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# The Effects of Digitalization on Education and Operations in Expert Organizations

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Työssä tuodaan esille digitalisaation laaja-alaiset vaikutukset ja mahdollisuudet niin opetuksessa, kuin asiantuntijaorganisaatioiden sisäisten toimintojen muutoksessa. Tutkimuksen tavoitteen on ymmärtää, miten digitalisaatio vaikuttaa opetustapoihin, sekä myös johtaminen, mittaaminen ja prosessien kehitys pyritään käsittelemään, sekä aihepiirin teoreettisia malleja sisällytetään kattavasti. Työssä analysoidaan kattavasti aiheen kirjallisuutta ja pyritään lopulta myös luomaan ohjenuora digitalisaation vaikutusten ymmärtämiseksi kontekstissa.



Avainsanat: Digitalization, Education, Expert Organizations, Operational Efficiency, Change Management

## Abstract


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| Author: | Kare-Petteri Rintala |
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This research paper explores the wide-ranging effects and possibilities of digitalization both in teaching and in the overall operations within expert organizations, such as educational institutions and specialized corporations. The study aims to understand how digitalization impacts teaching methods, efficiency, and overall productivity.

Management, measurement, and process development are addressed, and theoretical models are comprehensively included. The research is conducted through a literature search process and the research analyzes a comprehensive amount of literature aiming to provide an understanding toward the effects of Digitalization.

The key findings reveal that digitalization can significantly enhance operational efficiency and educational methodologies while also presenting many challenges, for instance within integration and change management. The outcome of this thesis is a guideline for effectively approaching digital technologies to eventually optimize training and operational processes in expert organizations.



Keywords: Digitalization, Education, Expert Organizations, Operational Efficiency, Change Management

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## Abbreviations

TAM: Technology Acceptance Model
ICT: Information and Communications Technology
LMS: Learning Management Systems
CPD: Continuous Professional Development
MOOC: Massive Open Online Course
AI: Artificial Intelligence
AR: Augmented Reality
VR: Virtual Reality

# 1 Introduction

## 1.1 Research Meaning and Motivation

The main idea of this research is to offer an understanding about the effects of digitalization on education to all kinds of expert organizations, such as educational institutions or corporations which has a high level of expertise in a certain field, which requires regular training. An expert organization is a subjective concept that can be seen to describe many kinds of organizations. This research could be very useful particularly, for instance, for a smaller company or part of an organization with limited resources to start charting their possibilities and to achieve some understanding about the subject at hand.

According to the author's point of view through recent years Digitalization has radically changed the possible ways different expert organizations train their personnel. The rapid development of technology and the usage of digital tools have brought with them many new opportunities and challenges. The motivation for this research comes from a need to deepen the understanding of the effects of digitization on education, training, and operational activities in expert organizations, which can be seen widely in our society. The topic provides possibilities for enhancing processes, end results, and a basis for innovative models. This in itself makes researching this topic important. It is necessary to understand how we can make use of different tools and models in the future to guarantee advanced and efficient performance.

## 1.2 Research Problem and Questions

The main research questions in this paper are:

- How has digitalization changed educational methods and strategies in expert organizations?

- What effects has digitization had on the operational efficiency and productivity of expert organizations?

- What are the key challenges and opportunities that expert organizations face in connection with digital transformation?

- How can expert organizations best utilize digital tools and technologies to improve training and operational processes?

## 1.3 Research Goal and Frame

The research is framed to comprehend the effects of digitalization in educational systems and further on all organizational processes within that context. The goal is to provide understanding about a switch in this field and a guideline to tackle challenges due to the growing usage of digitalization, but also to have basic knowledge of how to systematically take an advantage of possibilities of digitalization.

## 1.4 Research Methods and Literature

The research in chapter 5 is implemented through a literature search process, by analyzing different sources of scientific literature and combining theoretical models, relevant research papers, and practical examples, with the author’s own conclusions and assessment included mostly in the last two chapters.

The structure of the research process is as follows:

- Literature was searched from platforms such as Google Scholar and different online libraries by using keywords such as "digitalization in education", "digital transformation" and "change management” with different variations to search related research papers, books, journals and case studies.

- Filtration of all the relevant sources out of the non-relevant, which did not comprehend in any way my pre-determined research questions. The maturity of the sources was also assessed based on the following evaluation criteria:

    - Relevance: Quality, in which the source addresses the research questions and objectives.

    - Credibility: The reliability and authority of the source, including the reputation and/or position of the authors and the publication.

    - Date of Publication: Preference for more recent sources to ensure the analysis reflects the latest developments and trends.

- Extracted key information and data from the selected sources, focusing on insights related to the research questions.

- Combining the extracted information to identify trends and insights related to the impacts of digitalization on education and operations. The following subtopics were used in this process:

    - Development of Technology and Its Effects on Educational Needs

    - Renewal of Processes and the Effects of Digitalization

    - Challenges in Adoption of Digitalization

    - The Role of Technology in Education and Skill Development

    - Possibilities Through Digitalization

- Then that information was used for analysis in chapter 6, firstly in subchapter 6.1. Which partly converted also to the second subtopic “Guide-

line for the Change, when Applying Digitalization in Educational Processes”, which is a much more applicable part and uses more of the author's personal evaluation on the side of supporting sources. It also combines theory models the author finds relevant towards the desired outcome.

Throughout the research, theoretical models presented in this paper were subjectively evaluated by using following evaluation criteria:

- Relevance
- Effectiveness
- Flexibility in use
- Level of recognition

The research primarily focused on using only models that are commonly known and very basic, to easily justify possibilities in using them and them to be easily applied in different situations in vast fields of different organizations. Thus from the author's perspective, it seems easy to widen these approaches, if doing a more comprehensive analysis in a specific context, based on this research paper.

## 1.5 Structure of Thesis

The thesis is structured in three stages. The first stage is about comprehension of the place of education and digitalization in organizations, understanding relevant theory in processes, measurement, and change management within the changing environment, with the support of theoretical models and covering chapters 2-4.

The second stage in chapter 5 consist of analyzing case studies and research literature, with the support of some minor sources and to answer the following topics:

- Renewal of processes and the effects of digitalization
- Challenges in Adoption of Digitalization
- The role of technology in education and skill development
- Possibilities Through Digitalization

The third stage includes combining all the theory and conclusions from the second stage to form a guideline to understand and evaluate effects of digitalization in this context, covering chapters 6 and 7.

## 1.6 State of Scientific Discussion

The author believes that it is commonly acknowledged that digitalization has made a remarkable change in the implementation of education and the overall functioning of different expert organizations. After going through much literature during this whole process of finding properly fitting sources, it seems that the modern consensus in scientific discussion is that Digitalization causes a demand for constant personal development to keep up with the changes. A swiftly changing environment also raises questions about ethical aspects and security of the systems handling personal data, which in this paper is left more in the background, while it still is important and needs to be mentioned. The scientific basis is intricate, and still vastly researched in different contexts.

For instance, Neuvo et al. (2016) highlight that digital transformation in education necessitates continuous adaptation and skill development among educators and students. Danielsen (2021) states among other things the need to address data privacy and security challenges that come with increased digital integration in educational settings. Haleem et al. (2022) discuss how digital transformation impacts both operational efficiency and ethical considerations within expert or-

ganizations. Andriushchenko et al. (2021) describes how digitalization in education processes enhances human capital. Susilo et al. (2023) discuss the profound effects of enhanced accessibility and flexibility in education through digital technologies.

Many discussions seem to center around applying new methodologies and how it enhances skill development.

# 2 Definition of Education and Digitalization in Organizations

This section aims to provide an understanding of the connectivity of Education and Digitalization within the research paper context.

## 2.1 Digitalization within the Frame of Organizations

Defining digitalization and achieving an understanding of what integration in fact means aims to give better insights into the perspective of this research paper.

### 2.1.1 Definition of Digitalization

Digitalization is a powerful cause of global economic growth. Different advancing technologies and innovations coming along, are making changes to all sorts of organizations all over the world. In the context of Organizations, the affections are markable, because it creates a constantly changing platform for business models and accelerates the aging of present methods and strategies. It creates an urge to make swift changes to maintain competitiveness. (Calderon-Monge and Ribeiro-Soriano, 2024)

Digitalization affects, many ways into user's assumptions and behavior. Digital technologies enable stakeholders to take part more interactively. That raises expectations toward the service provider. Digitalization also creates a many different kind of approaches and diversities markets by providing new ways of reaching the end users. (Calderon-Monge and Ribeiro-Soriano, 2024)

Central parts of Digitalization are social platforms, mobile networks, analytics, and cloud services. These technologies provide a modern set of tools for organizations to store, use, and share data and information. (Calderon-Monge and Ribeiro-Soriano, 2024)

Digitalization is still not only about technological advancements, but economic and social change. It converts digital technologies to infrastructure technology,

that modifies society and economies. It enables efficient information communication, mobility, rapidity, Virtualization, coalition, transparency, and evolvement of competition. (Calderon-Monge and Ribeiro-Soriano, 2024)

Digitization means, when analogical data is converted to digital form. It can be used e.g. when scanning paper documents or transforming voice records to digital form. It can often be seen as a first step towards digitalization. (Tilen Gorensek and Andrej Kohont, 2019)

Second important part of digitalization is deployment and integration of the technologies into Organizational processes. It can contain deploying digital tools, programs, and automation, and embedding them to present processes. (Tilen Gorensek and Andrej Kohont, 2019)

Modern organizations often use cloud services to store data, artificial intelligence and/or data analytics to enhance their decision making and efficiency. Digitalization creates a new way for value creation. Digital platforms, such as e-commerce, social media, and mobile apps, create possibilities to reach customers and provide services. These platforms can also effectively collect data and help organizations to understand the evolving market. (Calderon-Monge and Ribeiro-Soriano, 2024)

More efficient processes, lesser expenses, and better quality of services is often achieved by digitalization. As said about the social impact, digitalization changes ways of organizational culture and management. To strive in changing environment, organizations need to create an open, flexible, and innovative culture. Sometimes it can cause great changes to old outdated systems and ways. (Calderon-Monge and Ribeiro-Soriano, 2024)

Digitalization is a multilayered process. This creates vast changes in organizational culture and business model, but when deployed properly can provide great benefits overall. (Calderon-Monge and Ribeiro-Soriano, 2024)

### 2.1.2 Integration in Organizations

Key factors in the integration of digitalization are a robust technological infrastructure, it contains fast internet, cloud services, advanced data analytics, and well-handled cyber security. (Li et al., 2019)

Integration of digitalization also demands leadership and a workforce, which has the necessary skills to really utilize new tools and concepts. Continuous training is inevitable to ensure that everybody is proficient with the new tools. Organizations should focus on developing technical skills and comprehension about digital environments. For instance, educational institutions offer digital platforms to provide practical experience from digital technologies. (Li et al., 2019)

Digitalization involves many processes. Both, completely new ones and changes to the old ones. It raises the importance of process optimization, which includes planning of the new processes and replanning the old processes. Lean management are often used to analyze and optimize these processes. Integration of digital technology, such as automation and data-analytics. can offer modern ways of measurement and management of processes. (Li et al., 2019)

From lean management, can be jumped to the essential part of the integration, which is change management. Efficiently implementing digital change within an organization it demands quality change management, to handle resistance and ensure smooth transition. In practice it means clear communication, inclusion and support. This ensures, that all stakeholders are committed to the digital transformation. (Li et al., 2019)

Some characteristics of proper integration is interconnected operations within the organization. It means that all the functions and stakeholders are connected to each other and data flows seamlessly across different departments and levels. This kind of connectiveness ensures better coordination, enhances transparency, and makes process faster. Also, analytic tools and real time data ensures organization to have possibility to make more conscious decisions. When integrating digitalization, it is important to take these things into consideration to

understand the relations and changes of the changes, and in the long run when analyzing trends and evolution of technology and culture. Important characteristic is also the culture of continuous innovations, which encourages pupil to try out new tools in different ways. (Li et al., 2019)

The author concluded that proper integration of digitalization into organizations seems to be essential for maintaining competitiveness and efficient processes. Key factors such as technological infrastructure, leadership, workforce skills, process optimization, and change management play critical roles in this integration. Digitalized organizations benefit from interconnected operations, enhanced decision-making, flexibility, and a culture of continuous innovation.

### 2.1.3 Diffusion of Innovations Theory, Technology Acceptance Model (TAM)

The Technology Acceptance Model is a widely applicated model especially in the field of Information Technology (IT), to disclose acceptance of the users towards the technology in practice. TAM was first introduced by Fred D. Davis in 1986, and it has scientific base on social psychology. Especially in Theory of Reasoned action (TRA). As figure 1 showcases, the model assumes that the believes of users towards the usefulness of the technology in practice and the beliefs about ease of use is influencing users' attitudes and intentions for usage of this technology. Ultimately it would in theory predict the acceptance of this certain technology. (Davis, 1989)

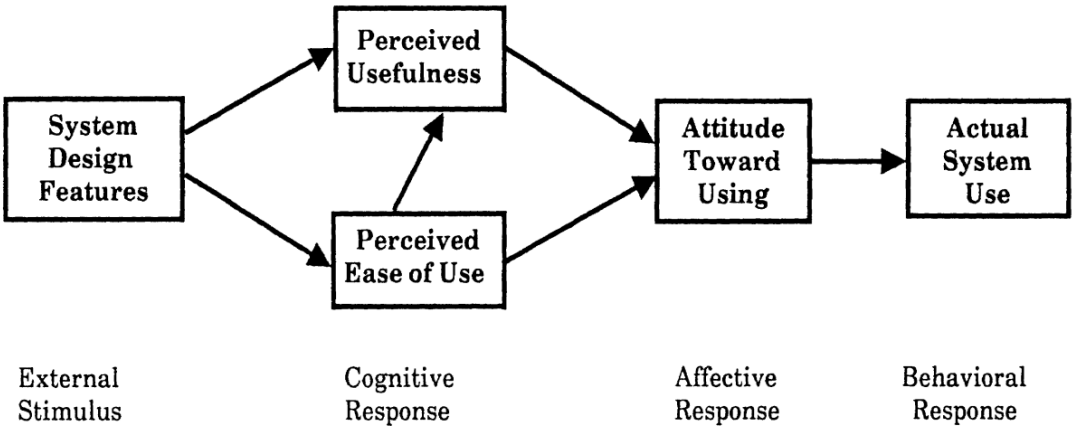


Figure 1. TAM process. (Davis, 1989)

The next chapters explain in detail how the process in this model works:

- Perceives usefulness, which means user's comprehension about how much new technology would enhance their performance or productivity. If users feels that the technology is useful and helps in pursuit of goal more efficiently, user would in higher probability accept and start to use it. (Davis, 1989)

- Perceived ease of use, this means how easy and effortless does the user perceive using new technology. If technology is easy to apply and learn, it will be more likely for the user to accept and use it. (Davis, 1989)

- Behavioral intention to use, perceived usefulness and perceived ease of use affect the user's intention to use, meaning whether he intends to use the technology. Positive experiences of these factors increase the user's willingness to use the technology. (Davis, 1989)

- Actual system use, which means that the intention of use leads to really using the technology. This is the final goal of TAM, to get users to really apply new technology in their processes. (Davis, 1989)

TAM is a widely used model in research within technology and its usage level. Many times, in the deployment and planning phase of the new technology. It also has many further applications, which can be considered if more specialized conditions. (Davis, 1989)

TAM has been tested extensively, in many empirical studies. Its sophisticated and predictive nature has been widely acknowledged. Some empirical tests have still produced mixed and somewhat inconclusive results, leading to inconsistencies and differences in reported conclusions. (Davis, 1989)

The meta-analysis also highlighted the importance of perceived usefulness in technology adoption and suggested that developers should focus on system functionalities and features to improve acceptance. Additionally, the relationship between ease of use and usefulness cannot be ignored, as it has a strong impact on end-user's perception of a system's usefulness. (Davis, 1989)

In summary, the TAM model provides a framework for understanding user acceptance behavior towards technology, with perceived usefulness and ease of use playing crucial roles in predicting technology acceptance. However, the model's empirical findings have been inconsistent, and further research is needed to address these inconsistencies and enhance its applicability in different technological contexts. (Davis, 1989)

## 2.2 Role of Education in Organizational Development

From the author's perspective education can be seen not just as acquiring knowledge and skills through formal educational processes, such as schooling, but also as a significant social process that influences an individual’s cognitive abilities, social behaviors, and economic opportunities. Education and continuous training seem to form the basis also for organizational development.

There are many essential aspects and goals for education. The development of human capital means developing an individual's personal skills, such as technical capabilities, and analytical thinking. These can be seen in increasing productivity within an organization. Education also serves as a sorting mechanism in the labor market, through different labels and degrees achieved through educational processes. It helps to acknowledge different capabilities and allocate human resources better. Education has a crucial role in socializing individuals, rooting social norms, and organizational values. This helps to create individuals, who are more likely to contribute to the common goals. (Kingston et al., 2003)

Within the organizations education and training enhance skills to be productive, well-educated, and trained workforce also most likely contribute to innovation and adapt to organizational changes, which drives organizational growth. Education can be seen as the driving force of cultural development, which helps interaction between different levels and sectors of an organization and with the other stakeholders. Education contributes to the development of leadership and management skills, which are essential for effective organizational governance and strategic decision-making. Essentially, education offers a key factor in organizational Development, through Personal development. (Kingston et al., 2003)

# 3 Process Development and Measuring Throughout Digitalization

This chapter plays an important role in answering the research questions by providing a comprehensive look at process development and measurement models that the author has concluded through the previously described evaluation process to be easily used in this context. It contributes to understanding how digitalization can change educational methods and strategies through theoretical models such as the Hayes-Wheelwright Matrix and the concept of mass customization. These models illustrate how educational processes can be optimized and personalized using digital tools.

The chapter also comprehends operational efficiency and productivity by discussing key performance indicators and benchmarking practices. These sections highlight how digital tools can enhance various aspects of operations, from speed and cost to quality, flexibility, and dependability, thus directly addressing the second research question of ‘’What effects has digitization had on the operational efficiency and productivity of expert organizations’’

As a conclusion, this chapter aims providing background knowledge to understand these factors within the main topics of digitalization and education.

## 3.1 Theoretical Models of Process Development

The following theoretical models gives insights about what kind of approaches can be used when evaluating organizational processes.

### 3.1.1 Hayes-Wheelwright Matrix

Also known as the Product-Process Matrix, seen in Figure 2, is a well-functioning frame for organizations. Matrix aims to combine production processes into a strategic tool to help organizations identify and pick the most well-fitting strategy

for production. This model has two main dimensions within it, product life cycle/structure and process life cycle/structure. (Robert H. Hayes and Steven C. Wheelwright, 1979)

The author finds this model among the others within this chapter relevant, because education can be simplified to be just an “expertise production” process among the other processes within an organization. So, it is important to have an understanding of different approaches and what are the core differences.

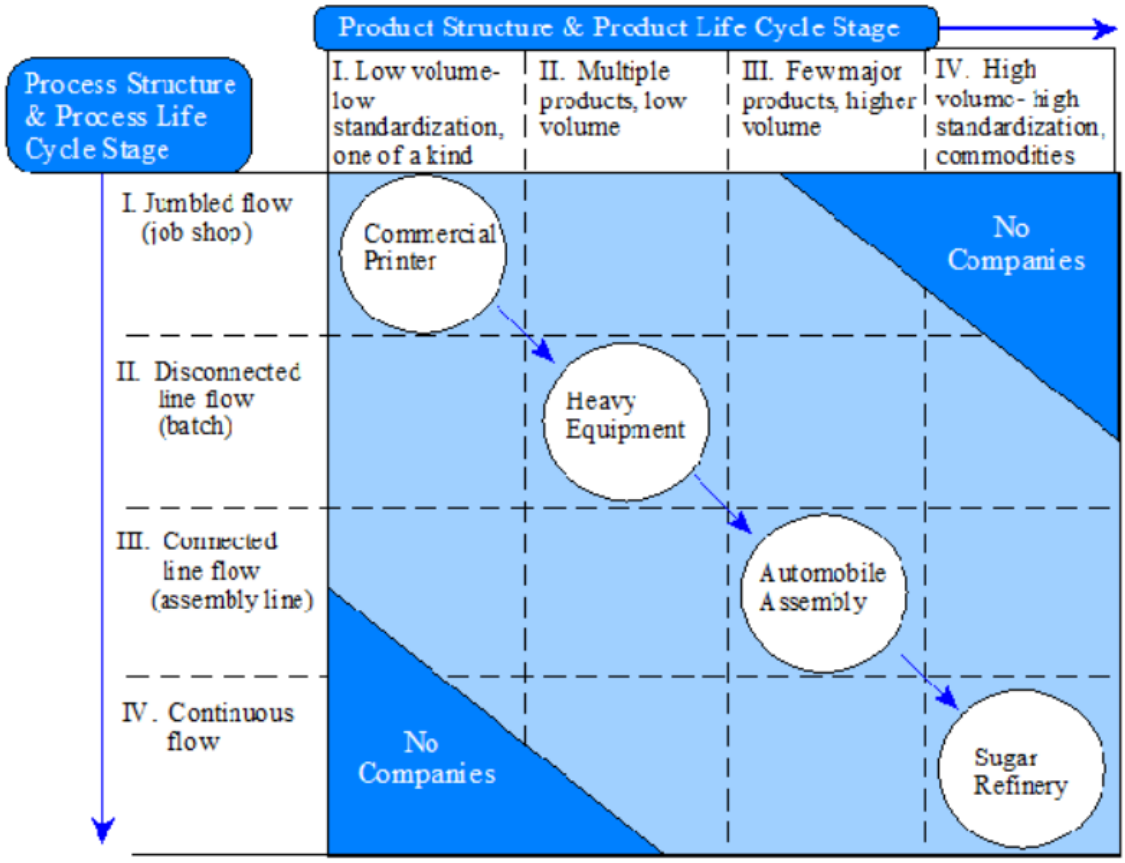


Figure 2. Traditional Process–Product matrix. (Robert H. Hayes and Steven C. Wheelwright, 1979)

Product life cycle/structure comprehends the phases through the development of the concept to entry to the Market. The diagonal formation of the Matrix points to the most convenient path, that the organization can optimize one’s production strategy. Phases consist of the formation of the concept, planning,

manufacturing, and testing of the prototypes, planning of the production process, pilot production, and eventually entry to the Market. (Robert H. Hayes and Steven C. Wheelwright, 1979)

Process life cycle/structure comprehends project/ job flow production, batch production, mass/connected flow production, and continuous production. (Robert H. Hayes and Steven C. Wheelwright, 1979)

Project production means high level of customization, where production takes place as an individual projects. Batch production sets in the middle with mid-level customization and flexibility, and products are manufactured in small to mid-size batches. Mass production aims to maximize the quantity with low expenses, while customization options are set to the bare minimum and involves manufacturing in big batches. Continuous production means producing goods constantly in high volume, an easy example would be Oil refining. (Robert H. Hayes and Steven C. Wheelwright, 1979)

The intersection of these dimensions in the matrix helps organizations identify the most suitable production approach for each stage of their product’s life cycle. Organizations typically follow a diagonal path through the matrix, starting with project production in the early stages of a product's life cycle and then by moving towards continuous production as the product evolves and demand stabilizes. However, disruptions from this path can occur, and these strategic choices must be made with a clear understanding of their implications. (Robert H. Hayes and Steven C. Wheelwright, 1979)

Matrix aids in strategic decision making and allocating the resources. Advancing competitiveness of the organization, by adapting into current state of the technological possibilities and state of the Market. (Robert H. Hayes and Steven C. Wheelwright, 1979)

### 3.1.2 Service-Process Matrix

Service-Process matrix was introduced in 1986 by Schmenner, it is a framework used to evaluate and categorize service-based firms. This matrix helps in understanding the delivery and management of various service types, offering insights into optimizing performance and efficiency in service operations. It serves as a valuable tool for managers to tailor their strategies according to the specific characteristics of their service offerings. (Mackelprang et al., 2012)

Matrix is based on two critical dimensions, as seen in Figure 3. Labor intensity and customization/customer interaction. Labor intensity refers to the amount to which service relies on human labor. High labor-intensity service depends heavily on the involvement of the workforce, which requires significant input to produce services. In the other hand, low labor intensity services rely more on technology and machinery, which mitigates the need for a human workforce. Customization and customer interaction assess, how much of customization is necessary for the pointed customer profile and how much customer interactions are involved. Highly customizable are much more personal and it includes significant amount of customer interaction, when services with low customization are standardized with minimal customer interactions. (Mackelprang et al., 2012)

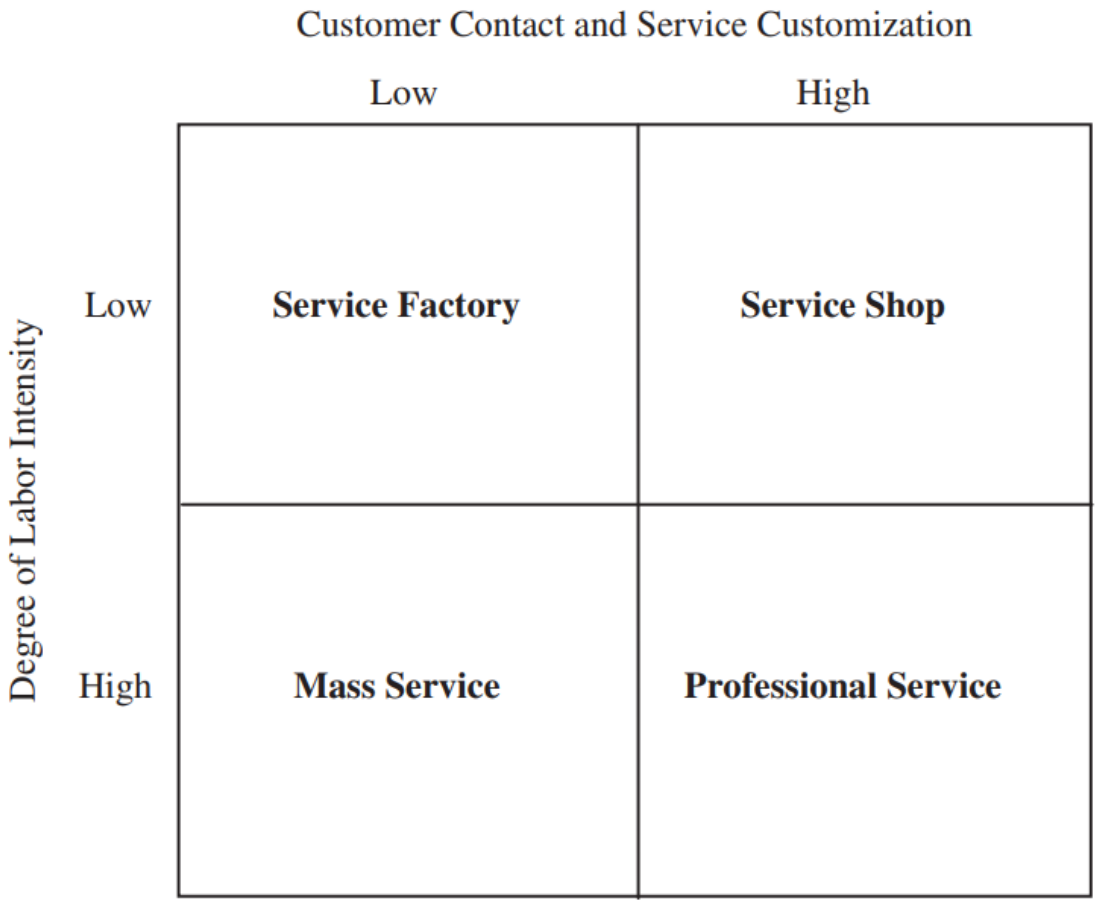


Figure 3. The Service-Process Matrix. (Mackelprang et al., 2012)

Service-Process Matrix divides Services into a quadrant based on previously explained dimensions:

- **Expertise services,** which has characteristically high level of customization and labor intensity, can be for instance, legal services, consultancy and architecture. (Mackelprang et al., 2012)

- **Services shops,** with high customization and low labor intensity, could include hospitals and auto repair services. These services rely on specialized equipment and require work force to be adept at using this equipment to tailor services to specific customer needs. (Mackelprang et al., 2012)

- **Mass services,** characterized by low level of customization, buy high labor intensity. For instance, retail and education. These services are relatively highly standardized and executed by large workforce. Central aspects are efficient management of large teams and maintaining high level of quality. (Mackelprang et al., 2012)

- **Service factories**, which have low level of both, customization and labor intensity are, for instance, airlines and many logistic companies. These services are highly standardized, with minimal customer interaction and management focus is on maximization of technology and process efficiency. (Mackelprang et al., 2012)

The Service-Process Matrix has a great amount of implications for how managers view and handle training and performance optimization. Training and education approach can be divided broadly into quality training, or more job specific subjects. (Mackelprang et al., 2012)

Quality management training focuses on systemic capabilities and process improvement, enhancing overall service system performance by standardizing processes and reducing variability. This type of training can be seen as more effective in low variation settings, such as mass services, where standardization is key. Job-specific training focuses on specific skills and knowledge related to daily tasks, which can be crucial in high variation settings such as service shops. This kind of training improves the workforce's capability to handle specific pointed tasks and use specialized equipment effectively. (Mackelprang et al., 2012)

In mass services, quality management training has a larger impact on performance than job-specific training due to the standardized nature of the services and the need for process optimization. In service shops, job-specific training has much more significant impact on performance as employees need specific

skills to handle customized services and complex equipment. Managers should consider and tailor their training programs based on the type of service they offer. For instance, managers in mass services should emphasize quality management training to streamline processes and enhance consistency, while managers in service shops should focus on job-specific training to ensure employees can effectively deliver customized services using specialized equipment. (Mackelprang et al., 2012)

From the author's point of view, The Service-Process Matrix provides a valuable frame for comprehending different services. It helps managers to detect specialties of the service on point.

### 3.1.3 Importance-Performance Matrix

Importance-Performance matrix is a central tool, similar to Hayes-Wheelwright, and Service-Process Matrices, to design and manage service products. It provides a structural approach to analyze, prioritize, and enhance the functions of the process. By using this matrix, the detection of the key factors come clearer, and through these resources can be allocated more strategically in decision making. (Slack, 1994)

Importance-Performance Matrix is based on two different dimensions, Importance, and Performance. The importance is usually evaluated through the customer's eyes, taking also in consideration, how important is the function in the sense of overall customer experience and business. The performance itself is evaluated through quality of service, efficiency, and customer satisfaction. (Slack, 1994)

The first phase in structuring the Important-Performance matrix is to identify and list all the organization's key service processes. These could include, for in-

stance, customer service, sales, delivery processes, and different kinds of support and maintenance services. Each process is evaluated individually to accurately determine its importance and performance. (Slack, 1994)

The next phase is about determining the criteria, which gives a basis for evaluation of the process. For instance, the importance to the customer effects on business goals, the efficiency of the process, the quality of the process, customer satisfaction, and expenses. (Slack, 1994)

Then every process is evaluated by chosen criteria. In practice, this usually happens through a numerical scale, such as 1-5, where 1 means low, and 5 means high importance or efficiency. This phase usually demands wide cooperation between different sectors of an organization, so that the evaluation forms accurate and comprehensive outcomes, without biased views. (Slack, 1994)

After this evaluation, the Matrix itself can be formed using results as a basis, as illustrated in Figure 4.

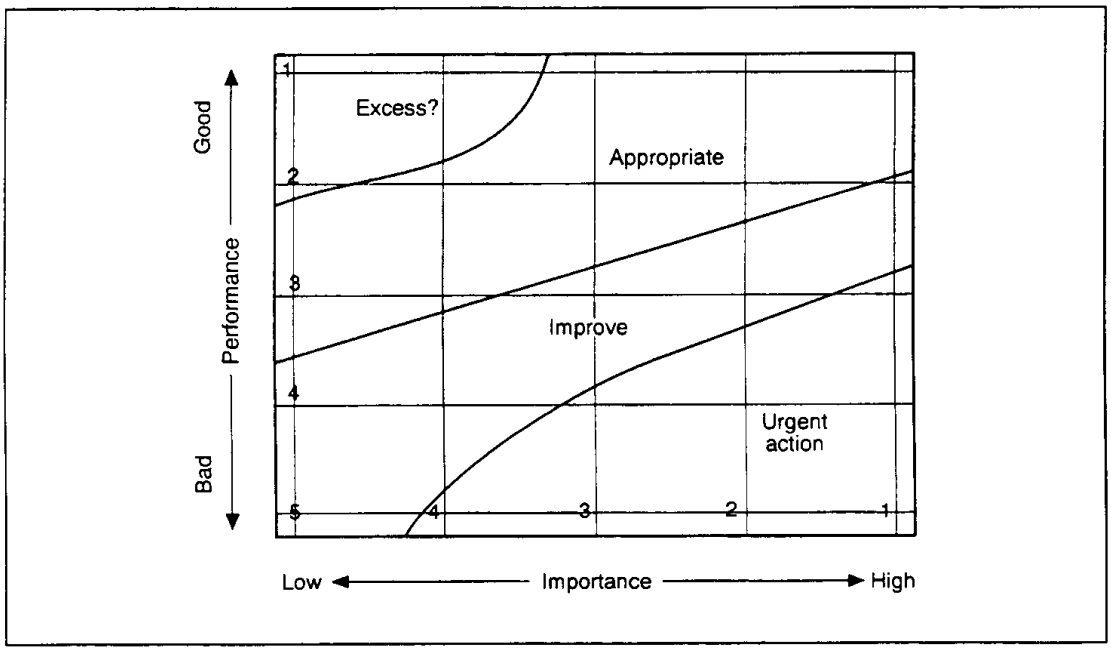


Figure 4. Importance-Performance Matrix. (Slack, 1994)

Analysis of the matrix is a critical phase, where results will be interpreted, and typically the matrix area is divided into a quadrant, to help prioritize. For instance:

- **High importance, high performance.** These processes are organizational strengths. They are critical to business success and perform well, but their continuous development and maintenance must still be continued. (Slack, 1994)

- **High importance, low performance.** These processes are critical but perform poorly. Improvement resources should be primarily allocated to these so that they meet the organization's goals. (Slack, 1994)

- **Low importance, high performance.** These processes work well but are not strategically important. They can possibly be further optimized or outsourced, freeing up resources for more important targets. (Slack, 1994)

- **Low importance, low performance.** These processes should be looked at critically, and their necessity may be questioned. Possibly they can be reduced or eliminated completely. (Slack, 1994)

Importance-Performance Matrix can offer a clear and structured view of the current state of an organization and ease the detection of central targets for aid and enhancement. With analyze can be produced concrete development plan, which include enhancement procedures, resource allocation, and possible structural changes in the process. This method can be a valuable tool in the strategic management of an organization. (Slack, 1994)

### 3.1.4 Mass Customization

In modern business world, the concept of mass customization has grown into critical strategy, for companies, that are willing to balance mass production efficiency and personalized customization options. Mass customization involves tailoring products and services to meet the specific needs of individual customers, while still maintaining the cost-effectiveness and efficiency typically seen with mass production. This kind of approach allows companies to answer the growing demand for diversity, without causing prohibitive costs or operational complexities, that traditional customization often has. (Gilmore and Pine II, 1997)

Mass customization can be approached in four different ways to answer for different kind of needs. Collaborative, Adaptive, Cosmetic, and Transparent customization. Each approach offers unique methods for delivering tailored products and services, and companies often use a mixture of these strategies to best meet their customers' demands. (Gilmore and Pine II, 1997)

- **Collaborative customization** involves an interaction between the company and individual customers to help them articulate their needs and preferences. This approach is particularly useful for businesses whose customers cannot easily specify their requirements or can easily become overwhelmed by too many options. By engaging in a collaborative process, companies can create highly personalized products that precisely meet customers' needs, through a process of comprehensive interaction and dialogue. (Gilmore and Pine II, 1997)

  Gilmore and Pine II, (1997) describes an example of collaborative customization about Paris Miki, a Japanese eyewear retailer. The company developed a Designing System, which could help customers choose the perfect pair of rimless glasses. This system takes a digital picture of the customer's face, analyzes their features, and uses customer input to rec-

ommend lens shapes and sizes. The customer and optician then collaborate to finalize the design, ensuring a perfect fit and style. This method enhances customer satisfaction and also simplifies the decision-making process.

- **Adaptive customization** approach uses a standard product that customers can modify further to suit their individual needs. This approach can be ideal for products that need to perform differently under various conditions or for different users. Adaptive customization allows customers to adjust the product themselves, providing flexibility and control without direct interaction with the company, like in the collaborative approach. (Gilmore and Pine II, 1997)

  Gilmore and Pine II, (1997) Introduced an example about Lutron Electronics, a manufacturer of lighting systems, showcases Adaptive customization with its Grafik Eye System. This system connects various lights in a room, then allowing users to program different lighting effects for different purposes. Users can easily switch between settings, such as for a different occasion such as a party or a quiet evening, without needing to manually adjust each light. This approach offers convenience and versatility, answering to diverse customer preferences.

- **Cosmetic customization** presents a standard product just differently to different customers. While the core product can remain even completely the same, its presentation, packaging, and marketing, all the cosmetic aspects, are tailored to meet individual customer preferences. This approach is suitable when customers use the product in similar ways but desire different forms of presentation. (Gilmore and Pine II, 1997)

  Gilmore and Pine II, (1997) used the example about Planters Company, which utilized Cosmetic customization to match with all the varying merchandising demands of its retail customers. By refining its packaging lines, Planters was able to offer different sizes, labels, and promotional

packages tailored to each retailer’s needs. This approach made possible for the company to satisfy these diverse customer requirements without compromising the core product.

- **Transparent customization** provides individualized products or services without explicitly informing customers that customization has occurred. This approach can be effective, when customer needs are predictable or can be determined from behavior, and also when customers prefer not to maintain a dialog about their needs repeatedly. (Gilmore and Pine II, 1997)

  Gilmore and Pine II, (1997) also describes an example about ChemStation, a manufacturer of industrial soap, which employs transparent customization by custom-formulating soap mixtures for each customer based on their specific needs. The company monitors usage patterns and delivers more soap when needed, without requiring customers to act and place orders. Customers receive the right product at the right time without being involved in the customization process, Enhancing convenience and satisfaction.

Mass customization represents a significant shift from the traditional mass production model, where fully standardized products are offered to a homogeneous market. As markets become increasingly inclusive and customer preferences more diverse, companies must move beyond ”one size fits all” solutions. Mass customization gives companies a chance to create value by efficiently answering independent customer's demands. This also mitigates the sacrifices customer have to make in the process of acquiring services or products, that really match their needs. (Gilmore and Pine II, 1997)

Effective mass customization necessities organizations to understand the dimensions of the products and services they are offering, to have a comprehension about which of their customers’ needs vary the most. All the previous examples should give a good view about the essence of mass customization and how it can be applicated in different fields to solve different problems, all relating

to combine mass production and customization options. It is said, that by doing exactly what each customer requires, mitigating processes. Customized service can be less costly to provide, than its standard service, of course demanding good planning and the right area of use. (Gilmore and Pine II, 1997)

To successfully implement mass customization, organizations should carefully consider which types of customizations are appropriate for their business and when to apply them. The process involves examining customer needs, identifying the most effective customization approach, and integrating customization capabilities into their operations. For instance, a collaborative customization approach could be ideal for organizations, where customers or users will face intricate problems, such as choosing new shoes or such shown in the eyeglass company’s example situation. (Gilmore and Pine II, 1997)

By analyzing the organization's and markets capabilities and combining different approaches implementer can have fitting solutions for the demand, in every phase and level of the process. In essence, mass customization is strategic approach, which need planning and in best case helps an organization to achieve almost same convenience than mass production, still attracting customers with individual needs. It can be a competitive tool present and especially in the future, when digitalization creates much demand for individually planned services and products. (Gilmore and Pine II, 1997)

## 3.2 Measurement

Measurement is an essential part toward organizational efficiency. This chapter provides insights into different approaches and fundamentals.

### 3.2.1 Five Performance Indicators

In the modern globalized world, organizations must enhance and evaluate constantly efficiency and management to maintain their market position and competitiveness. Key performance indicators, such as speed, cost, durability, dependability, and quality could be seen as the basis and most important frame for evaluating and improving organizational performance. These indicators help organizations develop core competencies that lead to a competitive edge towards their peers. As the market evolves, intense competition requires businesses to adopt strategies focused on sustainability and dominance. The ability to leverage technology, demand shifts to a certain direction, new segments, cost structure changes, and regulatory changes strengthens an organization's competitive edge. (ul Haq and Faizan, 2022)

Slack et al. (2022) describe that these five performance objectives mentioned; quality, speed, dependability, flexibility, and cost are all connected and collectively crucial for operational success. By focusing on these five objectives, organizations can deliver better customer satisfaction, improve internal efficiency, and gain that competitive edge in the market. Balancing these objectives allows us to respond effectively to market demands and achieve long-term strategic goals. In figure 5 it is illustrated the interconnections and internal and external affections.

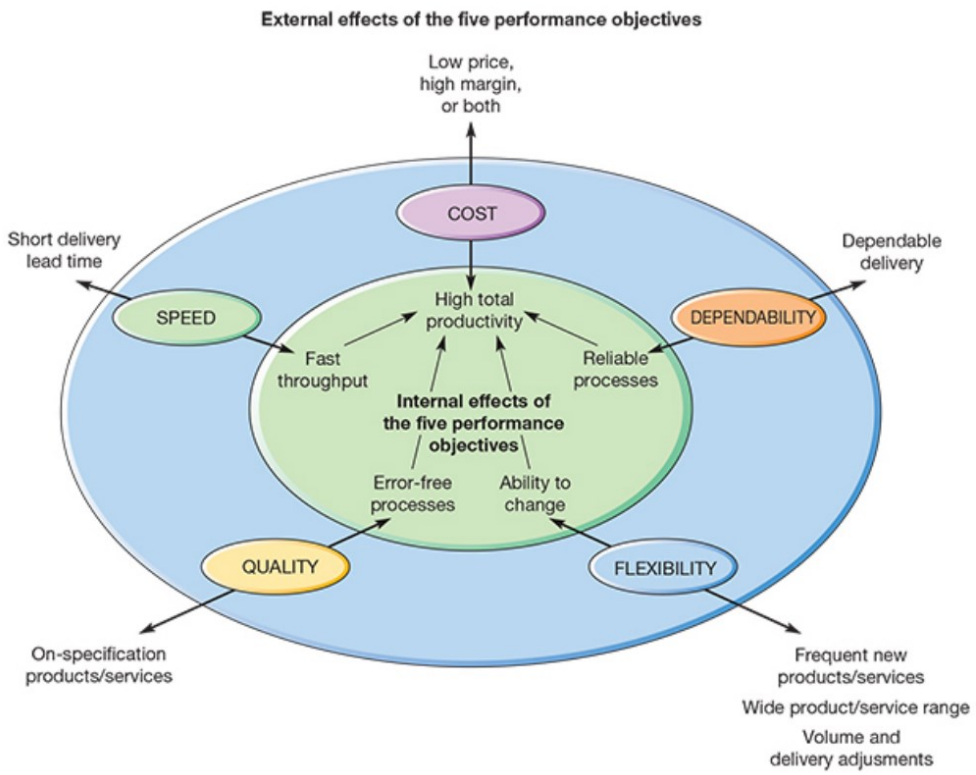


Figure 5. Five Measurement Objectives (Slack et al., 2022: 168)

- **Quality** is fundamentally about delivering products or services that match customer expectations consistently. It involves producing goods that are standard quality and providing services that are reliable and effective. High quality is critical because it directly impacts customer satisfaction and loyalty. In different areas, quality can mean many things. For a hospital, it might mean accurate diagnosis and effective treatment without complications. For a vehicle plant, it can mean manufacturing cars that meet all the safety and performance standards. High quality reduces waste, rework, and errors, leading to more efficient operations and lower costs. Therefore, quality is not just about meeting external customer expectations, but also about ensuring smooth and effective internal processes. (Slack et al., 2022: 143-146)

- **Speed** can be determined, as the time taken to fulfill customer requests. This includes the process time, from order placement to delivery to the

end customer. In today's fast environment, customers usually value quick service, and speed can be a significant competitive advantage and determine the level of customer satisfaction. For instance, for a supermarket, speed could mean having full and easy to locate shelves and efficient checkout processes to minimize time consumption. For a vehicle factory, it could mean reducing the production cycle time to get cars delivered faster. Internally, improving speed can help reduce the time used in work in progress, and storage levels, thus cutting storage costs and improving cash flow. Swift operations also mean being able to respond more quickly to environmental changes and market demands, enhancing the overall agility of the organization. (Slack et al., 2022: 149-150)

- **Dependability** is about being reliable. It often means providing products and services when they were promised and ensuring consistency in operations. From customer's point of view, dependability is a key factor in building trust and repeating business processes. For example, a bus company must follow consistently its schedule to be considered dependable by its passengers. Internally, dependability ensures that various parts of the operational process can rely on each other to deliver inputs on time, which reduces disruptions and allows for better planning and resource management. (Slack et al., 2022: 151-154)

- **Flexibility** points to the ability of an operation to adapt to changes. This could often involve changing the product or service offering, adjusting the mix of products or services, changing the level of output, or changing delivery times. Flexibility is stated to be crucial in a fast-changing environment where customer needs and preferences can change rapidly. For instance, hospitals may view flexibility as being able to handle a sudden wave of patients in an emergency. For a supermarket, it could involve adapting inventory to seasonal changes. Internally, flexibility aids operations withstand with unexpected disruptions and allows for customization depending on the demand, which can enhance customer satisfaction and open new opportunities. (Slack et al., 2022: 159-162)

- **Cost** efficiency involves mitigating all the expenses associated with producing goods or providing services. This is a crucial aspect in maintaining competitive pricing, and so on achieving profitability. Organizations that do not compete directly on price, also need to manage costs effectively to ensure financial sustainability. In a vehicle plant, this could involve sourcing of cost-efficient raw materials and labor to reduce production costs. For a supermarket, it could mean streamlining supply chain operations to lower logistics expenses, such as facility leases and fuel costs. Internally, cost efficiency is often achieved by improving the previously described performance objectives; high quality reduces waste, speed lowers inventory costs, dependability minimizes disruptions, and flexibility can lead to better utilization of resources at hand. (Slack et al., 2022: 161-168)

### 3.2.2 Benchmarking

Slack et al., (2022) states that benchmarking in its core relates to the idea of looking inspiration from outside the organization. It can be seen as the process of learning from peers. It involves comparing own performance or methods against other parties' comparable operations. This process extends beyond just setting performance targets. While including a thorough investigation into the different operational practices of other organizations, aiming to derive innovative ideas that could be applied to improve one's own operational performance. The idea behind benchmarking has its foundation based in the understanding that challenges faced in processes are most likely experienced somewhere else, and there is probably an organization somewhere, that has developed a more effective way of addressing those challenges. In essence, benchmarking is about stimulating creativity in improvement. (Slack et al., 2022: 539-540)

Slack et al. (2022) state that Benchmarking can be applied in various forms, each offering a different point of view. Some of the primary types of Benchmarking stated include:

- **Internal Benchmarking**: This bases comparisons between different operations or parts within the same organization. It helps identify internal best practices and leads toward standardization inside the organization. (Slack et al., 2022: 539-540)

- **External Benchmarking**: This approach compares an organizations operation to different organizations operations. This could offer insights into industry and disclose innovative practices from other fields and for instance, from peers. (Slack et al., 2022: 539-540)

- **Non-Competitive Benchmarking**: In this approach, organizations benchmark towards external organizations that do not compete in the same markets. This can be useful way of benchmark especially when pursuit of broadening to completely new ways of doing things. (Slack et al., 2022: 539-540)

- **Competitive Benchmarking**: This involves direct comparisons with competitors. It could help organizations understand their competitive position and identify clear weak points, or strengths. (Slack et al., 2022: 539-540)

- **Performance Benchmarking**: This approach focuses on comparing the levels of yet achieved performance in different operations. It helps in setting realistic performance targets based on industry benchmarks. (Slack et al., 2022: 539-540)

- **Practice Benchmarking**: Is a comparison between an organization's operations practices, or way of doing things, and those adopted from another operation. (Slack et al., 2022: 539-540)

While benchmarking has become a popular way of measurement, many businesses seem to fail of really taking maximum benefits out from it. It could be due to misunderstandings about its nature, while Benchmarking should not be viewed as a single project, but more as a continuous process of comparison and improvement. It aims to provide ideas and information, rather than direct solutions, which organizations can adapt straight to their unique contexts. Secondly, effective benchmarking requires resources and should involve staff at all levels to gather and analyze benchmarking information. If used correctly, Benchmarking provides good insights for improvement. Benchmarking involves a deep learning process and adapting best practices to fit the specific needs of one's organization in hand. (Slack et al., 2022: 539-540)

# 4 Change Management

Change management is commonly known to be an essential part of organizations to adapt to constantly evolving intricate surroundings. Changes can be technological, economic, social, or political, and many times they affect in every level of organization. In short change management set’s goal to help organizations navigate through these changes and achieve strategic goals.

## 4.1 Challenges and Possibilities in Change Management

Nowadays world change processes are getting more intricate and depending on systems. Changes in climate, dynamics of the society, safety, and sustainability are all phenomena, that cannot be fitted into simple models. Leaders need to have modern knowledge and skills to comprehend these topics. Intricate surroundings are full of uncertainty. Leaders must bear uncertainty and use different sources of data and information to create a common understanding with all the stakeholders. Many times, these processes include different stakeholders, such as companies, governments, and consumers, who all need to be taken into consideration. Leading change require skill to think outside of traditional institutional frame and detect important patterns and structures. (Kangas et al., 2019)

A successful change management process offers many possibilities to an organization. It can advance flexibility, innovativeness, and competitiveness. When an organization can efficiently lead change, it can better answer to the needs of the Market. (Kangas et al., 2019)

One significant opportunity in change management is the ability to develop organizational resilience. Resilience means an organization's ability to quickly recover from disruptions and adapt to changes. This is especially important in Nova day’s world, where changes can be swift and unpredictable. Organizations that can develop resilience can also maintain their competitiveness and ability to operate even in difficult conditions. (Kangas et al., 2019)

As mentioned earlier, significant opportunities come from the innovations. Change management can create a culture in an organization that encourages experimentation and testing of new ideas. This can lead to the development of innovative products and services, which can lead improvements in the organization's competitiveness and market position. However, promoting innovation requires openness, flexibility, and a willingness to take risks. (Kangas et al., 2019)

Change management can also improve an organization's ability to attract and retain the best employees. Organizations that can lead change effectively can create a work environment that is motivating and inspiring. This can improve employee engagement and reduce turnover. Change management can help organizations develop the skills and capabilities of their employees, which improves the organization's ability to meet future challenges. (Kangas et al., 2019)

## 4.2 Theory of Change Management (The 7-S Model, McKinsey)

The McKinsey 7s model originates from the 1980s by McKinsey experts Tom Peters, Robert Waterman, and Julien Philips with assistance from Richard Pascale and Anthony G. Athos. The model has been generally utilized in different fields by different experts and it remains as one of the most famous instruments, to align all the pieces in an organization. (Jurevicius, 2021)

It advances from traditional understanding to present an emphasis on human resources, determined as ¨soft S¨ rather than just observing the traditional paths, such as capital, infrastructure, and equipment, as a key to comprehensively higher organizational performance. The goal of the model is to present how the following 7 elements of the company: Structure, Strategy, Skills, Staff, Style, Systems, and Shared values, can be aligned together in pursuit of effectiveness. Seen in Figure 6. (Jurevicius, 2021)

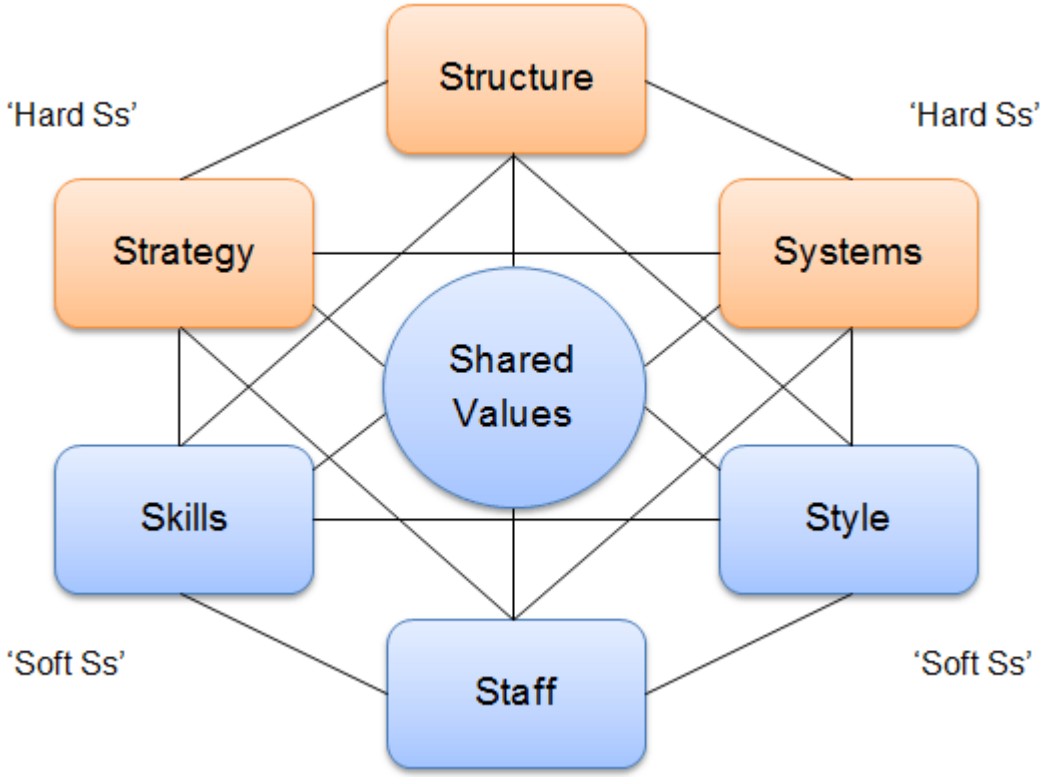


Figure 6. The McKinsey 7-S Model. (Jurevicius, 2021)

Essential in this model is that all the seven areas within the frame are interconnected and a change in one area, demands change in the rest of an organization, to remain as an effective entity. The model divides areas into 'Soft Ss' and 'Hard Ss'. The model can be applied in various situations, and it is often a valuable tool when organizational design is in question. According to (Jurevicius, 2021) The most common uses of the framework are listed to be when:

- Facilitating organizational change.
- Helping to implement a new strategy.
- Identifying how each area may change in the future.
- Facilitating the merger of organizations.

Below are descriptions of all the different areas of 7-S:

1. Strategy refers to the plan developed by an organization to sustainably maintain and build competitive advantage and successfully compete in the market. It includes setting goals and steps for the actions needed to achieve those goals. Effective strategies are clear, firmly communicated, and flexible enough to adapt to changing environments. (Jurevicius, 2021)

2. Structure represents the way the organization is layered and aligned, including the hierarchy, style of an organization, and job roles included. It defines the organizational lines of authority. A well aligned structure ensures efficient workflow and communication within the company. (Jurevicius, 2021)

3. Systems can be viewed as the daily activities and procedures that staff do to get processes finished. These could include information systems, financial systems, actual value creation processes, and performance measurement. Systems are stated to take great focus from the managers during changes. (Jurevicius, 2021)

4. Shared Values could be seen as the core beliefs and attitudes that create the company culture and influence employee behavior. The foundation of the organization. (Jurevicius, 2021)

5. Style refers to the leadership approach and management style adopted within the organization. How they interact, what actions do they take, and their values. (Jurevicius, 2021)

6. Staff approaches the matter with what type and how many employees an organization will need to be effective and how they will be recruited, trained, motivated, and rewarded. (Jurevicius, 2021)

7. Skills are the abilities that an organization's employees perform very well. They include capabilities, competencies, and an overall pool of different talents. During organizational change, is many

> times considered what skills the company will really need to maintain its effectiveness. (Jurevicius, 2021)

When starting to work with this model the first step is to make an assessment of whether the 7-S elements are aligned, or not, with each other. One should be looking for gaps, inconsistencies, and weaknesses between elements. For example, if a strategy of the organization got restricted by the structure of the organization. (Jurevicius, 2021)

In the second phase, Proper organizational structure should be determined, often in cooperation with the top management level. This requires finding the best alignment, which requires research and benchmarking. (Jurevicius, 2021)

The third phase is about deciding what changes need to be done, and creation of an action plan, to specify the necessary changes in detail. For example, if the organization's structure and management style are not in line with the values and structures, it must be rearranged. It can also mean re-evaluating communication processes and reporting relationships. (Jurevicius, 2021)

The last phase includes the actual implementation of changes, and it is the most critical phase. Only well implemented changes produce positive results. Finding experts in implementing changes within your company or by external services, is crucial. (Jurevicius, 2021)

All the seven elements (strategy, structure, systems, skills, people, style, and values) are dynamic, constantly changing, and affecting to each other. It means that constant evaluation is important in the future. (Jurevicius, 2021)

There are many possibilities for using this model in organizational design, it enables different parts of the company to act without friction, and it makes it possible to track the impact of different adjustments and how they affect in key elements, it is shown that it can be applied universally in different organizations. (Jurevicius, 2021)

It is still considered as a long-term model, which demands time and continuous evaluation, and cannot always predict how the model will adapt in changing environments, while it observes more inner factors, than external factors, which in many cases can be much more determining factors. (Jurevicius, 2021)

# 5 Changes in organizations' Educational Needs and Processes due to Digitalization and Technological Development

This chapter mirrors different institutions and researches that were picked through the literature research process described in the first chapter, to evaluate their conclusions and compare their findings, and to pursue a comprehensive understanding of the effects, considering challenges and possibilities. Following there are the most important sources, but this chapter’s topics also include some minor sources to support these findings and conclusions.

Neuvo et al. (2016) created research as part of the Bit Bang 8: Digitalization book, where they contacted various experts in academia to discuss how they see, as a frontrunner, the change of education in the future. They used semi-structured interviews, to provide a good framework for the discussions. This research was made within the university world but could easily be mirrored in educational systems outside of the universities, for instance into industry's own inner educational processes.

Department of Information Systems, University of Agder constructed An Expert Study on Norwegian Public Organizations, by Frank Danielsen. The study stated that there was a need to clarify the drivers, benefits, and challenges of digital transformation. To answer this need, seven Norwegian public organizations were investigated by gathering data through thirteen interviews. The findings pointed to a wide-ranging different drivers, benefits, and challenges, some of which stood out from the rest.

Elabuga Institute of Kazan Federal University investigated the challenges and outcomes associated with the use of digital technologies in education. The primary focus included identifying the difficulties in digital competence and disclosing potential sources for its improvement. The research involved a comprehensive sociological study, which included a significant sample size of participants to ensure fine results. (Vasilev et al., 2020)

Andriushchenko et al. (2021) created a journal about the digitalization of the education process and its effects on the human capital of an enterprise. Journal centralizes around advancements in digitalization and technology that have significantly changed the educational needs and processes within organizations. This shift necessitates the integration of various technologies, learning methodologies, and technical innovations into an educational system. In short, their pursuit was to understand the efficient education of the 21st century.

## 5.1 The Development of Technology and its Effects on Educational Needs

Through the relatively short history of modern digital development, it has significantly shaped educational needs, by changing ways of delivering and receiving information and knowledge. This transformation does not only mean embedding new tools into the traditional educational frame. It fundamentally molds the way education is seen, offered, and experienced. Technological advancements have led the shift of common understanding in educational needs, which necessities new approaches to education to integrate in the digital era. (Susilo et al., 2023)

Enhanced accessibility and flexibility are some of the most profound effects in education. With the use of technology, education has become more available with ease. digital environments, resources, and communication platforms have made it easy to approach a broader audience. Users can now use materials from anywhere in the world, whenever they want, which breaks most barriers speaking of time, and physical challenges. This kind of flexibility provides possibilities, especially for adult students pursuing education within other responsibilities, such as family and day work. (Susilo et al., 2023)

Digital technology enables a personalized learning curve, where mass produced learning content is customized by individual needs and preferences. This concept can also be seen as a form of mass customization. It enables the usage of data analytics and adaptive learning platforms to personalize users learning paths. For instance, these platforms can change the difficulty, learning curve, and methods to provide a more fitting learning experience, with an optimized

learning curve, to hit the goal efficiently. it helps users to engage and through considering unique learning styles, to improve learning outcomes. (Susilo et al., 2023)

Technology has made learning experience to be more interactive, by including game features, videos and simulations. These functions make learning vastly interesting, which helps in engaging users and enhance their comprehension through intricate matters. For instance, through digital simulation, users can investigate and test physical principles safely and cost effectively, without causing disruptions or hazards. This is not usually possible in a traditional classroom without challenges. (Susilo et al., 2023)

The use of digital technology in educational purposes provides an opportunity to collect vast amount of data and performance analysis about the studies, and study methods. It can be used for further development of the platform and deepen the understanding about scientifical aspects of learning. It can help to detect trends and models, which can be pointed to certain people or groups. This data-driven approach ensures that decision making is based on evidence, which supports the right direction of development. (Susilo et al., 2023)

The development of technology of course brings its own challenges along with the positive effects. One of the most primary concerns stated is the digital gap, which refers to the gap between those who have access to digital technologies and those who do not. Ensuring equitable access to technology is crucial to prevent further negative development of already existing educational inequalities. Also, the security of data will be taken into consideration moreover with the growing usage. (Haleem et al., 2022)

The COVID-19 pandemic disclosed differences between a person’s competence to strive through the digital environment in learning. One of the challenges can be the poor quality of teaching, or too one-sided approach, which does not necessarily serve all the users. Too swift change can cause a lack of knowledge, and outer motivation among the hosts and teachers of these digital

platforms. Moving to digital environments demands orientation, preparation, and engagement. (Haleem et al., 2022)

To conclude, technological advancements have fundamentally transformed education by enhancing accessibility, personalization, and engagement. Advanced technology improves teaching productivity through sophisticated planning, practical learning, and quick assessments. Online libraries and forums can facilitate global collaboration, while distance learning offers flexible access to all kind of educational resources. Assistive technologies can support students with disabilities, making education more inclusive. Virtual environments provide interactive and real-time learning experiences. (Haleem et al., 2022)

Technology fosters essential skills such as teamwork and communication and addresses educational challenges through collaborative platforms. Constant access to resources and personalized learning paths ensure that students can learn at their own pace. The integration of e-books and video-based learning enhances student engagement and makes learning more dynamic and interactive. (Haleem et al., 2022)

Overall, technology breaks down barriers, making education more flexible, accessible, and personalized. It supports continuous professional development and environmental sustainability, preparing students for the demands of the modern digital world. Ongoing evolution of technology will continue to shape the future of education, offering innovative ways for teaching and learning.

As stated before, now and in the future, technologies can enable the deployment of innovative methodologies, that serve different ways of learning. Blended learning, which is a mixed methodology of face-to-face methods and digital environments, has gained popularity in recent years. In the future, Learning Management Systems (LMS) could help users and user hosts to streamline the educational process. Artificial Intelligence (AI) can also be seen as a transformative tool that will be applied more in the future. AI can provide, technical

help, feedback, and guidelines, which helps users to concentrate into understanding concepts. AI can also be helping with platform development and working with data within e.g. mass customization. (Facer and Sandford, 2010)

The Danielsen interviews state, that development of technology has significantly influenced educational needs by driving digitalization. Interviews also provided many drivers, that initiated the technological development, which onward has its effects on education, such as changing environmental conditions, aging of the population, and COVID-19, these kinds of changes initiated the allocation of resources towards capabilities within digital technology, which seeks to offer more efficient service delivery cost and improved system management. (Danielsen, 2021)

Through these technological initials, public organizations within the frame of interviews, were also forced to adapt their infrastructures and processes. Usage of digital tools does not only enhance service delivery but also ensures that organizations can react fast and flexibly to educational demands and economical expectations. For instance, moving to the e-learning platforms during the pandemic is a good example of these kinds of environmental turbulence, and how technology can adapt swiftly. (Danielsen, 2021)

Digitalization in education seems to lead towards the transformation within the educational need itself. It centers the focus on skills, such as self-learning, and digital literacy, and requires adaptation of teaching methods, thus technology advancements widen comprehensively the scope of education and demand innovation and flexibility with the approach and infrastructure. (Danielsen, 2021)

Neuvo et al. (2016) states that one of the biggest needs within the current educational system derives from the swiftly changing need for proficiency in the job market. The current educational system has inability to adapt into these external changes fast enough, possibly leading to unemployment and underemployment of the graduates. It presents a necessity in shift of paradigms, to better align educational needs with rapidly evolving job market. Possible answers to these is-

sues, could be shifting educational systems towards more systematic and marketable, this approach could enhance university-industry cooperation and bring common benefits for every stakeholder in this educational process. (Neuvo et al., 2016: 113-117)

The essence of studies in the future is to be competence against arising challenges, such as unemployment, intricate economic situations and fast expiration of knowledge. In the world of universities, Massive Open Online Courses (MOOCs) have made education accessible to everyone, while still currently mainly already educated people take advantage of it. This kind of accessibility hands straight possibilities for future education. If unemployment keeps raising in the future, and it cannot be shifted into another direction, University studies might lose part of its attraction, because usually participants pursuit degrees for career prospects, and if there are no such prospects it is not likely that people will still educate them in same rates. While in an unstable job market, it can be the opposite, with the demand for informal alternatives, such as online universities. Especially, if cooperation between the students, educational institutions, and industries are aligned better for the needs of an end user, which is the industry. (Neuvo et al., 2016: 117-118)

Also, when taking the growing life expectancy into consideration, there will be most likely more elder students, especially if education focuses into personal enhancement, rather than pushing in more workforce. Most likely professions, such as engineering, remain relevant, although the environment and the approach towards the work changes. Future engineers will have many new interesting problems to tackle, and a similar development can be seen in many other fields as well. Continuous advancements in education are crucial while keeping people in work. (Neuvo et al., 2016: 126)

Digitalization affects directly to the educational institutions through technological changes and secondary through environmental changes, which also is mostly driven by technology. The basic idea stated is that everything that can be auto-

mated, will be automated. This means different changes in teaching technologies and methodologies, by enhancing methods and interaction with the society outside of the educational institution. (Neuvo et al., 2016: 121)

One of the significant societal changes that could be brought by digitalization is, as stated earlier, the improved accessibility of university education. Traditionally, universities have held the keys to advanced knowledge. Accessibility in this context refers to all factors determining who can pursue higher education. Wider access to information and university-level teaching materials would democratize education, making high level expertise available beyond traditional university institutions. With online materials, the exclusivity of university knowledge will be reduced. Especially, in areas like programming, skills and ‘’know how’’ will become more critical than formal degrees, compared to, for instance, medical fields, which will most likely hold their exclusivity inside the Universities. (Neuvo et al., 2016: 121-122)

## 5.2 Renewal of Processes and the Effects of Digitalization

Danielsen's interviews offer many insights about the benefits of organizational operations. Public organizations have been able to save significant amounts in working hours and overall expenses. Administrative processes have been able to streamline significantly due to the usage of digital technology. In practice, it has meant that the remaining resources could be used to enhance different processes, and many times to enhance learning experiences in public learning institutions. (Danielsen, 2021)

Digitalization has helped streamline processes. For instance, educational institutions handle administrative processes in every phase of the process from enrollment, to grading and such. In this case it leaves more space for enhancing education itself, rather than using resources to manage the process. Like stated

before the ability to transform the process is also a great benefit for all organizations in potentially swiftly changing environments. (Danielsen, 2021)

Their interviews also showed that many people see the improvement of quality, for instance in the educational process, digitalization makes it possible to offer much more interesting, interactive, and engaging education. Also, possibilities for cooperation between different organizations have improved and it creates easier to approach environment for ideation, innovation, and feedback. It can potentially make the organizational environment more inclusive. (Danielsen, 2021)

## 5.3 Challenges in Adoption of Digitalization

Although digital technologies and methodologies offers revolutionary possibilities in many ways, implementing these come with many challenges, that need to be taken into consideration to maximize the potential benefits. (Neuvo et al., 2016)

One of the biggest challenges in the initial phase, is the deployment of new learning systems. Digitizing traditional materials demands a high level of planning and continuous updating and corrections. A lack of sustainable deployment can lead to great difficulties during the using phase. It will easily lead to inefficiency and total system failures. Many universities can struggle with the initial phases of planning and resource allocation for online learning systems. This can include ensuring enough technical support, reliable infrastructure, and embracing faculty to positive firsthand experiences. Without a robust plan and enough resources, deployment of these platforms can hinder the process and lead to poor educational outcomes. (Neuvo et al., 2016)

Lack of integration is stated to be one potential drawback, causing frustration because of the lack of unofficial social interaction. Traditional models emphasize connectivity between students and teachers, which can be challenging to maintain in e-platforms. This is where adaptation of e-learning can be seen to

fail often. Research points out that students can experience technology as confusing and frustrating, even when they are used to use digital technologies. This lack of engagement can potentially lead to loss of outer motivation and perception, that e-learning can be used as an effective tool in educational pursuit. (Neuvo et al., 2016)

One major issue relies upon dishonesty, where it could be concluded, that the increase in digital opportunities, will cause the increase in dishonesty in digital platforms. E-learning has grown in such a big industry, that it attracts some service providers to encourage in cheating. This means physical absence makes it easier to engage in cheating, including hiring services to handle personal tasks, like assignments and tests. Which will affect to how academical standards are viewed. (Neuvo et al., 2016)

Daniels Interviews also stated many challenges that people within the organizations in the subject saw. These challenges were stated to have a straight affirmation to education. (Neuvo et al., 2016)

One of the most significant challenges, seemed to be difficulty of aligning digitalization with present laws and regulations, which are many times outdated and does not conduct modern digital practices. In education, this could be seen, for instance in the struggle with following privacy regulations, when deploying new technologies, that collect data and manage personal information. Difficulties came across with the intricacy of the integration phase of the new technologies. For educational institutions, it can be challenging to deploy many, or even on learning management platforms. The initial investment can be markable, which raises challenge within budgeting and management. Unrealistic expectations and user engagement was seen also as challenges. (Danielsen, 2021)

Kazan federal university SWOT analysis pointed possible challenges due to digitalization, such as loss of leadership, due to dependence on foreign developments, which can also be generalized in many levels, also outflow of human resources to third parties and emergence of new competitors. (Vasilev et al., 2020)

Gisma also states many issues relating to digital technology. While technology has the potential to democratize education, not all students have the same level of access, which can significantly impact their ability to benefit from technological advancements in their studies. Bridging this gap is essential to provide all students with the same advantages and to prevent the widening of educational inequalities. (Gisma University of Applied Sciences, 2023)

As stated, the increased reliance on technology raises many concerns about the privacy and security of student data. When Institutions collect and store more sensitive information, the risk of data leaks and unauthorized access grows. It is crucial to implement robust cybersecurity measures to ensure that user's privacy rights are taken into consideration. (Gisma University of Applied Sciences, 2023)

Effective deployment of the digital tools and not overemphasizing them over other methods in education also state concerns, because of the potential lack of knowledge on the side of parties hosting these educational processes. (Gisma University of Applied Sciences, 2023)

## 5.4 The Role of Technology in Education and Skill Development

Gisma offers many interesting insights about trends that can be further researched about the role, that technology could take in the future.

As stated before, one of the most significant trends in education is the extended usage of online learning platforms. These platforms, provide access to a wide range of courses and resources straight from their homes. The flexibility and accessibility open educational opportunities to a wide audience. (Gisma University of Applied Sciences, 2023)

Adaptive learning technologies that use data and algorithms to tailor content to fulfill individual needs. These technologies can track student’s progress and adjust the difficulty and pace of the material accordingly. This kind of personalised approach helps users to learn at their own speed, ensuring a more effective learning experience. (Gisma University of Applied Sciences, 2023)

Virtual and augmented reality (VR, AR) can offer immersive and interactive experiences. VR can transport students to different environments, while AR overlays digital information onto the physical world. These technologies provide interesting learning experiences, making complex concepts more understandable and giving a deeper understanding of the subject. (Gisma University of Applied Sciences, 2023)

Technology has facilitated collaboration among students and educators, transcending geographical boundaries. Tools like Google Workspace, Microsoft Teams, and Slack enable seamless communication, file sharing, and real-time collaboration. These platforms promote teamwork and help students develop essential skills for the modern workplace. (Gisma University of Applied Sciences, 2023)

AI is making a revolution in education by automating tasks, providing interactive learning experiences, and offering data-driven insights. AI-powered chatbots, and machine learning algorithms, can analyze the progress of the user. These innovations enable educators to tailor new enhanced teaching methods to answer individual user's needs more effectively. (Gisma University of Applied Sciences, 2023)

Gamification involves including game elements into educational activities to enhance engagement and motivation. By including game features and interactive simulations makes learning enjoyable and it can help students retain information better. This innovative approach encourages more active participation in the learning process. (Gisma University of Applied Sciences, 2023)

Blockchain technology is transforming how academic credentials can be verified and stored. By using blockchain, educational institutions can create secure digital records of academic achievements. This not only streamlines the credential verification process but also empowers individuals to have more control over their educational data. (Gisma University of Applied Sciences, 2023)

The integration of robotics in education goes beyond traditional STEM (science, technology, engineering, and mathematics) subjects. Educational robots can teach students problem-solving skills and computational thinking. Additionally, robots can assist in special education, providing personalized support to students with diverse learning needs. (Gisma University of Applied Sciences, 2023)

(Andriushchenko et al., 2021) describes wider those growing opportunities of the Internet and mobile communications through new technologies, that has increased the potential for distance learning. According to the journal, from 2010 to 2016 online education experienced a peak in demand speaking of MOOCs. It states that lately they have been developing in several parallel directions. At the same time, there are constantly available open courses, which are not tied into certain timelines, and chronologically structured courses, which may have limited access depending on the requirements. Even the largest providers seem to adjust their services for reaching a broader audience and pursue long-term financial sustainability. Udacity, which was the first MOOC provider, pioneered the transition from only providing undergraduate courses to corporate courses and continuing different education programs, while EdX, which is a nonprofit provider, focused on its original mission of expanding access to knowledge.

Interesting analytical materials which were provided by EdX, points that the majority of students within the platform are people with an education degree (69% with a bachelor's degree). On average, 17% of users complete more than half of the course content, while only 8% receive a certificate. Most of the participants were in computer science courses (36%), natural sciences, technology, engi-

neering, and mathematics (STEM - science, technology, engineering and mathematics) courses (26%), and humanities courses (21%). (Andriushchenko et al., 2021)

Coursera is another provider, which stated that the main motivation for Coursera students to follow through was to improve their current job or find a new one (52%) and to achieve their academic goal (28%). 26% reached their goal to find a new job, while only 3% received a pay raise or promotion in their present position, after successfully completing a MOOC. Only 12% of users who set themselves academic goals completed their studies, while 64% received significant knowledge towards their field of study. (Andriushchenko et al., 2021)

It seems to disclose the need to improve general human capital of the company, but despite of individual development, group knowledge has more influence on the company’s efficiency. This kind of new education approaches can bring both hard skills such as knowledge and new skills needed for work, as well as soft skills, such as adaptivity and flexibility. As vast research has shown the second may be as much important as the first one, as soft skills are becoming more demanded during professional growth in many organizations. (Andriushchenko et al., 2021)

MOOCs are also starting to get a footing with international organizations. For instance, The World Bank has partnered with Coursera to create specialized courses on education, health, and climate change aiding partners and technical experts in developing countries. (Andriushchenko et al., 2021)

Employer participation in MOOCs involves companies such as Deutsche Bank and Ikea using to train existing staff but also for digital recruiting to attract new talents. This kind of approach can enhance both employee skills and the company's workforce. The important step to create more engagement is deploying more eLearning courses, which tailor the educational experience to individual learners. Currently, they are mainly offered by large academic and commercial vendors. These courses use real-time student performance monitoring to adjust

the course content. Portions of video content are accompanied by tests that control the development of the material, and the subsequent content of the course is transformed depending on the identified gaps. Successful completion of basic-level problems leads to an increase in the complexity of the proposed tests. This kind of structure personalizes training, leading into enhanced learning curve and time management. (Andriushchenko et al., 2021)

## 5.5 Possibilities Through Digitalization

Digitalization is often seen as a blessing for universities, reducing routine tasks and allowing more focus on core activities, for example personalizing studies. Traditional lecturing, grading assignments, and exams can be minimized through digital means. Experts interviewed stated the Internet is a significant enabler of study freedom. Online lecture materials allow students to learn by their means, liberating lecturers from repetitive teaching duties and reducing unnecessary content. They state that Universities harnessing digitalization will thrive, but they must also adapt to remain competitive. Becoming platforms for knowledge and skills, universities should provide environments where learning is a personal process, and users can grow in diverse ways. (Neuvo et al., 2016. 122-123)

Learning can be divided into three metaphors of learning, monological, dialogical, and Trialogical, as seen in figure 7. While monological focuses on individual knowledge acquisition and dialogical on social interaction, Trialogical learning emphasizes collaborative creation of knowledge, involving social structures and processes that support innovation. Current university learning can be viewed primarily monological and dialogical, but making shift towards Trialogical learning is essential to address future challenges, offering many possibilities for development. This involves students cocreating knowledge, more actively with companies and public organizations. (Neuvo et al., 2016. 122-123)

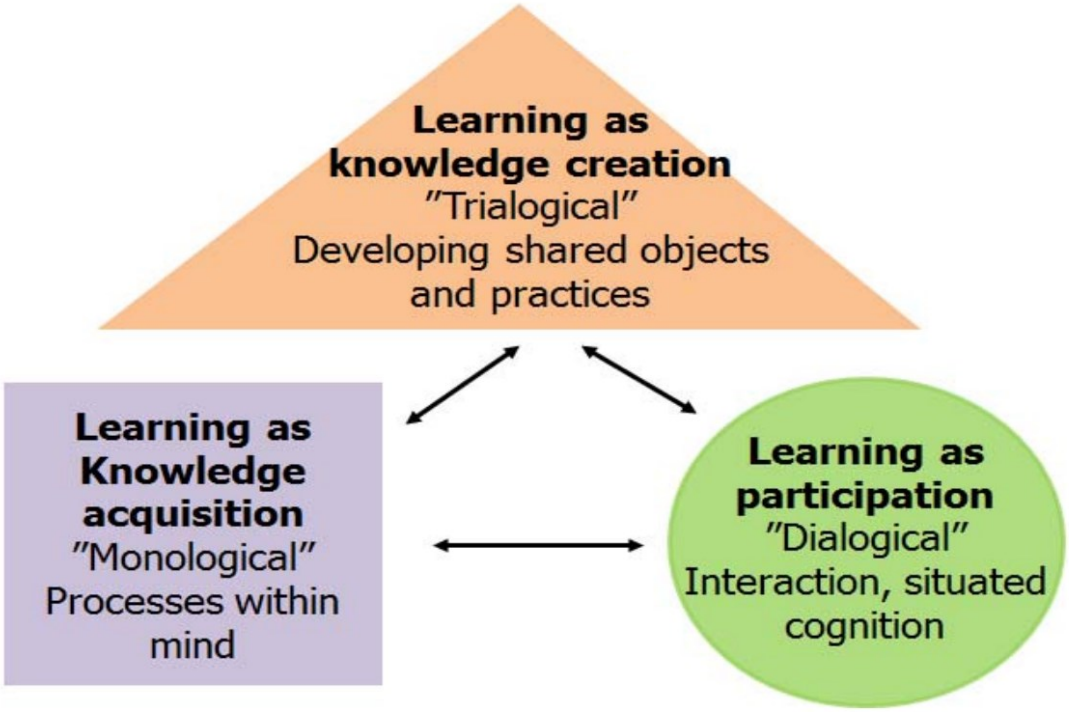


Figure 7. Trialogical, Dialogical and Monological learning. (Stefanova and Gercheva, 2015)

Kazan Federal University SWOT analysis conducted through vast investigation pointed many good possibilities that could possibly be generalized, such as possibility to transition to new digital technology-based lifestyle, capturing new markets, for remote work and study, it could stimulate the development of new jobs, by exporting growth of knowledge and changing the structure of economy towards higher productivity. (Vasilev et al., 2020)

# 6 Switch in Educational Processes and Guideline for the Process of Applying Digitalization in Educational Processes

This chapter's goal is to combine all the theory and research material by processing through the author's own reflection and evaluation, also adding some sources to support conclusions, to finally produce the following two main outcomes.

The first one is about achieving an understanding about the switch happening in education, processes and operations. The switch has been continuously evolving from the beginning of digitalization, but the change will most likely be as determining in the future as it has been in the past for organizations.

The second outcome is the guideline itself, for understanding the main steps in applying these modern digital technologies, and methodologies in an organization's educational processes. It also pursues to deliver a comprehensive understanding of how things in practice will change the overall processes, and why certain steps are important, for the sake of the overall functionality of an organization.

## 6.1 Switch in Education, Processes and Operations

This chapter aims to give a conclusion about the switch happening in Education, Processes and operations, while keeping in mind they are all bound tightly together. Figure 8 shows the main shifts that arise from this research in chapter 5. Further on in this section, these shifts are discussed and covered more comprehensively.

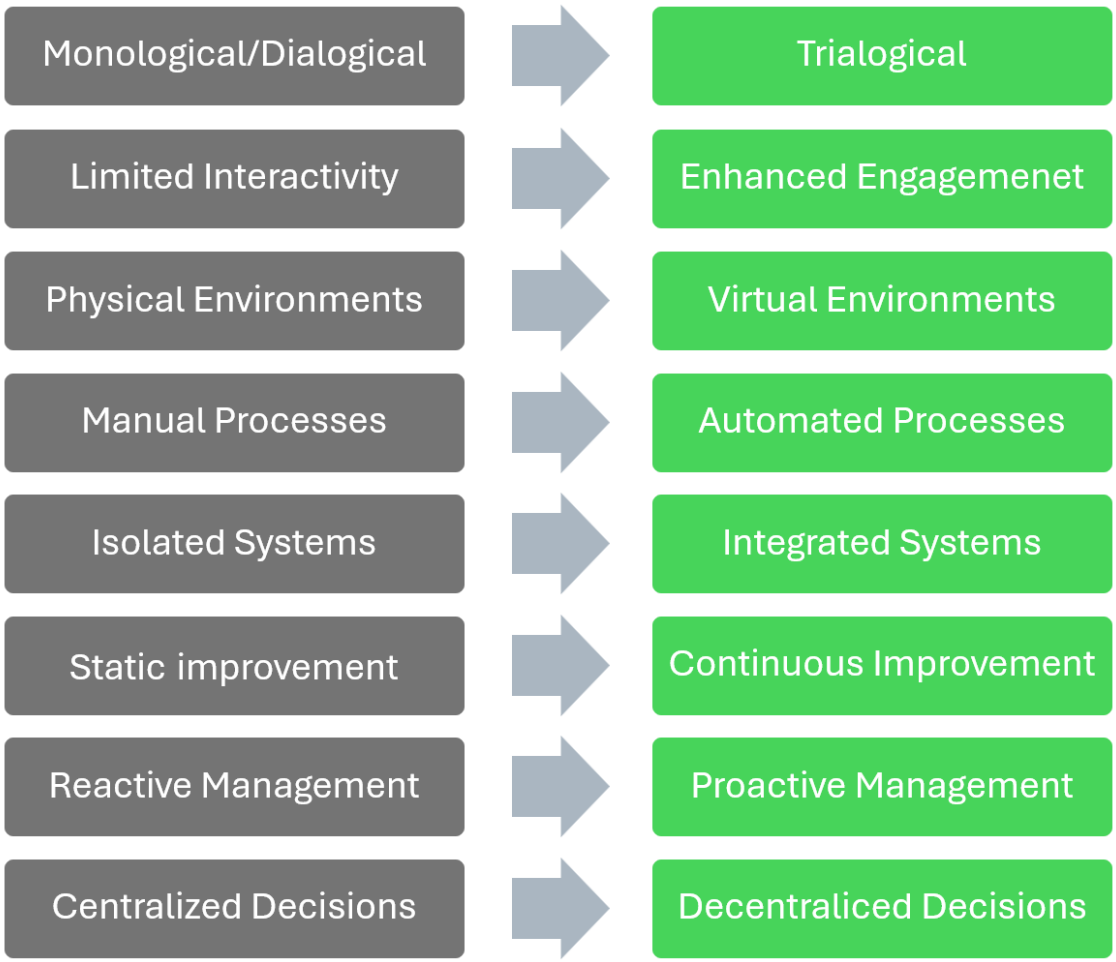


Figure 8. Switch in Education Due to Digitalization

### 6.1.1 Switch in education

While digital changes can be viewed just from the perspective of transforming education, The author believes it will have a major relation towards operations, and processes within organizations. This shift, driven by many previously described advancements in technology and attitudes, is characterized by the integration of digital tools and techniques that are reshaping traditional methods into more efficient, flexible, and personalized approaches.

As described by Neuvo et al, (2016), education has been often monological, with a teacher centered approach where knowledge flows one way and often

from one source, from the instructor to the students. This approach, purely focusing just on the transfer of knowledge, seems often lack engagement and personalization. These two topics seems to be more and more important nowadays, and most likely in the future too. Digitalization is making a shift towards dialogical and Trialogical learning models, emphasizing interactive and collaborative ways of learning. Dialogical could be seen involving discussions and peer interactions, enhancing engagement and deepening understanding. Trialogical learning goes further from that point, offering collaborative knowledge creation among students, educators, and digital tools, creating a more dynamic and inclusive learning environment.

As shown by Andriushchenko et al. (2021), the integration of technologies such as Learning Management Systems (LMS), virtual classrooms, and collaborative tools, for instance Moodle, Google Workspace, and Microsoft Teams commonly used nowadays, allows for many ways seamless interaction and knowledge sharing, regardless of geographical barriers. These tools not only enhance the learning experience, but also prepare students for the modern digital workplace by promoting digital teamwork and literacy. There would be most likely much space for development in this field, to make more functional and comprehensive LMSs, which could support better Trialogical approaches, in the best scenario including comprehensive collaboration, with MOOC providers and other companies.

Another vast change based mainly on Neuvo et al. (2016), is dynamic curriculum over static plans, which offer little room for adaptation to individual student needs. Through modern digitalization, the dynamic curriculum could widen its utilization. It can be continuously updated and personalized to match better in changing environments and to better serve trainings purpose. As Susilo et al. (2023) discussed, adaptive learning technologies can utilize data analytics to monitor student progress and adjust content in real time, ensuring that each student receives the appropriate level of challenge, support, and most relevant content. Thus, Artificial Intelligence plays a vast role in this transformation. AI-

driven platforms can provide, for instance real-time feedback, recommended resources, and offer personalized guidance, allowing students to learn at their own pace and leaving room for studying instead of managing the education process. This shift from a traditional approach to a personalized learning path can significantly enhance student engagement and improve learning outcomes.

When combining Trialogical learning approaches to dynamic curriculum, it could offer a highly adjustable way of learning, that could offer accurate education and training for every individual situation. With comprehensively working together possibilities within digitalization with different professional institutions, such as universities and companies, this kind of shift towards modern learning could be utilized more.

While traditional education flows through lectures and standardized assessments. Growing usage of digital tools has made learning more interactive and engaging. Elements such as videos, simulations, and gamification can make complex concepts more understandable and enjoyable. Virtual and Augmented Reality (VR/AR) technologies could create engaging learning environments, which are not yet common but are already used to, for instance, get familiar with working facilities, or when designing environments, allowing users to explore and interact. These technologies not only enhance the level of engagement but also support diverse learning styles. (Gisma University of Applied Sciences, 2023)

Also, while education has been shifting towards virtuality, the traditional model of education still relies heavily on physical classrooms, which can limit access to those who cannot attend in person. Danielsen (2021) best discussed how Digitalization offers solutions by enabling virtual classrooms that could support that Trialogical, dynamic, and engaging way of studying. Many of us have already met common online platforms, used as virtual classrooms, such as Zoom, Google Meet, and Microsoft Teams, which represent a foundation for possible applications for virtual classrooms and new integrations, allowing students to

participate in classes with flexibility and strongly serving students individual educational purpose.

Virtual classrooms can be profitable particularly for adult learners and those with other responsibilities, such as day jobs. Virtual classrooms could also be used in organizational training, either within the organization or by educating the workforce outside of the organization. It is important to also acknowledge students with disabilities who may find physical attendance challenging. Digital environments make it also easy to record and replay learning sessions to support students.

### 6.1.2 Switch in Processes

In addition to static learning, traditional processes are often static too, with infrequent updates and improvements. Digitalization enables continuous improvement through real-time measuring and feedback. Danielsen (2021) also described how Data analytics can identify areas for enhancement and support iterative process optimization.

For example, real time analytics can enhance organizational processes, such as common projects. Evaluating different stages of the projects with measuring, eventually providing insights that points demand for training to streamline these processes through educating and training work force. This continuous feedback loop ensures that processes remain cost-effective and meaningful.

Traditionally management practices are often reactive, solving issues as they arise. Digitalization enables proactive management through predictive analytics and AI-driven insights. Organizations can anticipate challenges and implement preventive measures, enhancing efficiency and reducing disruptions.

For example, predictive analytics could forecast trends such as enrollment patterns, and resource needs, or solving lack of training, as described before. In the end, it allows organizations to plan and allocate resources more effectively.

Digitalization also shifts decision-making processes toward decentralized from the traditional centralized approach, with hierarchical approval systems. Neuvo et al. (2016) among the others stated, how digitalization supports decentralized approach by offering employees a real time situational view with analytics and cross functional flow of information. This approach fosters agility and responsiveness, enabling a quicker decision making process and adaptation to vastly changing environments. Decentralized decision-making also embraces innovation by encouraging employees to take initiative and action with their new ideas. Digital tools that provide real-time data and collaborative platforms enable teams within an organization to make informed decisions independently, thus improving overall organizational agility.

Traditional processes often involve standardized services with limited customization. Digitalization enables the customization of services through digital platforms that adapt to individual needs and preferences and gives a foundation to evaluating processes to approach with, for instance, adaptative customization, that Gilmore and Pine II, (1997) properly introduced. Mass customization techniques balance efficiency with personalization, ensuring that services are tailored to meet diverse requirements and match properly with demand.

For example, individually created learning paths through adaptive learning technologies could provide customized educational experiences that are purposeful and thus, cost-effective. This not only enhances student satisfaction but also improves learning outcomes.

### 6.1.3 Switch in Operations

Operations within different organizations involve a vast number of processes, which many can be considered manual labor. For instance, tasks in educational institutions involve processes, such as enrollment, grading, and keeping records. Digitalization offers automation solutions for these tasks, reducing the administrative labor on staff. Danielsen (2021) and Slack et al. (2022) showed how

Automated systems can also increase efficiency and accuracy, freeing up time for instance educators to focus on teaching and student support.

Digital records and cloud-based systems streamline operations by providing easy access, and accuracy to data. For instance, a centralized digital system applying cloud service, can manage student records, track educational progress, and generate regular reports, reducing the need for physical labor and mitigating the risk of errors. This would most likely bring cost-efficiency due to streamlined processes excluding physical labor.

These kinds of centralized digital systems can make it easier to avoid isolating systems and processes. Traditional systems and processes can often be seen as isolated, leading to inefficiencies and challenges in data flow. This kind of integrated system seems to be already used in many organizations, but it is important to notice that digitalization promotes the integration of these systems, ensuring seamless data flow across departments. Integrated digital systems enhance coordination, transparency, and real-time data analytics support informed decision making.

The switch from traditional ways to applying digitalization in education, operations, and processes represents a significant transformation driven by technological advancements. This shift enhances cost-efficiency, flexibility, and personalization across various dimensions of education and organizational operations because, after all they are all very connected. By including digital tools and techniques, both educational institutions and companies can improve learning experiences, streamline administrative processes, and foster a culture of continuous improvement and innovation. Without forgetting the usefulness of cooperation between institutions in these matters.

However, as Haleem et al. (2022) stated, this transformation also brings challenges that must be addressed, such as the digital divide and data security concerns. Effective change management and continuous evaluation are central to ensure a successful transition to digital approaches.

## 6.2 Guideline for the Change, when Applying Digitalization in Educational Processes

When starting to re-evaluate organization's educational processes and applying new, or re-shaping old digital features, the author concluded these 7 main steps seen in Figure 9 that seem to set a good guideline for things to be taken into consideration, to eventually form a functional frame for digital change and understanding its affections. They are presented loosely in an order, but they are also very interconnected, so they cannot be viewed fully chronological. A chronological point of view could still be a good place to start when implementing a new strategy. It can be also viewed in many parts as an iterative process. By following these steps, organizations can effectively understand and manage the effects of digital change, ensuring a successful and sustainable digital transformation in educational processes and overall operations.

The structure is designed to follow a logical progression, starting from understanding the current state to sustaining digital transformation. This approach is justified by the author's own evaluation from findings in chapter 6.1 and pre-determined theoretical models that the author finds suitable to use in this context. Various sources affected to the structure. For instance, Calderon-Monge and Ribeiro-Soriano (2024) emphasize the importance of achieving that “situational picture” and understanding the current state of digitalization, Li et al. (2019) emphasized the need for effective change management to ensure smooth transitions, Neuvo et al. (2016) highlighted the importance of preparation for digital transformation, Calderon-Monge and Ribeiro-Soriano (2024) also underlined the importance of building a robust digital infrastructure, Susilo et al. (2023) discussed enhancing digital competence through continuous training, Andriushchenko et al. (2021) emphasized on redesigning educational processes to leverage digital tools for better outcomes, and Slack et al. (2022) emphasize the importance of continuous evaluation and improvement that can also be used to sustain digital transformation. From the author's point of view, all the sources were in many ways aligned with this approach, even when there were no straight statements relating to these stages in the provided guideline.

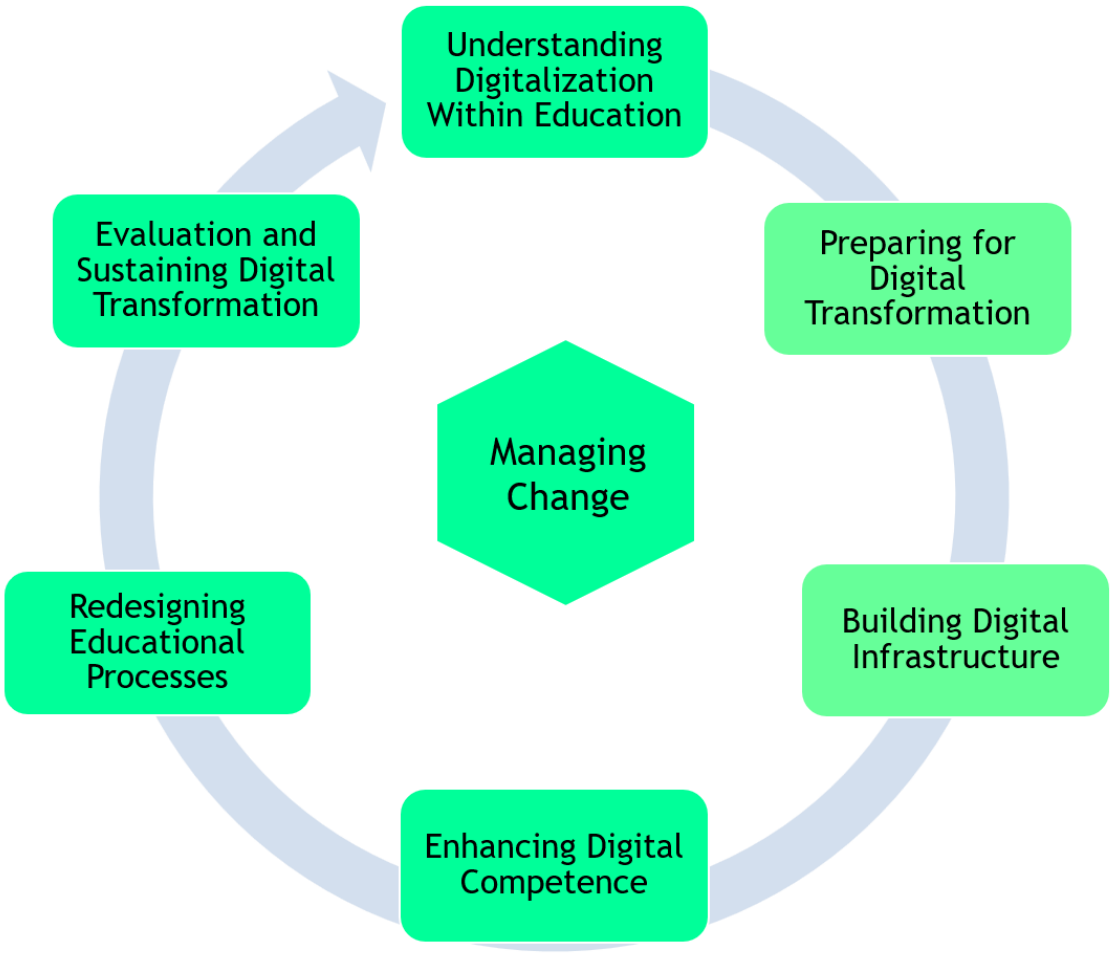


Figure 9. Guideline for applying and evaluating digital change in educational processes.

### 6.2.1 Achieving Situational Picture and Understanding Education and Digitalization

The first step should be achieving a proper understanding, about digitalization within education, and understanding all the possibilities and challenges relating to subject in hand. Earlier parts of this research paper do their part in achieving that understanding, but it is important to widen knowledge about the actual situation at hand. It pursues to achieve a good situational image about the present state of the organization, and its demands and goals. Much is about concluding of what is wanted to achieve, and what kind of relevant technology there is

available. It is important to take modern demands for education into consideration. Research material shows that understanding future educational changes in demand can guide effective implementation.

An important part should also be pursuing an understanding of technology acceptance. For instance, using models such as TAM described by Davis (1989), to form test groups or polls about new technologies or methods. It could help to analyze what kind of possibilities could be easy to apply and maintain.

This is a crucial step to avoid moving in the wrong direction or taking the wrong approach when applying certain technology. Everything really seemed to conclude into word situational picture, because without it, it is very hard to determine the correct approaches and goals. Achieving a comprehensive situational picture helps in identifying the right technologies and setting appropriate goals, ensuring the digital change is aligned with the organizations needs and strategies.

The main goal in this stage is to prevent surprises coming along the way when applying digital changes and charting all the possibilities to eventually achieve profit.

### 6.2.2 Managing Change

Change management is deniably one of the most important parts in every level of organizational change processes. The author thinks it really underlines when speaking about digitalization, because of the usual relationship between the end-users, producers, and digital technology itself. It can be very hard for the end-users to understand the technology, or its producers and vice versa. Change management has a big role in ensuring buy-in from all stakeholders, to make the process purposeful and cost-efficient. Change management interacts with every phase of this guideline, but when starting to implement new strategies, it should be acknowledged first, after achieving a situational picture.

Change management should serve by streamlining processes through making communication plans to keep all stakeholders informed and engaged in the transformation process. It should implement strategies countering challenges, such as the digital divide, and ensure it is accessible and relevant for all the parties, subject to pre-set goals. Also, data privacy and security protocols are important tasks for change management to make sure everything is handled correctly.

There are many good change management models. For instance, using the McKinsey 7-S Model, is very complete frame to start with managing change within digitalization, with clear structure and aspects to take into consideration all well relating to subjects such as education and digitalization.

The main goal for change management is to make sure the process eventually meets the goals, to minimize change resistance, ensure accessibility, security and smooth transition. For instance, Norwegian public organizations highlight the importance of clarifying drivers and benefits for stakeholders to manage digital transformation effectively, and have a clear vision, of ‘’what and why’’ we are doing.

### 6.2.3 Preparing for Digital Transformation

The third step would be preparing for digital transformation, which includes evaluating things, such as present technological infrastructure, level of digital literacy skills, and readiness for change. Much of this evaluation could be based on the first step described. At this point, it is also important to identify all the stakeholders, their needs, roles, and influence on the process. Part of proper preparation would also be setting the milestones and concrete goals. Generally, the author sees the goals that should be set at this point need to follow the SMART-guideline, which means specific, measurable, achievable, relevant, and time-bound, shown in Figure 10. Strategic alignment is an important aspect to consider when milestones and goals need to flow in hand with the overall strategies of an organization.

| | | |
|---|---|---|
| S | **Specific** | What will be accomplished? What actions will you take? |
| M | **Measurable** | What data will measure the goal? (How much? How well? |
| A | **Achievable** | Is the goal doable? Do you have the necessary skills and resources? |
| R | **Relevant** | How does the goal align with broader goals? Why is the result important? |
| T | **Time-Bound** | What is the time frame for accomplishing the goal? |

Figure 10. SMART goals. (University of California, 2017)

To give an example, when implementing a new LMS across the organization by the end of Q2 with at least 80% of staff trained and proficient by the end of Q4 it is a SMART goal, when also resources and relevancy is evaluated in the process.

### 6.2.4 Building Digital Infrastructure

When starting to build digital systems within an organization, a robust technological infrastructure is essential for supporting digital education. This includes high speed internet and cloud services, to sustain a good user experience and to enable efficient data collection and sharing, for instance supporting collaboration over the LMSs. Depending on the system at hand, the infrastructure for cyber security and data-analytics should be also considered. (Li et al., 2016)

Effective integration of digital infrastructure requires careful planning and execution. Organizations could start by digitizing specific processes, such as enrollment to training programs, before scaling up to more complex systems such as LMS and virtual classrooms. This ensures that stakeholders have time to adjust and that potential issues are identified and resolved early.

It is important to ensure that new digital systems can eventually seamlessly integrate with existing infrastructure. It is critical for maintaining data consistency and process efficiency.

Designing these digital systems or tools with the end-user in mind mitigates risks for having negative acceptance result and poor efficiency. User centric designing focus on creating easy to use interfaces and workflows that serve to the needs of students, educators, and other stakeholders. Involving users in the design and testing phases ensures that the solutions developed are practical, user-friendly, and effective.

Research materials emphasized the importance of adapting infrastructure to support new educational demands driven by many technological advancements. For instance, if MOOCs would be much more applied in the future, it could possibly be profitable to build LMS and educational processes leaning towards that, or if applying new LMS it could thrive better with advanced AI and data-analytic possibilities.

The Hayes-Wheelwright Matrix introduced by Robert H. Hayes and Steven C. Wheelwright (1979) or its derivative Process-Service matrix described in this paper by Mackelprang et al. (2012), can be used to help organizations align their process choices with their strategic goals, which is crucial when developing a digital infrastructure. By using this matrix, it can evaluate where organization stands in terms of process maturity and identify the most appropriate digital tools and processes to implement. For instance, when evaluating the level of mass customization pursued.

### 6.2.5 Enhancing Digital Competence

The digital competence level of all stakeholders included is an important matter, because according to research material, digital systems seem to easily be seen and felt overwhelming. Training and development are important phases in applying digital systems to educational processes. It is necessary to regularly evaluate digital literacy skills, and set up training possibilities, when necessary. From the author's perspective, Continuous Professional Development (CPD) is

a good frame for keeping staff updated of the latest advancements, tools and methodologies, shown in Figure 11.

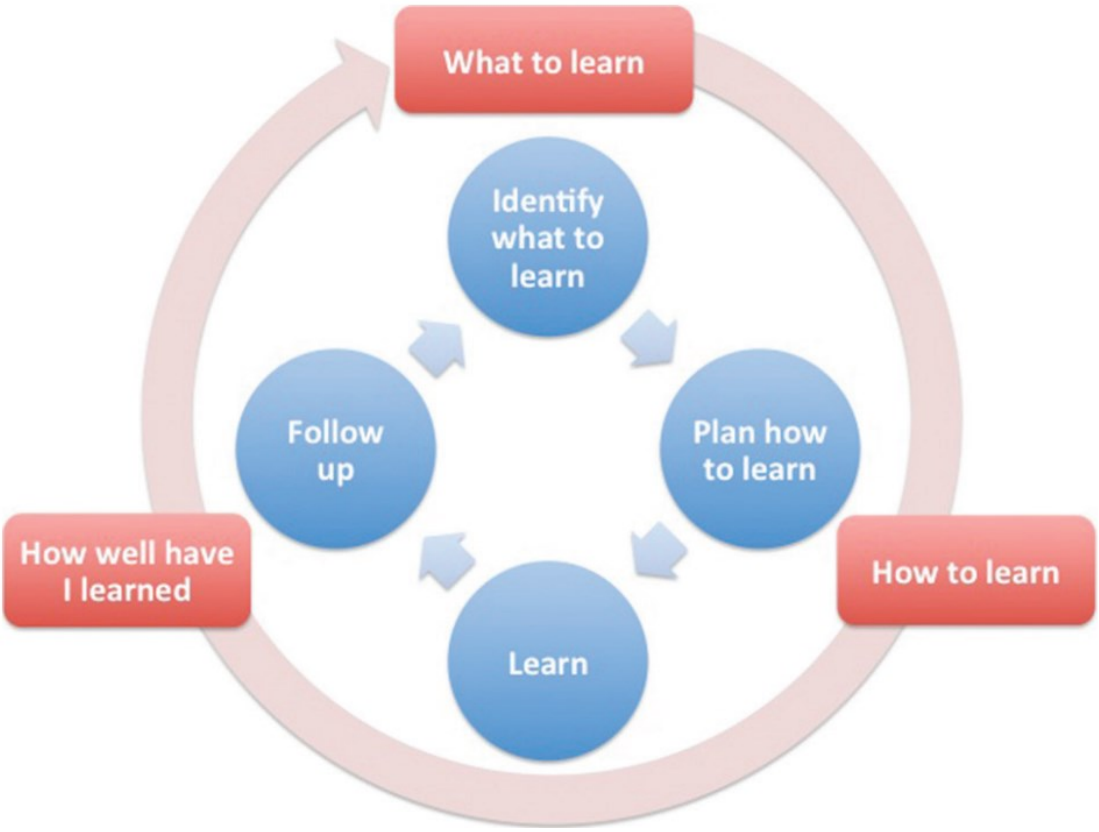


Figure 11. Illustration about CPD method. (Filipe et al., 2014)

In addition, when speaking about new systems, as Neuvo et al. (2016) described, it is important to sustain a good technical support system covering the new advancements, which then helps to guarantee the efficiency goals set, even when challenges arise. The key factor in this stage is to emphasize continuous improvement to address challenges.

### 6.2.6 Redesigning Educational Processes

Research material showed the importance and need for blended learning models in learning processes. Redesigning educational processes enhances learning outcomes and operational efficiency, ensuring that the educational environment is responsive and adaptive to student needs. For instance, Danielsen

(2021) notes the improvement in educational quality through digital tools that make learning more engaging and interactive.

From the author's perspective, to achieve positive outcomes through change, after this research it seems it is important to aim to automate administrative tasks, enrollment, grading, and feedback. The whole process will streamline, and it will reduce work from the educators, and save time for students. Using real time data-analytics is key to many functions because it enables to customizing content and giving good feedback.

Redesigning educational processes involves both curriculum development and process optimization. The Importance-Performance Matrix can lay a good frame to prioritize these changes by highlighting which processes are most critical and where improvements are most needed. This targeted approach ensures that resources are allocated effectively to enhance educational efficiency and effectiveness.

### 6.2.7 Evaluation and Sustaining Digital Transformation

Continuous evaluation and improvement ensure that digital transformation stays sustainable, adapting to new challenges and opportunities while still maintaining alignment with organizational goals. It is quite clear that ongoing evolution of technology will continue to change education methods, offering new ways of teaching and learning, as highlighted by Neuvo et al. (2016) and Haleem et al. (2022).

Key steps to handle evaluation are:

- **Setting proper KPIs.** It means identifying relevant KPIs to align with strategic goals, to disclose for instance digital tool usage and cost savings. Following with regular monitoring and identifying trends and areas of improvement to guarantee operational efficiency.

- **Feedback mechanisms.** Conducting surveys, interviews, or focus groups to collect insights. Feedback can be used to make then data-driven decisions.

- **Foster innovation.** encouraging staff to experiment with tools, rewarding innovative practices, and fostering a collaborative environment can uplift the usage of effective teaching methods. This step is very important, because of the importance of common engagement to change, ensuring buy-in of all stakeholders.

- **Active evaluation.** Such as benchmarking and regular audits to evaluate the effectiveness of new digital education processes.

By following these steps, organizations have a good foundation to effectively evaluate and sustain their digital transformation. Good frames from ul Haq and Faizan (2022) and Slack et al. (2022) described how to execute evaluation is to look things through a frame of five operational objectives, which were cost, speed, dependability, flexibility, and quality. This ensures that digital tools and processes continue to remain relevant for the operations, and enhance educational outcomes, thus improve operational efficiency. The author concludes it is also important to iterate previous steps, when environmental changes are happening, or digital changes are planned to be conducted.

# 7 Conclusion

## 7.1 Key Findings

This section strives to answer all the main research questions and points from the beginning that initiated this research paper. It is quite clear that Digitalization can significantly impact in education methods, operational efficiency, and organizational strategies in expert organizations. The transformation brought by digitalization has led to several critical changes.

Traditional teacher centered approaches to education have given way to more interactive and collaborative models thanks to digitalization. Participation, collaboration, and engagement can be increased with Trialogical learning, which enables combining students, teachers, companies, and digital tools in a collaborative knowledge creation process. Through the facilitation of real time communication and collaborative projects, tools such as Learning Management Systems and virtual classrooms streamline learning. Learning environments that are adaptive and personalized thanks to artificial intelligence and data analytics can better meet the needs of each individual student by customizing educational materials. Thus, this is making education as relevant as it can.

Expert organization’s productivity and operational efficiency can both greatly increase because of digitization. Digitalization offers possibilities to apply e.g. mass customization and different “education production” processes. Teachers can now focus on more important tasks, for example content creation because administrative tasks such as enrollment, grading, and record keeping can be automated, which can decrease errors and free up time. Enhanced analytics and data management capabilities enable businesses to make data driven decisions, increasing overall productivity. Stakeholder coordination and information sharing are streamlined by enhanced communication and teamwork via digital platforms.

The digital transformation does, however, come with several difficulties. These include making sure that everyone has equal access and understanding to digital tools, handling worries about data security and privacy, and getting user resistance to change towards new approaches. To create an environment that is responsive to digital adoption, organizations need to engage stakeholders and train employees to improve their digital literacy. Despite these challenges, digital transformation offers many opportunities for innovation in teaching and learning, operational efficiency, and global collaboration.

The guideline for understanding the effects of utilizing digitalization in expert organizations aims to show the importance of investing in robust digital infrastructure, enhancing digital competence through continuous training, and redesigning educational processes to integrate better modern learning technologies. Not forgetting to foster a culture of innovation and regularly evaluating the impact of digital tools. By keeping these areas in mind along the way, organizations can navigate the complexities of digital transformation, enhancing educational outcomes and operational efficiency while properly overcoming challenges and detecting opportunities, with systematic change management and measurements.

## 7.2 Research Limitations

This study has many limitations that should be noticed. Firstly, the present pace of technological advancements means that these findings may become quickly outdated, although this was meant to be an widely applied guideline, without an exact field or industry. Secondly, the amount of different organizational structures and educational systems means that the applicability of certain educational switches and parts of guideline may vary. Thirdly, the study primarily relies on secondary data, and additional primary research could provide more specific insights.

## 7.3 Suggestions for Further Research

From the author’s point of view, it feels that there would be an endless number of possibilities to deepen this research, by conducting research and testing with support of different organizations and specific contexts. It could be profitable to deepen the understanding in, for instance, just one of the guideline sub-topics presented, to understand the effects deeper.

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