



Digital learning: Developing skills for digital transformation of organizations

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HIGHLIGHTS

- Effectiveness of digital learning in organizations digital transformation.
- Impacts of digital learning in organizations digital transformation.
- Contexts in which digital learning can take place.
- Influence of the digital learning on skills development and impacts organizations digital transformation.

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ABSTRACT

The primary goal of this paper is to contribute to the discussion of an effective digital transformation of organizations based on the latest trends of skills. It also intends to analyze the perceptions of individuals regarding the challenges faced by organizations and opportunities for new disruptive business. A literature review about the digital learning contexts and the identification of skills needed for organizations digital transformation was made. Moreover, it was also launched an online survey to identify the importance of skills for an effective digital transformation. As primary results, the main skills identified were artificial intelligence, nanotechnology, robotization, internet of things, augmented reality, digitalization; and the main digital learning contexts were mobile technologies, tablets, and smartphone applications – which are becoming more and more popular among the employees. This study will help organizations to rethink their strategies according to skills development to respond to the challenges of digital transformation.

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1. Introduction

Digital learning can be a driver for skills development to potentiate organizations digital transformation, and this study purpose is to contribute to the discussion about this emergent topic. Digital transformation will take place when organizations embrace the potential of social learning in the design and the process of delivering contents, including social elements embedded within the digital content, informal problem solving, knowledge sharing, communities of practice and user-generated content. In the light of this context, this research main problem is to identify the skills needed to promote organizations digital transformation, followed by three research questions: (RQ1) what are the skills developed through digital learning for organizations digital transformation?; (RQ2) what are the contexts of corporate digital learning to de-

velop skills for organizations digital transformation? (RQ3.1) what are the perceptions of individuals regarding the digital transformation challenges faced by organizations?; (RQ3.2) what are the opportunities for new disruptive business that emerge from the digital transformation?; (RQ3.3) what the latest trends of skills to be developed?

These questions will help to operationalize this research analyzing the many ways in which digital learning can take place, because it includes a wide range of practices and various dimensions of digital learning, such as participants, learning contexts, learning processes, learning facilitators, framed by factors as intention, consciousness, and expectations which can conditionate the outcomes of the learning process and how they can contribute to effective the organizations digital transformation.

The article has the following structure: the theoretical framework for digital learning, digital transformations; the methodology topic and finally the discussion and the conclusions, including limitations and further research.

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2. Theoretical framework

2.1. Digital learning

Digital learning is a complex phenomenon linked with many different interpretations in the existing literature. To have a base for this research, we will use the definition given by [1]. They describe digital learning as an unplanned and implicit process with unpredictable results [2] using several types of technological devices like smartphones, tablets, computers, and others. This “everyday” learning process has a self-evident character and takes place in the daily working situation [3,4]. It is never organized or intentional from the learner’s point of view. It is seen as the development of the individual through interaction with others [5].

In one hand, digital learning often happens spontaneously and unconsciously without any prior stated objectives regarding learning outcomes, but it has the potential to prepare to think critically and solve complex problems, work collaboratively, communicate efficiently and has more autonomy independence in the learning process [6–8]. On the other hand, digital learning occurs as a planned process when organizations create specific courses related to the activities and procedures performed by employees. In these case, there are learning activities planned and defined, but they usually are combined with other spontaneously learning activities, like a search of information, watching complementary videos or other, in order to better understand the issues of the course or to acquire more knowledge about it.

2.2. Digital transformation

The list of changes that have shaped the modern world of work is long [9]. It includes the digitalization of work, the gig economy, among many others. Photo and video technology, eye-tracking, wearable sensors, to name a few, are more accessible to organizations than ever making possible to collect and analyze data in new and different ways [10]. Self-driving cars, drones, virtual assistance, software for translations, surgeries performed by robots will replace people who are now doing these jobs: scanners are already replacing cashiers in supermarkets.

Digital has transformed organizations, and this change has brought about new circumstances in which many organizations struggle to cope: new and emerging customer segments, cultural diversity in a global marketplace, market volatility, raised customer expectations about quality of products and services, and the impact of the internet on an organization’s core business [11]. In the job market, there has been a growth in higher-level jobs such as managerial and professional positions that require flexibility and problem-solving skills [12].

Projections by the World Economic Forum (The Future of Jobs 2016), five million jobs will be gone until 2020 due to Game Changers, namely artificial intelligence, robots, and nanotechnology. However, not all jobs are being eliminated by technology. Some are being transformed rapidly. Technology forces change upon companies and people [13–17]. Old skills become obsolete; new ones are needed. The constant need for acquiring new skills is becoming an economic imperative. Moreover, available research shows that investing in employees helps to retain them and gain competitive advantage.

In this context, the complexity and the uncertainty, partly due to the globalization and accelerated rhythm of technological change, demand human resources with skills that help the organizations to overcome the appearing challenges to digital transformation.

2.3. New trends in skills development

Historically, the word skills have been used to refer to individual characteristics. However, in the concept of [18], although the skills always apply to the individual, all of them have two dimensions, the individual and the collective (organizational).

The concept has been studied by several authors as [19–21] and previous by [22] and [23]. Skills development prevails as a research issue in higher education dominion; this is because is the primary goal to be achieved by the students. Skills development is perceived as a strategic management tool to cope with the current business environment [24–28], mainly because of the market has changed from one of mass production to one of customization where quality, price, and speed of delivery are stressed, and industries have a new reconfiguration [29] to face the challenges of digital transformation and industry 4.0.

Resuming the concept of skills and differentiating it from the concept of competencies [30] refers that competencies or “capabilities are complex bundles of skills and accumulated knowledge, exercised through organizational processes, that enable firms to coordinate activities and make use of their assets. Capabilities are manifested in such typical business activities as order fulfillment, new product development, and service delivery”. This concept brings light to this research and helps to make clear the importance of the skills development to potentiate the digital transformation of organizations.

3. Research methodology

To answer the research question, it was developed a content analysis from the literature review – including a literature survey and document analysis – following the conclusive design, through the secondary data of bibliographic databases. This methodology was used to analyze the presence of skills associated with the following expression “corporate digital learning skills”, and the period considered was between 2013 and 2018. Other criteria were “search in the integral text of the articles”; “available on b-on and catalogs”; “Peer Reviewed Reviews”; “Academic Reviews”; and the other expression were “educational technology”. The number of articles to analyze is 38 after all the criteria have been satisfied.

A quantitative methodological approach was also applied in this study based on data collected by an online survey during the second semester of the year 2017. The survey was conducted through LinkedIn, a professional network and the sample is 127 individuals. In order to achieve the research objectives and test the hypotheses, descriptive and analytical techniques were employed to test the hypotheses using the Statistical Package for the Social Sciences (SPSS) version 20 and different types of analyses were conducted including descriptive analysis and inferential analysis – reliability and validity, correlation coefficient analysis and structural equation model.

To analyze the problem under analysis expressed by RQ3.1, RQ 3.2 and RQ 3.3, the following hypothesis was defined:

Hypothesis 1. There is a significant difference between perceived challenges faced by organizations and opportunities for new disruptive business.

Hypothesis 2. There is a significant difference between perceived challenges faced by organizations and the new trend of skills.

Hypothesis 3. There is a significant difference between opportunities for new disruptive business and the new trend of skills.

4. Analysis and discussion of literature survey

4.1. Skills for organizations digital transformation

Skills for organizations digital transformation (Table 1) are being emerged in the market and the perceived impacts of new technologies being integrated into organizations and people life's will be lower labor costs; greater flexibility and shorter delivery time for products to the market; robots perform dangerous tasks (patient care or automate manual work); productivity growth, higher quality products; safer surgeries and better quality of life for the elderly and disabled; new challenges in employment and education; in the nature of work, at the manufacturing level (namely robotics); analysis of large amounts of data; with task automation, organizations can enrich the roles of workers; creation of new products and services; change the way companies and other organizations structure themselves. The following table will present the skills present in the literature review, allowing to answer the RQ1:

Through artificial intelligence, intelligent software systems are developed and can perform tasks that are in continual learning and improvement. For example aid of medical diagnosis and prescription; in teaching, through interactive programs; self-steering cars; among others.

On the other hand, robotization is transforming the industry: robots with ever more considerable skill and intelligence used to automate tasks; vehicles with reduced or no human intervention; advances in interfaces and sensors with better materials and ergonomic design. Moreover, it is also transforming medicine: Robotic surgeries to improve the precision and performance of invasive surgeries which can reduce postoperative complications.

4.2. Digital learning contexts

The literature review helped to identify digital learning contexts and new methods of learning using technology with the purpose to improve the quality of learning and involve the participants in the learning process. This literature review had the goal to answer RQ2 (what are the context of digital learning used by organizations to develop skills for organizations digital transformation?), and our findings lead us to the following dimensions: participants, learning contexts, learning processes and learning facilitators.

The methodology process of the content analysis is oriented by the research question and followed by the theoretically based definition of the aspects of analysis, categories and coding process and then the revision of the categories and coding, followed by the final work through the articles: analysis of abstracts, keywords, methodology, findings; and finally the interpretation of the results, as showed in Fig. 1.

The results are shown in Table 2, followed by the interpretation of the results.

According to the literature, the primary methods of learning by participants are Collaborative Communities; Cooperative learning; Collaborative learning; Network participation. The learning contexts are mainly: LMS; Youtube; Facebook; Instagram; Wikipedia; LinkedIn; Google; Websites, eLearning; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses. The learning processes are: Flipped classroom using digital media; Experiential online development; Open educational practice; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Web-based video; Digital video; Webinars. Also, the main techniques used by the learning facilitators are Project based-learning; Problem based-learning; Active learning; Gamification; Simulation; Narrated stop-motion animation.

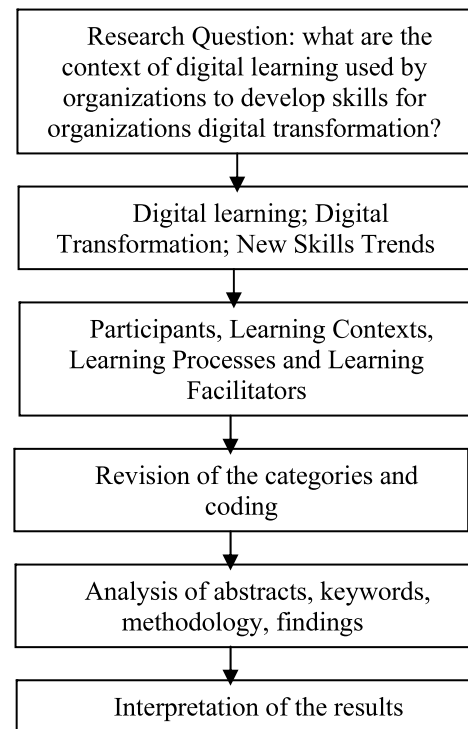


Fig. 1. Content analysis of the articles.

These methods of learning when integrated into digital learning contexts, which are spaces, facts or situations of learning which supports innovative pedagogical models, can empower learners, facilitating and promoting the learning process.

4.3. Analysis and results of the online survey

For the analysis, it was used the responses of 127 individuals. First, was calculated the frequency and percent of the constructs (see Table 3).

The Demographic profile Table 3 shows 55.9% of respondents are 21–40 years and 49.6% of them are graduates, and 11.0% respondents have HSC academic qualifications.

The reliability of 6 items is 0.82. The KMO counts 0.752 which is regarded as highly satisfactory for this analysis and further study (Table 4).

According to the perceived skills level (Table 5) needed, the resulting mean scores varied for skills for digital transformation between 3.8 and 4.8. Therefore all the skills identified in the literature review were evaluated as needing a moderate/considerable development.

It was also essential to verify the perceptions about the challenges faced by organizations, the opportunities for new business and new trends of skills development (Table 6).

The correlation Table 6 shows that the Pearson's coefficient of the correlation value for the relationship between Perceived challenges faced by organizations and Opportunities for new disruptive business is 0.046. This value indicates that there is a low level of positive relationship between these variables in the world of work. Since the *P*-value is higher than 0.05, Hypothesis 1 is accepted at 5% level of significance.

The correlation Table 6 shows that the Pearson's coefficient of the correlation value for the relationship between Perceived challenges faced by organizations and New trend of skills is 0.030. This value indicates that there is a low level of positive relationship between these variables in the world of work. Since the *P*-value is

Table 1
Skills for organizations digital transformation.

Skills	Applications	Impacts
Artificial intelligence and Nanotechnology	Intelligent software systems that can perform tasks and are in continual learning and improvement.	Impacts at various levels:
	Medical diagnosis and prescription assistance;	Like work, at the manufacturing level (namely robotics);
	Teaching, through interactive programs, using cyber systems, holograms, and intelligent systems.	Analysis of large amounts of data. With the automation of tasks, organizations can enrich the roles of workers. Creation of new products and services. Changing the way companies and other organizations structure themselves.
Robotization	In industry: – Robots each time with more exceptional ability and intelligence used to automate tasks. – Vehicles with reduced or no human intervention – Advances in interfaces and sensors with better materials and ergonomic design.	Reduced labor costs. Greater flexibility and shorter delivery time for products to the market.
	In medicine: – Robotic surgeries to improve quality; – Performing invasive operations which may reduce postoperative complications.	Carrying out dangerous tasks by robots (treating patients or automating manual work).
		Productivity growth, higher quality products; safer surgeries and better quality of life for the elderly and disabled. New challenges in employment and education.
Internet of things	Low-cost sensor networks	Embedding chips into objects and connecting them online, for example, Google Glass
	Real-time data collection Monitoring, decision making, and process optimization	
	Widespread application to: – Home appliances – Factories – Smart hardware – Wearable Technology – Sensor Networks – Smart-devices Can be applied to all economic clusters	Ultra-broadband speed allows: • improve operations; • reducing costs; • generating revenues; • creating competitive differentiation. Smart Cities: Barcelona, Chicago, and Hamburg have benefits at the level of: reduction of crime; improved services; better integrated infrastructure with real-time connections; access to data through sensors.
Augmented reality	Augmented reality is used to enhance the natural environments or situations and offer perceptually enriched experiences.	AR will allow for geo-tracking.
	With the help of advanced AR technologies (e.g., adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive.	The marketing and advertisement fields will explode with augmented reality devices.
	Information about the environment and its objects is overlaid on the real world.	The mobile applications that are being developed will offer facial recognition software that will mainstream quickly. For commuters and drivers, navigation devices will be built into the cars and mobile devices.
Digitalization	Enabling, improving and transforming business operations and business processes and activities, by leveraging digital technologies. Create an environment for digital business, whereby digital information is at the core.	It helps to create revenue, improve business, transform business processes.

higher than 0.05, **Hypothesis 2** is accepted at 5% level of significance.

The correlation **Table 6** shows that the Pearson's coefficient of the correlation value for the relationship between Opportunities for new disruptive business and New trend of skills is 0.763. This value indicates that there is a high level of positive relationship between these variables in the world of work. Since the *P*-value is less than 0.01 the hypothesis, three is rejected at 1% level of significance.

Analyzing **Table 7**, **Fig. 2** and **Table 8** it is found that the calculated *P*-value is 0.320 which is higher than 0.05 which indicates perfectly fit. [30] suggested the value for the relevant statistic minimum discrepancy/degrees of freedom (CMIN/DF), otherwise chi-square/ degrees of freedom as ≤ 5 , the above table value shows Chi-square value/ DF is 3.832 which is less than 5.00 which is perfectly fit. According to [30], the criteria for an acceptable model are as follows: RMSEA of 0.08 or lower; CFI of 0.90 or higher; and NFI of 0.90 or higher. Goodness-to-fit (GFI) test where the

probability is higher than or equal to 0.9 indicates a good fit [30]. Additionally, Hair et al. [65] stated the criteria for AGFI is 0.900 or higher, the root mean square residual (RMR) was 0.008, and the root mean square error of approximation (RMSEA) was 0.008, which indicated a good fit — Hair et al. [66].

5. Limitations and future research

Some limitations should be mentioned in this research study. First, there was only a small sample selected for this study, with a total of 127 valid participants. Future studies may look at a larger sample so that the results can be generalized and extrapolated to other contexts.

A second limitation is that the skills required were identified only in the literature review. We could conduct an additional Delphi process to fully cross-validate the list of skills.

Table 2

Digital learning contexts.

Source: Sousa et al. [7], Sousa et al. [31] adapted.

Dimensions	Digital learning contexts	Authors
Participants	Collaborative Communities; Cooperative learning; Collaborative learning; Network participation.	Barber, W.; King, S.; Buchanan, S. [32]; Chen, Liwen; Chen, Tung-Liang; Chen, Nian-Shing [33] Trotskovsky, E.; Sabag, N. [34] Muñoz González, Juan Manuel; Rubio García, Sebastián; Cruz Pichardo, Ivanovna M [35] Sohrabi, Babak; Iraj, Hamideh [36] Liwen Chen; Tung-Liang Chen; Nian-Shing Chen [37] Patricia; Curwood, Jen Scott; Carvalho, Lucila; Simpson, Alyson [38] Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella [39] Masterman, Elizabeth [40] Stewart, Bonnie [41] Liyanagunawardena, Tharindu Rekha; Lundqvist, Karsten Øster; Williams, Shirley Ann [42]
Learning contexts	LMS; Youtube; Facebook; Instagram; Wikipedia; LinkedIn; Google; Websites eLearning; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC — massive open online courses.	Tena, Rosalía Romero; Almenara, Julio Cabero; Osuna, Julio Barroso [43] Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirttee [44] Xu, Hong [45] Martin-García, Antonio V.; Hernández Serrano, Majosé; Sánchez Gómez, MaCruz [46] Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella [39] Guerra, Wendy Josefina Guzmán; de los Ángeles Martín Hernández, María; Pérez, Luisa Elvira Rojas [47] Stewart, Bonnie [41] McNaughton, Susan M; Westberry, Nicola C; Billot, Jennie M; Gaeta, Helen [48]
Learning processes	Flipped classroom using digital media; Experiential online development; Open educational practice; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Web-based video; Digital video; Webinars	Moorefield-Lang, Heather; Hall, Tracy [49] Alhajri, S. [50] Joshua Rudow & M. Anwar Sounny-Slitine [51] Unger, Daniel R.; Kulhavy, David L.; Busch-Petersen, Kai; Hung, I.-Kuai [52] Wendy Nielsen and Garry Hoban [53] Kosonen, K., Ilomäki, L. & Lakkala, M. [54] Friend, Jennifer; Militello, Matthew [55] Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirttee [44] Wood, Denise; Bilsborow, Carolyn [56] Stansbury, Jessica A.; Earnest, David R. [57] Guerra, Wendy Josefina Guzmán; de Los Ángeles Martín Hernández, María; Pérez, Luisa Elvira Rojas [47] Rai, S. S.; Gaikwad, Anil T.; Kulkarni, R. V. [58] Lau, K H Vincent [59]
Learning facilitators	Project based-learning; Problem based-learning; Active learning; Gamification; Simulation; Narrated stop-motion animation	Barber, W.; King, S.; Buchanan, S. [32] Epure, Manuela; Mihães, Lorena Clara [60] Kocaman-Karoglu, Aslıhan [61] Abdulmajed, Hind; Park, Yoon Soo; Tekian, Ara [62] Mantri, Archana [63] Amory, Alan [64]

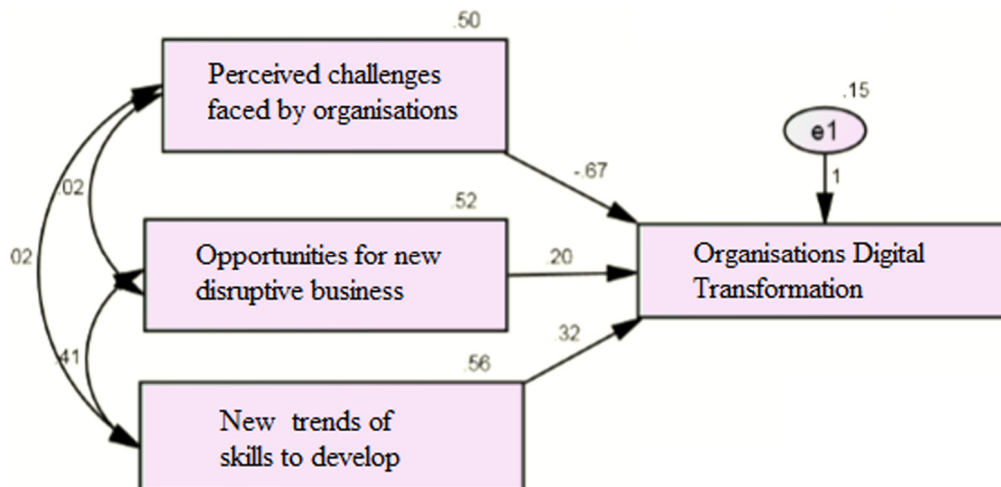
**Fig. 2.** Structural equation model on organizations digital transformation.

Table 3

Classification of respondent's demographic profile by age and academic qualification.

Demographic profile	Frequency	Percent
21–40 years	71	55.9%
41–60 years	37	29.1%
61 above	19	15.0%
Academic qualification		
HSC	31	24.4%
Graduate	63	49.6%
Post Graduate	33	26.0%
Total	127 respondents	100%

Table 4

Cronbach's alpha and KMO Bartlett's test of sphericity.

Cronbach's alpha and KMO Bartlett's test of sphericity		
Cronbach's alpha		0.82
No of items		6
Kaiser–Meyer–Olkin measure of sampling adequacy		0.752
Bartlett's test of sphericity	Approx. Chi-square	1045.322
	df	252
	Sig.	.000

Table 5

Skills to develop in current scenario (1 = no development; 2 = weak development; 3 = moderate development; 4 = considerable development; 5 = strong development).

Skills for digital transformation		0, 82(n = 6)	
1	Artificial Intelligence	4.80	1.20
2	Nanotechnology	4.50	0.50
3	Robotization	3.80	1.13
4	Internet of things	3.90	1.15
5	Augmented reality	3.80	0.40
6	Digitalization	4.57	0.65

A third limitation is that the survey was conducted through LinkedIn, but it was not targeting the nationalities of the respondents, and it is not possible to measure an eventual impact of heterogeneity of the sample in the results of the research.

A final limitation is the need to make a study to define the “perceived challenges”, but it will be done in future research about digital transformation in organizations.

Further empirical studies are required for developing theoretical and practical knowledge.

Another exciting research to be conducted is to identify and analyze the processes of skills development that can be used to achieve the market requirements and competitiveness.

Finally, a suggestion of further research is the development of a learning model with the several dimensions identified in this study: participants, learning contexts, learning processes and learning facilitators.

Table 6

Correlation and coefficient between perceived Challenges faced by organizations, Opportunities for new disruptive business and new trends of skills.

Correlation and coefficient between Perceived challenges faced by organizations, Opportunities for new disruptive business and a new trend of skills		Perceived challenges faced by organizations	Opportunities for new disruptive business	A new trend of skills
Perceived challenges faced by organizations	Pearson correlation	1	0.046	0.030
	Sig.(2-tailed)		0.593	0.740
	N	127	127	127
Opportunities for new disruptive business	Pearson correlation	0.046	1	0.763**
	Sig.(2-tailed)	0.593		.000
	N	127	127	127
New trend of skills	Pearson correlation	0.030	0.763**	1
	Sig.(2-tailed)	0.740	.000	
	N	127	127	127

**Correlation is significant at the 0.01 level (2-tailed).

Table 7

Structural Equation Model (SEM) on organizations digital transformation.

The Variables used in structural equation model are:	
1. Endogenous variables (Dependent)	Organizations digital transformation
2. Exogenous variables (Independent)	a. Opportunities for new disruptive business b. New trends of skills c. Perceived challenges faced by organizations
3. Unobserved, exogenous variables	e1: Error term for organizations digital transformation
Hence the number of variable in the SEM is	
– Number of variables in your model: 5	
– Number of observed variables: 4	
– Number of unobserved variables: 1	
– Number of exogenous variables: 4	
– Number of endogenous variables: 1	

Table 8

Model fit summary of structural equation model.

Indices	Value
Chi square value/DF	3.832
P value	0.320
GFI	1.000
AGFI	0.977
NFI	1.000
CFI	1.000
RMR	0.001
RMSEA	0.001

6. Conclusions

It is concluded that the primary impacts expected from the increasingly widespread use of technology in the context of industry 4.0 are: reduced labor costs, greater flexibility and reduced delivery time for products to the market, of dangerous tasks (treating patients or automating manual work), productivity growth, higher quality products; safer surgeries and better quality of life for the elderly and people with disabilities; new challenges in terms of employment and education and the nature of work, manufacturing (notably robotics), analysis of large amounts of data, creation of new products and services, and changes in the way companies and other organizations structure themselves.

The results of the survey also indicates there is a low level of positive correlation between Perceived challenges faced by organizations and Opportunities for new disruptive business, New trends of skills and also shows negative relationship between Perceived challenges faced by organizations and Organizations Digital Transformation and have strong positive correlation between Opportunities for new disruptive business and New trends of skills, Organizations Digital Transformation. The negative perceptions in the Organizational Digital Transformation need to be overcome with new opportunities and to adopt new trends in skills development.

The result reveals that better utilization of opportunities and taking new trends in skills development will help organizations to sustain and grow in the future.

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Appendix. Technical key terms definitions

Active learning

Is a form of learning in which the students are the center of the learning process participating, besides passively listening.

Digital storytelling

It is a short form of digital media production that allows people to share a story. The media used may include the digital equivalent of film techniques (full-motion video with sound, audio only and others).

Educational games

These are games explicitly designed with educational purposes to have fun and learn at the same time: math, sports, geography and others issues.

Experiential online development

Is an active engagement of students in opportunities to learn through doing. It aims to embed learning within real-world contexts using methodologies as problem-based learning, case-based learning, project-based learning, and apprenticeship.

Flipped classroom

A flipped classroom is a type of blended learning that reverses the traditional learning environment by delivering online content outside the classroom. In a flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home with the guidance of a mentor.

Gamification

It is the application of game principles in non-game contexts as learning or organizational productivity to improve learners engagement and success.

Narrated stop-motion animation

Is a way for students to create animations. The animation process using new technologies as smartphones is an easy way to capture images and play those images at 2 frames/second to create a slow-moving image and enable a narration.

Open educational practice

Is the use of open educational resources for teaching and learning in order to innovate the learning process by making it more flexible and collaborative.

Online learning environments

An online learning environment has no physical location and in which the professors and the students are separated by space. It promotes the knowledge acquisition within computer-mediated digital systems.

Simulation

It is the imitation of a real-world process or system, and they are used in many contexts, such as simulation of technology for performance optimization, safety engineering, testing, training, education, and video games.

Technology integrated teaching methods.

It is the technological devices that can be used for teaching and learning, like computers, smartphones, tablets, LMS and others systems.

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