions. At present, the self-disclosure hypothesis rests on the asymmetry between strong lexical uniformity (alignment) of negative but weaker uniformity of positive word use.

Additionally, in the context of a crisis event, emotional contagion and the transfer of emotional states to others is likely to be more negative than positive. At the same time, the tendency to respond more strongly to negative relative to positive stimuli arises across a variety of natural settings and experimental tasks [29], such that negative words, often signal danger or emergency and are thus attended to more closely than positive words [30, 31]. In this framework, increased interaction between tweeters as revealed by a greater use of I pronouns concurrent with generally exaggerated attention to the negative, may induce automatic mimicry [29]. Interpreted as contagion, the

general salience of the negative could manifest itself in word choice when producing a tweet and account for greater lexical uniformity for negative than positive word choice without invoking self-disclosure. Either negative emotion states are more contagious and undergo greater alignment or the inclination to self-disclose negative emotion states is suppressed more when tweeting from an individualist perspective (I). In future work we will explore responses over a time period that extends beyond 24-h as well as the generality of the link between self-disclosure when using first-person singular pronouns and negative emotional contagion as reflected in linguistic alignment. One strategy will be to examine retweets (i.e. re-posting another users' tweet) in response to crisis events to disentangle reactions of self-disclosure from emotional contagion. Retweets are less likely to exhibit comparable patterns for I and WE, and specifically, the disinclination for self-disclosure when valence is negative.

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Towards Cross-Cultural Design of Interfaces: Preferences in Interface Design Between Japanese and European Users

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Abstract. In an experimental study, cultural differences in preferences of interface layouts between Japanese and Europeans were examined. Participants could freely arrange a selection of buttons on an interface and layouts were quantitatively and qualitatively analyzed. Participants preferred symmetrical layouts with horizontally arranged buttons. Data suggest that participants considered usability as well as visual aesthetics in their layouts. Main differences were found in the choice of prominent buttons and their position in the layout. Furthermore, differences in way of thinking and communication appeared to be related to interface preferences.

Keywords: Cross-culture · Interface design · Japanese · European Human factors

1 Introduction

Our modern world is an information society where every individual depends greatly on the accessibility and availability of information. Travel, leisure, work or study nearly every aspect of everyday life involves the processing of digital information. Accordingly, an increasing number of devices for accessing information have penetrated public spaces. Interactive displays provide train schedules and information about train connections at stations in metropolitan areas. Tickets for movies, concerts or museums can be purchased at ticket machines; self-check-in counters at airports are replacing service counters. These interactive displays are used by a large variety of people. Especially when it comes to travel, or tourism, a large number of users from different countries will interact with these devices.

User Interface (UI) designers have become aware that culture is a factor that needs to be considered in design. The approach of “one design fits all” is not applicable anymore and designers are realizing that cultural factors affect ease of use, acceptance and emotional experience of users. Adaptive UI provide a great flexibility for designers to change the visual appearance of UI’s according to users’ preferences. Thereby adaptation should go beyond simple switching the input and output language but also must incorporate features such as color coding, use of graphics, symbols and icons, text directionality, information density, layout and organization structure of information. In

order to derive guidelines for cultural adaptive UI we have to answer the following two questions: (1) What cultural factors play a role in UI design? (2) How can these cultural factors be mapped with UI components?

In the following, the concept of culture will be reviewed. Furthermore, an overview of previous research of cultural factors and UI Design is given.

1.1 Dimensions of Culture

Culture has no geographical boundaries. Culture is learned behavior of a group of people who share knowledge, beliefs, values and attitudes that rules their behavior in society. Culture has been defined differently depending on the context of research. For the study proposed in this paper two approaches that are believed to be relevant for UI design are introduced. (1) Culture as differences in peoples' cognitive styles and perception [1] and (2) Culture as different degree of context in communication [2].

Nisbett [1] described in his book "The Geography of Thought" two distinguishable cognitive styles that are representative for Westerners (people of European culture) and Easterners (people of Chinese culture and countries influenced by it such as Korea and Japan). According to Nisbett, Westerners have the tendency to think analytically, use abstract rules, rather focus on objects, and apply formal logic to solve problems. Easterners tend to think holistically, focus on the relationship between objects, regard the context as important, and prefer an associative way of thinking. Numerous empirical studies seem to verify these claims (see an overview in [3]). For example, Masuda and Nisbett [4] showed American and Japanese participants animated scenes of a fish tank and ask them to describe the scene. Japanese made more statements about the background and relations between objects in the scene and the environment than Americans did suggesting, that Japanese attended more to the context and object relationships. Further studies have shown that East Asians are less likely to avoid contradictions compared to Westerners, and East Asians are more likely organizing objects thematically while Westerners prefer a taxonomic categorization [5]. In Sum, Easterners and Westerners differ in their way of thinking and what information they process from their environment and it can be expected that these differences are also relevant for UI interaction, where information processing plays an important role.

Another theory of culture that I believe is relevant for UI is Hall's [2] distinction of low-vs. high context cultures. Halls approach focuses on what information are considered in interactions. In high context cultures, e.g. Japan, non-verbal information from the environment such as the physical, social, and psychological context have a great impact on communication. On the other hand, in low context cultures, e.g. Germany, the verbal code is the primary source of information for creating and interpreting meaning. Gudykunst [6] compared communication patterns across US Americans, Japanese, Koreans and Australians and found that individualistic values and an independent self were related to low context communication whereas collectivistic values and an interdependent self were related to high context communication. Different styles in low vs. high context communication might affect UI interaction. For example, low context users might pay attention to and select different information as relevant for the interaction compared to high context users. Furthermore, the environmental, social, or psychological context an interface is embedded into might affect

user from high context cultures stronger than users from low context cultures. Users from high context cultures are more likely to refrain from using functions of a device, if that might have a negative impact on surrounding people. Japanese for example do usually not make phone calls when in the train but rather send text messages because speaking loudly on the phone can be annoying for other passengers.

The following paragraph will discuss the relationship between cultural factors and UI interaction in more detail.

1.2 Culture and UI

Culture determines users' response to interface design affecting users' perception, expectation and behavior. Users of different cultures emphasize different characteristics of usability and design. Ku and Chang [7] conducted cross-cultural usability testing of Web sites and found that even though Taiwanese and American users preferred similar interface designs and colors, they differed in their preferences of motion elements and button styles. Cultural differences are especially apparent when it comes to the design of icons. Choong and Salvendy [8] compared alphanumeric icons, pictorial icons and a combination of both. American users were more effective with the alphanumeric icons whereas Chinese users were more effective with the pictorial icons.

Several studies have intended to uncover the relationship between cultural factors and UI design. Würtz [9] compared Webpages across different countries with the goal to identify Web design components that are representative for specific cultural factors. According to Würtz, Websites in high context cultures used more animations, promoted collectivistic values and offered parallel navigation. Websites in low context cultures used fewer animations, promoted individualistic values and offered more likely linear navigation. Khan et al. [10] derived feature requirements for automotive touch screens based on Hofstede's cultural dimensions [11] (power distance, uncertainty avoidance, masculinity vs. femininity, individualism vs. collectivism, long- vs. short-term orientation) and tested different UI designs with participants from India and the UK. However, results were inconclusive across the cultural dimensions.

Problems with a top-down approach of mapping cultural dimensions to UI design is finding representative samples as reported in previous studies [6]. The drawn sample in Japan might be more individualistic than the sample in the US contrary to what one would expect according to Hofstede's cultural dimensions. Also instruments for measuring cultural dimensions don't work well on the individual level, making it difficult to apply these instrument in an experimental study with a small number of participants.

Therefore, the current study follows a bottom-up approach. Japanese and European users who represent different cultural backgrounds are asked to design an interface according to their own preferences. The goal is to find similarities and differences in the intuitive layout and arrangement of interface icons in order to understand user's preferences in visual aesthetics and information organization. In previous studies, participants could only choose between different pre-designed layouts. Such an approach can tell if people with different cultural background favor different design styles but it does not provide any qualitative data on users' preferences. The unique aspect of this study was that participants had a high degree of freedom to design their

own UI generating a rich data set that provides a deeper insight into culturally relevant components of UI design.

2 Method

2.1 Participants

Participants were recruited from Tokyo Institute of Technology in Japan. Fifteen Japanese and fifteen European Engineering students volunteered to participate in the experiment ranging in age between 20 and 32 years old. The European students were exchange students living in Japan for less than 12 months coming from countries such as Germany, Sweden, UK, Belgium and the Netherlands.

2.2 Material

Interface Task. A black sheet representing the size of a 13-inch display was used as surface for the interface design task. A smaller white field was inserted in the middle of the sheet for text and picture icons. Furthermore, 13 buttons with a diameter of 3 cm, 3 text fields and 3 pictograms the size of 3×3 cm were used. The 13 buttons represented typical functions for standard interfaces such as *Help*, *Menu*, *Home*, *Zoom In*, *Zoom Out*, *Search*, *Return*, *Forward*, *Speaker loudness*, *Speaker ON/Off*, *Brightness*, *Contrast* and *Print*. The buttons were selected based on students' recommendations in a pre-test. In this pre-test, 20 engineering students were asked which functions should a display that provides information for tourists in a public space provide. Students especially requested a *Print* button for being able to print out relevant information.

General Questions. The questionnaire consisted of general questions about participant's age, gender, study major, nationality and preferred used Operation System and Smartphone.

Choice's Analysis-Holism Scale [12]. This scale uses 24 items to rate peoples' tendency for analytic vs. holistic style of thinking. All items use a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Items were summed up to create a score for the way of thinking. Scores range between 24 (analytic style) until 168 (holistic style).

Low vs. High Context Communication Scale [6]. The scale measures if a person has the tendency to communicate in a low context vs. a high context style. The scale consists of 32 Likert items ranging from 1 (strongly agree) till 9 (strongly disagree). Items were summed up to create a score for the style of communication. Scores range between 32 (low context) until 288 (high context).

2.3 Experimental Design and Procedure

A quasi-experimental design comparing Japanese and European nationals was used in this study.

A group of four participants was tested at the same time. Every participant worked through the material at his/her own pace and it was made sure that participants were not able to look at each other's material. First, participants were greeted, and the purpose of the experiment was introduced. Then participants filled out the questionnaire with general questions. Afterwards, participants received the materials for the interface task and a written instruction. When participants finished with their interface layout, they notified the experimenter and a photo was taken from the interface. Last, participants filled out Choi's Analysis Holism scale and the Low vs. High context communication scale. An experimenter was present the entire time and participants could ask questions when they had problems to understand the written instructions. All materials were presented in English. One session took about 1 h.

3 Results

About 2/3 of participants used Windows operation system and 1/3 used macOS. There was no difference in the use of operation systems between European and Japanese participants. The majority of European participants used Android (60%) on their Smartphone, and 40% used Apples iOS. On the other hand, the majority of Japanese participants used Apples iOS (80%) and only a small percentage used Android (20%).

The interfaces generated by the participants were analyzed according to the following criteria: Symmetry, Horizontal vs. Vertical Orientation, Grouping, Positioning and Highlighting of specific buttons, and Arrangement of text fields and pictograms.

3.1 Interface Task

Symmetry. Symmetry is an important design principle and one of the Gestalt Laws. Each interface was evaluated on a scale from 1 till 6 (1 being highly asymmetrical and 6 being highly symmetrical). Highly symmetrical would be a layout that can be mirrored from left to right or top to bottom as shown in Fig. 1. A highly asymmetrical layout would be a layout where mirroring is not possible as shown in Fig. 2.

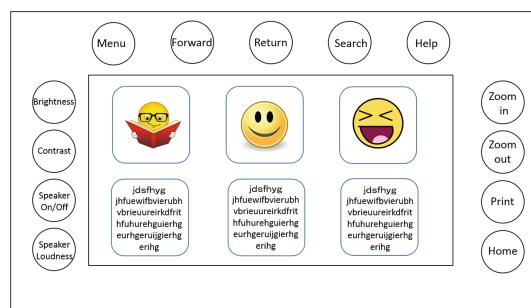


Fig. 1. Example of a symmetrical layout.

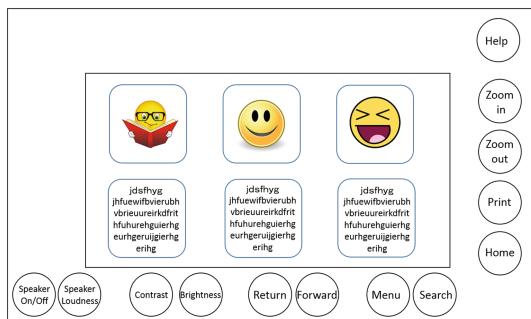


Fig. 2. Example of an asymmetrical layout.

Overall, participants showed a preference for symmetrical layouts (European: $M = 4.33$, $SD = 1.29$; Japanese: $M = 4.47$, $SD = 1.64$). There were no differences between European and Japanese participants in the symmetry of layouts, $t(28) = .25$, $p = .28$.

Horizontal vs. Vertical Orientation. Participant's interface layout was analyzed according to the preferred orientation for arranging the buttons. It was identified if buttons were more likely arranged on a horizontal axis or a vertical axis. If all 13 buttons were aligned horizontally, participants received the highest score 13. If all buttons were aligned vertically, participant would receive a score of 0. The higher the score for orientation, the more buttons were aligned horizontally. The example in Fig. 2 receives a score of 8, since 8 out of 13 buttons are aligned horizontally.

European as well as Japanese participants were more likely to align buttons in a horizontal way than in a vertical way (European: $M = 9.87$, $SD = 2.72$; Japanese: $M = 9.53$, $SD = 2.97$). There were no significant differences between the two groups, $t(28) = .32$, $p = .75$.

Grouping. The grouping of items is a common way to organize features that are believed to belong together. All participants used this Gestalt feature for their interface layout creating between 2 till 6 groups. The majority of participants organized the 13 buttons into 3–4 groups ($N = 19$). One participant only arranged one group, 6 organized buttons into 5 groups and 4 participants came up with 6 groups. European tended to create more groups than Japanese (European: $M = 4.33$, $SD = 1.29$; Japanese: $M = 3.87$, $SD = 0.83$), but differences failed to reach significance, $t(28) = 1.18$, $p = .25$.

Buttons were usually grouped according to their functionality. The majority of participants paired the following buttons: *Speaker ON/Off* and *Speaker loudness*; *Brightness* and *Contrast*; *Zoom In* and *Zoom Out*; *Forward* and *Return*. Many participants also formed the following groups: *Search*, *Help*, and *Menu*. The *Home* button was either displayed standing alone or grouped together with *Menu* and *Print*.

Positioning of Buttons. Japanese were more likely to single out specific buttons, arranging them slightly distant from other buttons. This was observed most often for the *Home* button ($N = 6$) and the *Print* button ($N = 4$). European participants selected

single buttons less likely, but if they chose a button to be singled out than this was observed most often for *Home* ($N = 4$) or *Search* ($N = 3$).

Furthermore, it was analyzed which buttons were placed at easy to reach areas, such as the corner of the display, or were easy to perceive, such as the center of the display frame. Figures 3 and 4 illustrate how a typical interface layout looked like for European and Japanese participants. The illustrations consider the most often chosen location for each button and the grouping of buttons observed in the interface task. European participants placed the *Home* button mainly in the left top corner ($N = 8$), and *Help* in the top right corner ($N = 9$). The *Menu* button was placed in the bottom left ($N = 5$) and *Print* was placed in the bottom right ($N = 5$). Japanese participants placed *Print* mostly in the top left corner ($N = 6$), *Help* in the top right corner ($N = 7$), *Brightness* and *Contrast* in the bottom left, and *Speaker On/Off* and *Speaker Loudness* in the bottom right corner. The biggest difference found in the Japanese participants' layout compared to the European participants' layout is the position of the *Home* button in the middle of the bottom frame. European participants did not use this location at all.

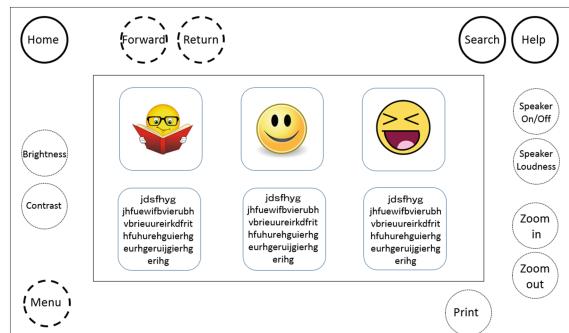


Fig. 3. Derived Interface layout for European participants. Highest agreement between participants were observed for buttons with dark circle, second highest agreement for buttons with dark dotted line and lowest agreement for buttons with thin dotted line.

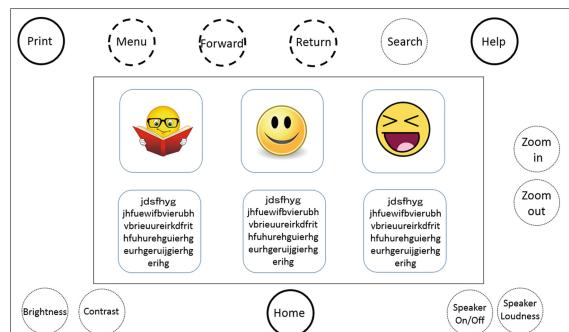


Fig. 4. Derived Interface layout for Japanese participants. Highest agreement between participants were observed for buttons with dark circle, second highest agreement for buttons with dark dotted line and lowest agreement for buttons with thin dotted line.

Similarities in the layouts were observed for *Search* and *Help* which were often paired and were most likely displayed in the top right corner. The *Home* button was often positioned slightly distant from other buttons to increase its perceivability. *Forward* and *Return* buttons were positioned at the top of the frame. Also the grouping of buttons was similar between Japanese and European participants.

Differences were especially apparent in the placement of the *Home* button. Germans chose the top left corner whereas Japanese chose the middle of the bottom frame. Location for *Print* and *Menu* buttons was different as well.

Arrangement of Text Fields and Pictograms. Text fields and pictograms were paired by most of the participants. Pictogram at the top and text field at the bottom was observed in 19 cases. The opposite was true for only 2 cases. Creating groups of only text fields and only pictograms was observed in 6 cases. Even though there was no indication that text and pictogram were belonging together, most participant felt grouping them together was most natural.

3.2 Questionnaires

Choice's Analysis-Holism Scale. Results of the Analysis-Holism scale indicate that participants had more likely a tendency to holistic thinking ($M = 114.53$, $SD = 8.38$) with a range between 101 and 129 points. There were no significant differences between European and Japanese participants, $t(28) = .60$, $p > .05$.

Low vs. High Context Communication Scale. Results of the communication scale indicate that participants favored more likely a high context communication style ($M = 167.17$, $SD = 14.75$) with a range between 136 and 195 points. German and Japanese communication style did not differ significantly, $t(28) = -.67$, $p > .05$.

3.3 Relationship Between Questionnaires and Interface Task

The Interface criteria Symmetry, Horizontal vs. Vertical Orientation, and Grouping were correlated with the results of the above questionnaires. The analyses revealed that analytic thinker preferred a symmetrical layout ($r = -.48$, $p = .01$). Furthermore, participants who employed high context communication generated more groups for the buttons of the interface ($r = .40$, $p = .03$).

4 Discussion

The goal of the study was to reveal cultural preferences in visual aesthetics and information organization of interface layouts. Other than in previous studies participants in this study could design an interface layout freely according to their own liking. The quantitative and qualitative analyzes of data showed similarities and differences in interface layouts between Japanese and Europeans.

Similarities were found in the preference of symmetrical layouts over asymmetrical layouts, and the preference of a horizontal arrangement of buttons over a vertical arrangement of buttons. Also, participants organized buttons in small groups creating similar pairs of buttons.

Differences were found in which buttons were chosen for prominent positions and their location. Japanese participants highlighted *Home* and *Print* button whereas European participants highlighted *Home* and *Search* buttons. Furthermore, Japanese displayed the *Home* button in the middle of the bottom frame in order to increase its visibility. However, European participants did not choose this position generally.

The similarities between the interfaces created by participants' show that especially young people who are familiar with modern technologies have developed a certain image of how interfaces are supposed to look like. There was especially high agreement among participants about the importance of certain buttons placing them at prominent positions. In addition, participants largely agreed on the functional grouping of buttons and applied basic principles of the Gestalt laws to come up with a visual pleasant design. Participants chose buttons and the location for each button intentionally considering the functionality of the buttons. However, participants also considered the overall look of the interface. Thus, not only usability but also visual aesthetics were an important factor for the design of these interfaces.

The position of the *Home* button at the middle of the bottom frame by Japanese participants was an intriguing finding and reflects the position of the *Home* button in Smartphones (e.g. Apple iOS or Android). We did not ask participants if they use computers or Smartphones more often, but the results suggest that Japanese participants might use Smartphones as a predominant tool whereas European students rely more on Computers.

Questionnaire data revealed that even though cultural differences in the way of thinking and communication style were not apparent, they affected interface preferences among participants. Analytic thinker were more likely generating a symmetrical layout, whereas high context communication was related to the grouping of buttons. Previous studies have reported similar difficulties in revealing cultural differences in student samples [6]. Our study sample might have been too small to detect differences. Furthermore, our study sample was very homogenous. All participants were engineering students studying at the same University, and being of similar age. Cultural differences might become more apparent when studying wider age groups with different backgrounds. Nevertheless, correlation data showed that cultural factors do affect preferences in interface layouts and therefore should not be ignored. Future studies should examine a wide range of different cultural factors in a systematic manner. At least, the results of the current study suggest that cultural factors affecting people's way of thinking and communication are good candidates to be examined more closely.

5 Implications

Interactive displays in public spaces such as train stations, airports or locations frequently populated by tourists must be accessible and perceivable by people with different cultural backgrounds. Designers have to consider that different preferences and expectations in interface design affects usability and acceptance of such systems.

Studying interface preferences in a bottom up fashion by letting users freely design their own interface layouts reveals what underlying principle users apply, and where users set priorities for the design. Those intuitively generated layouts are the result of many different factors such as users' previous experience, individual preferences, age, gender, and cultural background. Therefore, designers should first look at similarities between users and apply in what users agree upon to the design of interfaces. Additionally, discrepancies between users need to be addressed as well. Designers can let users chose between different design alternatives or let the system adapt automatically to specific user' characteristics. If providing design alternatives is not possible, than the functions that are linked to different user expectations need to be easy to perceive. Perceivability can be enhanced by highlighting functions through size and color, using motion, or placing them at easy to spot locations of the display such as top corners or the middle of the frame.

Designers should also keep in mind that interacting with an interface is a type of communication were information are exchanged between two parties. Communication per se is strongly influenced by cultural factors and it can thereby be expected that aspects of culture as well affect men-machine interaction.

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Cross-Cultural Comparison of German and Japanese Mobile Messenger Communication

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Abstract. The main goal of this research is to investigate cross-cultural differences in communication with Mobile Instant Messenger (MIM). A survey was conducted to ask German and Japanese students about how they usually communicate via MIM. The results of the survey indicate that German students had the tendency to use a direct communication style that is typical for low context cultures, such as voicing their opinion directly or creating clear and easy to understand messages. On the other hand, Japanese students were more likely to use an indirect communication style typical for high-context cultures by incorporating images into messages that could be interpreted in different ways. The results of the survey suggest that cultural differences in communication also affect how people communicate in MIM. Implications for future research and MIM applications are discussed.

Keywords: Mobile Instant Messenger · Communication · Cross-culture
German · Japanese · Low context · High context

1 Introduction

Mobile Instant Messenger (MIM) are the most popular way for young people to communicate with friends, exceeding face-to-face communication, email and voice calls [1, 2]. MIM are messaging services that allow the user to send instant messages over mobile devices such as smartphones. The number of smartphone-based Mobile Instant Messenger (MIM) applications has been increased tremendously in the last couple of years. As of January 2017, there are more than 1 billion WhatsApp users, 1 billion Facebook Messenger users, 846 million WeChat users, and 217 million LINE Messenger users [3]. Owing to their free-chat services, MIMs are a cheaper alternative to short message service (SMS) which is telecommunication operator-based, cost-consuming, and has a limit on the number of characters that can be send with one message [4, 5]. MIM applications, such as Facebook Messenger, WhatsApp, WeChat, and LINE Messenger offer features that are not limited to text messages, offering

popular functions, such as video and audio messages, voice-call, video-call, group chat, graphics exchange, as well as emoji¹ or stickers².

In the early stages of the digital revolution, e-mail was the main tool for communication. E-mail differs from MIM in several aspects. First, e-mail is an asynchronous communication medium. Sender and receiver do not have to be present at the same time and often several days or even weeks may be between messages. Also, e-mails are more likely used in a formal setting [6]. MIM on the other hand allows synchronous or near-synchronous communication between people without the need of meeting face-to-face. When installed on a Smartphone, messages can be received wherever, whenever making MIM to a convenient everyday communication tool. Messages can be rapidly exchanged allowing a near synchronous dialog with another person or even a group of people. The convenience, ubiquity, availability and the casual character of MIM have made it to a preferred tool for communication especially among young people. Considering the importance of MIM as a communication tool in everyday life it is surprising that only very few studies can be found that study this type of text-based messaging [7, 8]. The goal of this study is therefore to examine how young people communicate with each other via MIM. Since text-based messaging is a type of communication, we especially wanted to see if communication pattern typical for a certain culture are also reflected in MIM or whether MIM communication has universal characteristics.

1.1 Communication in MIM

Even though, there are various types of MIMs available on the market; MIM's interface, available functions and general use are comparable across applications [9]. MIM applications allow dialogs between two users or group chats. Text messages can be enhanced by including small images, symbols or ideograms. The application notifies users which communication partners are available, or if a sent message has been read. Some might therefore conclude that users across the globe use this technology in the same way. However, we believe that MIM is only a tool used for communication, just as a person's voice is used to convey a message. How that tool is used and what style of messages user send is affected by the communication culture a user is accustomed to. The study presented here attempts to understand how people with different cultural background use modern communication technologies such as MIM.

Modern communication technology such as MIM makes communication across the globe easier and faster than ever, however, it may also amplify cultural differences, and reduces communication effectiveness. Without the appropriate use of verbal and nonverbal codes, misunderstandings are very likely in computer-mediated or online communication [10, 11]. In our globalized world, it is necessary to adapt one's own verbal and nonverbal messages to the appropriate cultural context. Therefore, it is

¹ Emoji are small images, symbols or icons representing simple facial expression or displaying certain objects such as sun, snow, car, etc.

² Sticker are cartoon style drawings that depict a certain feeling, emotion, idea or thought such as "I am happy", "I am feeling lonely", "I am coming home" or "I want to go out drinking".

essential to understand cultural differences in communication with modern telecommunication applications such as MIM in order to improve communication effectiveness and to avoid misunderstanding. This research is also relevant for the development of chat bots, computer programs that conduct conversations via text messages. Chatbots have become increasingly popular and are often used for customer service or information acquisition. The messaging style of chatbots can have an effect on customer satisfaction or may affect the perception of a certain institute or company they represent.

The main objective of the present study is to investigate cultural differences in communication with MIM. For our research, we chose German and Japanese students because MIM is the most popular medium for young people to communicate with friends, and Germany and Japan are comparable in their technological advancement but differ in communication style. We expect that well described differences in previous studies of face-to-face communication will also affect the communication style people use in MIM. The results of the study will be used to derive suggestions to improve MIM communication.

1.2 Low vs. High Context Communication

A big difference in German and Japanese people's communication style is how much the context of the communication situation is regarded in an exchange. The context can be physical, social, and psychological. Differences in regard to the context of communication have been described by Hall [12] who distinguished between Low-context and High-context cultures. According to Hall's theory, Germany is a low-context culture whereas Japan is a high-context culture. In low-context cultures, the meaning of the message is explicitly encoded in the verbal message. The verbal code is the major source for creating and interpreting the meaning of a message. People from low-context cultures communicate directly and say what they think. The message can be segregated from the person. Moreover, rules and expectations are explicitly outlined [12–14].

On the other hand, in high-context communication, most of the information is internalized in the person or in the physical context. Apart from verbal cues, communicators also look to the physical, socio-relational, and perceptual environments for information. Those additional information have an immense impact on communication for high-context communicators [11]. Words are not always necessary to convey meaning, and messages are interpreted based on shared experiences and expectations. Therefore, as opposed to low-context communication, high-context communication is fast and proficient. However, the burden of understanding rests on the receiver, the rules for communication are implicit, and communicators are expected to know and understand unspoken messages. Hence, as opposed to low-context communication, in high-context communication it is necessary to interpret indirect messages, and to be sensitive to the social role of the communication partner.

1.3 Hypotheses

We expect that the differences in communication between German and Japanese that are well described in previous research will also affect how German and Japanese

communicate via MIM. So far, research in this area is spare. For example, Xie et al. [15] examined cultural differences in communication effectiveness and user interface design and found that high-context communicators prefer nonverbal cues whereas low-context communicators prefer verbal information. Another research conducted by Kayan et al. [8] on non-mobile instant messaging reported that multi-party chat, audio-video chat and emoticons were more popular in Asian cultures such as India and Singapore than in North America.

We assume that Germans who are low-context communicators will also use a low-context communication style in MIM whereas Japanese who are high-context communicators will use a high-context communication style in MIM. Specifically, it is expected that Germans will mainly rely on written words for creating and interpreting meaning, and do not feel the lack of nonverbal information as much as Japanese. Germans will convey their intentions, desires and needs explicitly in text messages. Germans will tend to send longer messages, and explain their thoughts more literally to avoid misunderstandings.

For Japanese, we assume that they convey their messages indirectly using graphical expressions such as stickers. Japanese avoid expressing their intentions and feelings directly and will set their messages into a context that needs to be interpreted by the recipient.

2 Method

2.1 Participants

91 German students and 96 Japanese students participated in this survey. Students ranged in age between 18 and 33 years old with a median age of 22. The majority of participants were Bachelor students (54%), followed by Master students (41%), and a small minority of Doctorate students (5%).

2.2 Material

We developed a Japanese and a German version of an online survey consisting of 72 questions. Questions were designed to test if cultural differences in communication style in MIM do exist. 14 questions were general questions about participants' demography, and the other questions asked about various communication styles in MIM. Three different types of questions were used in the survey, Likert scales, Multiple choice and free input. Some of the questions asked about often used communication styles in MIM, but we also developed specific scenarios and asked participant how they would respond. For example, in one question, we asked what type of message you would send if you would like to invite a friend for lunch or how would you respond if you have to decline an invitation for a party. We will present here a partial analysis of the survey data focusing on low vs. high context communication in MIM.

2.3 Experimental Design and Procedure

A quasi-experimental design was conducted comparing German and Japanese students' use of MIM. Participants filled out the survey online at their own pace. Filling out the survey took about 30 min

3 Results

The majority of German participants has been using MIM since more than 3 years and the most popular messenger is "WhatsApp" (96%). German students exchange messages with about 3–4 persons on average, who are mainly friends or family members.

Most of the Japanese students have also been using MIM since more than 3 years. However, the most popular messenger for them is "Line" (92%). Japanese students exchange messages mainly with friends and are messaging with 1–4 persons on a daily basis.

The goal of this survey was to examine, if there are cultural differences in the use of MIM between German and Japanese students. Specifically, we wanted to know if Germans use a communication style in MIM that reflects low-context communication and whether Japanese use a communication style in MIM that reflects high-context communication.

We found similarities as well as differences in German and Japanese students' communication styles on MIM. First, both Germans as well as Japanese liked to add graphical expressions such as *emoticons*, *kaomoji*, *emoji*, or *stickers* to their messages. Participants from both Nationalities also reported that they felt like something is missing, if they cannot incorporate *emoji* or *stickers* into their messages. The biggest difference between German and Japanese students was in the type of graphical expressions they prefer to use. Germans overwhelmingly reported to prefer *emoji* such as in Fig. 1, whereas Japanese prefer the more complex *stickers* such as displayed in Fig. 2 for MIM communication.

In addition, when it comes to receiving a message, German participants preferred messages that contained *emoji* whereas Japanese preferred messages that contained *stickers*. Japanese also reported that they could understand messages better when it contained *stickers*. In general, it seems that Japanese students had less problems to understand the meaning of stickers compared to German students. However, even if unsure about the meaning of *stickers*, Japanese still wouldn't mind to use them in messages, whereas Germans rather refrain from using an expression they are not sure about what it means. In one question, we asked respondents how they would reply if they were not interested in a specific discussion. The majority of Germans (about 40%) would not respond at all. However, still 30% of Germans would say directly that they are not interested. On the other hand, Japanese would either not respond at all (more than 50%) or just send a *sticker* (25%), see Fig. 3.

In another scenario, we asked participants what type of message they would send if they ask a friend out for lunch. German participants chose most often a *text message with emoji*. Japanese on the other hand would more likely send a *text with sticker*. In general, Germans prefer to use more simple graphical expressions such as text

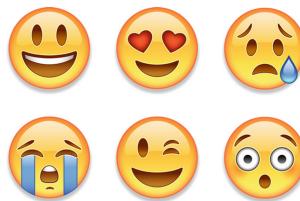


Fig. 1. Examples for *emoji* in MIM.



Fig. 2. Examples for *stickers* in MIM.

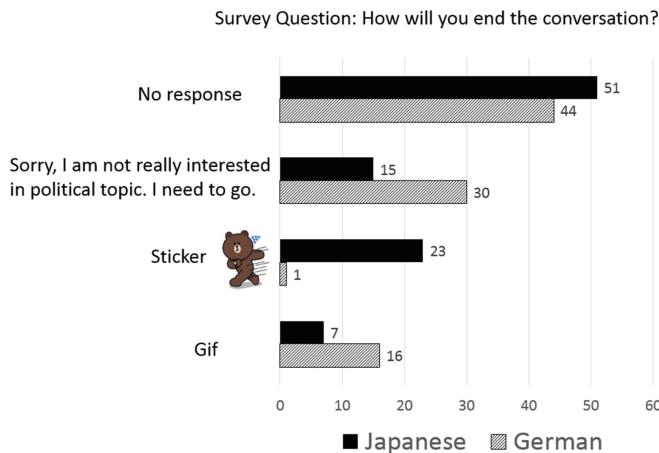


Fig. 3. Number of Answers for Japanese and German students to the survey question: in an IM conversation, your friend suddenly complains to you about the political situation in your country. Apparently, you are not interested in the topic and after some back and forth texting on the said topic, the conversation halts. How would you end the conversation?

emoticons, e.g.;), or *emoji* ☺, whereas Japanese prefer more complex graphical expressions such as *kaomoji*, e.g.: (^_^), or *stickers* as seen in Fig. 4.

In sum, both German as well as Japanese students liked to add graphical expressions to text messages and reported that they can express themselves better, if they can include such graphical expressions. The difference between German and Japanese is in

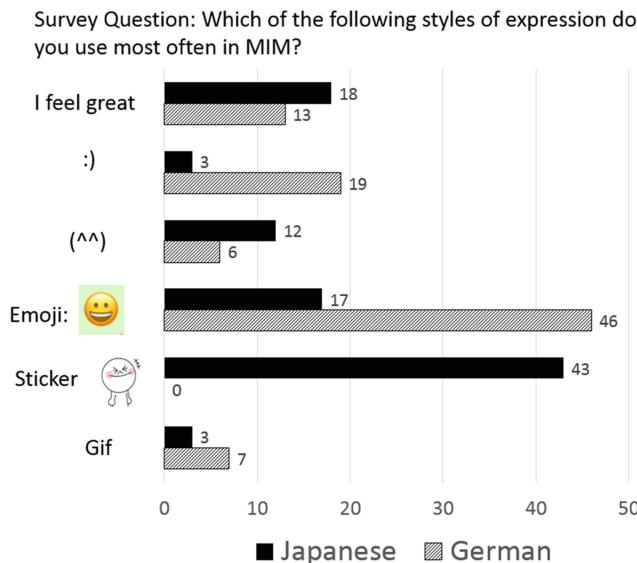


Fig. 4. Number of Answers for Japanese and German students to the survey question: which of the following styles of expression do you use most often in MIM?

the preference of different types of graphical expressions. Germans prefer the more simple *emoji*, whereas Japanese preferred the more complex *stickers*. Furthermore, Germans did not hesitate to voice disagreement directly, whereas Japanese preferred using a *sticker* that kept the writers intent unclear. That *stickers* are in general more unclear and leave room for interpretation was also shown in participants answers. Japanese had received graphical expression with unclear meaning more often than Germans. Also, Japanese did not mind as much to send unclear messages, whereas Germans would rather refrain from sending messages that are unclear and could be interpreted in different ways.

4 Discussion

The results of the survey suggest that German and Japanese students use MIM for similar purpose but employ different communication styles. German and Japanese students use MIM very frequently to communicate with family and friends. A common style of communication for German students is sending text messages with *emoji*. A common style of communication for Japanese students are text messages with *stickers*. It is interesting that both Japanese as well as Germans feel that something is missing, if there is only plain text and that they feel that adding graphical expressions such as *emoji* or *stickers* can improve the communication. However, it is interesting that Germans favor the more simple *emoji*, that mainly express a variation of easy to interpret facial expressions, whereas Japanese favor the more complex *stickers* that often leave room for interpretation. We believe that the choice of these different modes

of communication reflects cultural differences in communication. Germany is described as a low context culture where the sender has to express the message explicitly in the verbal code. It is the responsibility of the sender that the message will be understood correctly. Using *emoji* that depict certain feelings such as happiness or excitement add information to the message and help the receiver to interpret it correctly. Also, facial expressions of basic emotions as depicted in *emoji* are universally understandable and will be very likely understood correctly by the recipient.

On the other hand, Japan as a high context culture shows a communication style that involves the interpretation of the physical, social and psychological context. It is the responsibility of the receiver to interpret a message using not only the verbal code but also nonverbal cues for understanding what the sender intended to say. *Sticker* provide a rich context for a message. *Sticker* do not just express a specific emotion but can be interpreted in different ways depending on the situation. For example, the sticker in Fig. 5 could mean, “I am lonely”, “I don’t know what to do”, “I am a bit embarrassed”.



Fig. 5. Typical *sticker* used in the MIM application LINE

We believe that *sticker* are popular with Japanese students because they enable a communication style similar to typical face-to-face communication in Japan. Japanese speaker often chose an indirect way of expressing what they think and avoid saying anything directly that could hurt the feelings of the receiver. In general, Japanese are well trained to “read the air” to interpret the context of a message and have less problems to understand and interpret *stickers* compared to Germans. Moreover, Japanese are used to receive and interpret ambiguous messages and stated that they would use *stickers* even if they are not sure what it means. German students on the other hand are used that messages are explicit and direct and would therefore hesitate to convey a message in an unclear or ambiguous way. That was also reflected in students answering pattern. When asked how to voice a different opinion from the speaker most German students chose to say what they think directly whereas the majority of Japanese chose just sending a *sticker*.

5 Implications and Future Research

For many years, there had been a debate in the research community, if new communication media also will result in new ways of communication. Communication per say is strongly influenced by cultural factors, way of thinking, values and so on. People might

use new types of signs and symbols that are available with new communication media, but the underlying communication style still reflects cultural preferences and commonly accepted ways of communication present in a culture. New media might open up new ways to express oneself, but still people show cultural differences in how they use these new tools. This is even more remarkable if one considers that the technology behind or the basic interface layout people use is very much the same. Still, how that technology is used is strongly affected by cultural factors.

The study presented here has shown that differences in communication in MIM exist. Further research should study systematically how intercultural differences in communication are reflected in MIM by analyzing actual communication protocols of users. Our study has only asked users how they communicate. By analyzing communication protocols, users' behavior can be studied directly in an unobtrusive way. Looking at conversation protocols in MIM could reveal distinctive communication patterns for specific cultures.

A further line of research should focus on how the user perceives different communication styles in MIM. Does the communication style affect what impression the user has about the sender? Can different images be created based on the communication style? This might be also interesting for the development of chatbots in customer service. The goal in customer service is to satisfy user requests, but also to enhance the image and perception of a brand or company. Adjusting automatically generated chatbot messages to the customer's cultural background might increase communication effectiveness and reduce misunderstandings.

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Using Social Media to Understand Cyber Attack Behavior

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Abstract. As networked and computer technologies continue to pervade all aspects of our lives, the threat from cyber attacks has also increased. However, detecting attacks, much less predicting them in advance, is a non-trivial task due to the anonymity of cyber attackers and the ambiguity of network data collected within an organization; often, by the time an attack pattern is recognized, the damage has already been done. Evidence suggests that the public discourse in external sources, such as news and social media, is often correlated with the occurrence of larger phenomena, such as election results or violent attacks. In this paper, we propose an approach that uses sentiment polarity as a sensor to analyze the social behavior of groups on social media as an indicator of cyber attack behavior. We developed an unsupervised sentiment prediction method that uses emotional signals to enhance the sentiment signal from sparse textual indicators. To explore the efficacy of sentiment polarity as an indicator of cyber-attacks, we performed experiments using real-world data from Twitter that corresponds to attacks by a well-known hacktivist group.

Keywords: Cybersecurity · Social media analytics · Sentiment analysis

1 Introduction

As networked and computer technologies continue to pervade all aspects of our lives, the threat from cyber attacks has also increased. The broad range of cyber-attacks, such as DDoS attacks, data breaches, and account hijacking, can have a strong negative impact on individuals, businesses, and broader society. Therefore, understanding these attacks and predicting them before they occur is an emerging research area with widespread applications. However, detecting attacks, much less predicting them in advance, is a non-trivial task due to the anonymity of cyber attackers and the ambiguity of network data collected within an organization; often, by the time an attack pattern is recognized, the damage has already been done. Evidence suggests that the public discourse in external sources, such as news and social media, is often correlated with the occurrence of larger phenomena, such as election results or violent attacks. Social media, in particular, turns users into “social sensors,” empowering them to participate

in an online ecosystem that interacts with behavior in the physical world. We believe the same principle can apply to cyber attacks, where open source data may provide indicators to help understand the social and behavioral phenomena leading up to an attack.

In this paper, we propose an approach that uses sentiment polarity as a sensor to analyze the social behavior of groups on social media as an indicator of cyber attack behavior. For example, extreme negative sentiment towards an organization may indicate a higher probability of it being the target of a cyber attack. However, measuring sentiment itself in social media is a challenging task due to the lack of ground truth datasets with sentiment labels and the need to extract effective and robust features from short and noisy social media posts. Both challenges make standard supervised sentiment analysis methods inapplicable. Instead, we developed an unsupervised sentiment inference method that uses emotional signals to enhance the sentiment signal from sparse textual indicators. In this method, we incorporate both emotion words and emoticons and model the correlations among them in an unsupervised manner.

To explore the efficacy of sentiment polarity as an indicator of cyber attacks, we performed experiments using real-world data from Twitter that corresponds to attacks by a well-known hacktivist group. The experimental results show that the proposed sentiment prediction framework can recognize distinct behavioral patterns associated with these attacks. We also performed a temporal analysis on the sentiment for these attacks, which provides deeper understanding of the progression of ongoing cyber attack behaviors over time.

Our contributions are summarized as follows:

- (1) We propose to utilize sentiment polarity in social media as a sensor to understand and predict social behaviors related to cyber attacks;
- (2) We apply an unsupervised sentiment analysis using emotional signals, which models emotion indications without requiring labeled sentiment data beforehand;
- (3) We conduct experiments on real-world Tweet data related to several cyber-attacks by a well-known hacktivist group to demonstrate the effectiveness of the proposed sentiment prediction framework.

The remainder of this paper is organized as follows. In Sect. 2, we describe the use of sentiment in social media for understanding real-world events and its potential application to cyber attacks. In Sect. 3, we describe a sentiment model for social media that we applied to this problem. In Sect. 4, we present the results of experiments using Twitter data related to hacktivist attacks to illustrate the role of sentiment in this discourse. Finally, in Sect. 5 we present conclusions and plans for future work.

2 Sentiment Analysis for Behavioral Understanding

Sentiment analysis, the automated identification and quantification of opinions in a piece of text, has been an important task for natural language processing and computational linguistics. Because of the nature of social media platforms, such as Twitter and Facebook, as forums for explicitly sharing opinions and experiences, this rich social discourse can be exploited for understanding sentiment around a variety of topics

related to real-world observed behaviors. For example, sentiment analysis has been used in prediction of public opinion and political polls [10], stock market prediction [1], and analysis of large social movements or protests [2, 12].

While cyber attacks are often regarded as a technical problem for network security experts, the individuals and groups that perpetrate these attacks are still acting in accordance with the same types of social and behavioral factors that characterize these political events, stock market shifts, or social movements. Because cyber attacks are grounded within this social discourse, social media has already demonstrated value as a means for analyzing and understanding attacks, for example in threat intelligence fusion for systematic detection of cyber attacks [9] or detection of malicious cyber attack discussions [8]. Researchers have also used social media, such as Twitter and blog posts, to extract details about cyber attacks, such as attack identifiers (e.g., source IP address or MD5 hash of malware) [7], or the trending popularity of common vulnerabilities and exposures (CVEs) and their propensity to turn into real attacks [11].

We propose to extend this existing body of research on using social media to understand cyber attacks by analyzing the sentiment used to communicate cyber attack motivations, plans, or outcomes. Just as sentiment in social media can provide predictive indicators for other types of observed behaviors (e.g., political behaviors, social movements), we propose that it can also provide a way to understand and potentially predict cyber attacks. People on social media engage in massive discussion of upcoming and ongoing attacks, using it as a platform for describing possible motivations and emerging techniques, as well as for recruitment of participants for some large-scale hacktivist attacks. Social media provides us with abundant data, such as user profiles or network structure, to provide context for sentiment analyses of a post's textual content. This context enables analysis of sentiment towards particular targets of interest or motivating events, or sentiment patterns of social networks known to be part of cyber attack organizations. Preventing cyber attack damage may remain the purview of network security experts, but leveraging sentiment in the social discourse around cyber attack behaviors may enable prediction or early detection of attack preparations.

3 Modeling Sentiment in Social Media

Social media posts, such as tweets or Facebook updates, are distinct from other types of text communication. While they are often more explicit in terms of conveying sentiment than news media or other forms of communication, the posts themselves are often short and use quite informal language, making them harder to analyze using standard natural language processing approaches. Further, despite the massive quantity of social media data, there is a dearth of data sets that have been pre-annotated with sentiment information needed to train automated sentiment analysis tools. In this section, we discuss an approach to sentiment analysis in social media that addresses both of these challenges.

Many approaches to sentiment analysis in social media use supervised learning approaches [3], which require large sets of labeled training data and a large number of features for analysis. Acquiring such data is often very time consuming and labor intensive, especially when trying to develop a representative sample over large-scale

social media data. Unsupervised methods, on the other hand, do not require extensive annotation of training data, but tend to be based on predefined dictionaries of positive and negative words [1, 10]. Although manually labeling data for supervised learning is very costly, amassing vast quantities of unlabeled data for unsupervised analysis is relatively easy in social media.

To leverage the unique nature of social media data as a sentiment sensor to understand cyber attacks, we apply a novel unsupervised approach we developed in prior work [6]. Rather than relying exclusively on traditional linguistic features, this approach exploits the presence of emotional signals contained in social media posts. Examples of these emotional signals are given in Table 1. In this approach, we investigated the following problems: Are the emotional signals available in social media potentially useful for sentiment analysis? How can the emotional signals be explicitly represented and incorporated into an unsupervised sentiment analysis framework? Is the integration of emotional signals helpful for real-world sentiment analysis applications?

Table 1. Emotional signals used to indicate positive and negative sentiment in social media

| | |
|----------|---|
| Positive | :), (-:, =), (= , (:, :), :D, :d, d; , :), (;, 8), (8, 8), ;), ;), ;), (;;;-), (-;, (;, ^ _ ^ |
| Negative | :(,-):, = (,)= , :(,):, 8(,):8, :-() |

Abundant emotional signals are observed in social media. Emotional signals are any information that could be correlated with sentiment polarity of a document or the words in the document. For example, when communicating in the physical world, it is common for people to supplement vocal interaction with gestures and facial expressions. Similarly, in social media, users develop visual cues that are strongly associated with their emotional states. These cues, known as emoticons (or facial expressions), are widely used to show the emotion that a user’s post represents. When the authors use emoticons, they are effectively marking up the text with an emotional state. In this case, an emoticon is considered as an emotional signal. To link these emotional signals with the other content of a social media post, we look to emotional consistency theory [4, 5], which is well-established in the social sciences and models the fact that simultaneously occurring mental processes—emotions, speech, etc.—are compatible with one another. This theory suggests that words and emotional signals that often co-occur will be consistent with the same sentiment orientation, even when the posts are short.

Using this insight, our approach to sentiment analysis in social media models emotional indication in several ways:

- **Post-level Emotion Indication.** Post-level emotion indication strongly reflects the sentiment polarity of a post. The key idea of modeling post-level emotion indication is to make the sentiment polarity of a post as close as possible to the emotion indication of the post.
- **Word-level Emotion Indication.** The overall sentiment of a post is positively correlated with the sentiment of the words in that post. By modeling word-level

emotional signals, we can use this relationship to infer the sentiment polarity of a post.

Using these models of emotion indication, we then model the correlation between emotional signals and the text of a social media post at two separate levels:

- **Post-level Emotion Correlation.** To model post-level emotion correlation, we construct a post-post graph. The key idea is that if two nodes are close in the graph, their sentiment labels are also close to each other. This intuition is consistent with traditional supervised sentiment analysis, in which it is assumed that sentiment labels of two posts are more likely to be consistent when their textual similarity is high.
- **Word-level Emotion Correlation.** Similar to the interpretation of the post-level emotion correlation, we construct a word-word graph. The basic idea here is to build a latent connection to make sentiment labels of two words as close as possible if they are close in the graph.

Using this unsupervised framework, we developed a sentiment model that quantifies the sentiment of a social media post from 0 (negative) to 1 (positive). To train this model, we collected historical Twitter data from January through December 2016 related to cyber security topics, querying for specific known sources of attacks (e.g., names of hacking groups), discussions about cyber attack tactics (e.g., DDOS, phishing, etc.), specific known attack names (e.g., botnet, low orbit ion cannon, etc.), and announcements of new vulnerabilities and discussion of attacks by security experts. We collected a total of 498,019 total tweets using this method. These tweets were then automatically labeled as either positive (1) or negative (0) based on the words and emotional signal correlations indicated within the post; tweets with a mix of signals were discarded. The final training set consisted of 3,414 automatically labeled tweets. Using this dataset, we trained a logistic regression model to classify tweets according to their sentiment polarity. We performed 10-fold cross-validation on the training data, with the results shown in Table 2. The results show that, using this unsupervised method on our cyber-related training data, we can produce a high-quality model that can infer the sentiment of a tweet. In the next section, we explore how we can use this sentiment model to help understand and predict cyber attacks in the wild.

Table 2. Performance results of the sentiment model trained on cyber-related tweets

| Precision | Recall | F1 | Accuracy |
|-------------------|-------------------|-------------------|-------------------|
| 0.858 ± 0.092 | 0.844 ± 0.116 | 0.849 ± 0.049 | 0.852 ± 0.092 |

4 Experiments: Relating Sentiment and Cyber Attacks

In the previous section, we presented a model for assigning sentiment labels to social media posts. Here, we investigate the utility of this model for understanding and predicting cyber attacks. To explore the efficacy of this model, we created a dataset consisting of several real-world cyber attacks perpetrated by a well-known hacktivist

group. This group seeks social change through cyber attacks on government, corporate, and religious websites and networked systems and makes extensive use of social media for recruitment of attack participants and publicity of attack motivations and outcomes. We selected three attacks (referenced below as Attack1, Attack2, and Attack3) that occurred between 2015 and 2017 for in-depth analysis, collecting historical Twitter data related to these attacks (using keywords associated with the motivation, target, and perpetrating organization of the attack) for a period of three weeks before and one week after the attack itself. Using this data, we conducted two types of experiments: (1) analysis of sentiment classification results; and (2) analysis of temporal sentiment trends.

For our first experiment, we wanted to analyze the ability of our sentiment classifier to produce useful results for these real-world cyber attacks. To do this, we used a standard approach in unsupervised machine learning where clustering is used to assess the discriminatory power of a trained classifier. A successful classifier will be more discriminatory, that is, will be able to identify distinct, non-overlapping classes of behavior such that the clusters are maximally different from one another, but items within each cluster are maximally similar. In our case, we wanted to show that our trained sentiment model could discriminate between positive and negative sentiment tweets related to real-world cyber attacks. For this experiment, we assumed that the sentiment space can be divided into two or three distinct categories (i.e., either just positive or negative, or positive, negative, and neutral). To measure the quality of our sentiment model, we used two standard clustering metrics: separation (i.e., the inter-cluster distinctiveness) and cohesion (i.e., intra-cluster similarity). These can be combined into a single composite metric known as the silhouette score; the silhouette score ranges from 0 to 1, with a score closer to 1 indicating more discriminatory clusters. The results of this cluster experiment are summarized in Table 3, showing very high silhouette scores for all attacks for both two and three clusters. We see slightly better results when we assume three clusters, indicating that our trained model is good at using emotional signal indicators in social media posts to differentiate between positive, negative, and neutral sentiment.

Table 3. Silhouette scores for each cyber attack

| Cyber attack | Clusters | |
|--------------|----------|-------|
| | 2 | 3 |
| Attack1 | 0.914 | 0.976 |
| Attack2 | 0.921 | 0.981 |
| Attack3 | 0.908 | 0.986 |

We used principal component analysis (PCA), a feature reduction method, to project the clustering results into 2D space for easier visualization. Figure 1 shows the cluster analysis results for Attack1, Attack2, and Attack3. In all three attacks, we observe three very distinct clusters for positive, negative, and neutral sentiment, which is consistent with the high silhouette scores.

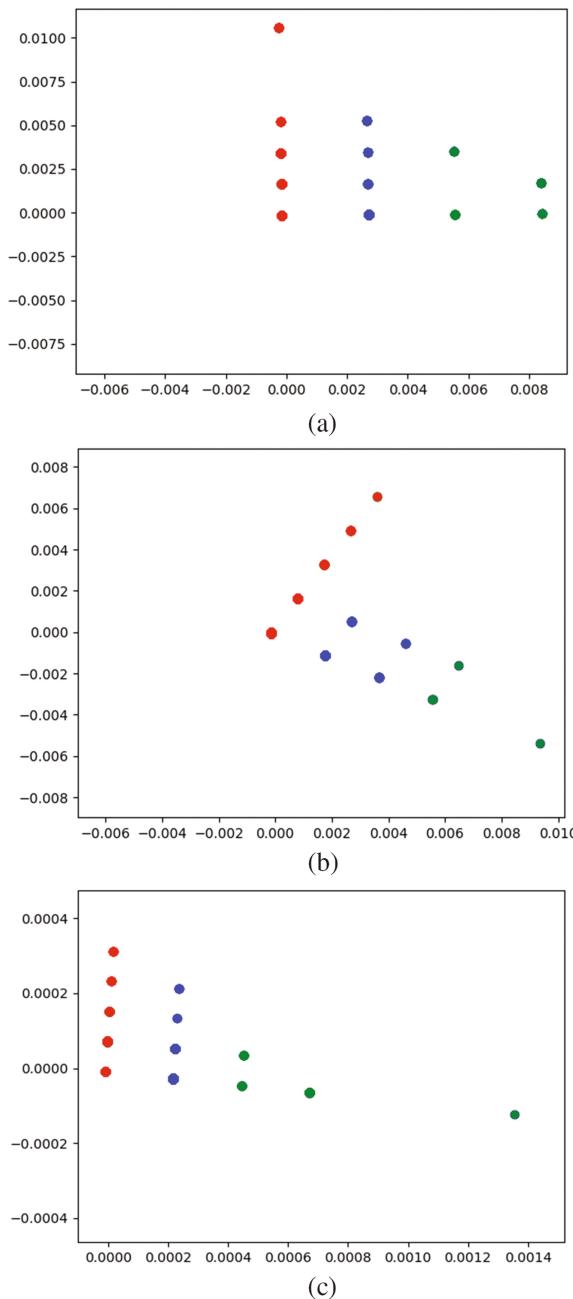


Fig. 1. Clustering results for hacktivist cyber attacks (a) Attack1, (b) Attack2, (c) Attack3

In our second experiment, we looked at temporal trends in the sentiment around each of the hacktivist attacks to better understand how sentiment relates to cyber

attacks and how it can potentially be used as a predictive indicator or early detection mechanism. For each attack, we tracked both the temporal changes in the quantity of tweets related to the attack as well as changes in sentiment over time.

Figures 2 and 3 illustrate the results of this analysis for Attack3.

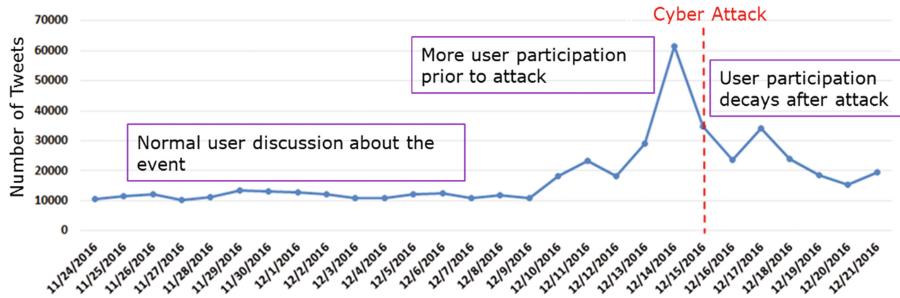


Fig. 2. Number of tweets over time before and after Attack3

Looking at these trends, we observe changes in sentiment and increased participation in the days leading up to an attack. The growing negative sentiment leading up to an attack may indicate growing anger toward the target of the attack. The subsequent spike in positive sentiment immediately before an attack parallels results in social psychology studying other types of violent attacks (i.e., terrorism), where there is a growth of in-group favoritism or enhancement immediately before an attack as the participants encourage each other and become increasingly motivated for the event. We observe similar sentiment and frequency patterns for the other two attacks as well. These results indicate that sentiment in social media may be able to provide predictive and explanatory information that can help us better understand certain types of cyber attack behavior.

5 Conclusions and Future Work

In this paper, we explore the use of social media data as a sensor for understanding cyber attack behaviors, leveraging the sentiment of posts to identify patterns that may help predict and explain cyber attacks. We apply a model of sentiment analysis that was designed to explicitly leverage the emotional signals present in social media, using unsupervised learning to exploit the massive quantities of available data without the prohibitive costs of manually labeling a training set for supervised learning. We then conducted several experiments using real-world Twitter data related to three hacktivist attacks. First, we demonstrated that our model of sentiment can successfully discriminate between positive, negative, and neutral sentiment related to cyber attacks. Second, we looked at temporal trends over tweet frequency and sentiment before and after these attacks, showing promising results for using explaining cyber attack behaviors and illustrating the potential for using sentiment for prediction.

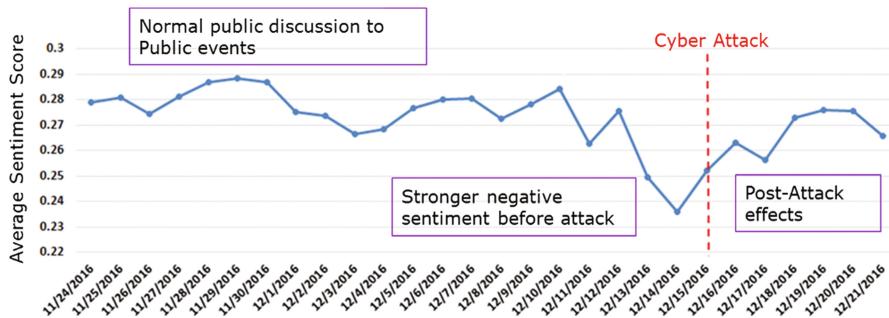


Fig. 3. Average sentiment over time before and after Attack3

The results of our early analyses are very encouraging for using sentiment in social media to understand cyber attacks. However, there are several directions for future work. First, we would like to expand our analysis beyond our initial three case studies, identifying trends in sentiment and behavioral patterns that may be common across a variety of cyber attacks. Second, we plan to analyze these sentiment results at a more granular level, separating out the positive and negative signals related to the attack target and motivation rather than looking at the average, which may obscure some more subtle variation. Third, we plan to look at other social features, such as credibility or veracity, to better understand the underlying social and behavioral patterns.

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The Proposal of Cross-cultural Understanding Model Using Place-Oriented Audio Guide System

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Abstract. In modern society, it is important to build mutual understanding between people of different nationalities and cultural backgrounds. Media can play a major role in such a society to materialize the intangible aspect of cross-cultural understanding. To achieve this aim, a place-oriented audio guide system was designed and implemented; the fieldwork experiment with 11 international and 5 Japanese participants was conducted in Tokyo. From the experimental result, the “Cross-Cultural Understanding Model” focusing on recognition of the difference, oneself, and a certain culture itself, was developed.

Keywords: Cultural understanding · System · Audio guide · Place-Orientation Japan

1 Introduction

Statistics of the Japan National Tourism Organization show that the number of foreign visitors to Japan in 2016 was approximately 24 million, an increase of 21% from 2015. Currently, visitors from Asian countries are on the rise, and as Japan is going to host the Tokyo Olympics in 2020, the trend of visitors to Japan has accelerated. Although historically, Japan has been regarded as a monolingual and mono-cultural country [1], the exponential growth of international visitors has led Japan to appreciate cultural diversity. We have to be aware that all foreigners are unique individuals, and we should take care not to stereotype them in any respect. Foreigners visit Japan for several purposes, such as sightseeing, studying, or working. Likewise, depending on their cultural backgrounds, problems they encounter as well as their interests to explore greatly vary, and there will never be a solution applicable to everyone. In such cases, creating new media to provide foreigners opportunities to know Japanese culture at a deeper level is meaningful from a cross-cultural viewpoint.

To find the clues of cultural exchange using media, Ito and Ogawa have proposed and implemented an audio guide system provides place-oriented contents to users [2]. The objective of the study is to suggest a model of cultural understanding by conducting detailed behavioral analysis to ascertain its contribution to users. The significance of implementing the system and conducting analysis is to place experiment participants in a fixed position to make a solid comparison, and enables us to observe

their behavioral change. Fundamentally, this study aims to examine the concept of cultural understanding in Japan among users of the system.

2 Related Works

Numerous scholars have been trying to define the concept of culture with some difficulty, and several models of cultural understanding have been proposed. For instance, “Cultural iceberg” is a term used from the organizational culture perspective and frequently mentioned in business contexts including international marketing; however, tracing its origin in academic literature is challenging. Several scholars have been attempting to provide plausible explanations.

According to Triandis [3], when we see an iceberg, the portion that is visible above water is only a small piece of a much larger whole. Similarly, people often think of culture as the numerous observable characteristics of a group that we can see with our eyes such as food, architecture, fine arts, cultural events or greeting rituals. The reality, however, is that these are merely an external manifestation of the deeper and broader components of culture: the complex ideas and deeply held preferences and priorities known as attitudes and values. Deep below the “water line” are culture’s core values. These are primarily learned ideas of what is good, right, desirable, and acceptable as well as what is bad, wrong, undesirable, and unacceptable. Ultimately, our interpretations of core values become visible to the casual observer in the form of observable behaviors, such as the words we use, the way we act, the laws we enact, and the ways we communicate with each other.

Hofstede [4] defined culture as “the collective programming of the mind that distinguishes the members of one group or category of people from others.” There are many ways to visualize the concept of culture, but one of the most popular models introduced is called “Cultural Onion,” which shows how culture has a number of layers. There are a number of interpretations of this model but the simplest one consists of four key layers. The outer layer represents cultural artifacts or visible symbols such as national flags, architecture or traditional clothing. Heroes make up the next layer, such as popular figures, sometimes celebrities and politicians, who tend to represent many of the culture’s values and beliefs. The next inner layer is composed of common rituals and traditions. This could include how people greet each other, eat meals, get married, or practice their religion. At the center of the onion are underlying values and cultural assumptions, which influence all of the other layers. These beliefs, norms, and attitudes are much harder to recognize without a thorough understanding of each of the layers and their effect on each other. Symbols, heroes, and rituals are fairly visible and easily recognized; hence, they are categorized as “practices.” Values, however, is located in the core and thus invisible, which is the most important aspect of cultural understanding in reality.

Shaules [5] used the terms resistance, acceptance, and adaptation as labels describing whether an intercultural experience provokes change within a sojourner. Resistance describes a conscious or unconscious unwillingness or inability to allow for an internal change in response to the patterns or expectations of a new environment. Resistance is considered to involve denigration or being dismissive of difference as a

way to uphold the primacy of one's internal cultural patterns. Acceptance implies a willingness to perceive as valid the cultural differences encountered, without necessarily implying a change in order to better align one's internal patterns with those of the environment. Adaptation implies a willingness to allow for an internal change in response to demands from the environment. These terms were developed, to be able to describe reactions to intercultural experiences in a neutral way (Fig. 1).

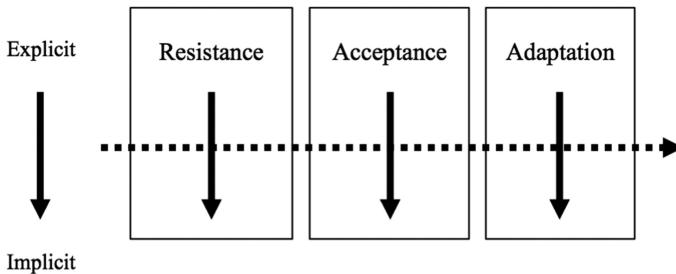


Fig. 1. Shaules's deep culture model

As explained above, there are several models of cultural understanding presented by the practitioners of the humanities; these are, however, created based on scholars' experience and its applicability to other disciplines is questionable. Since these assumptions are made entirely by an empirical context and not well tested in a practical setting, design and implementation of the audio guide system that Ito and Ogawa have suggested has its significance.

3 System

3.1 Concept

In this study, we tried to analyze human behavior by placing participants in a fixed setting to create the model for clarifying the process of cultural awareness. As a tool to achieve the goal, we used an audio guide system providing users with place-oriented contents. Although the contents of the system originally had been customized for an individual, since they were connected to the specific place where they were recorded, anyone who went there could listen to the contents once they were played. By repeating this process, a pile of self-reflection was created, and eventually, it formed the character of the place. It was drawn by different realizations and recognitions from listeners, which illustrated the place's dynamics.

The detailed concept of the system is shown in Fig. 2. The system works in three steps. The first step consists of a personality's content design for listeners. The second step is the listening process engaged in by various international listeners who are not yet familiar with Japanese culture. The third step is obtaining feedback from listeners, plus revision of the content by the personality. Three types of content are available for international visitors: contents from (a) "Guidebooks" (audio clips from famous

guidebooks), (b) from “Locals” (stories or tips from local people), and (c) from “Visitors” (feedback from listeners shared with other listeners). Following the cycle above is fundamentally human-centered activity.

Previous research has shown how to find the appropriate length of audio contents. Bodker [6] suggested a human activity approach to user interface design and claimed that an acceptable duration of content should be approximately 1 to 1 and half minutes, no longer than 2 min.

The target users of the system are international visitors who are staying in Japan for the middle to long-term, specifically a range of few months to years. Study abroad students or researchers would fit into this category rather than short-term tourists. These people usually come to Japan as a preferred study/research destinations; hence, it is reasonable to assume that they tend to be interested in knowing its culture at a deeper level than temporary tourists or businesspersons who stay in Japan only a few days.

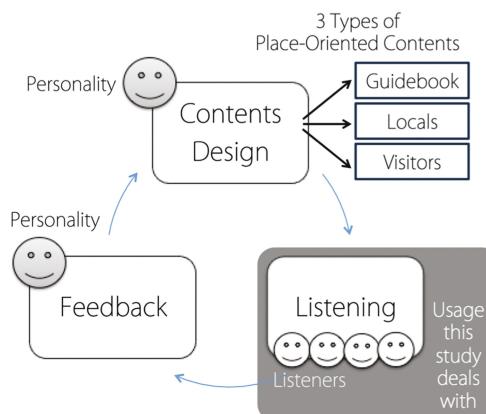


Fig. 2. Concept of the system

3.2 User Interface

The core module of user interface was designed based on the web guideline released by Google in 2014, which is called Material Design¹. Material design signifies interface design that makes users capable of performing intuitive operation by adopting the regulations of the real world into the web interface.

The system employed material design for the creation of the font, button, and text box. The difference between material design and conventional flat design is the material design’s three-dimensional representation. By using the non-flat texture for the button instead of the flat two-dimensional button, the user experience was improved. The guidelines for material design and its source code are open to public, and developers can download the package for free. In this system, I used the open source code provided by Google. After the basic website structure was designed and the URL

¹ Google Material Design Guideline by Google, Retrieved on January 2nd 2018 from: <https://material.io/guidelines>.

opened, the interface was applied for smartphone display and made ready for users to access via QR code (Fig. 3).



Fig. 3. Website interface accessible via QR code

4 Experimental Method

In this study, Asakusa, one of the most famous and popular tourist spots in Tokyo, was selected because it had a rich cultural heritage, including Japanese traditional temples and shrines, as well as dining venues and souvenir shops that attracted many international tourists. In addition, Asakusa was located at the heart of Tokyo and had great accessibility, which enabled effortless conducting of fieldwork.

To observe differences in cultural implications when participants listened to place-oriented contents depending on their nationalities, eleven international and five Japanese participants as “home-residents” attended the fieldwork (Fig. 4). Table 1 represents the attributes of international and Japanese participants.



Fig. 4. Fieldwork participants

Table 1. Fieldwork participants' attributions

| Nationality (Code:XX) | Age | Sex | Date/Time | Language |
|-----------------------|-----|-----|------------------------|----------|
| Uzbekistan (UZ) | 21 | M | 2/1/2016 14:00–16:00 | English |
| China (CH2) | 24 | F | 2/1/2016 16:00–18:00 | Japanese |
| China (CH3) | 25 | F | 2/1/2016 16:00–18:00 | Japanese |
| China (CH1) | 28 | F | 3/14/2016 13:00–15:00 | Japanese |
| China (CH4) | 27 | F | 3/14/2016 13:00–15:00 | English |
| Russia (RU1) | 28 | M | 3/19/2016 13:00–15:00 | English |
| Taiwan (TW1) | 20 | F | 3/19/2016 16:00–17:00 | Japanese |
| Malaysia (ML) | 21 | F | 3/20/2016 14:00–15:00 | English |
| Russia (RU2) | 26 | F | 6/11/2016 15:00–17:00 | English |
| Taiwan (TW2) | 27 | M | 6/26/2016 16:00–18:00 | Japanese |
| Vietnam (VN2) | 21 | M | 8/5/2016 14:00–16:00 | English |
| Japan (JP1) | 22 | M | 10/15/2016 12:00–14:00 | Japanese |
| Japan (JP2) | 20 | M | 10/15/2016 12:00–14:00 | Japanese |
| Japan (JP3) | 22 | F | 10/22/2016 10:00–12:00 | Japanese |
| Japan (JP4) | 20 | F | 10/24/2016 16:00–18:00 | Japanese |
| Japan (JP5) | 23 | F | 10/24/2016 16:00–18:00 | Japanese |

Participants were asked to walk and listen to the content of the audio guide system mapped into the set route. We observed participants' behaviors and asked questions for cultural implications or general comments. Fieldwork was conducted in either English or Japanese, depending on the participant's language ability. For international participants, we informed them that by having a cross-cultural conversation about the place-oriented contents that they listened to, we hoped to observe differences and similarities between Japanese culture and their culture. For Japanese participants, we gave the same instructions; however, we anticipated that comments and opinions would bring forth the similarities rather than differences as contents were based on Japanese cultural norms.

After the fieldwork, the recorded conversation of each participant was transcribed and prepared as fieldwork scripts. Building a good rapport with participants during the fieldwork was prioritized over focusing on conventional interview methodologies [7]. Extra care was taken to ensure that the topic flow was smooth and a pleasant atmosphere was maintained throughout. The script was transcribed as precisely as possible based on the conversation recorded. For fieldwork conducted in English, the transcription was written as is, whereas fieldwork conducted in Japanese was initially transcribed in Japanese and then translated into English. The volume of the Japanese script was 24549 letters and English was 17907 words.

5 Result

5.1 Behavioral Analysis of Participants

After the fieldwork scripts were prepared, we conducted a thorough analysis focused on participants' individual behaviors. We chose participants CH2, RU1, TW2, and JP4.

Participant CH2

CH2 walked the fieldwork route in the most touristy district of Asakusa, a major temple called Senso-ji and its premises, and the main street that led to it called Nakamise-dori, the most popular route of Asakusa sightseeing. Since CH2 had never been in Asakusa until the first fieldwork, she was considered a beginner tourist. It is reasonable to assume that she was delighted with the route recommendation on her first visit and therefore had a positive impression about the fieldwork.

At Senso-ji, she listened to the Visitors' contents about "Omikuji," the fortune-telling paper strips, which a previous fieldwork participant had bought, influenced by the Guidebook content. CH2 thought she might try it too, and purchased her own Omikuji. The front of the Omikuji was written in both Japanese and English, and the back in Chinese.

CH2 "*All flowers bloom when spring is approaching, if you are having something bad, it's time to be patient until the spring.' I'm very surprised, it's comfortable to know the meaning of the fortune exactly in my language.'*"

For her, understanding the essence of Japanese culture in her own language must have been an event to promote nonverbal communication and an awareness of the cultural difference between China and Japan. Besides, from the guidebook tips, she learned that Senso-ji had a lot of Omikuji with unfavorable predictions and that she had actually got one of the better ones. It was a fun moment when she got lucky and it influenced her overall experience and positive evaluation of the fieldwork.

Participant RU1

RU1 was a visiting fellow researcher who had been in Japan for around 2 months and was supposed to stay a few years more. In the course of the fieldwork route, there was a striptease building called "Asakusa Rock-Za," where the Locals' content included the local Mikoshi (portable shrine) carrier talking about the history of Asakusa. According to the Mikoshi carrier, the image of the city comprised not only the main sightseeing spots, but also these "unofficial" or "underground" cultural venues. He said that the local communities of Asakusa wanted to embrace these different types of cultural heritage to create a dynamic image of Asakusa.

- RU1* “Is it prohibited?”
I “No it’s not. As long as they have a license to operate, it’s totally fine to do this.”
RU1 “I was really surprised, it’s prohibited in my country.”
I “So, many things are prohibited in Russia, like Pachinko (Japanese pin ball)?”
RU1 “Yes. And this kind of strip theater – it’s a kind of red district. But this area looks like a normal place.”
I “Yea, during daytime. [...] but if you go a further inside, it will be more obvious.”
RU1 “Yea, they cannot avoid it because it’s a part of history. How about Shinjuku?”
I “Shinjuku? In Kabukicho, yes, they have such a place.”
RU1 “Because, one day I was excited to visit the Samurai Museum and it was a total surprise when I was there.”
I “I see, Shinjuku Ni-Chome is also a famous place for the LGBT community.”
RU1 “Yes I remember; that was a surprise too. In Russia, it’s not that open. [...] I think we have to keep all parts of culture, but in my case, it’s related to my family and upbringing, and I’m not openly supportive of this red district thing.”

RU1 seemed to be surprised that the striptease theatre was allowed to operate legally in Asakusa and had been accepted naturally by the locals. He stated that any kind of gambling and related business category was prohibited in his country, and therefore, recognized the difference between Russia and Japan. He tried to accept Japanese locals’ mindset though, saying, “They cannot avoid it because it’s a part of history.” He associated his surprise with a previous experience he had in another city, Shinjuku, and revealed he actually did not like the image of a red district city. Through the conversation with the interviewer, he realized his antipathy to such matters might be related to his upbringing. The contents listening experience contributed to RU1’s recognition of difference between his own country and Japan, as well as created in him self-awareness about his surroundings.

Participant TW2

TW2 was a full-time study abroad student doing his MA and had been in Japan for almost two years. The fieldwork was conducted in Japanese, as it was his primary language of communication, rather than English. He listened to the Visitors content, in which a visitor from India said he had not experienced a Japanese comedy performance and that he was not very interested in it, as he would not understand Japanese humor anyway.

- TW2 "We see comedians here. Old guys."
- I "Have you seen Yose or Rakugo?"
- TW2 "I've once seen a solo performance..."
- I "Rakugo?"
- TW2 "Yes, Rakugo. I saw a drama of Rakugo. But I didn't get it much."
- I "Do you have something like this in Taiwan?"
- TW2 "In Taiwan we don't have many comedy performances."
- I "You don't?"
- TW2 "We don't differentiate between comedians and idols. Comedians sometimes call themselves idols."
- I "In Japan, idol culture is a big thing."
- TW2 "In Taiwan, the word 'idol' can be used for any person who appears on TV."
- I "Interesting. So these Taiwanese 'idols' do some comedy stuff."
- TW2 "Absolutely. They do."
- I "I see. [...] Do you want to see Yose performances if you understand the language?"
- TW2 "I kind of want to."
- I "The guy in the content was saying 'I won't understand anyway.'"
- TW2 "Yeah, but I want to, I might get it."

Although TW2 had once seen a Japanese drama of Rakugo, he said that he did not quite understand the comedy performance, like the visitor in Visitor's content. He was asked if there were similar performances in his country. He pointed out that there were not many performances specifically focused on comedy, and there was a clear difference between Japan and Taiwan in this regard. He also said that Taiwanese would not understand it either. According to him, the acts of Japanese comedians would be considered as the Taiwanese equivalent of celebrity idols. It is clear that TW2 was paying close attention to his own country's culture in relation to Japanese culture, unlike the visitor in the Visitor's content. We could observe that he himself was keenly interested in Japanese culture through his enthusiasm for studying the Japanese language or understanding a Japanese comedy performance.

Participant JP4

JP4 had spent her life mostly in the western area of Japan (Tokyo is on the east), and had come to Tokyo as a university student. She was in Tokyo for 2 years but had few opportunities of visiting Asakusa then. Through the fieldwork, her overall impression of the Asakusa stroll was "*very enjoyable*." She was from Himeji City, a mid-sized city in the west known for its Himeji Castle, regarded as the most visited and finest surviving Japanese castle. She had lived at walking distance away from the UNESCO World Heritage registered site and knew what it was like to be a local surrounded by tourists from all over the world. She continuously compared the city of Himeji to Asakusa, and felt something in common with Asakusa locals.

JP4 “Asakusa has Senso-ji, Himeji has the Himeji Castle. It must be memorable for tourists, but for me, it is nothing special. It is always there, and I can see it even from my house window. But it doesn’t mean Himeji locals underestimate the Castle, it just resides in our daily lives and we do not pay particular attention to it.”

As a local person in a touristy place, she might have got along well with Asakusa locals, possibly because she identified herself with the local mindset of Asakusa locals and empathized with them.

6 Discussion

Through the fieldwork experiment, each participant’s interaction with the users, the locals, and the personality was observed. Additionally, their specific remarks that might be relevant to cultural implications were discussed. From both international and Japanese participants’ episodes found in behavioral analysis, we learned that the listening experience of the contents contributes to listeners’ awareness of cultural aspects to some extent, through the interaction between users. For instance, CH2 realized that getting information in her own language made her comfortable and thus she had a positive impression of the fieldwork overall. RU1 noticed that the local community accepts the old red district as cultural heritage, and recognized the difference in viewpoints between Japan and his own country Russia. TW2 recognized the difference of a comedy performance between Taiwan and Japan and expressed his enthusiasm to know the Japanese culture more. By listening to the contents, JP4 recognized her own national identity. She referred to her personality and admitted that using the system can be one way of interaction with others.

JP4 “Listening to the audio guide made me aware that I was a Japanese, and it was kind of surprising. I enjoyed it. I wish I could interact with foreigners more, but I can’t speak English very well. But listening to other people’s opinions can be one way to do that.”

By carrying out behavioral analysis focused on individual episodes, it was observed that participants’ cultural recognition on listening to the place-oriented contents could be roughly categorized into four patterns:

- (1) Recognize the difference (or similarity about their own culture vs. Japanese culture)
- (2) Recognize oneself (their personal history including family surroundings, cultural background, knowledge about their own country, etc.)
- (3) Recognize the culture itself (host country’s culture for international participants, in this context, Japanese culture)
- (4) Not applicable to any of these three (do not particularly recognize anything)

As Shaules's Deep Culture Model (Fig. 1) is revisited, cultural understanding has three linear stages, which are resistance, acceptance, and adaptation. Furthermore, Shaules pointed out that there are explicit/implicit levels, and that implicit awareness is crucial for the achievement of thorough cultural understanding. Explicit awareness would be represented in something visible, such as cultural objects, architecture, food, or traditional outfits. On the other hand, implicit awareness such as values, cultural norms, and mindset are usually invisible and thus deeply rooted. In accordance with previously observed four patterns of recognition and Shaules's model, we propose a Model of Cultural Understanding (Fig. 5).

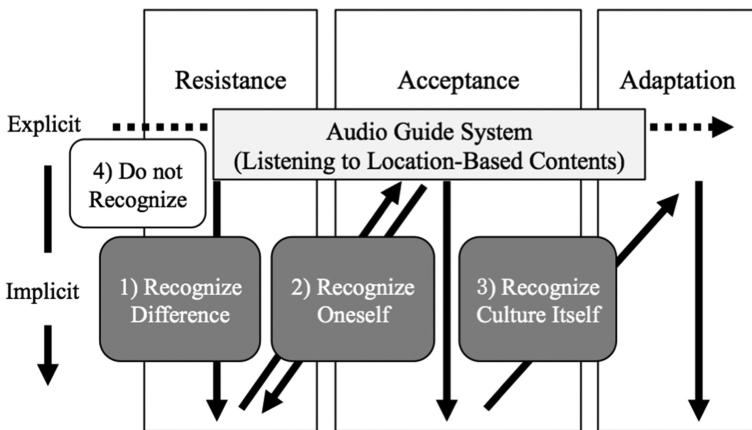


Fig. 5. Model of cultural understanding

Participants' cultural experience can be related to the recognition of difference or similarity between Japan and their home country, oneself, or the Japanese culture itself. Based on Shaules's model, these individual episodes categorized into four recognition patterns might roughly overlap the first two stages of cultural understanding: resistance and acceptance. The rationalization is that cultural adaptation of a sojourner in a host country takes a relatively long time [8], and the final "adaptation" stage of Shaules's model does not practically fit into the system's original target users (international visitors who stay in Japan from a few months to years). Besides, the location-based contents would help users to recognize some cultural aspects of Japan, but they are certainly not something to force these users to adapt to Japanese culture. The diagonal black arrow in the middle of Fig. 5 shows users' transition from resistance to acceptance including explicit/implicit comprehension and vice versa. Additionally, we should be aware of a possibility of users going back to resistance from acceptance depending on several factors, namely, national characteristics, religion, economy, social systems, and so on.

7 Conclusion and Future Works

This study intended to explore the possibility of cultural understanding in Japan, precisely focusing on the relationship between “the self” and “the other” of international visitors using media. To accomplish this attempt a place-oriented audio guide system was proposed and implemented. The system provided three types of contents from Guidebook (tips for tourists extracted from a popular guidebook), Locals (stories or opinions of local people), and Visitors (feedback and cultural implication from other users who have already listened to the previous two types of contents). The system was originally designed for international people to visit Japan to observe various cultural exchanges. However, to make a clear contrast and examine the effectiveness of the system depending on users’ nationalities, some Japanese users were invited later.

Although Japanese participants shared many examples of cultural norms, language, and knowledge about Japan that frequently appeared in the audio content, there were many instances where conceptualization of cultural understanding fit into these four types of recognition. These findings resulted in a proposed model of cultural understanding, which exclusively focuses on the recognition patterns. In contrast with conventional cultural models that dealt with differences between cultures, this model’s originality is a detection of the importance of self-awareness in the cultural context.

This study was carried out with a relatively small number of participants, mainly due to practical limitations such as scheduling, financing, and time management. Careful scrutiny was attempted in terms of behavioral analysis; however, implementation of fieldwork has always been a challenging activity, as it had to be an elicitation of a participant’s cultural implication, and not just a random conversation. Recruiting more participants for the evaluation experiment is crucial to make the system a more solid and reliable media. By adding participants, we will be able to find more clues focused on individual context, which can explain the contribution of location-based contents at a deeper level.

For future work, the assumption above brings out the significance of wider coverage in design and development of place-oriented contents, which might be helpful to stretch the possibility of the system too. While the effectiveness of Locals and Visitors contents was supported in the evaluation experiment, contents design should take the next step to cover a wider range of locals’ stories and users’ cultural implications. The more the contents accumulated into the system, the more the clues for cultural exchange would be available for users. Although this study has examined the effectiveness of the system by using the experimental method, extending the scheme into a real-life setting such as the upcoming Tokyo Olympics in 2020 and letting international users engage in the system is one prospect.

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Research on the Characteristics of Body Height and Weight in Eight Countries

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Abstract. The data about body height and weight is the basic data information in anthropometric study. Firstly, this paper gave the direct comparison among these countries based on analysis of variance (ANOVA). The results of ANOVA showed that gender and country were both significant factors for analyzing body height or weight in these countries. No interaction effect exists between the two factors. Based on the average data and percentile values of weight we can conclude that these eight countries fall into three groups: The Netherlands and United States had significantly larger weight than the other six countries; China and India had the smallest weight. As expected, men are taller than women. In general, the rank order of samples with regard to height was similar in men and women. Men and women in The Netherlands were the tallest and people in India the shortest. There was a strong linear association between height and weight in men and women. Secondly, height and weight inference were conducted based on the ergonomic data in these countries. The relation between human height with the main body indexes was established using classical regression analysis. The obtained results could be a reference for designing the export clothes and food to these countries.

Keywords: Analysis of variance · Principal component analysis
Regression analysis

1 Introduction

Height and weight are two of the most easily obtained anthropometric measurements, for some references see [1, 2]. In combination, they have been used to demonstrate the health risks associated with overweight as well as underweight [3, 4]. Height and weight inference is also an important project for individual identification work in forensic anthropology. For example, in the actual detection process case, height and weight prediction play a key role in finding the dead source as well as detecting the unknown body, albino bone entity, broken corpse and so on. In this paper, the characteristics of body height and weight in eight countries (Italy, Japan, Kenya, Korea, United States, China, India and The Netherlands) have been analyzed, compared and predicted.

The data information we analyzed is from ISO/TR 7250-2:2010 “Basic human body measurements for technological design —Part 2: Statistical summaries of body measurements from national populations”. This Technical Report is intended to serve as a continually updated repository of the most current national anthropometric data. It also provides statistical summaries of body measurements together with database background information for working age people in the national populations. Because the data information of some countries is missing, so we select data from eight countries to conduct the comparison.

2 Method

Firstly, we conduct the direct comparison among these countries based on analysis of variance (ANOVA). At first, we want to know whether height or weight are significantly different among these countries as well as between male and female in these countries. We take height or weight as response variable, gender and country as two factors. Analysis of variance is used to analyze the effects of factors, which may have impact on the result of an experiment. Normally there are three main assumptions when conducting ANOVA: (1) the normality assumption; (2) the assumption of homogeneity of variances; (3) The independence of the observations.

Secondly, height and weight inference were conducted based on the ergonomic data (such as arm reach from back, hand length, foot length, neck circumference and so on) in these countries. In order to reduce the dimension, the principal component analysis was applied and four principal components are used as the new variables for further analysis. The relation between human height with the main body indexes was established using classical regression analysis. From the best regression model, we can predict the height according to the main body indexes in these countries.

3 Results

3.1 Results of ANOVA for Weight

The general linear model procedure was used to do analysis with the help of Minitab software. The general linear model procedure has the following advantages: (1) it can be used in unbalanced designs; (2) it can evaluate differences between individual level means; (3) it allows covariates, random factors and nested factors. The results of Minitab are illustrated in Table 1.

Table 1. Results of ANOVA for weight

| Source | DF | Adj SS | Adj MS | F-Value | P-Value |
|----------------|----|---------|---------|---------|---------|
| Gender | 1 | 2827.5 | 2827.51 | 5.77 | 0.019 |
| Country | 7 | 11527.7 | 1646.82 | 3.36 | 0.003 |
| Gender*Country | 7 | 371.5 | 53.08 | 0.11 | 0.998 |
| Error | 80 | 39232.0 | 490.40 | | |
| Total | 95 | 53958.8 | | | |

In Table 1 DF stands for degree of freedom, Adj SS stands for adjusted sum of square, Adj MS stands for adjusted mean square. Without loss of generality, we take nominal significance level as 0.05. That means if P-value of one factor is less than 0.05, we think it is significant; otherwise it is not significant.

Then from Table 1 we can conclude that gender and country are both significant factors for response variable weight. However, the interaction of gender and country is not significant.

Figure 1 is the Four-in-one residual plot. We explain the figures in the following:

Normal Probability Plot – Because the points on the normal probability plot roughly follow a straight line, we can assume that the residuals do not deviate substantially from a normal distribution.

Histogram – Use the normal probability plot to make decisions about the normality of the residuals. With a reasonably large sample size, the histogram displays compatible information.

Versus Fits – The constant variance assumption does not appear to be violated because the residuals are randomly scattered about zero and have approximately the same scatter for all fitted values.

Versus Order – The plot of the residuals versus order does not show any pattern. Therefore, there is no time dependence in the residuals.

Figure 2 is the interaction plot for weight. From Fig. 2 we can obtain the following three information: (1) Overall, the weight of men is larger than weight of women in all eight countries. (2) The eight countries fall into three groups: The Netherlands and United States had significantly larger weight than the other six countries; The Indian had the smallest weight. (3) On average, the weight of male in The Netherlands is largest and the weight of female in United States is largest. The weight of people in Korea and Japan is similar.

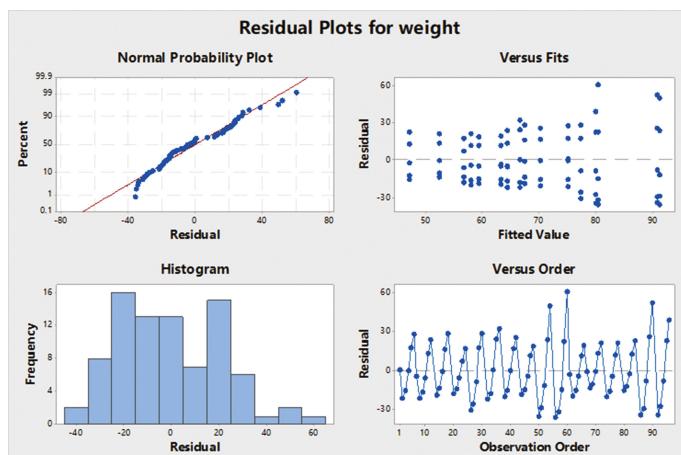


Fig. 1. Residual plots for weight

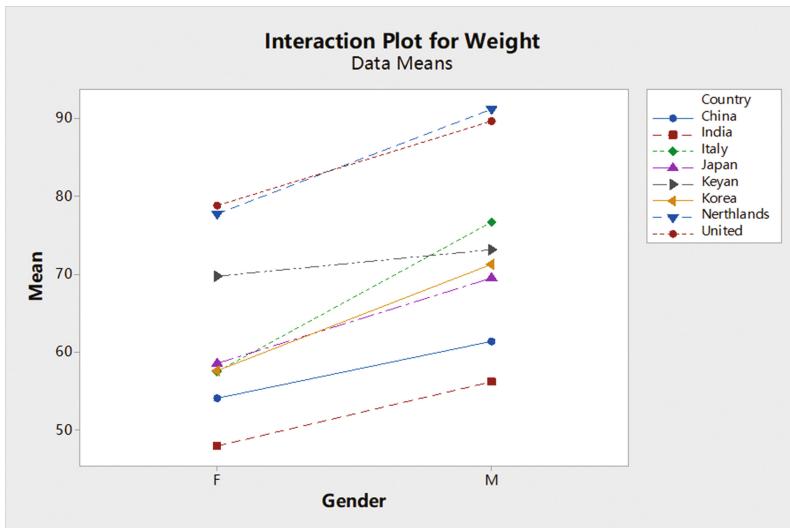


Fig. 2. Interaction plot for weight

3.2 Results of ANOVA for Height

The analysis procedure for height is similar to weight, so we give the results briefly. The results of fitting general linear model in Minitab show that gender and country both have significant effects ($p < 0.05$) on height and there is no interaction effect ($p > 0.05$).

Figure 3 shows that the three assumptions of ANOVA are approximately satisfied. Figure 4 is the interaction plot for weight. From Fig. 4 we can also obtain the following

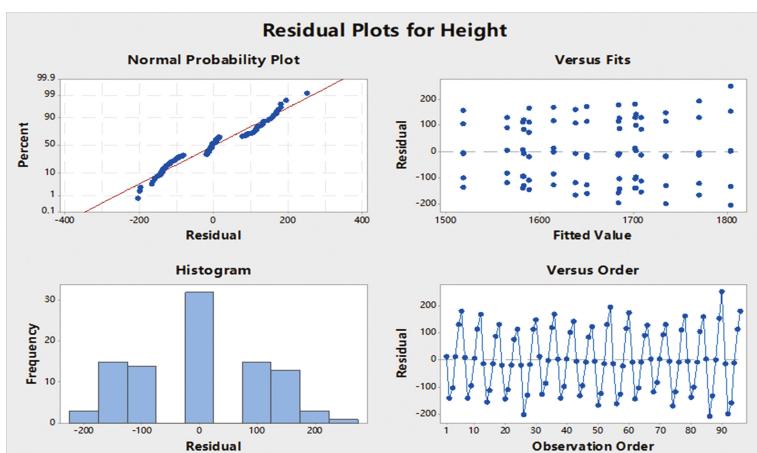


Fig. 3. Residual plots for height

information: (1) As expected, men are taller than women. (2) In general, the rank order of samples with regard to height was similar in men and women. Men and women in The Netherlands were the tallest and people in India the shortest.

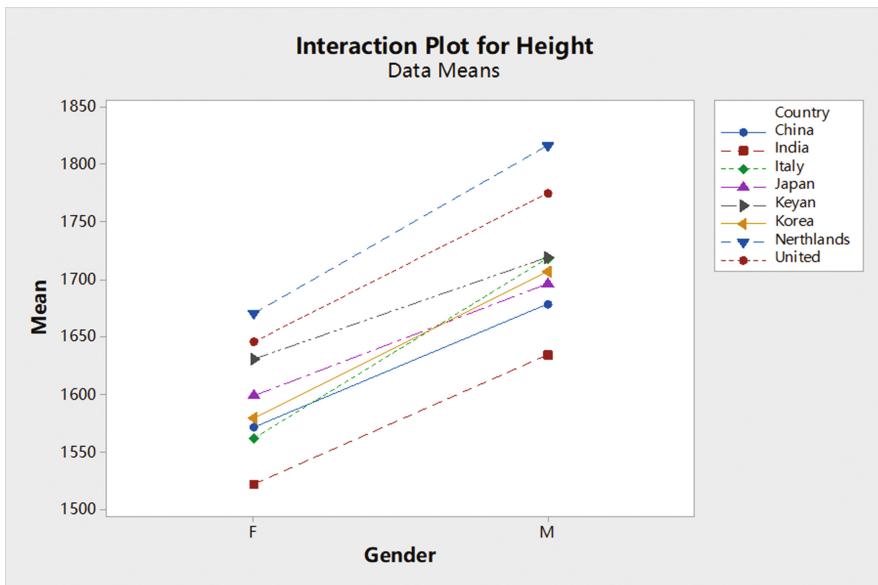


Fig. 4. Interaction plot for height

3.3 BMI

Next body Mass Index(BMI) in these countries are analyzed and compared. The BMI is defined as the body mass divided by the square of the body height, and is universally expressed in units of kg/m^2 , resulting from mass in kilograms and height in metres. In general men had a higher mean BMI than women in most samples (Table 2), which may reflect greater variability in weight among men. The highest mean BMI was generally found in the sample of men in Unites States.

It is widely believed that if BMI is $18.5 \sim 24.9$, it is normal. If BMI is larger than 25, it is overweight. Table 2 gives the BMI of the eight countries. From the Table 2 we can see that on average The United States people and The Netherlands are overweight. The Italian men are also overweight.

3.4 Results of Regression Analysis

In order to predict one's height and weight, it is often necessary to establish a model which can describe the relationship between other variables and height and weight. Here we choose main variables which can be related to height or weight, that is, hip breadth (mm), hand length (mm), foot length (mm), thigh circumference (mm), neck circumference (mm), chest circumference (mm), waist circumference (mm), head width (mm). Here we take Japanese men as an example, other countries are similar.

Table 2. Mean, SD and average BMI for eight countries

| Country | Weight (kg) | | Height (mm) | | BMI | |
|------------|-------------|------------|--------------|--------------|-----------|-----------|
| | Men | Women | Men | Women | Men | Women |
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Italy | 76(10) | 60(9) | 1716(69) | 1592(64) | 25.8 | 23.7 |
| Japan | 67.5(9.8) | 51.9(7.0) | 1695.6(59.9) | 1570.3(55.1) | 23.5 | 21.0 |
| Kenya | 70.6(13.7) | 67.9(13.5) | 1717.4(74.6) | 1628.9(69.2) | 23.9 | 25.6 |
| Korea | 70.1(9.7) | 56.1(7.8) | 1707.6(61.3) | 1579.0(54.8) | 24.0 | 22.5 |
| The Neth. | 85.6(17.3) | 73.9(15.8) | 1808.1(92.8) | 1672.3(79.0) | 26.2 | 26.4 |
| United St. | 83.2(17.4) | 69.6(19.9) | 1766.6(80.6) | 1637.9(78.4) | 26.6 | 25.9 |
| China | 60(8) | 52(8) | 1678(59) | 1571(54) | 21.3 | 21.1 |
| India | 54.7(8.7) | 46.3(7.8) | 1633(68) | 1515(61) | 20.5 | 20.2 |

It is unavoidable that there is multiple collinearity between the explanatory variables. Actually the condition number we compute in R is 23120, so there is serious collinearity in these eight variables. When the multiple collinearity of the observed multiple matrices is too high, the mean square error of the regression coefficient will be too large. That will affect the goodness of the model fitting. If we can deduce the relevant variables into a few independent variables which can capture the main information, we can avoid the above problems. Principal component analysis is an effective way to deduce multiple variables into a few independent variables by means of linear combinations, which provides convenience for next analysis.

Principal component analysis is implemented in the R software. The principal component analysis of the eight variables is taken as the primary component. At last, four principal components are used as the new variable values for further analysis. For the convenience of the description below, the four principal components are referred to as limb data.

3.4.1 The Relation Between Japanese Body Height with Limb Data

In the study of the predicted model, the simplest and commonly model is the linear regression model [5]. For such model, least square method is the classical method. Next we introduce the basic procedure of least square method. Assume that we have n pair observation values, that is, $(x_1, y_1), (x_2, y_2) \dots (x_n, y_n)$, the regression equation is

$$y = bx + a. \quad (1)$$

Where a is the intercept term, b is regression coefficient. We use $\sum_{i=1}^n [y_i - (a + bx_i)]^2$ to quantitative description the point in the y direction to the straight distance of the straight line. So it can be seen as a binary function

$$Q(a, b) = \sum_{i=1}^n [y_i - (a + bx_i)]^2. \quad (2)$$

According to derivation operation, we can get

$$b = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})}, \quad (3)$$

where $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$; $\bar{y} = \frac{1}{n} \sum_{i=1}^n y_i$; $a = \bar{y} - b\bar{x}$.

By calculating the correlation coefficient, we found that height with limb data were highly correlated and they have a proportional relationship. According to the independent variable, we respectively estimated linear regression equation. The equation has extremely significant statistical significance by t-test and F-test (Table 3).

Table 3. Regression equation of height and the single variable

| Items X | Height Y | T value | Adjusted R-squared | F-statistic |
|---------------------|----------------------------|---------|--------------------|-------------|
| Hip breadth | $Y = 2.8137X + 660.41834$ | 53.29 | 0.8961 | 2840 |
| Hand length | $Y = 7.5264X + 245.3783$ | 71.08 | 0.898 | 5052 |
| Foot length | $Y = 5.67353X + 267.03197$ | 84.02 | 0.8984 | 7059 |
| Thigh circumference | $Y = 1.29225X + 965.8933$ | 37.70 | 0.8923 | 1422 |

Compare the adjusted R-squared in the table, we get the conclusion that it is better to establish the regression equation according to the hand length, foot length, hip breadth and thigh circumference. Furthermore, from the regression equation we can find that hand length and foot length have much bigger positive effect for height which is reflected by the bigger regression coefficients.

Then we choose all the variables, the estimated coefficients and significance of these variables are illustrated in Table 4.

From Table 4 we can see that the regression equation is

$$Y = -40.4132 + 5.1082X_1 + 2.3978X_2 + 1.9130X_3 - 1.8562X_4,$$

and the adjusted R-squared rise to 1. Compared to the prediction of single variable, the accuracy has improved.

Table 4. Summary of linear regression

| Estimate | Std. | Error | T value | Pr(> t) |
|-------------|----------|---------|---------|-------------|
| (Intercept) | -40.4132 | 31.7718 | -1.272 | 0.2440 |
| X1 | 5.1082 | 0.2884 | 17.711 | 4.51e-07*** |
| X2 | 2.3978 | 0.9713 | 2.469 | 0.0429* |
| X3 | 1.9130 | 0.6672 | 2.867 | 0.0241* |
| X4 | -1.8562 | 0.1125 | -16.494 | 7.35e-07*** |

Note: Multiple R-squared: 1, Adjusted R-squared: 1

3.4.2 Prediction Weight by Linear Regression

Prediction is an important issue in linear regression [6]. Now, we use the same method to do weight analysis on these four variables. We first give the regression equation of weight and single variable (Table 5).

Of course we can give the relationship of the weight with all four variables following the same procedure as Sect. 3.4.1.

Table 5. Regression equation of weight and the single variable

| Items X | Weight Y | T value | Adjusted R-squared | F-statistic |
|--------------------------|--------------------------|---------|--------------------|-------------|
| Hip breadth (X1) | $Y = 0.46738X - 98.8899$ | 38.87 | 0.893 | 1522 |
| Hand length (X2) | $Y = 1.2196X - 165.490$ | 27.84 | 0.887 | 775.1 |
| Foot length (X3) | $Y = 0.9178X - 161.616$ | 25.37 | 0.884 | 643.6 |
| Thigh circumference (X4) | $Y = 0.210947X - 49.616$ | 56.96 | 0.896 | 3425 |

4 Conclusion

This paper mainly discussed the characteristics of body height and weight in eight countries based on the statistical data in ISO/TR 7250-2:2010 “Basic human body measurements for technological design —Part 2: Statistical summaries of body measurements from national populations”. Based on the average data and percentile values of weight we can conclude that these eight countries fall into three groups: The Netherlands and United States had significantly larger weight than the other six countries; China and India had the smallest weight. For height, the Netherlands are highest and the Indians are shortest. As an adjunct, body Mass Index (BMI) in these countries are also analyzed and compared. The relation between human height and weight with the main body indexes was established using classical regression analysis in Japan. The obtained results could be a reference for designing the export clothes and food to these countries. What's more, the obtained regression equations have a great reference value for forensic science and anthropology.

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Cognitive Biases and Distorted Decision Making that Prevent Rational and Efficient Sports Management - Cross-Cultural Difference Between MLB and NPB

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Abstract. This study explored and summarized cognitive biases and distorted decision making that prevent rational and efficient sports management in markets of professional athletes, in particular, baseball. In addition to this, cross-cultural difference between MLB and NPB (Nippon Professional Baseball) was pointed out to avoid inefficiencies in baseball markets and reach rational decision making in sports management.

First, a variety of cognitive biases and distorted decision making commonly observed in both MLB and NPB were identified. It was demonstrated that cognitive biases and distorted decision making in home field advantage, draft picks, team organization, or judgment or feeling about the game itself such as momentum shift were ubiquitous in both professional baseball leagues. Throughout the comparative study of MLB and NPB in particular paying emphasis on the concentration (MLB) and the spiritualism (group harmony) (NPB), it is suggested that the cross-cultural difference potentially leads to different decision making in baseball management such as the contracting money, draft picks, or contraction with no promising players.

Cross-cultural difference between MLB and NPB is also a cause to give rise to cognitive biases or behavior in sports management or decision making. Until now, the biases that stem from cross-cultural differences have not been fully explored and identified. The biases in decision making and behavior in draft picks or making a continued contract with players peculiar to NPB and not observed in MLB have been summarized in this study.

Keywords: Distorted decision making · Cognitive bias
Cross-Cultural difference · MLB · NPB · Sports management

1 Introduction

Lewis [1] pointed out a variety of irrational behavior in team management in MLB in this book “Money Ball”, and showed how Oakland Athletics made use of the irrationality of other MLB teams and reached a strategy of team management how to earn more wins without investing more money in players. Oakland Athletics have reached

the post-season playoffs three years in a row, even though they spend just one third of money that New York Yankees spends every year. The secret to earn more wins without investing money, as demonstrated in Lewis [1], was not on the baseball field but in the team management conducted by the general manager, Billy Beane. Unable to afford to hire star players like rival teams that can pay much money, he disdained the biased wisdom that highly paid players contribute to more wins, and directed his attention toward the neglected statistics that revealed how runs can be really earned without highly paid star players. Such ideas that a team can win more and more without start players if the team manages rationally how to enter right non-star players to the right situations in the game based on proper statistics had begun to attract MLB disciples.

As pointed out by Lewis [1], any market of professional athletes experiences a phenomenon that a poor team like Oakland Athletics could beat rich teams like New York Yankees by exploiting the inefficiencies of rich teams and neglected statistics of baseball games. As written in Lewis [1, 2] was criticized because he did not realize the detailed reason for the inefficient market of baseball players. A lot of cognitive biases have been explored and pointed out in a variety of sports [3–6] even before “Money Ball” was published.

Moskowitz and Wertheim [7] explored the hidden influences behind how sports are played and games are won, and suggested that a lot of professional baseball, basketball, or football teams are suffering from cognitive biases. They showed that the strategy to win more games and reach the playoff or championship is based on the number of highly paid players and is cognitively biased. We also generally don't seem to recognize that more outstanding players in college or high school leagues does not necessarily guarantee the success in professional leagues in MLB, NBA, or NFL.

Gilovich, Vallon, and Tversky [3] was the first to point out our biased mind of random sequences that is believed to occur actually in basketball game and called as the myth of hot hand. After the issue of this article, many studies conducted similar studies and showed affirmative results to the hot hand fallacy [6, 8–10]. The hot hand myth represents our misunderstood thinking that the percentage shoot success of a particular player rises and leads to the momentum shift of the game. We tend to feel as if the percentage shoot success of a particular star player rises and this eventually turns the tide of a game to own team, which scientifically and statistically proved to be wrong. We mistakenly use the phrase “momentum shift” or “turn of a tide of game”, and judge that the momentum shift occurred in a variety of games, or the tide of a game suddenly turned to an opponent team. Similar examples can be enumerated as follows:

- (1) Giving a lead-off batter a walk turn a tide of game worse than permitting a base hit.
- (2) A pinch after a chance (A chance brings a pinch).
- (3) Bases loaded with no outs scores few.
- (4) Mistakes in offenses turn a tide of game worse and give impetus to opponents.
- (5) If a catcher batted well in a game, he defends well and his combination of pitches gets better.
- (6) If the team wins a game in the bottom of the last inning, the tide of team gets better.

Unfortunately, such phenomena are not scientifically verified and recognized as universal law in baseball games.

Such examples can be explained using cognitive biases as follows. A baseball commentator sometimes mentions that a tide of game turned worse or better. Such an impressive event is readily and vividly stored into our memory system like a gambler feels that he or she is superior in gambling. We tend to misunderstand that such an impressive event is universal one based only on the limited information that is available to us. This corresponds to the availability heuristic, that is, halo effect and devil effect. A baseball commentator frequently says that experienced player who has marked more than .300 for many years is likely to hit even if he has no hits three times in a row. Even if he does not hit until the third at bat, the probability of having a hit at the fourth at-bat does not increase at all. We, however, don't notice such misunderstanding. This is similar to the myth of gambler that the gambler misunderstand that he will win the gamble at the 10th trial if he continues to lose nine consecutive times. This bias is categorized as representativeness bias. A baseball commentator always interprets that a fine play or mistake turned the tide of game better or worse. Although he, based on the memory of a few events, interprets like this, this is not necessarily true. We tend to get trapped into the bias of small numbers (categorized as representativeness bias) and make a conclusion on the basis of a few data or examples. In this manner, we tend to mistakenly regard such a commonly accepted view as truth without scientific evidence and based on a few impressive examples.

The curse of the Billy goat or the curse of the Bambino is well known fallacy in MLB. The curse lasted 71 years, from 1945 to 2016. Billy Goat Tavern owner William Sianis was asked to leave Wrigley Field (Cubs' home ballpark) during game 4 of the 1945 World Series, because the odor of his pet goat was bothering other fans. William Sianis outraged and declared, "Them Cubs, they ain't gonna win no more," which had been interpreted to mean that either the Cubs would never win another National League (NL) pennant, or that they would never again win a World Series. The Curse of the Bambino was a superstition evolving from the failure of the Boston Red Sox baseball team to win the World Series in the 86-year period from 1918 to 2004. While some fans took the curse seriously, most used the expression in a tongue-in-cheek manner. The reason why Chicago Cubs could not win world championship is analyzed in detail in Moskowitz and Wertheim [7]. Things we don't want to explain is often attributed to luck. We too often attribute success to our own high skill and failure to luck, and such a mind is called self-attribution bias. The two curses above are also explained using a self-attribution bias. A curse or bad luck is an easy solution to explain the reason why the team does not perform better and win the world championship.

The "Sports Illustrated jinx" is also a well-known cognitive bias that belongs to representativeness bias (regression to mean). An athlete whose picture appears on the cover of "Sports Illustrated" is expected to perform poorly the following season. One athlete believed in the jinx and denied to appear on the cover of this magazine. The Sports Illustrated cover jinx is an urban legend that states that individuals or teams who appear on the cover of the Sports Illustrated magazine will subsequently be jinxed (experience bad luck). The jinx can be readily explained using the concept of representativeness bias, that is, the regression to mean. Although it is a self-evident truth that the exceptionally high performance cannot be surpassed so readily the following season and the performance degrades the following season due to the regression to mean [11], we tend to readily get trapped into such a cognitive bias.

Home field advantage is also cognitively biased and misinterpreted. The reasons for home field advantage are conventionally pointed out as the following wisdoms: (1) crowd support, (2) rigors of opponent (visitor)'s travel, (3) kinder and gentler schedule of home games, and (4) advantages of unique characteristics of home ball park. As summarized in Moskowitz and Wertheim [7], these conventional wisdoms are misinterpretation of home field advantage. The reason for home field advantage is discussed using other factors such as referee bias other than (1)–(4) above in many studies [12–21].

Biased behavior of golf players is reported in Pope and Schweitzer [22]. Persistent bias in the face of experience, competition, and high stakes, that is, loss aversion [23] seems to exist in PGA tour golfers. They began to explore the putting tendencies among 421 golfers in more than 230 PGA tournaments. They recorded, using more than 2.5 million putts measured by laser, the success rate of nearly identical putts for birdie, par, and bogey. Their study found that the golfers tended to fail more to make a birdie than to make a par for the nearly identical putt. This was also true for Tiger Woods. They attribute this to loss aversion. PGA golfers seem to be so concerned with a loss in putting that they are more aggressive and better in avoiding a bogey than in taking a birdie.

Even in draft picks of athletes in a variety of professional sports, cognitive biases are ubiquitous as Moskowitz and Wertheim [7] and Lewis [2] suggested. Scouts readily tend to form a near-instant impression especially for their favorite candidates of draft pick. All other data of the candidates tends to organize itself around the near-instant impression. This has a property of anchoring and adjustment and confirmation bias. Our mind is not good at seeing things as it does not expect to see, and tend to see only what is expected to see. If we get trapped into a confirmation bias, we tend to look for and gather only information that fit to our expectation. Anchoring and adjustment is representative of such a bias that once we lower an anchor, we cannot see situations distant from the anchor and we adjust our behavior or action at a limited and narrow area around the anchor. Such cognitive biases prevent us from selecting a proper candidate of draft pick, and make us end in failure.

As mentioned above, there exist a variety of irrational decision making and behavior in many situations in sports such as draft picks, team organization, or judgment or feeling about the game itself such as momentum shift or home field advantage in a game. Although these irrational decision making and behavior is commonly observed in both MLB and NPB, there are other types of cognitive biases peculiar to Japanese culture.

In Japan, the word “Wa” means that one must essentially have the group harmony especially in Japanese “yakyū,” or baseball. Japanese baseball fans view American player’s individualism as a fatal flaw, and tend to hate this. “Wa” corresponds to the creed of Japanese baseball, played since the 1850s (and professionally since 1935). NPB had been discouraging Japanese players from entering MLB until Hideo Nomo played for Dodgers in 1995. The interesting comparative studies of the sport culture (baseball or yakyū) as it is played on both sides of the Pacific (Japan and US) were conducted in Whiting [24, 25]. He explained the frustration of American baseball stars who have come to play in NPB and felt the gap between MLB and NPB. Whiting [24, 25] showed that American players, in order to perform better and survive in NPB,

cannot help adapting to punishing spring training and pre-game practices throughout the season in Japan. More concretely, they must adjust to such aspects of the sport as the sacrifice bunt, the hit-and-run and the squeeze. Whiting [24, 25] also pointed out the struggling of American to adapt themselves to tyrannical managers and coaches, and umpires, and concluded that MLB and NPB baseball are vastly different games that stem from the cross-cultural difference. Former MLB player Bob Horner (1978, MLB NL ROY) expressed Japanese baseball using a phrase “Eureka! (I have found!) different baseball across the globe”, which straightforwardly express the difference between two baseball leagues.

Cross-cultural difference between MLB and NPB is also a cause to give rise to cognitive biases or behavior in sports management or decision making. Until now, the biases that stem from cross-cultural differences have not been fully explored and identified. The biases in decision making and behavior in draft picks or making a continued contract with players peculiar to NPB and not observed in MLB have been summarized in this study. This study firstly explored and summarized distorted decision making and cognitive biases that prevent rational and efficient sports management in markets of professional athletes, in particular, baseball. In addition to this, cross-cultural difference between MLB and NPB (Nippon Professional Baseball) was pointed out to avoid inefficiencies in baseball markets and reach rational decision making in sports management. This paper identified the biases and irrational decision making that stem from cross-cultural differences.

2 Comparative Study of Cultural Difference Between MLB and NPB

2.1 Cross-Cultural Difference Between MLB and NPB

It is well recognized that only foreign players who comprehend the following cross-cultural difference between MLB and NPB and are able to adapt to such environment can survive NPB. Without such adaptation and understanding of NPB culture, even famous former MLB players with past high achievement cannot perform better in NPB.

2.1.1 “Wa” (Harmony)

Whiting [24, 25], in his book “The Chrysanthemum and the Bat” and “You Gotta Have Wa”, compared the baseball culture between MLB and NPB. NPB prefers to use the word “Wa” (group harmony) that is the creed of NPB. MPB pay emphasis on concentration and individualism. Therefore, Japanese baseball fans regard MLB player’s individualism as a fatal flaw in adaptation to NPB, and interpret that this is a hindrance to adaptation to NPB. American baseball stars who decided to play in NPB are frustrated and feel the great gap between MLB and NPB. American players, in order to perform better and survive in NPB, cannot help adapting to punishing spring training and pre-game practices throughout the season. More concretely, they must adapt to such aspects of the sport as the sacrifice bunt, the hit-and-run and the squeeze which are based on the mind for not individuals but the team and more frequently used in NPB. As well as such adaptations to team harmony, American players must struggle to adapt

themselves to the order by tyrannical managers and coaches, and the difference of judgment by NPB umpires. The vast difference between MLB and NPB baseball, which is based on and stem from the cross-cultural difference, was expressed straightforwardly by former MLB player Bob Horner as “I found a different baseball across the globe.”

2.1.2 Feeling or View Toward Baseball

Japanese views of life, stressing group identity, cooperation, and hard work are the soul of all kinds of Japanese baseball including NPB. Baseball originated in US has been modified to accommodate Japanese culture and social value, which is based on the word “Bushido” which most directly represents the soul of Japan and differences between East and West. In Japan, amateur players never fail to gather around the home plate and salute before and after the game, which is never seen in US. Although the games are continued until win or loss is determined in US, draw (tie) games are tolerated in Japanese baseball. While baseball is national pastime, Japan regards baseball as a way of life. Japanese baseball has a philosophy characterized by spiritualism or collectivism. The most important elements are formed by group harmony, rigorous game practices, tolerance for games, and pitchers encouraged to “pitch through the pain” (this is completely baffling). Such an act is never recognized or permitted in MLB or US amateur games, and US baseball game is not formed by such a philosophy.

2.1.3 Hard Training

While MLB places importance on concentration in a game and never plays in inappropriate environment such as under fierce heat that makes it difficult for players to concentrate on the game, NPB players pays emphasis on spiritualism and plays even under poor environment. While US people enjoy a variety of sports and head for MLB if they are especially better at baseball, Japanese people engage in only baseball as a way to discipline themselves. In MLB, player’s own training is allowed, and the objection to a skip (head coach) is frequently expressed. There exists no senior-junior relation in MLB, and they respects with each other without senior-junior relation. US baseball game avoids excessive loading to an arm and shoulder, and 100 pitches are norm of pitcher per one game. There also exist different attitudes toward mistakes. While US baseball is positive to mistakes, Japanese baseball is very negative to them. While US players enjoy training, Japanese people regard it as a precious opportunity of hard self-discipline.

2.1.4 Popularity of High School Baseball Among Japanese

High school baseball is very popular among Japanese people. Japanese high school pitchers are encouraged to pitch through the pain throughout long innings a few games in a row. Therefore, excessive loading is imposed on an arm and shoulder, and eventually pitchers are vulnerable to shoulder and elbow injuries. Although US high school pitchers are regulated to throw 100 pitches per week, no such regulation is enforced for Japanese high school pitchers, and they are forced to pitch excessively. Japanese mass media frequently pay attention to prospective high school players, and make a great fuss on the high school candidates of NPB draft picks, although it is

uncertain whether they apply in NPB. Even after picked up by NPB team, Japanese mass media pursues them persistently. Anaheim Angels player Syohei Ohtani was such a prospect and pursued by mass media. Although he was successful in NPB, it is true that all prospects are not necessarily successful in NPB and few prospects can pass for NPB. US mass media pays attention to not such high school or college prospects but prospect who achieved better in minor leagues such as 3A. So, prospects who were just draft picked can concentrate on their own training.

2.1.5 FA (Free Agent)

FA (free agent) system was established to equalize the competitive power among teams in MLB, and it helps to some extent. Although FA was later established even in NPB, there is still a team to which no player transferred via FA system. This difference might come from whether FA systems was established aiming at the coexistence and mutual prosperity of teams in the league. Unfortunately, NPB's system was not established with such intention. Such a state never occurs in US. This might be caused by the cross-cultural difference. In Japan, it is practically impossible for the team with no history of FA transfer to complain of FA system, because such a complaint is regarded as an action to disturb "Wa" (harmony) among teams that belong to NPB.

There is a problem of less authority of NPB's commissioner behind inefficient FA system. The commissioner in MLB is called Cesar of the baseball, and has supreme authority to manage MLB. On the other hand, NPB's commissioner has less authority than owners of NPB teams who are generally CEO of family firm that owns the team. The commissioner of NPB has only limited authority to hold all star game and Japan championship (corresponding to World Series). Therefore, it is implausible to establish FA system that is fair and effective for all NPB teams.

2.2 Explanation of NPB's Hard Training as a Team Using Behavioral Economics

It seems that there is apparently cross cultural differences between MLB and NPB. NPB tend to force a pitcher without command to practice hard for long hours. Is this really effective for the pitcher to concentrate on the practice and improve his command? The coaches in MLB point out the drawbacks of each player and give some advice for improvement. The coaches are never responsible for the improvement, and the improvement is completely put into a player's hand. Players must perform a voluntary training and overcome the drawback by themselves. Is it really true that hard work produce high performance? Rather, hard training does not necessarily guarantee the success in professional baseball league, and it is not scientifically established that hard work leads to high performance. As Whiting (1989) pointed out, NPB players spend many hours (more than ten hours) in hard training as a team in a spring training. MLB teams, on the other hand, do not practice for such a long time, which does not mean that MLB players make less practice than NPB players. They must recognize that hard work for long hours does not necessarily bring desirable results, and that the concentration and the useful method are essential for overcoming their own drawbacks and improving their performance further. As the inverted U-curve concept [26] suggests, the moderate duration of training is necessary to maximize its effect. As Mullainathan

and Shafir [26] shows, the hard training for excessively long hours must corresponds to the scarcity state with less slack.

Ford motors discontinued long working, shortened working time, and succeeded in enhancing the production efficiency, which also demonstrates that the long working hours will not increase the processing capacity of each worker. It means that the working hour is not proportionally related to the processing capacity of each worker, and eventually the production efficiency. Similar results are applicable to the relation between the training duration and the improvement of skill, and it can be speculated that hard longer training does not necessarily enhance the skill of players. The hard and long hours training also increases the risk of injuries. The physical and mental aspects necessary for enhancing baseball skill must be fostered not by hard and long hour training but incessant, reasonable, and moderate training fitting to each player. Hard and long training increases the scarcity of players and never deserves to be a sufficient condition for concentrated and effective acquisition of enhancing baseball skills. It seems that hard and long training grasps the cause and effect mistakenly and make NPB training practice get trapped into a representativeness bias. It is more rational to recognize the relation between each player's skill or capacity and the quantity and quality of training and practice a scientific training appropriate for each player as MLB adopts.

2.3 A Cognitive Bias to Demote Pete Rose from Hit King to Hit Queen?

There also exists a cognitive bias peculiar to NPB that is related to media reports. The record of life-time hits 4256 was achieved by former Cincinnati Reds player Pete Rose. When MLB player Ichiro Suzuki (at that time he was playing for Miami Marlins) recorded a total of 2979 hits, Japanese media reported and made a great fuss that Ichiro Suzuki surpassed the record of Pete Rose by adding his number of hits at NPB (1278) to 2979 and comparing the added number ($4257 = 2979 + 1278$) with MLB record of life-time hits (4256). It is completely irrational to try such a comparison, and Ichiro Suzuki's MLB life-time hits 3073 (before the start of 2018 MLB opening) should be compared with Rose's life-time record (4256). The author does not mean that the life-time record of Ichiro Suzuki is by far inferior to that of Pete Rose. It goes without saying that Ichiro Suzuki is a splendid player to leave his name in MLB history, and certainly inductees into the Baseball Hall of Fame. US MLB fans might feel that Japanese mass media forces to demote Pete Rose from MLB life-time hit king to hit queen.

In fairness, it must be noted that Pete Rose recorded 427 hits at minor league, and recoded a total of 4683 hits throughout his professional career. Rationally speaking, the truth is that Pete Rose holds the record of MLB life-time hits, and the comparison above should not be tried by Japanese mass media. Although MLB fans in US praised Ichiro Suzuki's historical achievement, this should be separated from the record of MLB life-time hits accomplished by Pete Rose. It is not until Ichiro Suzuki excels 4256 hits that he becomes a record holder of MLB life-time hits. This is regarded as a cognitive bias that stems from heuristics (confirmation bias) that makes us look for only data or information favorable to us. It seems that in-group bias (blindly cooperate to an in-group member) also contributes to this fussing event. Such a fuss by Japanese media seems to lack in rationality and fairness.

3 Hidden Biases in Decision Making Related to Sports Management Peculiar to NPB

3.1 Irrationality in Contract Money

NPB teams tend to spend much money for contracting draft picks whose future achievement is uncertain. It is irrational to pay much money for draft picks who have not yet performed well (are not certain about their future performance). In general, sign-on bonus is paid according to the draft order for both MLB and NPB. We can judge that this system is rational and induces no waste of money if the player performs according to the draft order. However, it is self-evident that this is not necessarily true. Therefore, the draft system is basically irrational. Representativeness bias that the evaluation of draft pick before joining a team guarantee the achievement after enrolling a team works for such an irrational system of contract money. Assuming that 60 (6 players/year) players join a team over 10 years, 40–45 players leave NPB in despair without getting a chance to play an active part in MLB or NPB. The probability that players selected at the first or second round of draft plays the mainstay of the team is unexpectedly low. The risk of failure of first or second round draft pick is high. NPB scouts tend to underestimate the risk by paying attention to only a successful draft pick due to the representativeness bias, in particular, the ignorance of base rate and availability bias (Halo effect).

3.2 Sunk Cost in NPB

There are many athletes still playing at NPB even if the team found out that they cannot play regularly at the game as it is. On the other hand, MLB makes a quick judgment to terminate the contract with such players or transfer them to other teams if the team judges that they are no longer expected to play regularly at the game and greatly contribute to the team. NPB continues to employ such players, because they judge that they must wait and see how they grow for the time being and regain the money invested for them. This is similar to Concord fallacy. This represents a bias that makes us continue to invest in a project or something merely to justify past investment in it even if we recognize that continuing the investment is waste of time and money. Concord fallacy is one type of sunk cost effect that tends to continue an endeavor to a project or something that is merely a waste of time and money once an investment in money, effort, or time has been made. Money that has already been spent cannot be regained. However, as mentioned above, we irrationally behave as if sunk cost can be recovered somehow.

3.3 Cognitive Biases in Competency of Professional Scouts

In NPB, it is generally believed that one particular NPB team's ability to pick up an appropriate candidate of draft is higher than that of other teams. Is it really true and rational that this NPB team is superior to other teams in picking up a talent who is superior in baseball? It is never told that even this team fails in picking up excellent players in draft picks. This must correspond to an availability bias that attempt to look

for only information that fit our hypothesis or assumption. We never pay attention to data or information that is contradictory to our assumption or hypothesis. It must be noted that even such a team frequently fail in selecting excellent players at first round of draft. Is it possible to demonstrate scientifically that this team's scouting competence is higher than that of other teams in NPB? We must recognize the fact that we cannot avoid two types of errors, that is, Type I error (producers' error) and Type II error (consumer's error). Professional scouts judge that promising candidate of draft pick as not necessary, and regard no promising candidates as necessary.

It is difficult for us to avoid cognitive biases. Therefore, it is further implausible that scouts rationally evaluate candidates of draft pick without affected by a framing effect and overconfidence, because we usually tend to evaluate human's skill, ability, or capacity from the viewpoint of fixed frame and cannot conduct an evaluation from multiple perspectives. Scouts at NPB seem to get trapped into such a bias more readily than those at MLB.

Here lies a possibility that we overestimate and illusionary assume the false relation between the cost for reinforcing a team in the draft pick and the future achievement of draft picks. Although it may be speculated that the team is not good at selecting candidates at draft pick but good at raising young players, such an analysis is never carried out. We should further identify whether the team is actually good at predicting the future performance of draft picks or good at raising these player. Without such detailed analysis, we readily become a victim of representativeness bias, in particular, the misunderstanding of cause and effect relation. Without such an approach, we cannot integrate the strategy of draft pick and the effective training system of young players into a rational and effective selection and training system. It is not until such a system is established that we can lead to a non-biased decision making.

Another problems is that mass media is intermediating in creating such a fallacy. Mass media should carefully mention their opinion by referring to scientific evidences, and should not trigger such a fallacy (representativeness bias) on the competency of professional scouting activities. It tends that NPB spends more money for contracting draft pick than MLB. Such a tendency is not rational at all. We should pursue more rational draft pick system without such cognitive biases that does not waste time and money in scouting activities of draft picks.

3.4 NPB Team's High Payment for a Player Who Had Once Played in MLB and Judged to Be Unnecessary Even in 3A

Here, it is discussed why NPB make a wrong decision to employ and assure high salary for former MLB player who never has a chance to play at MLB. NPB, getting trapped into availability and confirmation biases, sometimes re-employs players and wasted much money. Based on the splendid past memories that the player achieved excellently in NPB and MLB (this corresponds to Halo effect), one team at NPB contracted with Daisuke Matsuzaka. He played at NPB (Tokorozawa Seibu Lions) and MLB (Boston Red Sox), and was on the starting rotation at both teams. After moving from Boston Red Sox to New York Mets, he was judged to be not usable at major league. In spite of this, NPB team (Fukuoka Softbank Hawks) made an agreement with Matsuzaka under the three-year (2015–2017) contract of paying four million dollar per year. As

expected, he pitched only one game (IP: 1, Hit: 3, Walk: 2, ERA:18.0), and could not perform well at all so that he deserved to be paid so much money. Although he managed to be employed by other NPB team (Nagoya Chunichi Dragons) in 2018, there is no prospect that he can pitch at the major of NPB. When he was tested by Chunichi Dragons, the team did not make a decision to employ him based on the detailed check of his pitching ability at that time. He only pitched less than 40, and the team decided to employ him. MLB never makes such a decision. If such a player is invited to the MLB spring training and win the contract at MLB, he must outstandingly perform better at spring training and exhibition games. This is a rational way of thinking. However, it seems that NPB cannot obey such a rational procedure to make a contract with former MLB players.

MLB never make a mistake to have been employing such a player who could not achieve better at all for the past three years. There seems to be a great bias in NPB recruiting of players. NPB apparently get trapped into an availability bias (Halo effect). Once got trapped into Halo effect, it seems that NPB teams misunderstand that the player's glory is regained somehow and without basis. They apparently did not judge the evaluation by MLB objectively and without biases. Here apparently lie irrationality and cognitive bias that are peculiar to NPB and stems from the cross-cultural difference between MLB and NPB as mentioned in Sect. 2.1.

3.5 Summary

There are many cognitive biases or irrational decision making in common to both MLB and NPB as shown in Sect. 1. As have been already mentioned in Sect. 3, more excessive and persistent cognitive biases are ubiquitous in NPB than in MLB. The reasons for this were discussed based on cross-cultural difference of point of view toward baseball between MLB and NPB. It seems that NPB is suffering from additional and more excessive cognitive biases and experiencing more irrational behaviors than those observed in common to both MLB and NPB. It is speculated that the reason for this is attributed to the cross-cultural differences that stem from spiritualism (“Wa”, that is, harmony). Figure 1 summarizes the results obtained in this study.

Japanese Sumo scandal occurred in 2017. Former yokozuna grand champion Harumafuji (from Mongolia) committed an outrage to his junior makuuchi (high-ranking division of Japan Sumo Association) wrestler. The correspondence to the scandal by Japan Sumo Association also seems to be based on the spiritualism that tradition and harmony should be preserved at all means as stated in “You Gotta Have Wa” written by Whiting [25]. The Japan Sumo Association never attempted to reveal the truth behind the scandal from multiple perspectives or frames. As guessed from the points raised in this study, the cultural factors also seem to implicitly make this Sumo scandal more complicated and entangled.

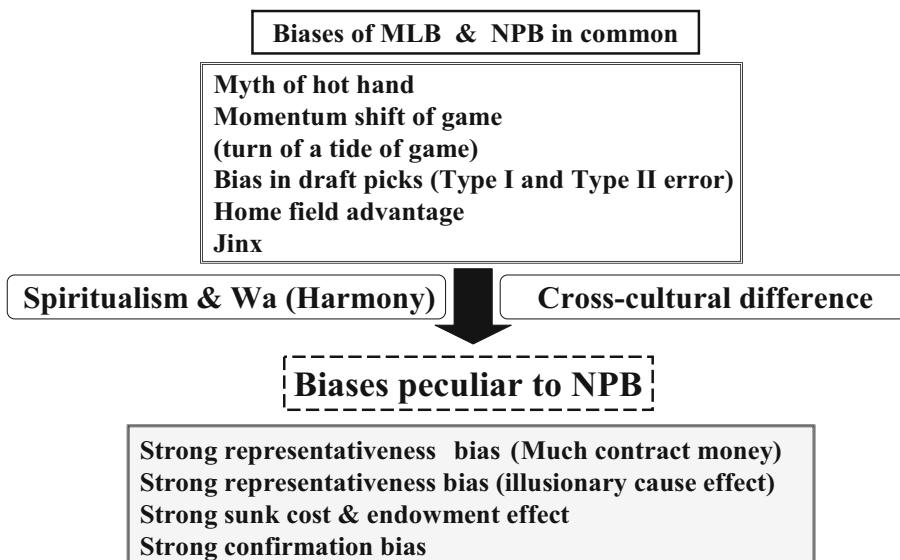


Fig. 1. Summary of the study. Biases in common to both MLB and NPB and those peculiar to NPB that are speculated to stem from spiritualism (“Wa” (harmony) in NPB) and cross-cultural difference between US and Japan.

4 Conclusions

This study demonstrated that cross-cultural difference between MLB and NPB gives rise to cognitive biases or irrational behavior in sports management or decision making. The biases that stem from cross-cultural differences have discussed. In other words, the biases in decision making and behavior in draft picks or making a continued contract with players peculiar to NPB and not observed in MLB have been identified. Cross-cultural difference as a contributing factor of distorted and irrational decision making should be carefully taken into account to practice rational and effective management in sports.

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Proactivity in Career and Identity Styles in the World Oriented Towards Global Change

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Abstract. The multi-contextual social changes, expressed in the permanent creation of the contemporary society, contribute to difficulties in the attempt to capture and unequivocally define the factors which determine them. A strictly “global” theoretical reflection refers to the complexity, heterogeneity, progressive interdependence of the world’s societies and the awareness of its totality. The complexity and temporal multidimensionality of the contemporary globalizing society (its ambiguity, ambivalence, transience, diversity) and the transformations of the socio-cultural reality which is subjected to constant fluctuations, make it difficult to grasp the description and standardization of the heterogeneity of the society which is undergoing objectivization in its actions. This fact is not without significance for the development of a new configuration of global policy, market structures and new patterns and models of careers. The issue of identity crystallizes the problem of individual career trajectories and the construction of the subject’s professional identity. In this sense, it is a narrative which has to be developed and which requires the creative contribution of the individual and their reflective approach to their own biography. Identity is shaped in the context of social and cultural influences of a reality which is subject to permanent change. The identity styles determined by the socio-cognitive processes relate to the individual preferences in the processing of information concerning the subjective “I”, in making decisions, in the selection of strategies of constructing or avoiding the crystallization of own identity and the quality of career decision-making in the world of “boundaryless careers”. In a situation where no career scenario adopted *a priori* provides a guarantee of success, investing in a career identified as the “property” of the subject, pursued “in one’s own case”, becomes a necessity and enforces the proactive planning, directing and management of a career.

Keywords: Career · Constructing a career · “boundaryless careers”
Proactive orientation · Globalization · Identity styles

1 Introduction

Post-modern, ambiguous and ambivalent socio-cultural reality, which succumbs to continuous fluctuations, leads to dramatic social transformations expressed by permanent self-creation. Temporal multidimensionality of the future society contributes to some difficulties in capturing the heterogeneity and changeability of forms in the modern social organization. Conceptual disputes in sociological theory are

concentrated on an attempt to answer the question: “where, how and in what form the society exists” [1], simultaneously presenting processual, structural and functional attributes of “historically established and currently existing society, which is objectivizing itself in its activities” [1].

Contemporary career study requires taking into consideration multi-contextual changes in the world of work, which set new challenges for employees. This fact causes that “doing research into careers means studying changes both within individuals and organizations and also within the society” [2]. In “a non-continuous space-time and in heterogenic system of cultural meanings” [3] career development and occupational identity formation becomes a cognitive practice based on individual experimentation. Contemporary social configuration, where seeking identity has become a flexible reference point, opens before an individual a whole range of numerous opportunities to create one’s own career in the course of life [4, 5].

Human existential situation requires that an individual, shaping their own biography according to the motto “<do it yourself> and using such elements as norms, values, preferred lifestyle or ideological convictions, which one <acquires> from many sources nowadays” [6], should embrace and take full responsibility for their own decisions and choices. Prospective temporal orientation towards anticipation of events, planning future activities and also evaluating consequences and considering adverse side effects means an ability to perceive global character of a change and to create alternative solutions. The critical feature of modern man mentality should be temporal orientation towards the future, which is expressed by the ability to forecast and create desired future occurrences. The increase of the role attributed to career showcases the problem of planning, management and monitoring one’s career in a lifelong perspective. Global tendencies and processes of differentiating and correlation between various walks of social life undoubtedly draw attention to the problem of implementation of life-long learning, planning, management, development and shaping a career.

In the knowledge-based economy, which actually reflects the knowledge orientation of modern society, career development of its members becomes the key factor. Similarly as investing in a career portfolio which is an asset and sustainable capital on the way promoting development and identity style formation.

2 Proactive Attitude as an Ability of a Subject to Shape Career Environment

The image of an individual as an actor constitutes an important theoretical construct. Individuals are capable of creating a career. Careers do not exist as occupations or jobs [7]. As K. Obuchowski points out, this specific “orientation shift of an individual from external determinants of existence towards internal ones” [8] leads to considering a career in connection with an individual, as a separate entity whose property is their individual career [9]. It is appropriate to evoke here a fragment of the discussion between Collin and Watts, where the authors assume the need to re-evaluate thinking about a career. They express the need to focus on career as a subjective construction of an individual rather than something that is objective” [10]. Hence a subject develops their career on the basis of perception and attitude towards it, which means that career

is “a pattern of influences that coexist in an individual’s life over time”, as Patton and McMahon put it [10]. This view represents an individualistic tendency (ambition, empowerment, motivation), which is justified by economic theories promoting investment in human resources development within an organization [11]. This opinion lays basis for thinking about a career as an individual’s “property” taking into consideration individual career choices, individual career planning strategies or individual stages of career development.

Problematization of the process of career management and development enhances the interest in the issues regarding proactivity in a career. Adaptation to amorphous environment takes place by the practice of learning about a new context in which one participates contributing also to its change. The strength of impact on a current situation or social surrounding is individual and depends on the subject’s inclination to undertake activities which indirectly cause changes in the environment. Contemporary studies should take into consideration its broadly understood pro-developmental dimension which in fact refers to what T. S. Bateman and J. M. Crant called shaping pro-activity of individuals. Initiative, as a component distinguishing pro-active behaviours, is understood as an ability to initiate activities and gather resources and support for the process of change, whose essence is not limited to triggering some changes but also involves being engaged in the process of achieving a goal, i.e. seeing the change through [12]. Temporal orientation towards the future will allow an individual to focus on the “choice” rather than “fate” or “contingency”. This way of thinking is closer to promoting autonomic subjective agency rather than adjusting to the existing conditions. Pursuing subjective activity is fostered by educational activity directed towards being open for new opportunities and situations instead of being uncritically rooted in traditional homogeneous convictions and rules. Proactive behaviours as purposeful activities of a subject were studied by Z. King; R. A. Noe and C. Orpen. The studies allowed them to distinguish two groups of components of proactive behaviours which can be described as cognitive and behaviouristic components [13]. The main distinctive feature of proactivity is undertaking some initiatives to change the environment which means that an individual has the “ability to shape the environment in the manner superseding the ability of the environment to shape behaviours” [14]. Proactive behaviour as a cognitive practice occurring permanently, understood as a turn towards proactive personality will be a “basis” for constituting of the following features: searching for change, perceiving opportunities, creating situations, revealing initiative and undertaking activity [15]. The way of thinking about proactivity as a personality disposition and proactivity as a commitment resulting from given conditions, needs and contextual circumstances was significantly influenced by the views represented by T. Bateman and J. M. Crant. According to the authors proactive persons are distinguished by seven inter-related characteristics. Emphasizing personalistic dimension in the culture of school reality and entering the road of (self)education means the concentration on creating the following features: looking for the possibility of change, establishing effective change-oriented goals, anticipating problems and taking remedial measures, looking for ways of achieving goals, entering a path of action with the awareness of risk and responsibility, perseverance in the pursuit of goals and goal achievement, showing achievements and implementing changes which have impact on the environment [16]. An important aspect of status and proactive conditioning, of

personality disposition pointed out by E. W. Morrison and C. C. Phelps, is “responsible commitment”. This construct is defined as a constructive effort of a subject directed towards negation of a status quo in order to implement functional changes within the conducted tasks [17]. Similarly the concept proposed by Frese, Kring, Soose and Zempel emphasizes the problem of personal initiative of a subject. This concept suggests that proactivity is “a behaviour directed towards showing initiative (someone does something when they are not told to do it and when their role does not require it; (...) long-term concentration, awaiting future problems or possibilities), and perseverance (overcoming limitations so that changes could occur)” [18].

3 The Influence of an Individual Identity Style on the Level of Career Involvement

The issue of identity highlights the problem regarding the trajectory of individual career paths and constructing professional identity of a subject. In this sense as “every other formal narrative it is something that must be developed and obviously requires some creative input” [19] and contemplative approach to one’s own biography. Identity constitutes “a contemplative loop in which leaving oneself one comes back to self” [20]. In the context of contemporary world transformations, it seems particularly important to look for and specify an answer to the question “Who am I in this quickly changing world?” (a dynamic question). An individual who perceives the pace and intensity of changes when answering a complex question of a dynamic character, in her/his outlook on the world and career plans is trying to specify to what extent s/he is an active subject of prospective changes occurring in cultural and social contexts [21].

In the situation when social life is clearly organised around multiple and various alternatives, young people face a task to define their relations with this world, which is crucial for the quality of career planning and management and modifying its individualised paths. This involves a peculiar internal exploration and the element of looking for the answer to the complex and recurring question: How and to what extent am I a subject of prospective changes? Significance and dynamics of changes implies changes in identity aspects of social life in which a young person particularly looks for oneself and defines oneself. For young people, participating in the unstable reality, who are in the period of double transition: from adolescence to adulthood and from the academic education to the job market, finding the answer to the question: “Who am I becoming?” gains particular importance but turns out to be more and more difficult to specify in the “multiplicity of worlds”.

Awareness, feeling and making statements about “who you are?” and “who you are becoming?” makes it possible for a subject to formulate an image of a desired result. In the sense that we are interested in, formation one’s identity determines the direction of career development and makes it vital. In this meaning the loss and permanent change of individual reference points highlights the problem of identity styles and addresses the issue of “how identity is created and how it changes” [22] depending on the social context and the quality of the involvement of a young person in the process of exploration. Recognizing oneself and understanding oneself increases the sense of

agency and leads to taking responsibility for agency – to making a commitment. Undoubtedly these processes are crucial in planning one's own career paths.

Exploration is one of the basic dimensions on the way of defining personality which is emphasized in psychology by J. Marcia, Erikson, A. Brzezińska, among others. The essence is “looking back at oneself, contemplating oneself, trying to understand who one was and who one might become, (...) which makes it possible to realise who one is in their relationship with the external world and surrounding environment” [23]. A young person entering adulthood faces a necessity to define oneself permanently (in a situation of dominant change and ambivalence) and individualize the course of their biography (which is forced by losing “connection” with the community). In the course of life, individual career development takes a prominent place, which a subject endows with meaning. And this occurs, as E. Gurba puts it: “by taking personal initiative in developing one's professional activity and social networking, in managing one's education and career and in future planning” [24]. This idea is developed in the concept of identity styles proposed by M. Berzonsky. Identity is shaped in the context of social and cultural influence of constantly changing reality. M. Berzonsky's model creates a possibility to capture dynamically the way in which identity is formed. Identity styles determined by social and cognitive processes refer to individual preferences as regards the following issues: processing information concerning the subjective “I”, decision making and choosing strategies to construct identity or to avoid identity formation. Identity style is understood by the author as “the manner in which an individual copes with problems concerning identity” [25]. Identity style model proposed by the author refers to some differences in individual processing of information relevant to identity and the differences in the contents constituting self-conception of a subject. For example, an individual might be concentrated on obtaining information, process it meaningfully and evaluate before one decides to make a commitment and define oneself, or alternatively one may adjust automatically and internalize normative directives of significant people or groups and communities to which one belongs [26]. M. Berzonsky proposed that values influence the manner in which individuals engage in the process of forming one's identity and coping with identity conflicts. Values motivate an individual and give her or his life some sense of direction. Conscious and rational approach to identity, typical for the information style is connected with values which indicate some independence and autonomy of the subject with simultaneous ability to go beyond one's own pleasure and self-indulgence. The normative approach to the aspect of identity is connected with such values as conformity, institutional commitment and responsibility. The diffuse/avoidant approach “full of procrastination and evasion” is connected with interestedness and orientation towards achieving personal pleasure and avoiding distress [27]. Cognitive orientations engaged in the process of identity formation, as M. Berzonsky claims, can reveal various identity styles, such as the information style, the normative style and the diffuse/avoidant style. The author distinguishes also a construct of commitment known as a factor of identity commitment or the power of commitment.

The information style characteristics individuals who look for information in the process of forming their identity, or more precisely before making decisions regarding identity. The ways of exploration in the course of identity formation are based on independent and active search, on processing a wide variety of information data. The

essence is based on invoking such elements of “I” as: personal standards, goals and system of values [28]. People with the information identity style act in a well-considered manner, intentionally look for, evaluate and refer to information which they find useful. The information style characterises individuals who reflect on their ideas and evaluate them numerous times, particularly when receiving contradictory feedback. The information identity style is positively correlated with the need for cognition, cognitive complexity, self-reflection, mindful coping with problems basing on rational consideration, careful decision making, openness towards new experiences, and conscientiousness. The information identity style is connected with subjective activity and causal competence of the subject. E. L. Deci and R. M. Ryan distinguished integration among other regulation processes. Activities requiring awareness of goals, values and standards result from the integrated self-regulation and making choices which by the act of choosing, reciprocally motivate the subject to the agency stemming from one’s own preferences [29].

The normative style invokes the manner of coping with decisions that are crucial for ME by acceptance and internalization of expectations of people significant for the subject or of binding social norms. Solving identity conflicts occurs by referring to such elements of “I” as: family, nation, religion [30]. “Normatively” oriented individuals have only a slight inclination for internal exploration and have a clearly outlined direction of action, limited tolerance of ambiguity and are also closed to information which might threaten their personal convictions and value system. The normative process, which according to E. L. Deci and R. M. Ryan is connected with internalization of standards, goals, values of significant others, causes that commitment is not fully treated by the subject as their own. His or her actions are accompanied by anxiety caused by a sense of possible guilt, approval or obligation [29]. Normative commitment is more rooted in emotions than in information. Moreover, the normative orientation can strengthen what Langer (1989) calls “immature cognitive engagement”. The engagement based on emotions (“cognitively immature”) occurs without critical consideration and evaluation of information. Although commitment is based on emotions with little evidence which could be proved or justified (in contexts in which problems, requirements and standards are rather stable), the power of commitment as such promotes effective functioning, independently of the level of rationality revealed in its basis. Thereby commitment based on emotions can result in committing oneself, which exemplifies subject’s activeness and causative competence [31].

The diffuse/avoidant style reflects an attitude of procrastination and postponing solutions which are important for identity formation, and solving identity conflicts. Individuals with diffuse/avoidant style avoid confrontation with personal problems and procrastinate making important decisions as long as possible and their behaviour is determined mostly by situational factors. Crucial central components in “I” structure are popularity, making impression and reputation [28]. In individuals classified as representing diffuse/avoidant style, requirements connected with and determined by situational context usually control or limit subject’s behavioural reactions. The diffuse/avoidant identity style is positively correlated with emotional strategies of coping with problems, with situational changeability, with neuroticism and depressive reactions, but also with meticulousness and cognitive inquisitiveness [32]. In the model of identity styles proposed by M. Berzonsky, diffusion/avoidance means something

more than just dispersed and “lost” “I”. This style is connected with strategic attempts to avoid or hide potentially negative feedback and little commitment.

The commitment factor reflects the power of motivation, readiness, stability in pursuing internalized system of values, making decisions concerning identity and striving for goals. Identity commitment gives the subject a sense of meaning and direction towards the goal. Internalized standards and criteria serve as a reference point when evaluating feedback resulting from solving problems. Commitment can be cognitive, based on information and reflecting the extent to which views and beliefs have been developed and are justified by the subject within rational ideas and evidence, or emotional, reflecting the sense of subjective certainty which is irrational but persistent [33]. Identity commitment is for the subject a carrier of the sense of purpose and direction and also constitutes a “frame” of reference for a system of values which serves such goals as: monitoring, evaluation, behaviour regulation and receiving feedback. The strength of commitment is positively correlated with careful decision making and the ability to cope with problems and negatively correlated with the tendency to procrastinate or panic when making a decision [34]. According to P. Brickman, commitment “stabilizes behaviour of an individual which in given conditions would be prone to changes” [35].

“Permanent career change” means development of one’s own career on the way of personal commitment. Subjective insight into a career emphasizes personal experiences in a career (in development and planning of its perspective) and takes into consideration subjective meanings given to a career. Meanings ascribed to a career are valuable mostly subjectively and the identity style cannot be overestimated in this process. Referring to identity style throws a new light on peculiarities of approaching a career issue. Identity styles, when considering identity commitment factor, reveal discrepancies in information processing, negotiating identity issues and personal decision making [36], which makes them analytically vital from a cognitive point of view because they serve explaining relationships that can be captured between identity styles and opinions, views and beliefs regarding the career as well as the subject’s proactivity in pursuing a career.

4 Conclusion

At the level of individual decisions, transition to post-modernity, according to which the future does not constitute a simple continuation of the presence, as well as experiencing late modernity, in which constitutive features of modernity take an extreme form, means that one can and should live only experiencing change, where everyone must “become a model of an epoch which we want to create” [37]. Existence of many reference systems which have their own rationality criteria constitutes an attribute of the presence and will be a permanent feature of the future, and “experiencing ambivalence is a <life sentence> or even a curse of modern man” [38]. The vision of the constantly fluctuating world and ideas undermining the existence of career competence acquired “once and for all” emphasize the need to focus on the issue of “proactivity”. Development of career competence is a specific requirement concerning human condition, which is significant for the shape of social order. This is a constant

process of acquiring new skills and improving those which one already has. Multiplicity, fragmentation, changeability and complexity of forms of social life organisation influence the changes in the career development perception and overcoming the tension between past experiences and future possibilities. An individual as a conscious creator of one's own biography participates in the processes of "investing and renovation" (A. Bańska) of career capital. Referring to the category of proactivity, which can be found in the studies of E.W. Morrison, among others, makes it possible to demarcate another field of correlates indicating the existence of a connection between individual's activity and career success exemplified by such factors as: getting a job, commitment, job satisfaction and satisfactory evaluation of "human capital assets", i.e. "market value" of an individual. In this sense career commitment is significant for career development and fulfils subject's ideas as a conscious creator of one's own biography forming identity style supported by commitment.

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Novel Multi-objective Optimization Algorithm Incorporating Decisions Factors in Design Modeling of Hydraulic Nets

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Abstract. Engineering designs are multi-objective and contain more than one design goals, comprising many design variables to be optimized at the same time making the design problems more complex. These design objectives theoretically inflict differing requirements on the technical performance of system design. In this study, firstly, we analyze the tolerances among multi-objectives and conflicting engineering CAD design and explored optimum design solutions for that matter an optimization problem with multi objectives has been mathematically modeled in this paper. The present work, proposes a new methodology that allows supplementing the nets design in order to support large scale water distribution system. The design solutions guarantee that the obtained results after optimization process are practicable and feasible. For this the design methodology, the understudy engineering systems is analyzed, in a systemic way, the problem of aqueduct design task is formalized mathematically considering all its complexity and constraints. In our study the “Stochastic Search Variable Code” algorithm allows to iteratively explore the solutions space and, in a systematic way modifies the interval limits of the possible variable code solutions values, that avoids to be caught in local minima and reaches global optimum minima with more computational efficiency.

Keywords: Multiple-objective functions · Optimization · Decisions process
Hydraulic nets design · Human factors · Systems engineering

1 Introduction

In the last decades, special attention has been devoted to the optimal dimensioning of water distribution networks. To this end, various optimization techniques are applied that allow a greater reduction of the capital costs of these systems. Some of these

methods are restricted in their application to branched networks. Such as, the Linear Programming model for the joint dimensioning of pipes and headroom height, and therefore, are not applicable to the design of meshed networks that, due to the need to maintain the service in any circumstance, cannot be subject to the fragility of a single supply conduit per supply area, which requires considering circuits. The use of metaheuristics is based on problems whose solution is not satisfactory by traditional methods and the implementation of exhaustive search methods is not justified in practice. So, it is applied with the objective of obtaining “good solutions” in a reasonable time [1].

The classic objective function is considered multimodal and concave (the stationary points are maximum). The minimum of this function are not stationary points as they are in the discontinuous-derivative. Although there are models that yield important results [2], most are limited to networks with few circuits due to the high consumption of computational resources and do not avoid the result of the network implicitly branched. Such a design solution is not feasible in practice because the objective of meshed distribution networks is to guarantee supply even if there are factors that affect it, such as: ruptures, maintenance, or other reasons. If any of these events occur in the sections of larger diameter pipes, the flow that must flow through it will not be efficiently driven by the smaller diameters, which were the result of the optimization to close the circuits [3]. Many researchers use only investment costs during the formulation, energy costs are rarely taken into account [4] and include a certain fixed pressure value in the supply node [5]. For this reason, optimization leads to the “opening” of the circuits of the meshed network giving rise to branched or quasi-open networks [4].

Other investigations devote efforts to consider the energy aspect [6] but are generally considered in terms of energy cost product to pumping, which implies, that the supply to the network is not by regulation. The formulations that present such considerations do not allow to analyze other circumstances which are the most common in practice, as is the supply through tanks [7].

2 Indicators of Efficiency in Water Distribution Systems

In order to evaluate the energy efficiency in water distribution systems, regardless of the supply system to the network, it is proposed to consider the sum of the energy losses for the conditions in which the optimization process is carried out. For all these reasons, the following are considered as Efficiency Indicators in the mathematical formulation [8]:

- Minimum total cost (C) of the water distribution network.
- Minimum value of energy loss (E).

The energy loss to be considered includes the friction losses and the losses produced by singularities in the water distribution network, which will determine if the system performance, in a particular state, can be good because there is little loss of available energy; or not so good, due to a large loss of available energy. The reduction of energy losses in a system is proportional to the guarantee of pressure height in the

nodes; therefore, the minimization of this indicator is aimed at maximizing the benefit of excess pressure at the critical point.

2.1 Other Indicators of Efficiency

There are attempts to minimize the obtaining of quasi-open networks in optimization processes, such as, to include within the objective function other indicators such as the reliability of the pipes, in which is considered the time that a pipeline must be isolated by some reason [9]. Reliability is an indicator that can be quantified in various ways: take into account the type and aging of the pipes in the network, changes in demand or pressure, the type of soil, the seismic threat in the area, among other factors [10]. It can be measured from the surplus of pressure obtained in the nodes in relation to the minimum or admissible pressure value and also considers the uniformity of the diameters connected to a certain node. The increase in reliability allows the network to assume better behavior in the event of unforeseen events.

To achieve an accurate characterization of this new indicator is necessary to store large amount of information through expensive technologies and to make historical measurements to determine: the type of soil, seismic hazard area, leakage of the fluid, mechanical breakdowns, including other factors that increase the degrees of freedom and makes reliable modeling of the system difficult [11].

Considering reliability in an optimization model is a difficult and complicated task, and there are no universally accepted definitions for its explicit expression [12]. On the other hand, in an objective function in which more than one criterion is present, there cannot be a solution that is the best in all the criteria. Instead, in a problem of multi-objective optimization there is a set of Pareto-optimal solutions or non-dominant solutions [13]. These solutions are superior to the rest of the solutions in the search space, when all the objectives are considered, but inferior to other solutions in one or more objectives.

3 Calculation of the Quality Function

One of the most used schemes in recent years for the approximation of multi-objective function is the minimization of Tchebycheff's distance from an ideal solution (or desired) to the region of existence of the solution [13–15]. Once the reliability is considered from the graphical advantages, the probability of obtaining a better compromise between the two efficiency indicators expressed previously is increased: energy loss (E) and total cost (C). The minimization of the weighted distance of Tchebychef (Z) is expressed in 4 when each parameter is affected by a weight established by the designer. In this way, the quality function of the system is proposed by means of the following equation:

$$Z = \max \left\{ w_1 \frac{E - E^{id}}{E^{id}}, w_2 \frac{C - C^{id}}{C^{id}} \right\} \quad (1)$$

Where:

- Z - Quality function.
- E - Loss of energy in the network.
- Eid - Ideal or desired energy loss.
- C - Total cost of the network.
- Cid - Ideal or desired total cost.
- w1 - Level of importance established for the energy efficiency indicator.
- w2 - Level of importance established for the cost efficiency indicator.

3.1 Calculation of Penalties

Every water distribution network has certain restrictions in relation to the pressure height values at the nodes and the flow velocity in the sections. For the task under study, the following are considered:

- a. Pressure (Node)
- b. Speed (Sections)

The above restrictions are taken into consideration by calculating the value of a function Pen, of penalty, expressed in (2) according to the method of JN Kelley, [16]. The result of this function will increase significantly when the velocity and pressure values obtained do not correspond with the permissible parameters.

$$\begin{aligned} pen = & \sum_i^n 10^{25} \theta_i (P_i^{\text{lower}} - P_i) + \sum_i^n 10^{25} \mu_i (P_i - P_i^{\text{higher}}) \\ & + \sum_i^m 10^{25} \delta_i (Vel_i^{\text{lower}} - Vel_i) + \sum_i^m 10^{25} \varphi_i (Vel_i - Vel_i^{\text{higher}}) \end{aligned} \quad (2)$$

When:

$$\begin{aligned} \theta_i &= \begin{cases} 1, & \text{if } P_i < P_i^{\text{lower}} \\ 0 & \text{in another case} \end{cases} ; \quad \mu_i = \begin{cases} 1, & \text{if } P_i < P_i^{\text{higher}} \\ 0 & \text{in another case} \end{cases} \\ \delta_i &= \begin{cases} 1, & \text{if } Vel_i < Vel_i^{\text{lower}} \\ 0 & \text{in another case} \end{cases} ; \quad \varphi_i = \begin{cases} 1, & \text{if } Vel_i < Vel_i^{\text{higher}} \\ 0 & \text{in another case} \end{cases} \end{aligned}$$

- n - Number of nodes.
- m - Number of sections.

3.2 Generalized Efficiency Indicator

The generalized efficiency indicator (IEG) for each network variant is calculated from the quality function plus the penalties for not permissible speeds and pressures.

$$Z' = Z + Pen$$

When:

Z' - Generalized efficiency indicator for each design variant

4 Findings and Results

In the doctoral thesis [17], the importance of integrating the stages of the water supply network design process in a single CAD system was demonstrated, which allowed to reduce project delivery times and increase the quality of the solutions obtained by decreasing the probability of committing human errors. Among the activities that were computerized, the following stand out:

Benefits provided by the CAD System to help the designers. Following are the major benefits:-

- a. Projection of the design population.
- b. Determination of the flow required by the water distribution network according to population, tourism and large consumers.
- c. Generation of the triangular mesh that describes the prevailing topography in the locality.
- d. Definition of geological zones classified by soil types and their depth.
- e. Determination of the three-dimensional location of the nodes [18].
- f. Determination of the lengths of the pipes according to the trajectory made by the designer and the irregularities of the terrain.
- g. Selection of the type of material and dimensions of the pipes from the market offers.
- h. Definition of the areas of supply based on data on population, housing or population density as well as the demand of tourism and/or large consumers.
- i. Planning of the water supply by relating the consumption elements (supply areas) with the nodes that are considered of the water distribution network.
- j. Display of the classified information according to the hydraulic element that you want to analyze.
- k. Obtaining the branched network that unites all the nodes of demand or supply by the minimum route (minimum network prioritized).
- l. Generation of closed network variants according to permissible perimeters.
- m. Proposal of variants of diameters for sections of pipes when considering the criteria of the designers and the presence of existing pipes.
- n. Generate a population of feasible solutions under technical-economic criteria that can be evaluated subjectively through its graphic representation inserted in the environment where it should work.
- o. Automatic generation of executive plans, tables of results of the hydraulic calculation as well as technical data reports that allow to elaborate the budget of the project.

For the case of buried pipes

- a. Edition of the topographic profile of the sections of underground pipes in correspondence with the values of the coatings in the pipes and the maximum and minimum slopes.
- b. Calculation of excavation volumes when considering excavation equipment, trench parameters, type and thickness of pavement, topography and distribution of soil types from the depth defined in each geological zone.

5 Analysis of CAD System and Human-Machine Interactions

The CAD designs enables operators to simulate a design problem and enable them to be tested upon few protocols before launching into the actual system. The role of human machine interact in multi-objective design problems is vital [19] and used in pattern recognition and decision making in human factors engineering. The human operators make few decisions based upon the flow required by the water distribution network that unites all the nodes of demand or supply by the minimum route to reduce the water waste and utilizing the optimum flow pattern. These human decisions are based on the CAD designs of pipes and hydraulic nets. Further human factors is incorporated in the CAD design problems to make them ergonomically feasible in to actual working environment and water flow system.

6 Conclusions

It is considered to include as an efficiency indicator, the energy losses (result of the hydraulic simulation). In this way, energy efficiency can be properly evaluated during the design activity of the water distribution networks, independently of the supply system (injection or regulation). The study, proposed a new methodology that allows supplementing the nets design in order to support large scale water distribution system. The proposed CAD system allowed to reduce project delivery times and increase the quality of the solutions obtained by decreasing the probability of committing human errors. These hydraulic net design solutions guarantee that the obtained results after optimization process are practicable and feasible to the flow to water and reduce waste in the actual environment.

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Correction to: Convolutional Gravitational Models for Economic Exchanges: Mathematical Extensions for Dynamic Processes and Knowledge Flows

Mike Horia Teodorescu

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In the original version of the book, the following belated correction has been incorporated:

Chapter 22 has been changed to Open Access.

The book and the chapter have been updated with the change.

The updated version of this chapter can be found at
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