Identifying and Documenting Best Practices and Challenges in Digital Transformation

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ABSTRACT

Digital transformation allows organizations to maintain sustainable development and address ongoing challenges. The current digital transformation and advanced technology mega-trend significantly impact society and organizations, making digital technology crucial for public and private organizations, universities, and daily life. Despite the rising demand, there is often a lack of standard policies governing the use of digital technology. Practical experience and literature reveal key challenges in transitioning from traditional to digital systems, including limited public awareness, mindset, ICT skills, government support, and collaboration between organizations and software engineering societies. Governments must establish digital transformation policies and offer software development guidelines for public organizations to digitize their systems. Additionally, they should provide or support research projects funded by governmental and non-governmental organizations to identify infrastructure and regulatory issues within Afghanistan's digital transformation context. This study documents six organizational patterns observed during the transformation of traditional systems into digital systems, illustrating their sequence and explaining the development of a pattern language from these patterns.

CCS CONCEPTS

• **Software and its engineering** → **Organizational patterns**; • **Digital transformation** → *Patterns.*

KEYWORDS

Patterns, Software Engineering, Organizational Patterns, Digital Transformation

ACM Reference Format:
Mohammad Yusuf Momand and Valentino Vranić. 2023. Identifying and Documenting Best Practices and Challenges in Digital Transformation. In *28th European Conference on Pattern Languages of Programs (EuroPLoP '19), July 5–9, 2023, Irsee, Germany*. ACM, New York, NY, USA, 10 pages. https://doi.org/...

EuroPLoP '23, July 5–9, 2023, Irsee, Germany

ACM ISBN $15.00
https://doi.org/...

1 INTRODUCTION

Digital transformation is a continuous and complex process to transform an organization and its operations significantly. Transformation involves a holistic change in the business processes of an organization. Digitalization, achieved through technology, facilitates the transition of a business into a digital form, a process commonly known as digital transformation [7]. It is not just about technology or organizational changes; digital transformation impacts the entire process (workflows, tasks, methods, and constraints), people (culture, skills, capacity), and the organization's infrastructure. Regardless of the enterprise or firm, digital transformation contains four essential dimensions: changes in value creation, structural changes, technology use, and financial factors [16].

In today's interconnected world, where technology is transforming every aspect of life, developing countries face unique opportunities and challenges in embracing digital transformation. Information technology (IT) is revolutionizing all aspects of life worldwide, including technology, education, business, and the international economy. However, developing countries have not fully experienced the potential of this global revolution. They encounter numerous challenges in transferring and adopting digital transformation, encompassing government policies, inadequate infrastructure, training, business processes, lack of expertise, insufficient capacity building, and cultural differences. Despite these obstacles, developing countries possess the potential to leverage the power of digital transformation, pushing themselves into a new era of growth and prosperity [11].

Firms and other organizations need to provide services effectively and efficiently through digital transformation. They should be appropriately managed and monitored at each stage of the transformation to ensure the practical application of sound practices and avoid mismanagement of resources due to recurring problems. Organizations need to innovate and embrace technologies to stay ahead of the competition in the digital revolution that transforms every business sector into digitalization. As Marc Andreessen [3] famously noted that "software is eating the world." The world is now ruled by digitalization powered by data and technology more than ever before. Digitalization and digital technologies have managed to capture every part of our life. The three significant implications of digitalization in organizations can be described as:

organizing people, administration of business processes, and IT infrastructure and tools. Unless employees' mindsets and existing organizational practices are not ready for the change, digital transformation has no meaning for an organization. Leveraging insiders, digital transformation requires daily operations skills during and after the transformation. We need people to have skills to use digital technologies and tools effectively, organizing people based on their existing technological capabilities and capacity to adapt newly acquired skills.

The core of digital transformation is to design digital services that simplify traditional and classical business methods. However, transforming traditional documents and processes into digital form using technology solutions can be complex and not always feasible. Digital transformation requires a robust process of designing digital services that add value to the organization. The IT infrastructure and tools used in digital transformation today form an ecosystem of interdependent digital technologies that will continue to drive economic and societal growth in the future. Blockchain, big data, cloud computing, grid computing, the Internet of Things, and artificial intelligence represent some of the most common aspects of digitalization.

Patterns had existed earlier and were developed by Christopher Alexander to solve the challenge of building towns and construction [2]. Our goal in this research is to document the best practices that normalize processes and lead to autonomous innovation. We aim to identify the recurring challenges of digital transformation and explore the organizational aspects of digital transformation, covering the best practices derived from practical experience, literature, and lessons learned from digital transformation frameworks. The following diagram illustrates the transition from traditional or manual operations to digital processes. The traditional approach often encounters various issues, whereas digitalization enables faster and more accurate processes, effectively addressing those problems. The process is depicted in Figure 1. a flow from left to right, illustrating the shift from traditional operations to digital processes. On the left side is a representation of traditional methods, such as manual paperwork and physical files. As we move toward the right side of the diagram, digital elements are introduced. This includes icons representing digital technologies, such as computers, cloud storage, automation, and online communication tools.

The rest of this paper is structured as follows. Section 2 explains the challenges and best practices in digital transformation. Section 3 provides the story behind the patterns and pattern format we used. Sections 4–9 presents the patterns. Section 10 discusses our results. Section 11 relates our results to what others have achieved, Section 12 concludes the paper.

2 CHALLENGES AND BEST PRACTICES IN DIGITAL TRANSFORMATION

For nearly a decade, we have engaged with and observed numerous organizations, including HELMIS (Higher Education Learning Management Information System), HEMIS (Higher Education Management Information System), CMIS (Certificate Management Information System), and various public institutions. We have encountered challenges and best practices throughout the digital transformation implementation process. Particularly, when working with public organizations seeking to digitize their traditional systems, we found that implementing digital transformation can be especially challenging, with a less assured success rate. We encountered various challenges during these transformations. As part of the operational teams in organizations transitioning from traditional to digital systems, we have firsthand experience with these challenges and have observed effective and efficient practices.

Organizations leverage digital transformation for various purposes, including streamlining processes, creating new business opportunities, innovating products, reducing costs, and establishing new business models. To maintain its competitive edge, implementing digital transformation must be strategic. However, employees may face certain challenges from their perspective. Some may resist replacing traditional systems with digital ones despite recognizing the innovative approach as a way to address future challenges and enhance business operations. Common challenges encountered during digital transformation initiatives include communication gaps, a lack of necessary expertise, limited IT resources, low awareness, insufficient commitment, transparency issues, time wastage, concerns about employee integrity, trust issues, digital maturity gaps, mindset challenges, and a lack of transparency, among others. These challenges are frequently observed in digital transformation initiatives and, in some cases, have led to project failures.[14].

The analysis reveals that digital transformation (DT) is being implemented across various industries. Companies utilize digital technologies for a range of purposes, including business process integration, creating new business opportunities, product innovation, cost reduction, and the development of novel business models. Nevertheless, companies must adopt a strategic approach to DT to enhance their market position and maintain competitiveness. The paper concludes that DT can assist businesses in making improvements and addressing future challenges[14].

During our work, we observed some public projects.[1] After observing numerous organizations, we identified several areas of concern. Our goal was to emphasize some of the challenges and best practices, documenting in the form of patterns.

3 THE STORY BEHIND THE PATTERNS

We propose to tell a short story about a public organization in Afghanistan. The story behind the patterns is authentic and practical. And in the pattern story, the discovered patterns are presented in the order they were observed. Prior to documenting, it is critical to explore the patterns in real-world practice. The organization was working manually, but needed to digitalize their system. The organization's name was KTH (for privacy reasons), but the rest of the story is true. In the story, we mention the corresponding organizational patterns in italics in parentheses. KTH was facing a shortage of IT resources, professional employees, and software developers. Furthermore, there was a need for software and hardware equipment, maintenance, and support. The organization could not perform these tasks alone. Therefore, Nangarhar University-related Computer Science Faculty (CSF) decided to cooperate and digitalize their entire organization's system to enhance transparency,

[1] The projects are E-NID Afghanistan, ASAN KHIDMAT Afghanistan, HELMIS (Higher Education Learning Management Information System), Certificate Management Information System (CMIS) at MoE, E-ELECTION SYSTEM, HEMIS Project at MoHE, E-Passport System.

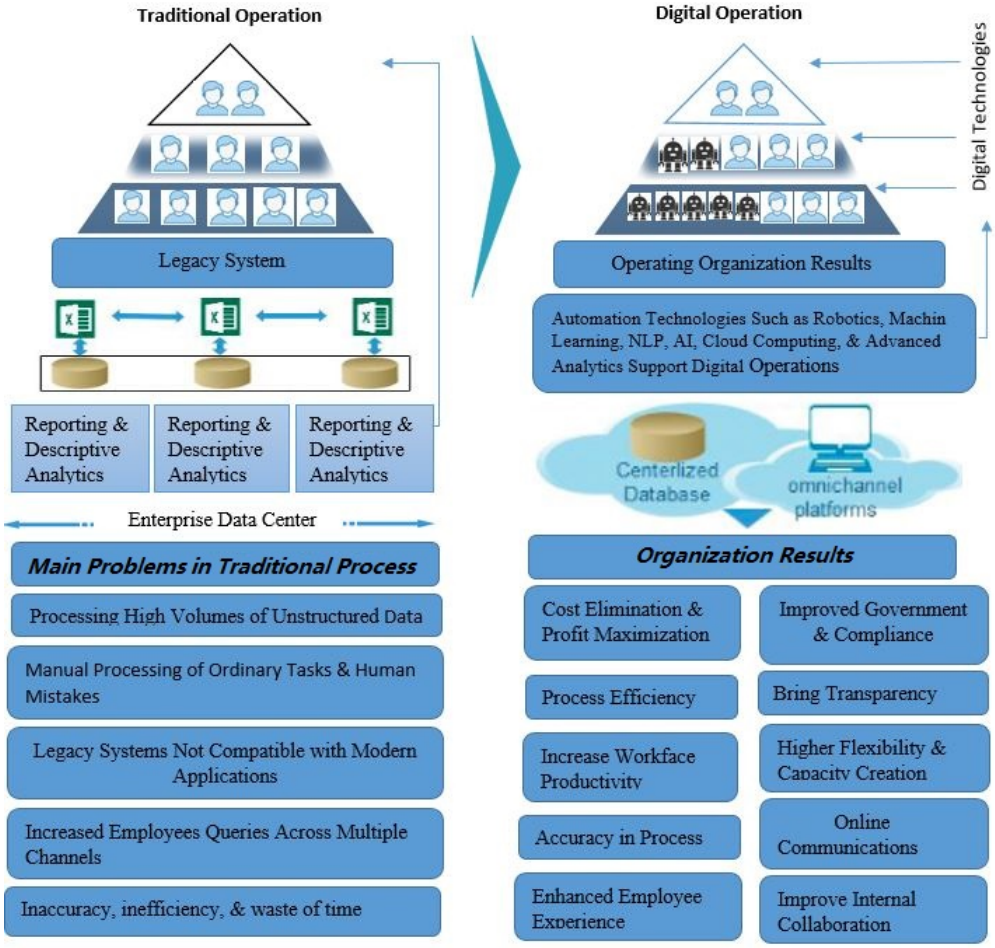

Figure 1: Moving from traditional operations to a digital process.

facilities, and efficiency. The pattern story presents the discovered patterns in the order they were observed.

Various branches of the organization aimed to implement digitalization with the appropriate resources, timelines, and budget. KTH had planned to digitalize the entire system. To ensure accuracy, speed, security, and efficiency for all processes and communication, Moving from Manual Operations to Digital Processes is needed (*Embrace Digitalization*, Section 4).

As a result, CSF decided to begin digitizing the entire system of KTH. CSF (vendor) had analysed and re-engineered all the processes of the KTH (client), and the vendor built the prototype of the same part/department (Build Prototype [9]).

The development team of CSF was responsible for understanding the requirements, business process and reviewing the required system's structure (Developer Controls Process [9]).

The development team was also responsible for developing and simplifying the business processes of the system. Both organizations need to make sure they are on the right path towards development. (Engage Quality Assurance [9]), which is dependent on prototyping.

In most countries, organizations wish to digitize their systems, but don't have the skilled employees. In addition, there is poor awareness for the already recruited employees of technology usage and business processes because the employees don't have awareness of updated technology. In addition, there is a challenge to digitalize the public sector in developing countries such as Afghanistan. As technology is a new phenomenon, employees often do not know about the advantages of digital transformation. Thus, they need to be aware of technology and digital transformation ((*Digital Awareness*, Section 5).

Most organizations are working through a digitalization process and incorporating cutting-edge technologies. They will have to overcome many barriers through digital transformation. As a result, they will support the digital transformation process and improve their mindset. The capacity of employees is low, and most of them are not IT-oriented and they are IT illiterate.

According to reference [15] within public organizations, a mindset refers to a "typical" manner of thinking, behaving, solving, relating, approaching, and stabilizing. It could also relate to organizational culture. This suggests that a mindset is a mental scheme. In

order to improve the performance of employees and the implementation of digital transformation, a Growth mindset toward digital transformation of employees toward technology needs to be developed((*Growth mindset toward digital transformation*, Section 6).

The public sector has been left out of digitalization for a decade because of some obstacles towards digitalization. If an employee works for an organization as a technician, he/she must possess technical skills. Conduct a digital maturity assessment to understand the organization's interest in creating value through digital transformation. Use a digital maturity model to evaluate the current digital maturity level of the organization ((*Digital Maturity*, Section 7).

During the last decade, CSF has witnessed a massive change in the public and private sectors regarding the digitalization of many organizations. In developing countries, such as Afghanistan, there is a culture of nepotism, lack of trust, and technical expertise. These issues result in delays in deliverables, corruption, and even project failure. Often corrupt practices like bribery and nepotism occur in manual systems. It is the only way to reduce or eliminate the above-mentioned problems. In order to implement transparency and efficiency within the organization, the current manual system must be converted into a digital format to bring transparency ((*Digital Transparency*, Section 8).

There is a complex and complicated workflow in the traditional system. Since paperwork has influenced them for years, employees are not well prepared for digital transformation. In addition, they are afraid of losing their employment opportunities. There was no trust and mutual understanding between staff to share information. Comprehensive awareness and a trust-building program are required to switch the current employees to the digitalized system ((*Trust Building*, Section 9).

It is essential that team members believe in each other, otherwise, it is difficult to get things done. In order for any team to work smoothly, members must communicate in order to coordinate their efforts. If individuals do not trust each other, communication will not be smooth. As a result, team members need to trust each other (Community of Trust [9]).

If there are some problems still remain after the digitalization process has been accomplished. The organization can recruit a few domain experts for certain roles, and build a small expert team. Teams and groups tend to form around common interests and focus. Employees should take responsibility for their roles. Hiring domain experts is vital to the success of an organization (Domain Expertise In Roles [9]).

Although some parts of KTH are digitalized and successful results are achieved. KTH is still able to recruit competent employees across all departments where they are needed. This way, KTH can meet the requirements of the organization, and they can replace the unprofessional employees with experts (Phasing It In[9]. The pattern diagram of digital transformation, specifically designed for the KTH organization, is depicted in Figure 2. The diagram illustrates a comprehensive set of interconnected patterns to drive the organization's successful digital transformation.

We present our pattern language of digital transformation, and we document six patterns (highlighted blue in figure 2). These patterns are observed in practice from real projects gradually while we were engaged with several organizations' projects in Afghanistan. The prominent, reoccurring, general, and proven methods are considered to document and write the patterns.

We expressed the patterns in Coplien and Harrison's pattern format [10] with the conflict of the most prominent contradicting forces expressed in the *but* form proposed by Vranić and Vranić [18]. This is the format:

> **<Pattern Name>**
> . . . The context in which the pattern occurs.
> ✣✣✣
> **The text in bold describes the actual problem as a conflict of the two most prominent contradicting forces**.
> **Therefore**
> **Here, the text in bold describes the solution.**
> ✣✣✣ – An optional part with resulting consequences upon applying the given pattern. **Description** optional description to explain the pattern.

4 EMBRACE DIGITALIZATION

. . . In a rapidly evolving landscape, organizations face societal expectations, resource constraints, and the need for transparency. Embracing digitalization becomes crucial for modernizing operations, improving service quality, and enabling data-driven decision-making to serve communities effectively.

✣✣✣

Organizations struggle to embrace digitalization and undergo successful transformation due to challenges like resistance to change, outdated processes, legacy systems, a lack of technical staff with expertise in new technologies, and the need to meet evolving community needs. These issues lead to decreased service quality and diminished public trust.

Adopting new technologies with consideration for the well-being and engagement of employees is necessary for the success of digitalization, but employees express concerns about job losses and fear disruption to established processes. This fear creates resistance and poses obstacles to the smooth implementation of digitalization efforts.

Organizations realize the significance of modernizing operations and leveraging digital technologies for better decision-making, but they face challenges such as a shortage of experts, limited budgets, and resource constraints.

Therefore:

To address employees' concerns and ensure a successful digital transformation, organizations should create a clear digital transformation plan aligned with goals and objectives. They should implement comprehensive training programs to address employee concerns and promote acceptance of new systems, while also ensuring job security and fostering a culture of innovation to encourage employee support. Adopting a phased implementation strategy that balances integrating new technologies with existing systems can minimize disruption and facilitate a smoother transition, mitigating

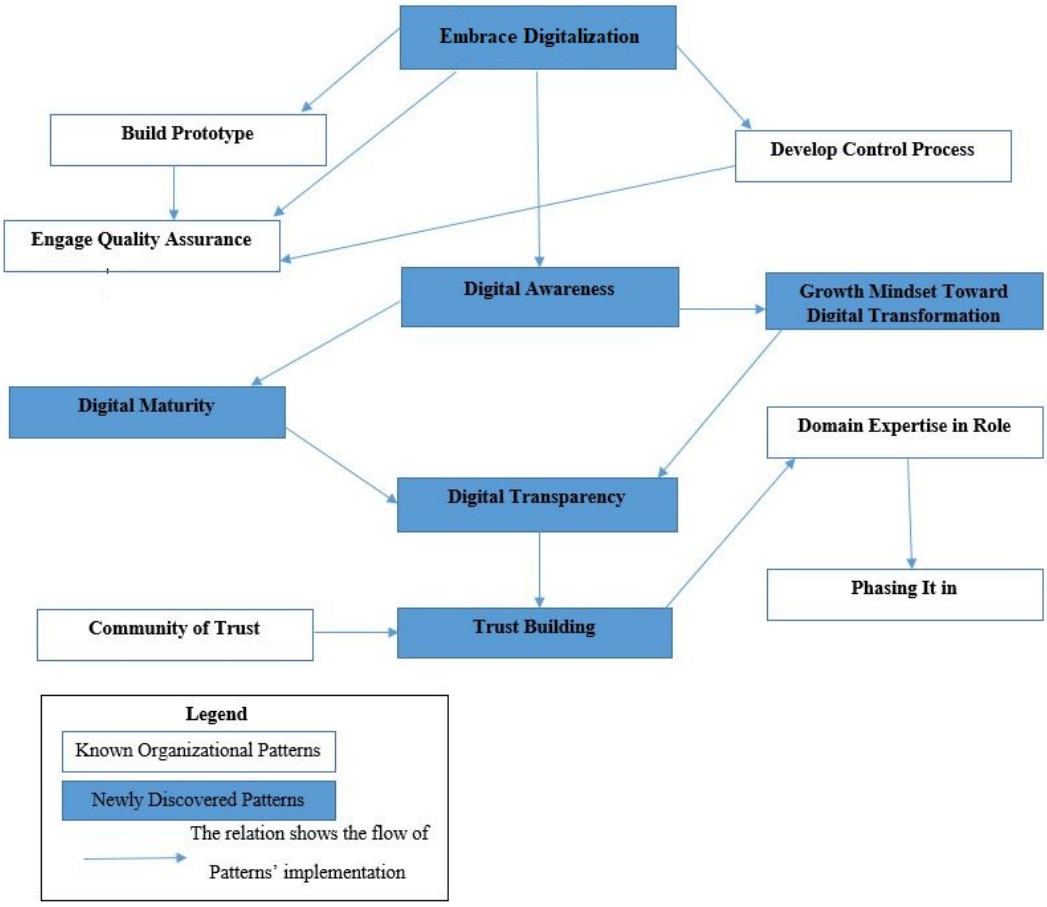

Figure 2: Pattern Diagram of Digital Transformation for KTH Organization.

resistance and obstacles. The Ministry of Finance has successfully implemented this pattern at the ARD (Afghanistan Revenue Department) with the support of the World Bank to improve tax services through the E-filing system.

5 DIGITAL AWARENESS

…As organizations shift from traditional systems to digital platforms, employee digital awareness becomes crucial for a successful digital transformation. Without fostering strong digital awareness among the workforce, the transition is neither feasible nor efficient, and employees need to learn and embrace digital tools and processes.

✣✣✣

Organizations often struggle to equip their workforce with the skills needed to use new digital technologies and processes during digital transformation effectively, but inadequate digital awareness can delay adaptation and limit the benefits of the transformation and implementation.

Additionally, digital technologies can potentially improve productivity and efficiency for public organizations, but the lack of employee digital awareness and proficiency can delay adoption and limit the advantages of digital transformation. Effective communication and collaboration through modern technology can enhance public services, but a disconnect between employees and digital advancements due to inadequate training and support can prevent organizations from fully realizing the potential of digital transformation.

Therefore:

Governments and IT-focused organizations should collaborate to create and implement comprehensive public awareness initiatives to address digital awareness gaps among management and employees in public organizations. These programs should be led by experts and utilize a variety of approaches, such as digital skills development, e-learning, in-person instruction, mentorship, coaching, continuing education opportunities, hands-on activities, workshops, symposiums, and seminars. Additionally, mass and social media promotion can increase awareness and encourage the adoption of digital technologies, leading to improved efficiency and productivity for public organizations. The Ministry of Finance effectively applied this pattern at the ARD

(Afghanistan Revenue Department) with support from the World Bank to enhance tax services using the E-filing system.

6 GROWTH MINDSET TOWARD DIGITAL TRANSFORMATION

…Public organizations are shifting to digital platforms to enhance services for citizens and adapt to technological updates. However, this transformation is accompanied by challenges such as employee resistance, skill gaps, and a limited mindset toward digitalization. Addressing these obstacles is vital to ensure successful growth.

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The main obstacle to digital transformation lies in employee resistance, stemming from fears about the effect on their roles. Senior employees may be particularly concerned about job loss or adapting to new tasks, and their mindset needs to shift from fixed to growth-oriented.

Digitalization presents numerous benefits and opportunities for public organizations, but employee resistance fueled by fears of role changes and job security can hinder progress and limit the potential benefits. Cultivating a growth mindset among employees is crucial to overcoming resistance and increasing adaptability. However, a lack of digital skills and proficiency can impede progress and limit the potential for success in digital transformation.

Therefore:

To achieve successful digital transformation, organizations should foster a growth mindset among employees through various initiatives. This includes providing comprehensive training, ensuring consistent communication, establishing internal support mechanisms, and involving employees in the planning stages. Moreover, offering material, emotional, and moral support, along with incentives, while fostering a learning culture, can enhance employee engagement and facilitate effective change implementation.

7 DIGITAL MATURITY

…Employee and organizational maturity is paramount for sustained success in the ever-changing digital landscape. With digital maturity, employees effectively leverage technology, innovate, and make data-driven decisions, supporting the organization's growth and agility.

✣✣✣

The organization is challenged to keep pace with emerging technologies, impacting their competitiveness and operational efficiency. Simultaneously, employees face the challenge of developing and maintaining digital skills to meet the needs of a rapidly growing digital environment.

Emerging technologies are continually being developed, requiring organizations to keep up with the pace of change to remain competitive. However, organizations lack the digital maturity needed to integrate these new technologies into their operations. Furthermore, organization must prioritize digital maturity to maintain a culture of continuous learning and development, but some employees may lack the skills and ability to utilize emerging digital technologies effectively, posing a challenge to their successful adaptation.

Therefore:

Organizations should assess their current digital readiness to achieve digital maturity and outline a clear transformation process. Prioritize continuous learning, foster innovation, and establish a mature digital environment. Implement comprehensive training, encourage employee experimentation, and prioritize data security. This pattern was successfully implemented by the University of Nangarhar and the Department of HELMIS, with the support of the Ministry of Higher Education. The pattern was designed to facilitate the teaching staff in delivering lectures, managing course material, recording attendance, and conducting exams.

8 DIGITAL TRANSPARENCY

…In the digital era, emphasizing transparency and effective communication is crucial. It involves leveraging technology to share information and foster honesty, openness, and teamwork. Promoting organizational transparency empowers individuals and creates a better creative and transparent work environment.

✣✣✣

Organizations face challenges in establishing and maintaining transparency among employees and in their daily activities. They need to ensure transparency in communication and information sharing, both internally and with stakeholders. The lack of transparency can hinder collaboration and potentially lead to harmful practices.

Digital transformation can increase transparency and efficiency, but organizations may encounter resistance from certain employees, especially those with corrupt tendencies, who are reluctant to embrace radical changes. Leveraging technology to share information enhances transparency, but achieving consistency in information sharing within a digital environment poses challenges, particularly when some employees lack commitment to transparency and ethical practices. This can lead to inconsistencies in data sharing and hinder the organization's transparency efforts.

Therefore:

To develop a culture of digital transparency, organizations must prioritize honesty, clarity, and accessibility in their communication and information-sharing practices with employees internally and with external stakeholders. This concerns leveraging technology to promote openness, cooperation, and ethical behavior, such as using digital tools to share information and foster teamwork among employees. By embracing digital transparency, organizations can enable well-informed decision-making, foster trust and accountability, and reduce the risk of harmful practices, resulting in a more innovative, efficient, and ethical work atmosphere for employees and stakeholders alike.

9 TRUST BUILDING

...Organizations must prioritize transparency, accountability, and security in the modern business landscape to build trust with their customers, partners, employees, and stakeholders. Trust-building efforts enhance the organization's reputation, foster meaningful connections, and simplify processes, leading to greater success in the digital era.

Within digital operations, organizations face challenges building trust with employees, customers, and stakeholders due to transparency, accountability, and security issues. The lack of trust can lead to lost opportunities, customers, partners, and employees, ultimately hindering the organization's growth and success.

The organization faces trust-related challenges, including a lack of trust within the organization and among employees. But, for a successful and unified digital transformation, the organization must prioritize transparency and accountability and overcome these obstacles. Transparent communication is essential in rebuilding trust and creating a cohesive environment conducive to a successful transition to digital operations. Despite organizations' efforts to build trust through these principles, a lack of trust can significantly impact an organization's reputation, resulting in missed opportunities and weakened connections, ultimately impeding overall growth and progress.

Therefore:

To foster and sustain trust in the digital landscape, organizations must prioritize transparency, accountability, and security, while actively engaging stakeholders through open communication and inclusive processes. However, maintaining trust consistently can be challenging in the ever-evolving digital environment, where online risks are prevalent. Establishing robust data protection measures becomes essential to safeguard sensitive information and ensure security. Organizations should embrace a culture of admitting mistakes, learning, and process improvement, promoting ethical behavior, integrity, and mutual trust among employees and aligning with core values and the organization's mission.

10 DISCUSSION

A common problem domain involves the transformation of traditional systems into digital systems. As we delved into the KTH organization's digital transformation process, we encountered persistent challenges that merit in-depth examination. There were several common problems in that organization, including corruption in current traditional systems, lack of commitment from employees, fears of digitalization, weak management, lack of transparency, lack of accuracy, lack of effectiveness, and low capacity, inaccuracies in data, operational inefficiencies, and overall limited capacity. Our investigation into these common problem domains revealed a pressing need for innovative techniques and comprehensive solutions to address the underlying

issues hindering the organization's transition to a digital landscape. By delving into these specific problem areas, we aim to contribute insights to

facilitate the successful digital transformation of other organizations facing similar hurdles.

Reseacher[6] For a successful transformation, digitized organizations must concentrate on technology and social domains.and[5] People, processes, strategies, structures, and competitive dynamics are also included in the digital transformation process. The following results and recommendations were developed to help overcome these challenges: If an organization's daily activities are not digitalized, it should face different challenges. In order to become trustworthy, accurate, and transparent, the system needs to be digitalized. And the organization's employees preferred traditional systems over digitalization. This is the right way to prepare them for digitalization and familiarize them with the latest technologies. Furthermore, they can rest assured that they won't lose their jobs. By using modern technology, they can improve their skills, knowledge, and perform daily activities with ease. Whenever a system or a complete solution is large and contains several independent business modules or infrastructures, employees are unable to digitalize the traditional system.

Traditional systems can lead to employee corruption, so it is necessary to digitalize the system to reduce corruption. In addition, the organization's current employees are unable to maintain the system. The computer science faculty member suggests collaborating with them to computerize their system. As well as providing assistance in utilizing the entire digitalization system, as well as solving their technical issues. The computer science faculty feels comfortable supporting KTH technically. The organizational structures of today are being transformed by digital transformation when an organization's entire solution is composed of multiple independent modules. Moreover, the KTH manager is not capable of integrating and coordinating several modules of digital transformation, so they need the support and assistance of the faculty of computer science. So the faculty assigned technical members to work on the various modules. The KTH organization will be focused on the quality of deliverables, while the integration of modules and handling of tasks will be the responsibility of the computer science faculty. These tasks will include managing and integrating all modules for the entire organization. All modules for the entire organization can be managed and coordinated through the technology-mediated communication platform within the organization to provide parallel access to all technical employees.

Additionally, it will reduce the gap between the organizations in the exchange of information. As organizations become digital, they'll perform their daily activities digitally in a sufficient and accurate manner.

Despite the discussions and mentioned common results above, it is important to note that no single solution covers all cases. Therefore, further study and research are necessary to address this issue.

Figure 3 illustrates the common problems encountered during the implementation of digital transformation.

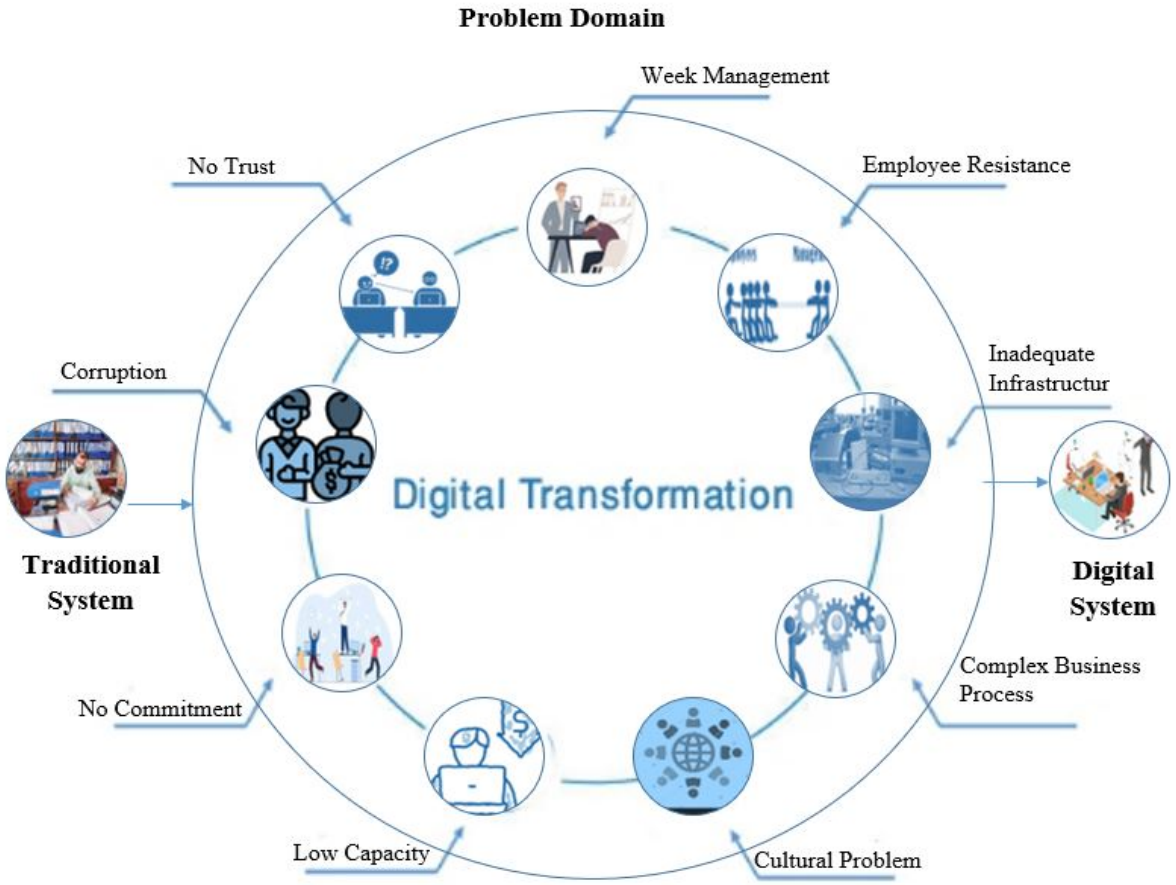

Figure 3: Common problems while implementing digital transformation.

11 RELATED WORK

Digitalization can challenge traditional perceptions in organizations by exploring innovative approaches and board structures. In this context, initiatives that aim to familiarize employees with technology and provide training play a pivotal role. Additionally, digitalization facilitates knowledge exchange, promotes a growth mindset, transparency, trust, and improves information accessibility for businesses. The study identifies several critical success factors for digital transformation, including cost-effectiveness, heightened employee productivity, increased innovation, and a reduced culture of mistrust. Furthermore, initiatives to enhance transparency and foster a culture of innovation have shown positive outcomes. Moreover, the involvement of younger generations and expert members has a demonstrably positive impact on performance outcomes.

The patterns were applied in software development architecture, software engineering, and the organization of software businesses, providing a proven and versatile solution in these domains [9]. Patterns had already existed and were developed by Christopher Alexander to address the challenges of building towns and construction [2]. Several earlier studies have focused on various methodologies and techniques for documenting and implementing digital transformation within organizations. These studies demonstrate that digital transformations are integral to daily life and business operations. In this era, digitalization is essential for enabling daily communication, conducting business, and facilitating all daily activities.

A successful digital transformation requires a profound understanding of the domain. Supporting the involvement of digital transformation in organizations, businesses, and daily activities and specifying their roles can enhance the effectiveness and efficiency of the digital transformation process.

A study conducted by Lina María Castro Benavides et al. [5] The dimensions of digital transformation in Higher Education Institutions (HEIs) are primarily intangible and bring about shifts in meaning and technological advancements. These dimensions influence university cultures and impact administrative, educational, and evaluative activities, as well as teaching, research, extension, and administrative functions.

A research study by A. Xinxian et al.[19] emphasizes the importance of embracing digital transformation, understanding its impact on enterprise growth, and utilizing financial insights for successful navigation. It highlights that digital transformation is a revolution in the competitive landscape, and businesses must actively embrace the changes it brings. The study also develops a financial

early warning model based on CNN data to guide corporations through the digital transformation process. A study conducted by Aghakhani et al.[1] proposed a framework for modeling and strategizing digital transformation (DT) concepts within organizations. It emphasizes the importance of adopting a consistent digital strategy and shifting from a technology-driven approach to a systematic, integrated one. The conclusion highlights that the framework helps organizations effectively understand and operationalize their digital transformation approach.

A study conducted by Vladimir Lvovich Vasilev et al.[17] This study aimed to specify the level, problems, and prospects of the development of digital competencies in higher education organizations in Russia; the authors used the methods of sociological survey and statistical information processing.

A research study by A. Kutnjak et al.[14] An overview of a case study on Digital transformation. To integrate business processes, create new business opportunities, innovate products, reduce costs, and make new business models, a company should have a strategic approach to digital transformation operation to create a better market position and stay concurrent on the global market. A digital transformation is a new approach recognized as a way to improve business and answer future challenges.

A research conducted by Hansen et al.[12]. Organizational leaders must rapidly adapt existing approaches to digital transformation, requiring a shared mindset between IS and business leaders. The authors challenge IT strategies, align IS leadership with organizational assumptions, and recommend adaptive approaches. A survey of Slovenian companies discovered six organizational patterns, guiding the company to determine its unique path forward. A research study by Indihar Štemberge et al. [13] for the digital technology role is increased day by day in the organizations and functioning of socio-economic relations [4]. This research paper examines the use of digitalization strategies by small and medium-sized enterprises (SMEs) and large enterprises (LSEs). It looks at how these companies are using new technology, changes in value-added, structural changes, and financing to achieve a holistic transformation. The study also compares similarities or differences between SMEs and LSEs regarding their approach toward digitization [8]. This paper has contributed to understanding digitalization's impact on environmental sustainability in manufacturing. It identified two main findings. First, digitalization can contribute positively by increasing resource and information efficiency as a result of applying Industry 4.0 technologies throughout the product lifecycle. Second, the negative impacts are primarily due to increased energy use, waste production, and emissions from the hardware used for technology lifecycles. Based on these findings, this study proposed a new perspective that considers both positive and negative implications when funding new digital technologies related to manufacturing operations [20]. This paper significantly contributes to the existing literature by quantitatively analyzing the association between digital transformation and traditional operations. Moreover, the paper also introduces six organizational patterns derived from practical experiences during the project, which collectively constitute a pattern language. The research strongly emphasizes promoting digital transformation over manual or traditional systems, focusing on the public and private sectors and the overall development of this transformative process.

12 CONCLUSION AND FUTURE WORK

Digital transformation demand and identification of organizations and businesses have been increasing rapidly, but finding the entire organizations and firms and involving them in digital transformation is challenging for organizations. The main problems in digital transformations are the creation of mindset, culture, business process, skills, etc.

It takes a long time to find the actual workflow when faced with various problems in the field. The problem is the difficulty of some employees to change their mindset. Several expectations and different information make the digital transformation process more complex and overload the digital transformation scope.

As well, digital transformation takes more time, and the digital transformation goal is challenging to achieve. The above problems are the leading causes that create a complex process and difficulty in digital transformation.

We present to overcome the mentioned issues by providing a pattern language composed of six organizational patterns for the recurring structure of digital transformation We relate them to well-known patterns and practices, practically established and documented during our practical work on some digital transformation to overcome these problems.

A pattern story of the actual active organizations is considered the general idea of a pattern language. Further study is required to digitalize and merge some public organizations due to their daily tasks based on a qualitative survey to uncover additional patterns and links between them.

ACKNOWLEDGMENTS

We want to express our gratitude to Daniel Lübke for his role as our shepherd and his constructive remarks. Our appreciation extends to Stefan Holtel, who moderated the writers' workshop dedicated to our paper. We also extend our sincere thanks to our writers' workshop group members: Haruto Aoki, Thomas Epping, Natsuki Fujii, Norihiko Kimura, Christopher Preschern, Sawami Shibata, Aleksandra Vranić, and Branislava Vranić for their time and effort spent reading and discussing our paper. The work reported here received funding from the Operational Program Integrated Infrastructure for the project "Support of Research Activities of Excellence Laboratories STU in Bratislava," project No. 313021BXZ1, co-funded by the European Regional Development Fund (ERDF) and the Erasmus+ ICM 2020 program under grant agreement No. 2020-1-SK01-KA107-078196.

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