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An Exploration of the Influence of Process and Organizational Innovation on the
Implementation of Digital Technologies in a Small Enterprise

Master Thesis

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I have written this Master Thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced.

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List of Abbreviations

AR	Augmented Reality
DBMS	Database Management System
CAD	Computer-Aided Design
IT	Information Technology
KPI	Key Performance Indicator
MR	Mixed Reality
XR	Extended Reality

Abstract

Digital transformation is becoming a necessity for almost every corporation and especially the COVID-19 epidemic has put many companies under pressure to successfully digitize their business operations. For small and medium-sized companies, this poses a major problem, as they oftentimes lack the resources to do so. Therefore, this thesis aims to explore ways of digitally transforming a company by implementing digital technologies and identify the necessary requirements. A German manufacturing company was observed over a 6-month period and aided in the process of implementing two digital technologies. Especially the perceived impact of process and organizational innovation was examined with the help of a survey and interviews. The data showed that depending on the technology at hand, requirements for a successful implementation can vary greatly. For both technologies, process and organizational innovation had a positive relationship with their performance, but with differing strength. Understanding the necessary steps for a technology implementation can help companies to allocate resources more efficiently and therefor making digital transformation more accessible.

Keywords: process innovation, organizational innovation, digital technology, digital transformation, small and medium-sized enterprises

Introduction

When in early 2020, the COVID-19 epidemic (WHO, 2020) started happening on a global scale, many companies experienced a sudden awakening regarding their digitalization efforts. Global travel and trade bans, social distancing, legally enforced remote work and many other restrictions were a new reality and posed a variety of problems for citizens and companies alike. For private people it brought a massive reduction in terms of their social life and personal activities, but for many firms it meant fighting for survival. New regulations were enforced on a monthly, if not even weekly basis, in most countries around the world and demanded a higher level of flexibility as ever before. According to PricewaterhouseCoopers (2020), almost all industries were negatively or very negatively impacted by COVID-19 and modernization of business processes was urgent. Interestingly enough, this necessary change was, as it rarely happens in economics and science, universally agreed upon: Digitalization (Forbes, 2020; McKinsey, 2020a; PricewaterhouseCoopers, 2020).

Even though, the economic situation imposed by the COVID-19 virus, threatens the existence of many companies, it is also seen as an opportunity to catch up with digitalisation. In a recent analysis, McKinsey (2020a) has shown that digital adoption in business has leaped as much as five years forward in a matter of around eight weeks, just because many traditional ways of doing business were, at least for periods of time, not applicable. Although the term digitalisation has gained a lot of importance since early 2020, the process of digitizing a company has been around for decades (OED, 2021). The benefits range from increased operational transparency and remote collaboration to higher levels of flexibility and efficiency (PricewaterhouseCoopers, 2020). Despite the obvious advantages, digitalization is not as dominant as one would imagine. Most companies themselves feel behind when it comes to digitalization and 70 percent of firms attempting digital transformation fail (McKinsey, 2020b). As digital products and services keep improving and revolutionizing many traditional means of business, the question is why most companies struggle to properly adopt these tools and digitize their company. As many researchers and business managers have already stated, simply buying digital technologies is not enough and will in most cases not result in long term improvements (OECD & Eurostat, 2018; Parviainen & Tihinen, 2017).

Even though digitalization has been widely covered in recent literature from a theoretical perspective (Bloomberg, 2018; Deloitte, 2013; Ustundag & Cevikcan, 2018), there is little empirical evidence in the context of practical implementation, especially focusing on

smaller traditional companies that are not considered high-tech. These small and medium-sized enterprises had encountered difficulties with digitalization, even before the COVID-19 epidemic, as they lack resources, absorptive capabilities, and digital knowhow (Vrontis et al., 2021). Additionally, existing research falls short of addressing methodologies that can support a firm's digitization attempt, such as process and organizational innovation. Process innovation describes the implementation of new or significantly improved work methods while organisational innovation refers to the reorganizing of work routines and procedures (OECD & Eurostat, 2018). Although, the terms process innovation and organizational innovation can be found in the context of digitalisation (Berman, 2012; Genzorova et al., 2019), existing literature fails to explain how exactly they support the implementation of new digital technologies and alleviate some of the problems common with digital transformation.

This thesis aims to explore the benefits of incorporating digital products and solutions into a firm's working system, specifically for companies that do not have the capabilities and resources to undergo a complete restructuring. Moreover, exploring the effects of process and organizational innovation on the implementation of new digital solutions into a working business environment. Based on this, the following research question was proposed:

RQ1: How do process and organizational innovation facilitate the introduction and implementation of digital technologies in smaller and medium-sized enterprises?

To do this, process and organisation innovation strategies will be examined in detail, to find ways in which they can support the implementation of digital technologies. Furthermore, common problems connected to digital transformation, as well as internal factors hindering the implementation process, such as management and firm culture, will be analysed. Thus, the following research question was proposed:

RQ2: Which problems related to the implementation of digital technologies can be alleviated by the deployment of process and organizational innovation?

By highlighting the benefits and demonstrating ways of circumventing potential problems, this should help small and medium-sized companies to start digitizing their company step by step. Analysing digitalisation, its advantages and challenges, is possible from a theoretical standpoint, but many of the problems that impede or slow down the digitization process play out very differently in practice. Personal values of employees and management,

corporate culture and other intangible factors can hardly be described on a theoretical basis, therefore it is necessary to gather data in a company undergoing these changes. For this, extensive data collection will be conducted in a German manufacturing firm over a 6-month period. In this time frame, two new and cutting-edge technology solutions have been either implemented or at least tested for an extensive period, to modernize or restructure various business activities. First, an Augmented Reality (AR) Application used on the phone or in combination with AR glasses, enabling global remote customer support. Second, a customizable Database Management System (DBMS), that allows the structured archiving of data related to their customer service.

Supported or changed processes have been analysed before and after the implementation, regarding usefulness, convenience, and employee satisfaction. Additionally, data about other necessary changes, related to management, firm culture, personal values and opinions will be collected via surveys and interviews. These surveys will be used to get a general idea of how the technology implementations impacted the overall processes and with this, the employee's way of working. Interviews with management allowed a deeper insight into problems they had faced in the past as well as obstacles that are currently hindering further digital transformation. By combining the data from interviews and surveys with the literature background of digitalisation, process innovation and organizational innovation, this paper builds a foundation for small and medium-sized enterprises to attempt digitization without being frightened of its complexity and other challenges. It should also allow companies to pursue the incorporation of digital solutions without the need of overhauling the entire business model, which many firms do not have the resources for.

Due to the nature of this research, the data collected for the analysis is very limited. In order to properly identify the impact of both, process and organizational innovation, it was necessary to closely observe the transition process. Therefore, the data was only collected in one company. This means, that the results of this thesis do not necessarily represent the entire industry, but rather explore the potential effects of process and organizational innovation on the implementation of new digital technologies into a working business environment.

Chapter 1 will explore the basic concepts of process and organizational innovation. Additionally, by highlighting common problems that occur while undergoing change, successful strategies can be extracted. Additionally, the topic of corporate culture will be outlined, as research has shown that it is the foundation for a successful digital transformation.

Chapter 2 will then dive deeper into digital transformation. The basic concept of digital transformation will be summarized and the effects it can have on various business areas will

be described. A comprehensive list of potential digital technologies will also be given, focusing on the manufacturing industry. As with process and organizational innovation, problems with undergoing digital transformation will be highlighted. Finally, these problems will be addressed with the help of in chapter 1 discovered process and organizational innovation strategies.

Although literature provides a list of theoretical frameworks and guidelines for digital transformation, several studies (Earley, 2014; Ng et al., 2018; Vrontis et al., 2021) have shown that practical realization is often far more complicated. This is especially true for companies with fewer resources and a low initial level of digital know-how. Therefore, in chapter 3, the collected field data will be analysed to identify how existing frameworks support the digitalization process of smaller traditional companies and where adaptations might be necessary.

Chapter 4 will finally combine findings from the study and literature, to discover ways of implementing digital technologies into companies that lack the resources to undergo massive restructuring projects.

1. Innovation

1.1. Innovation Concepts

Finding new opportunities and thus a competitive advantage over the competition is the main goal of any existing company or organization on this planet. Even the biggest companies within a certain market or industry have to pursue these goals viciously as most advantages are temporal and, in many instances, very short lived. History has repeatedly shown that market-dominating companies collapsed within years or even months, simply because of the inability to adjust to new and emerging trends or technologies. In many cases, technologies were overlooked and considered irrelevant by the management, that by the time they realized their mistake, competition had already overtaken them. Prominent examples of this failure exist in almost every market. Blockbuster, a massive movie and video gaming rental service failed to adopt digital solutions and was quickly overtaken by streaming companies like Netflix (Satell, 2014). Polaroid and Kodak experienced a similar situation, as they failed to explore digital solutions and were quickly forced to file for bankruptcy, even though they both were market leaders not long before (Goh, n.d.). In these and many other cases not being flexible enough was the problem, or more precisely the lack of innovative activities.

Innovation, according to Schumpeter (1983), is the invention and usage of something new, in either a commercial or industrial sense. When talking about innovation, most people default to the idea of new products, but innovation also consists of other, equally important,

areas: new methods of production, the exploitation of new markets, new sources of supplies as well as new forms of managing business. Unfortunately, in most cases companies interpret innovation like the general public and focus mostly on product innovation. Although these product innovations might result in short-term success, they usually do not yield long time benefits, as no sustainable competitive advantage is being created (Vijay & Jatin, 2013). In the case of previously mentioned companies, a simple product innovation would have not saved the companies, as the entire business model had not adapted to the rapidly changing market conditions. A restructuring of the entire company would have been necessary, and with this a heavy focus on process and organizational innovation. While these examples were based on massive multinational corporations, research has also shown that this is even more applicable for smaller and medium-sized enterprises. Analysing the innovation expenditure of 1800 German manufacturing companies, Fritsch and Meschede (2001) discovered that small enterprises spend considerably more of their R&D budget on product innovation than on process innovation. Combined with the fact that product imitation is becoming increasingly easier as many parts come from independent hard and soft-ware suppliers (Ettlie & Reza, 1992), it is surprising why process and organizational innovation is still something companies are reluctant to undertake.

In order to understand what hinders effective innovating in companies, a proper understanding of the various innovation areas has to be established. With this as a basis, important innovation activities can then be identified. This part will outline a variety of innovation types and activities in a very general way and will only describe a few in more detail, as they have a more significant impact on the process of digitally transforming a company. The general taxonomy used in Table 1 is taken from the Oslo Manual 2018 (OECD & Eurostat, 2018).

Innovation, in their understanding, is divided into two major groups: Product innovation and business process innovation. Product innovation concerns a company's output, which is being sold to the customer to generate income. Business process innovation on the other hand, attends to the processes and the general way business is being performed. In the following sections, some of the innovation types will be further examined, namely process innovation and organizational innovation, regarding their impact on the use of digital technologies. The remaining four will not be explained in further detail, as they have either little impact on the introduction of digital technologies (marketing and sales, distribution and logistics) or have already been covered in a variety of papers (product innovation) (Cooper, 2000; Ettlie & Rubenstein, 1987; Goldenberg et al., 2002). It is important to note though, that

these innovation types are not independent entities, resulting in the fact that most innovations are combinations of two or more innovation types (Frenz & Lambert, 2012; Simonetti et al., 1995).

Table 1

Differentiation of Innovation types according to the Oslo Manual

Product Innovation	
Goods	Tangible objects, that can be used, owned, and traded.
Services	Intangible activities which can be produced, consumed, and alter their conditions
Business Process Innovation	
Production of Goods and Services	Activities that directly affect the transformation of input into goods and services and supportive activities.
Distribution and Logistics	Activities that concern the moving and storing of goods, including warehousing and order processing.
Marketing and Sales	Activities that manage everything related to sales and marketing, including pricing strategies, sales and after-sales activities, and advertising activities.
Information and Communication Systems	Activities that allow the provision and distribution within the company and with external entities, including hardware and software, data processing and database maintenance.
Administration and Management	Activities that allow the strategical, legal and financial steering of the company, including activities such as accounting, strategic and general business management, human resources and managing external relationships.
Product and Business Development	Activities that manage the identification, development, improvement and change of new or existing processes. This can be done by any department or by a specially for this task designed unit.

Source: Adapted from OECD & Eurostat (2018)

Innovating requires a company to embrace all facets of innovation, as they all influence the eventual outcome of an innovation activity (Gunday et al., 2011). Additionally, research has shown that companies which consider the innovation process as a whole regularly outperform firms that focus on a specific aspect, e.g., product innovation (Vijay & Jatin, 2013; von Tunzelmann, 1995).

Based on this paper's research goal, the following section will examine innovation types, that play an important role considering the implementation and usage of digital technologies, namely *production of goods and services*, *information and communication systems* and *administration and management*. Bearing in mind that the taxonomy (Table 1) used to describe innovation types was only established in 2018, most of the categories mentioned have not yet been intensively addressed by the scientific community. Therefore, *production of goods and services* as well as *information and communication* will be substituted with process innovation, while organizational innovation will replace *administration and management*. This conversion is based on the Oslo Manual (OECD, 2005), a predecessor to the already mentioned Oslo Manual from 2018.

1.2. Process Innovation

Deploying process innovation in essence refers to the approach of improving the way how certain things are done in a company. The goal is to achieve higher levels of speed, accuracy and quality (Jin & Cedrola, 2019), while simultaneously increase affordability, reliability and resilience. It furthermore aims to form processes in a way that raise usability and convenience for people involved in the process (OECD & Eurostat, 2018). One hugely important driver of process innovation is the introduction of new equipment and software to the production of goods and services. Prominent examples are the invention and implementation of the first moving assembly line at Ford Motors, the introduction of self-service counters in supermarkets or automated welding robots in the automotive industry. Although technology plays a huge role in process innovation, it is not a required component. Japanese manufacturing companies hugely increased their competitiveness with new manufacturing processes that did not involve, at least not as a main component, technical products. Many of these systems, such as Just-in-Time and the Kanban system, are still widely regarded as industry standards (Jin & Cedrola, 2019). While innovations regarding the production processes remain a substantial part of process innovation, they represent only a fraction of the overall process innovation field. Because of the multitude of areas where process innovation can be applied to, specific terms have been coined to describe the various sub-types.

These include technical innovation, management and administrative innovation, and business system innovation (Rowley et al., 2011).

To get a better understanding of process innovation and its impact on a company, following question needs to be answered: Who is affected by process innovation, and how? For product innovation, this question is relatively easy to answer. Most product improvements are visible to the end customer, as they usually have a direct impact on product performance, design, and product features. This incentivizes a customer to either pay more, or to choose it over a competitor's product (Cooper, 2000). With this, product innovation has a direct effect on a company's sales numbers, and its therefore apparent why it is considered important for a company's success. For process innovation, the situation is very different. According to Jin & Cedrola (2019), process improvements can, firstly, indirectly affect the end customers buying decision, as product and service quality increase. Secondly, process innovation generates value to internal customers, which include employees, departments and/or the organization as a whole. Third, they can also enhance collaborative capabilities with external customers, such as business partners and suppliers. Improvements for these three customer groups, especially the latter two, can be numerous. Enhancing or restructuring a process or parts of it, can significantly reduce the time it takes to produce a product or to provide a service (Taifa & Vhora, 2019). It can also render tasks more enjoyable and comfortable for employees, by shifting workloads or automating repetitive activities. Additionally, it allows for cheaper sales of the end product, by streamlining the entire production process and the surrounding supportive processes and therefore, lowering overall production costs (Jin & Cedrola, 2019). This allows process innovation to have a positive effect on customer satisfaction, but indirectly, as it stems from improved processes within the company.

Beside the already mentioned advantages, process innovation plays another major role that is often neglected. It facilitates a company's product innovation activities, which contribute to a firm's effort for market dominance. Improved processes can lower overall costs, which in turn allows a company to spend more money on their R&D. They also influence product quality, as it is directly linked to production quality. Higher quality machinery, better skilled workers and an improved knowledge flow can all contribute to a final product that has better quality and a lower defect rate (Piper, 2008).

Finally, by establishing highly efficient and streamlined processes, process innovation can act as an entry barrier for potential competitors. Enhanced production processes can result in high quality products and low prices, that competitors cannot match or easily imitate (Piper, 2008). Streamlined knowledge transfer within the company and with customers can be the

foundation of a customer support service, that outperforms rival services in terms of speed, quality and convenience. This knowledge transfer can also result in better connections to suppliers and other business partners, which only further increases a firm's productive, research and service capabilities. As Ettlé & Reza (1992) highlight, having superior internal processes is the most effective way to stay ahead of competition, especially in times where many products are based on hard and software components from independent suppliers, which renders product imitation increasingly easier.

It is apparent, that process innovation can have a tremendous impact on the overall performance of the company, its internal processes and even facilitate product innovation. This begs the question, why it is still not on top of most companies' priority list, far behind the already established product innovation (Piper, 2008; Vijay & Jatin, 2013). And even if process innovation is being deployed in a company, it is mostly being applied to processes directly connected to production, ignoring other equally important business functions (Fritsch & Meschede, 2001). Additionally, technical aspects (e.g. software, hardware) are heavily favoured, while organizational features are mostly ignored (e.g. human capital, skills, structure) (Boer, 2001).

One of the reasons why companies favour investing into product innovation, is the simplicity of measuring success. Improvements based on process innovation can be far more difficult to evaluate and measure, than product innovations. In most cases, process innovations have an impact on a variety of tasks, therefore making it hard to pinpoint where improvements have been made and to which extent. Easy examples would be improvements in the production line, e.g., a robot automating a specific set of tasks, therefore accelerating the production for a measurable amount of time and thus, saves resources. In most cases though, improvements based on process innovation, are not as easily quantifiable. Measuring the impact of a new database structure, built to streamline knowledge transfer and information processing over multiple departments, turns out to be vastly more difficult, as many improvements made are intangible: e.g., having faster and easier access to information and helping employees to work more efficiently. It also allows them to focus more on their actual tasks, as structuring, archiving and sharing are done by the database (Harteis, 2018). Speed and efficiency might be measurable, but how can a company identify the impact of a more focused, motivated, and enabled workforce? The very nature of process innovation is what stops many companies from attempting it, as they cannot reliably measure its success, and therefore do not see its benefits.

Restructuring whole processes can be a daunting task, that requires a very systematic approach. The process can take months and years and bears a high risk, as many vital business

functions are being changed. This can lead to confusion, as employees need to get used to their new work surrounding, tasks and activities, which might still need some fine tuning. Therefore, Boer (2001) advises to break down the restructuring process into chunks, that can be easier implemented. With this, only parts of the main processes get interrupted and testing implementations is easier. Although breaking down a project into smaller pieces can be helpful, one has to keep in mind that process innovation aims to transform entire processes and therefore a holistic view is of great importance. This requires the consideration of all existing features of targeted business processes and functions (OECD & Eurostat, 2018). Grand scale changes like these, also contain another very difficult problem - testing. As full functionality is in general only achievable once the entire structure has been rebuilt, evaluating parts of it might only give very little insight on how the overall change will perform. Additionally, running small scale trial runs might also give wrong results as the system would perform very differently (Boer, 2001). Extensive planning, assessing the current state, formulating explicit goals and constant monitoring are vital for a successful implementation of process or organizational innovations (McKay, 2018).

Considering duration and complexity of such restructuring attempts, another key feature of innovation is often neglected. Continuous innovation, or in a more general context continuous improvement, refers to the never-ending process of incremental changes to a system or product. In other words, innovation is never actually completed as products, processes and organizations need to constantly adjust to changing market situations and trends. This applies especially for companies that operate in a technological environment, as the technological landscape is changing faster than ever before (Berman & Dorrier, 2016; Cole, 2001).

1.3. Organizational Innovation

When it comes to innovation taxonomies, researchers have not yet found a consensus, and this is especially true for the term organizational innovation. For some, it is similar to process innovation, with some distinguishable characteristics, e.g., being applied on a higher level (Flecker, 2009). For others it is an independent entity, that shows significant differences to other existing innovation types (Camison & Villar-López, 2014). In other instances, organizational innovation, administrative innovation and management innovations have been aggregated under the term managerial innovation (Damanpour & Aravind, 2012). OECD & Eurostat (2005; 2018) even adjusted their taxonomy in two subsequent versions of their Oslo Manual, replacing organisational innovation with administration and management innovation. Although nomenclature differs a lot between researchers, the overall idea of what

organizational innovation is, remains very similar. It describes the idea of changing and restructuring a company's internal structure, in ways that facilitate a more effective work environment, higher flexibility and overall growth. This includes the restructuring of organisational structures, implementing new and advanced management techniques and re-orientation of corporate strategies (Damanpour & Aravind, 2012; OECD, 2005).

In many cases, innovations are very hard to assign to a specific innovation type, as borders can be very fluid. This is even more so the case with process and organizational innovation. The overall goal of both is quite similar: improving processes, internally and externally, by changing how tasks and activities are being performed. The difference lies in the way how these changes are implemented and where. While process innovation aims to innovate on the task and activity level, organizational innovation focuses on enhancing firm performance on a much higher, strategic level. Simply put, process innovation focuses on improving specific tasks to achieve better performance, while organizational innovation looks to change the entire system (Boer, 2001; Damanpour & Aravind, 2012).

One example for this can be restructuring information channels and decision-making processes. From a process innovation perspective, the main goal is enhancing the information flow by introducing new systems and technologies that allow for faster and more precise data sharing. It would furthermore streamline the decision-making for this specific type of task or activity, by automating parts of it or removing unnecessary steps. The organizational innovation approach, on the other hand, is more general and high level. Instead of introducing new processes to enhance parts of the organisation, it restructures the entire system. This then has an effect on the whole company, not just specific processes or departments.

Continuing given example, one option of accelerating the decision-making process, is flattening the overall hierarchy. This allows for faster reaction times, as required authorization levels are reached faster. Additionally, new positions can be introduced that have the necessary authorization levels. In this case, the organizational innovation approach is very different from process innovation. In other instances, differences are harder to find. Restructuring the information flow could look very similarly using either organizational or process innovation: e.g., a database can be introduced to collect, store and share data in a more efficient and structured way. The difference would then only lie in the scope of the project, as organizational innovation aims to incorporate the entire company, while process innovation focuses only on a specific part.

The fact that organizational innovation has a more holistic approach than process innovation, and with this a bigger project scope, is responsible for the reluctance of companies

to use it. Of all innovation types, its implementation time, from start to finish, is by far the longest (Boer, 2001). Similar to process innovation, the difficulty of measuring progress and success is one of main reasons it is rarely being attempted. Improvements on an organizational level have a much higher impact area, considering a company's structural landscape. This makes the evaluation of the restructuring very vague, especially short term, which unfortunately is what many managers focus on (Georgetown University, 2018).

On the surface, organizational and process innovation share many commonalities and therefore have similar requirements for a proper implementation, such as constant monitoring, reinforcing, and adjusting (McKay, 2018). They furthermore require well-structured work, knowledge, time and manpower – but in many cases, these are not the main reasons for failure. Trener et al. (2021) describe leadership, human resource and especially organizational culture as key components of a company's ability to transform. Internal corporate culture has a tremendous impact on innovation activities and is according to many researchers and companies one of the primary reasons why process and organizational innovation projects either fail or succeed (Boer, 2001; Deloitte, 2015; OECD & Eurostat, 2018).

Kotter & Heskett (1992) describe corporate culture as an “interdependent set of values and ways of behaving that are common in a community”, or within a company. Cameron & Quinn (2011) expand this description by adding managerial styles, paradigms and problem solving approaches. Looking at the given characteristics, it is clear why corporate culture is important. It describes how a company operates on the most fundamental level - its people. Everything else, products, processes, strategy, departments, external and internal connections and all other things that are important for a running business are built on this foundation, and neglecting it endangers a company's success and ultimately survival (Lewis, 2020).

In their analysis of various studies, Cameron & Quinn (2011) found that the most frequently given answer - regarding failures in restructuring projects - was neglecting company culture. In order to successfully transform a company by applying process or organizational innovation, the underlying structure, beliefs and ways of behaving need to be adjusted or even radically changed. Without the transformation of this core, attempted changes will either stay very superficial and short-lived or fail entirely.

Although the importance of corporate culture is evident, changing it is rarely being attempted. Values, ideas and ways of working, have in most cases perpetuated themselves over long periods of time, which makes them hard to identify, as they are simply considered normal (Kotter & Heskett, 1992). This perpetuation is influenced by social forces which are often very subtle or even invisible, slowly pushing people to accept the already established norms and

values by rewarding them or penalizing them if not. Based on this, the difficulties emerging while undergoing cultural change are easy to comprehend, as it attempts to alter characteristics that have been burned into the mindset of employees over years and decades. Even more problematic is the fact that people are usually unaware of their culture, further complicating the process of addressing it in the first place.

In an attempt to systematically define the core components of an organization, Peters & Waterman (2011) constructed a framework of seven variables: structure, systems, style, staff, skills, strategy and shared values. This model is also known as the McKinsey 7-S Framework, as this project was done in a cooperation with McKinsey & Company. While most companies are aware of their corporate structure and overall strategy, other variables like style, staff, skills, and shared values are rarely looked at. This has two main reasons: first, they are not considered as important and secondly, hard to observe and measure. Figure 1 shows that only a small part of the culture is observable, namely explicit actions and artifacts (e.g., clothes, office design, logos), but the implicit assumptions and the resulting conscious contracts and norms are not (Cameron & Quinn, 2011).

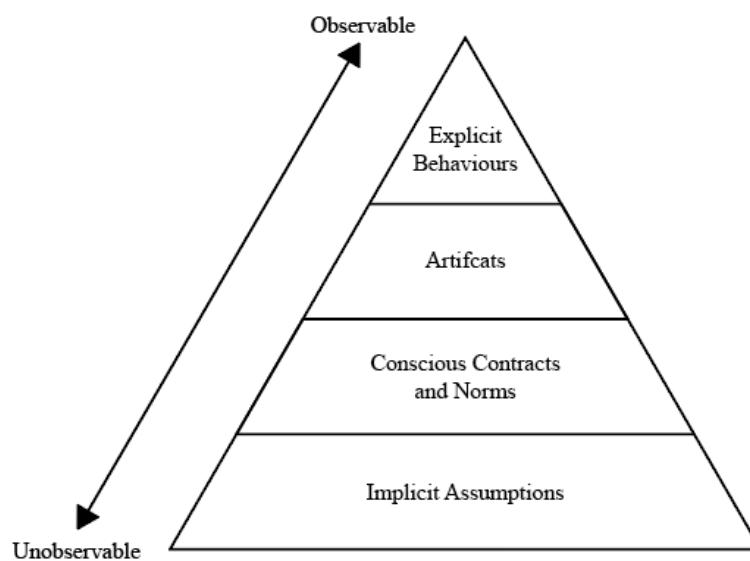


Figure 1. Observability of Corporate Culture

Source: Cameron & Quinn, 2011

In 1979, Peters & Waterman (2011) analysed 75 successful American companies, that were on top of their respective industries. Very few of these companies showed classic competitive advantages, such as high market entry barriers, non-substitutability of products, buyer and supplier bargaining power, etc., but still managed to consistently outperform their

rivals. Their results supported their theory about the impact of corporate culture because the main advantage these companies had, was that they were excellent when it came to the most fundamental levels of their organizations – its people.

Corporate culture represents a company at the most fundamental level and has a great influence on everything else that is built on top of it (Boer, 2001; Cameron & Quinn, 2011; Camison & Villar-López, 2014; Peters & Waterman, 2011). Therefore, culture is not necessarily a problem, but can be a company's downfall if it does not adapt to changes in the business environment. This thesis is not supposed to be a framework for initiating and steering the process of cultural change - this has been covered in a variety of other papers (Cameron & Quinn, 2011; Wilhelm, 1992). Rather, give a brief overview of how culture can affect innovation and digital transformation and thus impacts the introduction of digital technologies. Therefore, some of the key components of successful cultural change will be outlined.

- Changing a company's most fundamental values, requires role models that embody the newly set goals and visions. Strong leadership and devotion are therefore quintessential for a successful transformation. Managers need to fully embrace and live the change, to allow diffusion of these values and ideas into the rest of the company (Boonstra, 2013; Cortellazzo et al., 2019).
- Furthermore, achieving cultural change is not something done solely by individuals, it requires the integration of all involved people. Change needs to be communicated and agreed upon. If it is not accepted by everybody, it will most likely fail (Wilhelm, 1992). It is also important to understand that change can be tough at times, requiring the removal of existing barriers, like employees or managers which are unwilling to accept change (Cameron & Quinn, 2011).
- Finally, changing characteristics that are so deeply embedded into the foundations of a company requires time. Change can take years and requires massive reinforcement, measuring and monitoring. It is nothing that has a clear deadline, rather consists of a multitude of small iterations that slowly steer the company into a new direction, through constant corrections and adjustments (Boonstra, 2013; McKinsey, 2003; Wilhelm, 1992).

To stay ahead in today's rapidly evolving market, where technology is accelerating the change of market conditions, companies have to focus on various innovation strategies, such as product innovation, process innovation and organizational innovation. To do so, the

companies most basic functions must be constantly adjusted, which is only possible when its people are willing to do so.

2. Digital Transformation

2.1. The Concept of Digital Transformation

Digitalization, Digitization, Digital Transformation – these buzzwords have been a constant companion to most business managers around the world for many years. Although there are distinctive differences, they generally pursue the same goal: using technology to go from analogue to digital and therefore changing and enhancing business procedures (Bloomberg, 2018). More precisely, adapting the business model to use digital solutions to facilitate the generation of new revenue streams and value producing functions (Gartner Glossary, 2021). According to Fitzgerald et. al (2013), digital transformation can impact a company in three major areas – customer experience, operational improvements and business model change.

Improvements made in the area of customer experience, directly influence the relationship with the customer, whether through service and communication channels, or through the product itself. Digital solutions can have a major impact on the launch of new services and the quality, price, and features of these products. Important to note is that this type of digital transformation is not solely driven from the company side (S. J. Berman, 2012; Fitzgerald et al., 2013). Customers have grown more and more accustomed to high quality and instant digital service, which forces companies to fulfil it. Analysing a study from the Institute of Customer Service, Deloitte (2013) found that on the one hand, customers are experiencing less problems with purchasing goods or services than in the past. On the other hand, although, the percentage of complaints filed - once mistakes have occurred - has risen dramatically. This goes to show that customer expectations have risen increased, and not meeting them might impact the business negatively.

Operational improvements focus on the enhancement of internal processes, including employee productivity, internal communication and operational services (Fitzgerald et al., 2013). These changes also influence the final products and service, although only indirectly, as they determine their means of production. Additionally, resource usage is being improved, downtimes reduced and overall production costs decreased, while raising quality and speed (Gehring, 2020). Another buzzword linked to operational improvements is Industry 4.0., a globally used term describing the connection of machines through intelligent information and communication technologies. Although this topic is instrumental to digital transformation, it

will not be further elaborated on, as it would blow up the extent of this paper and has already been thoroughly discussed in modern literature (Lasi et al., 2014; Ustundag & Cevikcan, 2018; Xu et al., 2018).

The last, and according to Fitzgerald et al. (2013), the least performed type of digital transformation focuses on business model change. It consists of completely reshaping key aspects of the existing business model by using digital solutions and through this exploring new means of growing the business. These fundamental areas can be found on every business model canvas and include customer segments, customer relationships, channels, value proposition, key resources, key activities, key partners, cost structure and revenue streams (Genzorova et al., 2019).

To illustrate how digital transformation can have an impact on business models, some examples are outlined in the following:

- A. Customer segments: The usage of digital technologies can expand a company's customer base, through improved ways of product delivery, additional communication channels, product testing and other ways of targeting customers in markets that have not yet been explored (Elyse, 2018).
- B. Key partners: Deploying new communication technologies and ways of sharing information might open the doors for new business-to-business collaborations, that otherwise would not have been feasible, due to geographical distance, different ways of working or language (Lasi et al., 2014).
- C. Value proposition and revenue streams: A company's entire value proposition can be radically expanded with digital solutions, allowing it to offer more than just a product. Services can be built around the product and communicated directly to the customer, increasing the products value and simultaneously unlocking new ways of making profit (Genzorova et al., 2019).

In essence, digital transformation influences all areas of a business model, depending on its target. Usually, these building blocks are interlinked, and improving one might start a chain reaction, effecting many others as well. Reshaping customer relationships, for example, can also have a strong positive effect on the customer base. Additionally, it could be the basis of new services which would upgrade the value proposition, resulting in new revenue streams (Berman, 2012).

2.2. Digital Technologies

As discussed in chapter 3.1, the overall consensus of the scientific community and the industry is that digital transformation plays a major role for nearly every business on the planet. It's general effects on a company's business model are also agreed upon, even though, slight differences exist. But what are these "things", that can have such a strong positive impact on a company's performance? This chapter aims to give the reader a brief overview of existing technologies and digital trends that are part of digital transformation. This list will not be fully representing all existing digital solutions, as this is neither helpful nor possible. Technology is advancing with such speed, that specific technologies might already be obsolete a year after this thesis has been published, therefore this list will be kept very general.

- A. Mobile technologies allow the user to be geographically independent. It is no longer required to work at the office, as mobile phones, tablets and other newly emerging devices such as smart glasses enable the user to have access to everything he needs from anywhere in the world – provided a network is accessible (IBM, 2020).
- B. Cloud computing is another key technology that is already very popular but has even more potential. It generally refers to computing services which can be accessed remotely via the internet. This shift from internal or on-premises IT infrastructures to cloud services hosted by external provider brings substantial advantages to a firm. First, it reduces the amount of IT located within the company, which for many companies is problematic, as they lack staff and knowledge to properly run it. Second, it drastically lowers prices and maintenance costs. Third, it gives access to many other advanced technologies such as artificial intelligence, internet of things and mobile (Coyle & Nguyen, 2019).
- C. Another rapidly evolving concept and especially important for manufacturers is the Internet of Things. It describes a global network of digital and physical assets, that are intelligently linked through communication and information technologies. This new way of gathering data, automating processes, decreasing reaction times and a more effective human-machine interaction gives way to different business models that would have otherwise not been possible (Wortmann & Flüchter, 2015)
- D. When it comes to changing ways of working, enhancing collaboration, and removing geographic distances, one particular set of technologies has received

a lot of praise – extended reality (XR). XR is the umbrella term for virtual reality (VR), AR and a combination of the two – mixed reality (MR). Combined with mobile devices, such as phones and tablets and emerging smart glasses, these technologies can reshape internal and external processes, collaborations and customer relationships and much more (Chuah, 2018).

- E. Artificial intelligence and machine learning can have a massive impact on a firm's data management and learning capabilities. Both imply the usage of smart computer programs, that are able to learn from experience and make decisions independently. As these fields are highly complex, they will not be explained in further detail (Iriundo, 2021).
- F. The deployment of Robotic Process Automation restructures a company's manufacturing processes, by automating recurring and repetitive tasks. It not only drastically reduces costs, but also usually leads to higher quality and shorter production times. Additionally, new means of production can be explored that were previously not feasible, e.g., additive manufacturing (Bandyopadhyay & Bose, 2019; van der Aalst et al., 2018).

It is important to note that this list only contains a selection of technologies that either already impact companies or that are on the verge of doing so. It could be extended by many other emerging technologies, sub-categories to the already existing ones and combinations of two or more. The intent of this list was mostly to showcase the variety of options for companies that wish to undergo digital transformation.

2.3. Problems with Digital Transformation

Looking at the number of technologies available and their advantages, it seems almost unnecessary to highlight how important digital technologies are for the business world. One would think that the majority of companies have already incorporated digital solutions into their day-to-day business and have therefore achieved a certain level of digital transformation. Unfortunately, the reality looks very different. In a study from 2020, McKinsey (2020b) have found that around 70 percent of attempted projects regarding digital transformation fail and do not provide any long term competitive advantages.

Although digital technologies enable very straight forward improvements, such as higher levels of flexibility, faster and cheaper processes, new means of communication and much more, the way of achieving them is much more difficult. Simply buying technologies

and using them is just not enough. Deploying new machinery, tools or software can drastically improve productive capabilities, but only if staff is able to properly use it. Datamining through smart devices, can enable companies to identify weak or strong points of their products and services, but only if they have the skills to handle big amounts of data. The introduction of a DBMS can strongly improve storing, sharing and analysing information, but only if the database is maintained correctly. Buying the technology is only the first step of digital transformation. Shaping the organizational structure and processes around it is where most companies fail.

By interviewing more than 1550 executives and managers, Fitzgerald et al. (2013) identified some of the root causes of failed digitalisation projects. Figure 2 shows that almost 40 percent of respondents think that a lack of urgency is one of the main reasons. In other words, complacency is strongly hindering the successful implementation of digital technologies, as they are not considered essential. The second most given reason for failure is lack of funding. Many projects are being started without the allocation of sufficient resources, resulting in unfinished projects that, in most cases, get disbanded after a while. Almost 30% believe that the assignment of roles and responsibilities is unclear, leading to an uncoordinated change process. Additionally, 16% believe its leadership is not up to the task, completely preventing change in the first place.

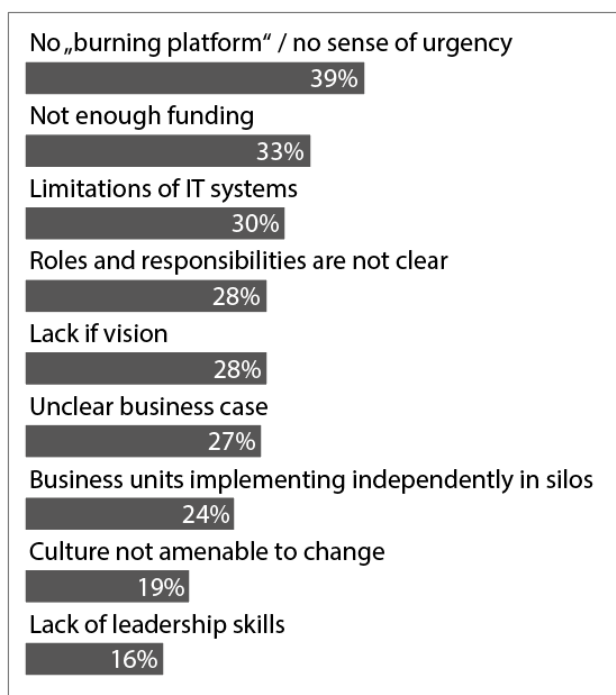


Figure 2. Perceived barriers of digital transformation

Source: Fitzgerald et al., 2013

When it comes to company culture, most of the world's leading consulting agencies seem to agree that it is a crucial part of digital transformation (Deloitte, 2019; EY, 2020; McKinsey, 2020b). In their survey, Fitzgerald et al. (2013) examined cultural problems further that hinder digitalizing a company, which can be seen in Figure 3.

More than half of respondents put a lack of time as their primary reason of not being able to focus on innovative activities. Almost the same amount of people put their inexperience with digital devices as a main reason for not attempting digital transformation. Finally, the attitude of continuing how it has always been, is a hindering factor for 40% of respondents. Change is not only a problem for companies, but also equally hard for people, a firm's most basic entity. For many, change is connected to feelings such as confusion, loss, lack of competence, more work and losing control (Scott, 2016).

That digital transformation is vital for almost any company is universally agreed up, but only if executed correctly. The past chapters have elaborated on the advantages of digital solutions and the problems that arise while attempting implementation. Therefore, the next chapter illustrates how process and organizational innovation can facilitate digital change and how culture can be used to aid this undertaking.

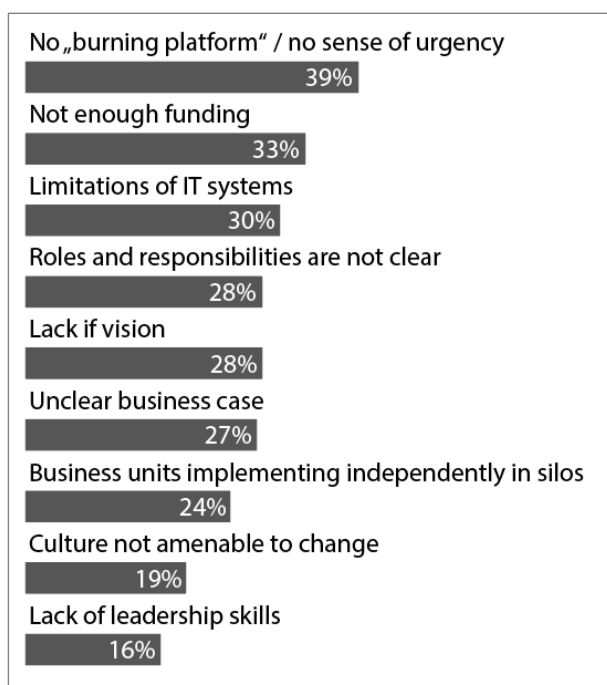


Figure 3. Cultural barriers hindering Digital Transformation

Source: Fitzgerald et al., 2013

3.4. Process and Organizational Innovation as Facilitators of Digital Product Implementation

As described in previous chapters, digital products and solutions can have a tremendous positive impact on business processes and models, but properly using them involves more than just acquiring them (Tabrizi et al., 2019). Zangiacomi et al. (2017) further highlight how a lack of understanding of these complex transitions can lead to failed implementations.

To successfully adopt and implement new digital technologies, firms need to possess certain characteristics. In a study, Kamble et al. (2018) found that some of the major barriers of digitalization (in their case Industry 4.0) are organizational and process changes. The importance of process and organizational innovation is further supported by Depietro's Technology-Organizational-Environment Framework (TOE) (Depietro et al., 1990). According to Depietro, technology adoption depends heavily on the organizational context. This organizational context consists of four features that impact technology adoption in different ways: Size, Slack, Structures and Communication. All these features are connected to organizational innovation, and on a lower level to process innovation. This means that by applying process and organizational innovation one can drastically increase a company's digital adoption capability and with this enable the efficient introduction of new digital technologies (Gillani et al., 2020).

On the one hand, the importance of process innovation regarding digital transformation can be seen by looking at business articles covering *digital process innovation*. Essentially, an approach that focuses on the implementation of new technologies and thus enabling novel and improved ways of working (McKinsey, 2015). On the other hand, the low number of existing literatures examining *digital process innovation* highlights how little industry and science have focused on combining digital transformation and process innovation. According to the website Dimensions (Dimensions, n.d.) only 39 publications connected to *digital process innovation* can be found, while more than 7000 papers centred around *process innovation* have been published in 2020 alone. Additionally, digital transformation has mostly been viewed from a conceptual standpoint (e.g. Ng et al., 2018), aiming at a complete transition. Papers that have discussed digital transformation on a practical level have mainly focused on multi-billion dollar companies (e.g. Capgemini, 2011). Literature about digitally transforming smaller and medium-sized enterprises, that do not have sufficient resources for such a wholistic approach, is scarce, and when existent fails to discuss the implications of process and organization innovation (Vrontis et al., 2021).

This absence of literature focusing on smaller and medium-sized companies is also apparent when considering company culture as a factor influencing the adoption of digital technologies. Even though it has been discussed in the context of digital transformation (Deloitte, 2019), the exploration efforts of the effects of company culture in general have focused on global players (Peters & Waterman, 2011).

As standalone topics, process innovation (e.g. OECD, 2005; Piper, 2008), organizational innovation (e.g. Boer, 2001; Camison & Villar-López, 2014) (company culture as a subtopic of organizational innovation (e.g. Boonstra, 2013; Kotter & Heskett, 1992)) and digital transformation (e.g. Bloomberg, 2018; Tabrizi et al., 2019) have been widely discussed in literature. Some papers addressing digitalization have even included the process level and organization level as beneficiaries of the implementation of digital technologies (Parviainen & Tihinen, 2017), but applying process and organizational innovation as means of facilitating digital change presents a big research gap. This paper will try to examine how the implementation of digital technologies can be supported by process and organizational innovation, focusing on smaller and medium-sized enterprises. This focus is especially important as they oftentimes lack the resources for a complete business overhaul, which according to Fitzgerald et al. (2013) is responsible for more than 30% of failing digitalization projects.

4 Methods and Data

4.1. Procedure for Data Collection

The aim of this thesis is to identify how process and organizational innovation can help small and medium-sized manufacturing firms to adopt and implement digital technologies. Therefore, data was collected from one manufacturing company based in Bavaria, Germany. This company produces and sells machinery to other businesses, including maintenance contracts. It employs 75 people, from which 12 work in the service department. In a timeframe of 4 months, two digital technologies were introduced into the service department: an AR remote maintenance application to support the customer support staff with their global clients and a DBMS to improve service planning and execution. Initially these technologies were introduced without applying process and organizational innovation. In the following months, parts of the service department were systematically restructured to allow both technologies to be implemented as efficiently as possible. Capturing the benefits and problems prior to the application of process and organizational innovation and after is essential for determining the

effectivity of process and organizational innovation methods on the implementation of digital technologies.

The data for this thesis was gathered in two ways. To get an overall view on the success of the implementation, and how it has been impacted by process and organizational innovation, a survey was conducted. This survey was handed out to all workers in the company that have direct or indirect contact with the newly introduced technologies. These surveys were presented in a paper format. As the survey questions were quite general, additional more in-depth data had to be gathered, which was done via 3 surveys with people from middle to upper management.

4.2. Research Design and Approach

One way of measuring the success of the implementation would be looking at KPI's (Key Performance Indicators) such as speed and accuracy. This was not being done for this research based on two observations:

- A. Tasks in the service department have very different durations, ranging from a two-minute call to three-day operations. Additionally, they contain a wide range of subtasks. Measuring time and efficiency would not yield any useful data.
- B. Selecting, implementing, observing, and analysing requires time. Many of the effects of new technologies will only emerge after months of usage, especially concerning KPI's. In the short time frame of 4 months, it is almost impossible to gather numeric data concerning time, saving, error rate, etc.

Therefore, this thesis employed a survey and interview research design analysing employee opinions and views towards the new changes and how they affect their day-to-day work. To do so, both quantitative and qualitative methods were used, which is referred to as mixed methods (Wisdom & Creswell, 2008).

The quantitative part of the research consisted of surveys to capture the overall opinion of employees towards the changes. Due to the relatively simple nature of these questions, they can be answered using the Likert-scale (Albaum, 1997). Additionally, the survey facilitates questioning a variety of people in different positions in a short time span.

The qualitative approach, in the form of interviews, was used to address questions where using a quantitative approach would not be sufficient. Many of the potential problems and benefits are hard to predefine or are unknown, which renders a questionnaire less useful. Additionally, it would fixate the employee on potential ideas, hindering a free flow of ideas (Howe & Eisenhart, 1990). Finally, it supports the quantitative approach, as the number of respondents is too low for a purely quantitative analysis.

4.3. Sampling and Measures for Data Collection

The survey was handed out to all employees that have used the database or are in some form or way affected by it. In total, this are 37 workers, of which 32 filled out the survey. Because the survey focuses on two distinctive types of questions, two 7-point Likert scales with different scales were used. Part 1 and 2 of the survey concentrate around the performance of the technologies, therefore using following scale: 1 = “Very Poor”, 2 = “Poor”, 3 = “Somewhat Poor”, 4 = “Neutral”, 5 = “Somewhat Good”, 6 = “Good” and 7 = “Very Good”. Part 3 contains general statements about the digital transformation in the company, which the respondents had to answer with 1 = “Very strongly disagree”, 2 = “Strongly Disagree”, 3 = “Disagree”, 4 = “Neutral”, 5 = “Agree”, 6 = “Strongly Agree” and 7 = “Very Strongly Agree”.

Initially 4 interviews were planned in order to cover all management levels and positions. Due to COVID-19 related difficulties, only 3 were conducted. The interviews were held in person, or via Skype. The recoding was done with a phone or computer, respectively.

4.4. Analysis

The surveys were evaluated statistically to identify if workflows and tasks have improved once the introduction of digital technologies was supported by process and organizational innovation. The interviews will be used to support the findings of the survey analysis but also give a more in-depth insight. Firstly, interviews facilitate more detailed questions and thus answers, secondly, they not only address recipients of the change but people that were actively involved in the change process. These interviews brought out problems that have occurred during and after the implementation process and highlight benefits that emerged based on the usage of these digital technologies. Responses from the interviews were transcribed to allow for a proper analysis.

Results from interviews and surveys were then combined to identify how process and organizational innovation affect the implementation of digital technologies. This combination sheds light on how these changes were received by all levels of the company hierarchy and bring out future areas of improvement.

5. Results and Interpretation

The primary goal of the survey was to answer RQ1: *How do process and organizational innovation facilitate the introduction and implementation of digital technologies in smaller and medium-sized enterprises?* Therefore, both interview and survey, intend to capture how well the AR Remote Maintenance Application and the DBMS were implemented, and most importantly, how process and organizational innovation aided this undertaking.

5.1. Quantitative analysis

To do so, the survey was also split into two distinctive parts, focusing on the implementation of the AR Remote Maintenance Application and the DBMS, respectively. A third part posed some general questions about the digitalization state of the firm. Additionally, general information about the respondent was collected, such as age, gender, time with organization and education level (see Table 2). Although these are not the main focus of the thesis, they can still highlight some interesting effects on digitization activities.

Table 2

Descriptive statistics of respondents

	N	Minimum	Maximum	Mean	Std. Deviation
Age	32	25	51	36.69	7.07
Education	32	1	4	1.81	0.64
TimeWithOrganization	32	2	27	9.91	6.49

Source: author's calculations

The age of respondents was between 25 and 51 years, averaging 37 years, with a standard deviation of 7.069. 40.6% were between the ages 25 and 34, 40.6% were between the ages 35 and 44 and 18,75% above 45 years. 75% (24) of the respondents were male, while only 25% (8) were female. Their time with this organization was between 2 and 27 years, with a mean of 10 years and a standard deviation of 6.5 years.

The first core part of the survey then focused on the implementation of the AR Remote Maintenance Application (see Table 3). Questions 1 and 2 asked about the performance of the technology before and after the 3 months adjustment period, in which process and organizational innovation methods were applied to allow for a more efficient implementation. The mean for question 1 was around 4.5 with a standard deviation of 1.05, while for question 2 the mean was above 5.6 with a similar standard deviation of 1.07. This shows, that on average, respondents thought that the technology performed better after the adjustment period.

Especially the amount of “Good” and “Very good” ratings has risen drastically, as visible in Figure 4.

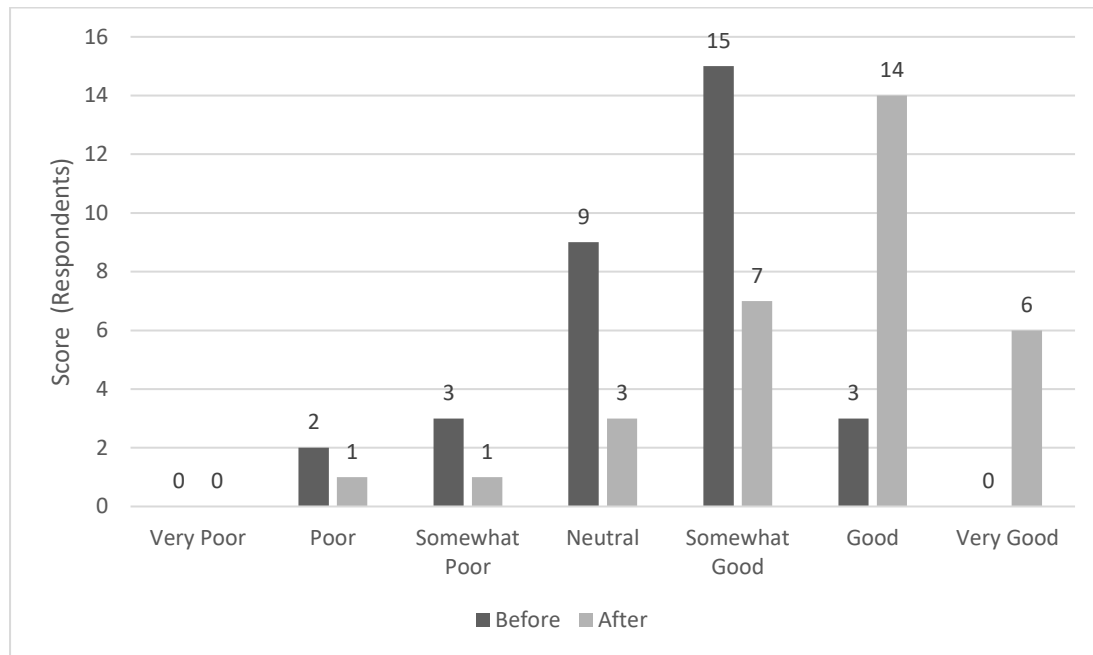


Figure 4. AR performance before and after the application of process and org. innovation

Source: Compiled by the author

Questions 3 and 4 inquired about the perceived impact of process innovation (Q3) and organizational innovation (Q4). Q3 had a mean of 3.2, while Q4 averaged 5.3, showing that most respondents believed that organizational innovation had a much bigger impact on the implementation of the technology than process innovation.

Table 3

Descriptive statistics of AR application questions

	Minimum	Maximum	Mean	Std. Deviation
Q1	2	6	4.47	1.05
Q2	3	7	5.66	1.07
Q3	1	5	3.22	1.07
Q4	2	7	5.31	1.42

Notes: Q1 = performance prior to adjustments, Q2 = performance after adjustments, Q3 = perceived impact of process innovation, Q4 = perceived impact of org. innovation

Source: author’s calculations

Questions 5 to 8 then focused on the DBMS, following the exact same order as questions 1 to 4 (see Table 4). Q5 and Q6 measured the perceived performance before and after the adjustment phase. In case of the DBMS, the results were even more striking. For Q5, the mean was 3.00 with a standard deviation of 0.92. Q6 showed a much higher mean of 5.47, an increase of almost 2 scale points. The difference in perceived performance can also be seen in Figure 5. While there were almost no positive scores for Q5, the results for Q6 are quite the opposite. The majority of respondents (84%) believed that the DBMS performs positively after the adjustments, while only 6% scored the performance positively before the adjustments.

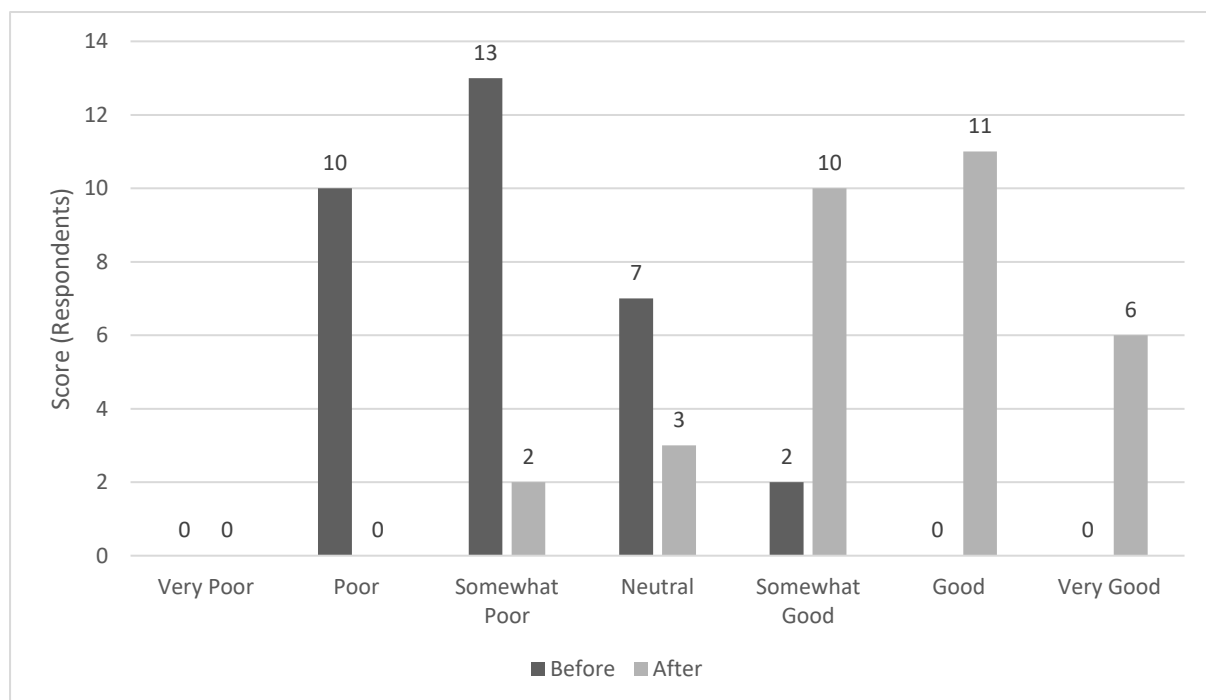


Figure 5. DBMS performance before and after the application of process and org. innovation
Source: Compiled by the author

Questions 7 and 8 then again focused on the impact of process innovation and organizational innovation. In contrast to the AR Remote Maintenance Application (Q3 and Q4), the results were much closer this time. Q7 (process innovation) had a mean of 5.22 with a standard deviation of 1.41. Q8 (organizational innovation) had a mean of 4.94 with a standard deviation of 1.46. This means, that in the case of the DBMS, both process innovation and organizational innovation were considered equally important for the implementation process of the technology.

Table 4

Descriptive statistics of DBMS questions

	Minimum	Maximum	Mean	Std. Deviation
Q5	2	5	3.00	0.97
Q6	3	7	5.47	1.14
Q7	2	7	5.22	1.41
Q8	2	7	4.94	1.46

Notes: Q5 = performance prior to adjustments, Q6 = performance after adjustments, Q7 = perceived impact of process innovation, Q8 = perceived impact of org. innovation

Source: author's calculations

The final part of the survey asked general questions about the state of digitalization within the company and the success of the test project (see Table 5). Corporate culture is a big focus of this thesis; therefore, it is interesting to see how the company addresses this through leadership and communication. Q9, therefore, focused on the involvement of the firm's management in the implementation processes of new technologies. The low mean of 2.00, equivalent to "poor", shows that most respondents believe that there is hardly any focus on this from management side. The relatively low standard deviation of 0.92 also shows that most people had a similar opinion about this. Q11 focused on the communication efforts regarding digital transformation. The results were quite similar to Q9, displaying a mean of only 2.09 and an even lower standard deviation of 0.82. Q10 on the other hand, inquired about the lasting impact of both, the AR Remote Maintenance Solution and the DBMS. The high mean of 5.50 and a standard deviation of 1.16 show that most respondents believe that they implementations will have a lasting impact on the company's business processes.

Table 5

Descriptive statistics of general questions

	Minimum	Maximum	Mean	Std. Deviation
Q9	1	4	2.00	0.92
Q10	2	7	5.50	1.16
Q11	1	4	2.09	0.82

Notes: Q9 = active pursuit of digitization, Q10 = lasting impact of DBMS and AR implementations, Q11 = communication of digitization goals

Source: author's calculations

To further investigate the effects of process and organizational innovation on the implementation of digital technologies the Spearman's Rank-Order Correlation was used. For both technologies, the ranked variables of "Performance after Implementation" (Q2 and Q6), "Impact of Process Innovation" (Q3 and Q7), and "Impact of Organizational Innovation" (Q4 and Q8) were used.

The results for the Spearman's Rank-Order Correlation on the AR Remote Maintenance Solution can be seen in Table 6. Organizational innovation was much more important for the successful implementation as process innovation. The data of the Spearman's Rank-Order Correlation supports this statement. The correlation coefficient between Q4 (organizational innovation) and Q2 (performance of AR application after adjustments) was 0.50 and was significant at the 0.01 level (2-tailed). This shows the strong positive influence of organizational innovation methods on the implementation of the AR technology. The analysis also highlighted the relatively low importance of process innovation on the technology implementation. Although the correlation was positive, the correlation coefficient was only 0.11, and was not statistically significant. The most likely explanation for this is the relatively low sample size.

Table 6

Spearman correlation of innovation types on performance of AR app

	Q2	Q3	Q4
Q2	1	0.10	0.50**
Q3		1	0.14
Q4			1

Notes: Q2 = performance after adjustments, Q3 = perceived impact of process innovation. Q4 = perceived impact of organizational innovation. ** correlation is significant at the 0.01 level.

Source: author's calculations

The same analysis was conducted for the second part of the survey, which focuses on the DBMS. The data also supports the findings from the interviews, as displayed in table 7. The correlation coefficient between Q7 (process innovation) and Q6 (performance of DBMS after adjustments) was 0.62 and the correlation coefficient between Q8 (organizational innovation) and Q6 was 0.58. Both were significant at the 0.01 level (2-tailed). This shows, that in case of the DBMS, both process and organizational innovation had a strong positive effect on the performance after implementation.

Table 7

Spearman correlation of innovation types on performance of DBMS

	Q6	Q7	Q8
Q6	1	0.62**	0.58**
Q7		1	0.78**
Q8			1

Notes: Q6 = performance after adjustments, Q7 = perceived impact of process innovation. Q8 = perceived impact of organizational innovation. ** correlation is significant at the 0.01 level.

Source: author's calculations

As a significant focus of this thesis was corporate culture, some additional tests were conducted. Especially interesting were the correlations between age, time with the company and Q10 (perceived lasting impact on both implementations). The correlation coefficient for Age and Q10 was -0.72, being statistically significant at a 0.01 level (2-tailed). The correlation coefficient between TimeWithOrganization (tenure) and Q10 was -0.71, also significant at a 0.01 level (2-tailed). At least for this small sample, this shows that age and time with this specific organization had a strong negative influence on the perceived lasting impact of the two introduced technologies. As discussed in the literature part, culture is something that perpetuates itself over long periods of time, and is especially strong with older people, that have been part of a company for many years. It is therefore not surprising that both variables have a strong negative impact on the perceived impact of changes, as they are less likely to change their work habits.

5.2. Qualitative Analysis

In contrast to the surveys, which focused on capturing the broad sentiments towards the changes and digital transformation in general, the interviews aimed to extract more detailed information from lower and upper management. The surveys were structured similarly to the interviews, addressing both technology implementations independently but also focusing on more specific information, such as problems and solutions with past digitization attempts and the present applications. The data collected via the interviews was especially important to answer RQ2: *Which problems related to the implementation of digital technologies can be alleviated by the deployment of process and organizational innovation?* The interview was conducted with 3 people from the middle and upper management: Interview A with a general

director of the firm, Interview B with the head of the service department and Interview C with a group leader of the service department.

The first couple of questions asked about past implementations of digital technologies in the firm (see Table 8).

Table 8

Interview excerpts regarding past technology implementation attempts

Theme	Respondent	Illustrative excerpt
Past implementations of digital technologies	Interview C	“The most important was WhatsApp.”
Past implementations of digital technologies	Interview A	“(…) a design program (CAD), for example, but that is normal for a manufacturing firm.”
Lacking digital skills can cause problems	Interview A	“The skills or affinity of the staff and the profitability calculation of digital issues.”
Lack of structure can cause problems	Interview B	“The structure (of the company) and the way of working (of the employees).”
Individualistic ways of working	Interview C	“The biggest problem is that everyone works the way they think.”

Source: Compiled by the author

In all three cases, respondents pointed out that nothing major was implemented in the last years, that is not crucial for a manufacturing company, such as CAD-software. One respondent (C) even mentioned WhatsApp, as this is something that is not considered industry standard. This was then followed up by questions regarding difficulties with the implementation of new digital technologies. Two of the interviewees (B, C) pointed at a lack of structure as the biggest problem for new technologies. Due to the absence of strict rules, employees tend to work in their own way, which oftentimes makes transforming the company difficult. Additionally, a lack of digital competences hinders the introduction of digital technologies, as employees are often reluctant to use them. Combined with the problem of standardized processes, this led to inconsistent usage and with this high probability of failure. One top level manager (A) explained that digital change is usually not being addressed by the management, due various reasons. First, there is not assigned budget for digital transformation, which is partly caused by a lack of understanding and perceived necessity. Secondly, it is hard to execute change if employees, such as mechanics and electricians, do not understand the relevancy. Therefore, imposing change does not usually yield positive results, instead, it has to be initiated on a lower level by motivated and affine workers.

Another problem connected do digital change, as highlighted by two interviewees (A, C), is the comprehension of possible benefits. Without the understanding of the actual advantages for each individual worker, employees will not be motivated to even attempt using the new technologies. This is one of the reasons why organizational innovation was rated as very impactful for both implementations, as it encompasses training, presentation, and motivation, which led to increased usage and therefore higher performance. This is further supported by the statement (A, B, C) that there is no responsible person for digital innovation and change in the company. That was changed for the two test technologies, resulting in an immediate performance increase.

The second part of the interviews was dedicated to the experiences with the AR Remote Maintenance Application (see Table 9).

Table 9

Interview excerpts for the AR Application Implementation

Theme	Respondent	Illustrative excerpt
Performance dependant on the user	Interview B	“For some people it works very well and they like to use the app. For others, it’s the opposite, they have less desire.”
Many problems solved, but new ones appeared	Interview C	“(…) the glasses have fixed many of the communication problems (…). But it has also brought new problems.”
Mentality key factor of successful implementation	Interview C	“For the glasses, it’s not so much about the processes, (…) but rather the mentality of the workers.”
Little process changes required	Interview B	“(…) little needs to be changed for this technology, as it is already delivered as a finished product and fits our processes.”
Problems have to be addressed on an emotional level	Interview A	“Probably these problems would have to be tackled on an emotional level.”
Creating incentives	Interview B	“Create incentives. For example, it must be made clearer what advantages these changes offer.”

Source: Compiled by the author

The consensus was, that the technology performed well and was helpful in solving some of the communication problems, that existed for years and were further intensified through the COVID-19 epidemic. Nevertheless, it was also highlighted that there is still a lot of room for improvement, as effectiveness is very employee dependant. Tech-savvy employees use the application rather effectively, while others prefer the traditional way. Especially international

workers, stationed around the globe have found more success than the ones located in Germany, which might be a result of reduced necessity, as national travel has not been a problem.

As already mentioned, the survey data has shown that process innovation was perceived to have a rather weak effect on the introduction of the AR Application. This finding was also supported by the interviews. Two interviewees (A, C) explained that for the AR Application, organizational innovation and changes had much more impact than process innovation. Especially the selection of tech-savvy employees as well as training and motivation were highlighted as crucial factors of enabling the technology. Additionally, creating incentives and showcasing the advantages with explicit examples had a big impact on the employee's willingness and interest.

A major part of the interview also explored the effects of corporate culture on the implementation of new digital technologies. All three interviewees found the company culture to be essential for enabling digital change. As the company is not usually operating with higher technology, many employees are reluctant to change their working habits. Therefore, it was imperative to not force the changes upon those workers but help them understand why they are necessary and essential. One of the most successful ways of doing this, was not to impose this from the top down, but rather identify workers that show an interest towards technology and deploy them as "promoters". With this, employees were able to learn the technology from their peers and understand its advantages on a practical level. Although understanding the factual benefits was important, addressing some of the problems on an emotional level was even more important, as one manager explained (A). As this is very time consuming, it is not always adequately achievable, but if done correctly can really motivate employees to change their working habits.

The third part of the interview mirrored the previous part but focusing on the introduction of the DBMS (see Table 10). As already shown in the survey section, the DBMS had a significantly worse performance prior to the adjustment phase, in comparison to the AR Application. As one interviewee pointed out, this was due to the completeness levels of both solutions. While the AR Application could be considered a turnkey solution, that can deliver many of its benefits from the start (if being used), the database required a higher level of implementation into existing process to enable its full potential. The keyword for all three participants was "structure". A database, simply put, is a structured accumulation of data, which in turn requires its users to work in an equally structured way. Without this organized way of working, the database loses its purpose, and will therefore fail in a short period of time.

This level of information storing had never been necessary before and was therefore a major challenge.

Table 10

Interview excerpts for the DMBS Implementation

Theme	Respondent	Illustrative excerpt
Structure is a key requirement	Interview B	“Structure. (...) If that doesn’t work, you can forget about the database. Then there is discipline.”
Understanding of new ways of working is vital	Interview C	“A big problem was getting the users to understand that certain new steps are now necessary, and that the short path can lead to problems”
Discipline is important	Interview A	“For the database, discipline is very important and building up a certain pressure to so that it is used.”
Internal structures were reorganized	Interview B	“The whole organization has been changed. Who has what tasks and permissions.”
Reordering of processes was necessary	Interview A	“Yes, processes have been adapted. (...) The way the technicians work doesn’t necessarily change, but the way the documentation is done does.”
Organizational changes were necessary	Interview B	“(…) new roles had to be created within the system because different employees have different rights. (...) Without these changes, the database would have added little value.”
Responsible person required	Interview C	“In any case, there needs to be a main person in charge of the system. (...) His role as a promoter is also very crucial.”
Motivation from top level management was very helpful	Interview C	“It was extremely important to show that these changes were wanted and supported from the top management. This gave employees additional motivation to learn the system.”

Source: Compiled by the author

A lack of standardization aggravated this even further as tasks were performed in various ways, depending on the employee. Stricter rules and regulations were a necessary foundation for the DBMS, as well as their realization. It was frequently mentioned by the managers (A, B), that an understanding of the future benefits was vital for the employees. Only with this knowledge did they operate the database accordingly. In addition, many steps of associated processes had to be altered, rearranged, or deleted, especially for inhouse staff which

is responsible for data maintenance. Every task now starts and ends with an entry in the DBMS, which is a major change, as data was usually only stored when problems appeared. A post-processing time was introduced, to ensure that employees have sufficient time.

Organizational innovation also contributed heavily to the successful implementation of the DBMS. The introduction of new roles, both within the software and in the general structure of the department were crucial. Additionally, resources were allocated to support the transition, both in terms of money and time. Although the database was focused on one department, the information stored within was still necessary for many other parts of the company, which required a variety of interfaces. New means of communication were paramount for this overarching usability.

Similarly, to the AR Application, training and motivation were crucial. Motivated employees were supported in their process of learning the technology, which started a chain reaction among the rest. All respondents rated the effects of the company's culture as high as with the AR Application. They emphasized that to successfully introduce the DBMS, the inclusion of all staff members is important and especially in this case, impulses from the upper management helped a lot.

The last part of the interview focused on general ideas that could help future endeavours and make digital transformation more accessible. When asked about potential changes the company could undergo to facilitate digital transformation in the future, a variety of answers were given. On the one hand, the upper management needs to be more aware of potential changes and digital products in general (B, C). Additionally, their benefits need to be better understood, as this is often the reason why their introduction is not being continued or even started (A, B). On the other hand, employees have to be identified, that have a general interest in digitization (A). These need to be supported to start innovating on specific processes or departments, especially when digital innovation is not a key focus of the top management. Communication has been highlighted as one of the most crucial features of digital transformation.

6. Discussion

Digital technologies can have a tremendous impact on many tasks and processes of a business, but simply acquiring them without proper implementation and the willingness to change these additions will not yield expected results (OECD & Eurostat, 2018; Parviainen & Tihinen, 2017; Tabrizi et al., 2019). This paper aims to further explore this idea, emphasising the impact of process and organizational innovation on the implementation of new digital

technologies. Additionally, it focuses on small to medium sized enterprises that have rarely been examined in this context (Vrontis et al., 2021).

The focus of RQ1 was to identify how process and organizational innovation affect the implementation of new digital technologies into a working business environment. The survey data shows that both technologies performed much better after the 3 months adjustment period, where processes and organizational structures were significantly altered. In both cases, the data analysis shows that the perceived performance of the technology was significantly higher after these adjustments than before. Especially for the DBMS technology, the average score increased drastically, from a generally poor score to an overall positive score. Similar findings were expressed by Depietro et al. (1990) and Gillani et al. (2020). Kamble et al. (2018) also highlighted organizational and process changes as some of the biggest barriers of digitalization, but if applied correctly, can really enable a technology. Although both survey and interview data support this, it also became clear, that depending on the technology, process and organizational innovation can have very different impacts. The data analysis has shown that although process and organizational innovation were always positively correlated with the technology's performance, these correlations varied in strength. In case of the AR application, process innovation was much less a factor than organizational innovation – motivating, educating and leading were much more imperative. This is especially important, as organizational innovation is less frequently linked to digitalization as process innovation (e.g. Jin & Cedrola, 2019). For the DBMS the data showed different results. Although organizational innovation again had a strong positive correlation with the performance of the DBMS, process innovation was even stronger correlated. The interview analysis also supports this, as all interviewees have explained that both organizational changes and process changes were required and especially the reordering of existing tasks was inevitable.

By comparing the two technologies, it also became evident that different technologies require different levels of implementation. Current literature addresses digital transformation as a very general idea (e.g. McKinsey, 2015; Ng et al., 2018; OECD & Eurostat, 2018), independent of the technologies at hand. This poses two distinctive problems: firstly, smaller companies do not have the resources or knowledge for a complete transformation and secondly, such a complete transformation might not even be necessary. The analysis of surveys and interviews showed that in contrast to the DBMS, the AR Remote Maintenance Application required significantly less change to perform at a similar level. Additionally, the required change was very specific, which shows that not every technology implementation requires a full company transformation. Regarding RQ1, the data shows that process and organizational

innovation have a positive impact on the implementation of digital technologies, although the level of this impact is dependent on the technology at hand.

RQ2 was aimed at the problems related to digital transformation, and how process and organizational innovation can help alleviate them. Many of the biggest problems with digital transformation described in the academic literature were found to be true in this analysis. The difficulty of measuring success presents a big obstacle to top level management, and is often the reason why digitization projects get abandoned (e.g. Cooper & Kleinschmidt, 1987; McColl-Kennedy & Schneider, 2000). Especially short term benefits are hard to determine, which is a focus point of many managers of small and medium sized companies (Georgetown University, 2018). Although measuring success of a technology implementation and its benefits was seen as a substantial problem for management decisions (Zangiacomini et al., 2017), the even bigger issue was communicating those to other employees. Without the understanding of how the technology is going to affect an employee's day-to-day work, he was very likely to abandon the new implementation or not start in the first place. Organizational innovation can help improve and reshape communication channels, which can lead to higher levels of understanding and acceptance.

One of the most frequently mentioned accelerators of digital change was the identification and support of promoters, which embody the new changes. While literature focuses mostly on managers as role models (Boonstra, 2013), the interviewees explained that these can also come from the work force. Especially in companies where structures are very loose, and the hierarchy is not as strict, these people can have an even bigger impact. Furthermore, the importance of emotions regarding digital change was highlighted, which can be addressed easier from colleagues instead of superiors. Organizational innovation facilitated this process of identifying, enabling, and coaching of potential role models, which then initiated change.

Changes in the organizational structure also increased communication, which is another key foundation of digital change (Cameron & Quinn, 2011; Wilhelm, 1992). If proposed changes are not being communicated and therefore not agreed upon, chances for failure are very high. The interview analysis shows that communication was regarded as one of the biggest reasons for success by all respondents. Ensuring that every employee understands the necessity of the change and its benefits helped tremendously in terms of motivating and convincing people to embrace the change.

This willingness to change is also being impacted strongly by the inherent company culture, which has been a focus of this thesis. Corporate culture greatly influences a firm's

capabilities to undergo digital change (Deloitte, 2019; EY, 2020; McKinsey, 2020b), as all of its features, such as processes, strategies, product and more, are built upon this foundation (Lewis, 2020). This was especially true for the DBMS, as it required a higher level of structure and organization, that had not been necessary up to this point. All interviewees pointed out that the biggest challenge was (and will be) to address these ingrained working habits, in order to build an adequate foundation for the DBMS. Although the Augmented Reality Application was heavily dependent on cultural changes as well, it was less about changing the working habits, but rather about achieving a collective understanding of why this change is necessary and beneficial.

Changing the way how company operates, from tasks and processes to entire departments and business functions, can be successfully addressed by process and organizational innovation but it requires time. Transforming a core parts of a business is not a project with a deadline, but rather a continuous process (Cole, 2001). Constant monitoring is crucial to determine if a company is moving in the desired direction (McKay, 2018; McKinsey, 2003). Consistent reinforcement, monitoring, motivation, and adjustments were highlighted by all interviewees to be instrumental for long term success. This requires a lot of time and consistency, but if not done correctly can quickly lead the attempted change to failure (McKinsey, 2019; OECD & Eurostat, 2018), which will result in even more resources wasted.

Process and organizational innovation can help tremendously to increase the performance of newly implemented digital technologies. By identifying the needs of a digital technology, they can be used to specifically address above mentioned problems to ensure a successful implementation. Not all introductions of digital products require a full revamp of the existing processes and structures, therefore knowing where to allocate resources, might make digital transformation more accessible to smaller and medium sized companies.

7. Conclusion

Introducing change has always been a major issue for companies. Especially the implementation of new digital technologies presents a variety of difficulties, as they generally require the alteration of many existing processes and structures. Current literature has mostly attributed failing digitization projects to a lacking holistic approach. Although this was partially supported by the data of this thesis, it also found that the requirement of a holistic transition is often times the reason digital transformation is not being attempted in the first place. Traditional smaller and medium-sized firms do not have the resources in terms of time, money,

skill, and experience to reshape their entire business. The data also highlights that not all digital technologies need equal amounts of integration and implementation to work efficiently. This is especially important as firms can identify technologies that require less integration, and therefore consume less resources. Nevertheless, properly incorporating these digital solutions is still vital for their success.

7.1. Managerial Implications

Process and organizational innovation can greatly influence the technologies performance, by altering and improving surrounding workflows and structures. Although this is not entirely novel, this thesis has also shown that depending on the technology, both innovation types have varying degrees of impact. Some technologies might benefit more of process related changes, such as new rules, regulations, and task restructuring, while others require organizational transformation, in terms of communication, firm culture or leadership. Knowing which type of innovation is vital for the success of a digital technology, can have a big impact on a manager's approach towards digitizing a company. With this, resources can be allocated more effectively, which is of great importance for companies with limited resources. Instead of focusing on the transformation of the entire business and later-on failing due to a too large project scope, managers of companies with limited resources should focus on small technology integrations that allow a step-by-step transformation. These integrations should be based on already existing resources and skills within the company and build the basis for further digitization. Additionally, identifying the right people to promote and communicate change is necessary for successfully transforming the company. Only when change is accepted and understood by every employee it can have a lasting impact on the firm's business operations.

7.2. Limitations and Future Research

Although the data regarding the effects of process and organizational innovation is very promising, this thesis also had some crucial limitations. First, a very short observation time frame. Attempting to change characteristics that are deeply embedded into the foundations of a firm, especially through organizational innovation, requires a lot of time. The observation period of discussed technology implementations was 3-4 months, in which many improvements were made. But change can take years, therefore the full extent of the results was not visible by the time this thesis was submitted.

Second, the ambiguity of the factors leading to improved performance. Although the data has clearly shown that both technologies performed considerably better after the

application of process and organizational innovation methods, it is difficult to identify the actual cause. It is hard to measure how much impact each of the innovation types had and if other factors, such as training and familiarization, had a significant impact as well. As discussed thoroughly in this paper, measuring success of change can be very difficult and is a fundamental problem of change.

Third, the data collection for this thesis was done in only one company. Therefore, the findings of this thesis can not necessarily be generalized. Furthermore, only two technologies have been tested, which represent only a fraction of available digital solutions. As presented, the differences between those two technologies in terms of implementation were quite substantial, which could be even more significant for other technologies.

Finding a more precise way of measuring success regarding process and organizational innovation could be the basis for future research. Additionally, identifying the required amount of innovation for a specific technology could be of great interest, as the data showed that not all digital technologies require the same amount of implementation to work successfully. This could help companies in their attempts to digitize their processes and structures, as it would highlight technologies that are easier implemented than others. Digital transformation is a process that requires the inclusion of all parts of a business, but this does not mean it has to be done all at once. Doing it step by step, starting with technologies that are easy to implement and work from there, might not be the ideal way, but for many firms the only way forward. Not attempting digital transformation at all is far too dangerous.

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APPENDIX A

Questionnaire of the survey as displayed to the respondent.

APPENDIX B
Interview Transcripts

I = Interviewer, R = Respondent

Interview A

I: Have any attempts been made in the past with regard to digitalisation? 00:23

R: Yes, we have. For example, a database that is linked to our merchandise management system to display the service processes and to record the data from the field service. Purely on the subject of service? 00:51

I: No, it can basically be anything in the company. 00:51

R: Oh, yes, then there was the introduction of a design programme (CAD), for example, but that is normal for a manufacturing company. 01:14

I: Is digitisation a core task at your company, or something that is done on the side when it becomes necessary? 02:02

R: No, it is not a core task. It's mainly done when clients ask for it, or when something new is implemented. Or certain areas grow or have changes. Then we start thinking about new processes or new technologies or digital applications. 02:33

I: Ok, so actually more reactive to customers, and not active from the management level? 02:43

R: Always when changes happen. Then that also comes from within, but only if the employee has an affinity with digitalisation. Not from management, rather from the person responsible for the process. No matter whether it's the data management system, or the CAD software or databases for circuit diagrams. It always happens when there is a change and the process owner is technology-savvy. 03:44

I: What were the biggest hurdles in the introduction of said technologies? 04:00

R: The skills or affinity of the staff and the profitability calculation of digital issues. How much you save when you invest into something to change an area. 04:45

I: It is difficult to work that out? 04:47

R: Exactly, difficult to present and therefore hard to justify if one pushes a change. 04:53

I: How exactly is money an issue? More from the side of traceability or from the general lack of budget for such innovations? 05:13

R: It simply does not appear in the economic planning. And it is not demanded by anyone external (...) connected to our company. If you are an automotive supplier, for example, the customer demands that the personnel file documents which employees include training - this ensures that employees do training and then there is a budget for employee training. But our end customer doesn't care if there are digital technologies in the company that are not absolutely necessary to produce the product. In this respect, no investment is made there. And if the management does not have a budget for digitalisation, little will be implemented if the economic advantages are not comprehensible. (...) 07:35

I: Is corporate culture a problem (for the adoption of digital technologies)? 07:39

R: I don't understand the question exactly. 07:41

I: The way people work in this company. Is it difficult to persuade employees to use a new system when they have been doing their job in a certain way for two decades? Does this culture, which is not used to digital products, prevent the introduction of new digital products? 08:04

R: Certainly. From top management to forklift drivers. It is not necessarily due to age or education. (...) I assume that many employees don't use much digital technology in their private lives either. Some use apps that are helpful and others just don't. 08:28

I: We have just discussed the introduction of digital programmes in the past. Have there been attempts that have failed? 08:42

R: The (old) database for the service. That is, the database that was originally linked to the merchandise management system for the service. It was programmed, introduced and failed. 09:03

I: And why? 09:03

R: Because, (...) it no longer fits the task. (...) it was of no use to the user in the end. (...) The data that was collected was no longer useful afterwards. The project then slowly fell asleep. 09:46

I: We had just touched on this briefly, but is there someone who is in charge of the digitisation of the company? 10:02

R: No, we don't have that. It's really only in the hands of the employees and department heads. Process owners, I would say. 10:19

I: When digital technologies were introduced, were processes and structures changed to adapt the company or department to the technology? 10:44

R: Depends. For example, with our CAD application, with the Vault system for data storage of the CAD models, you definitely had to adapt your work (...). This system is relatively complex and fixed because it is a finished product. You have to work in such a way that it works. Other areas have been freely programmed to fit our processes. For example, invoice verification. So, the processing of invoices, or invoice approval processes. 11:32

I: Is there a main person responsible for the Vault system? 11:38

R: Yes, there is something similar to an administrator for the Vault system who is the process owner. But this person is also a user of the system. This is a normal employee who has

simply started to take care of the system, without any additional training or anything like that.
12:10

I: Ok, thanks. Now we will talk a bit more about the two technologies we have implemented in our 3 to 4 months testing period. Namely, the augmented reality remote maintenance application and the database system for our customer support. Let's start with the augmented reality application. How is the technology performing currently? 13:22

R: We like the technology very much, especially from the management side. And we already use it regularly for foreign assignments. It took a while until the app, (...) could be used both on the glasses and on the mobile phone, but now it works relatively well. It has to be said, however, that this is a very special technology that requires a certain amount of training. Unfortunately, this technology is still very rarely used for domestic orders, as many employees show little interest in it. 14:05

I: I would have gone into problems with the introduction right now anyway. So staff were or are definitely a problem? 14:20

R: Correct. Some employees were immediately interested, and they immediately got involved with the new technology. It was especially important for us to motivate the "power users", as they will be mainly responsible for the new process. For some this worked very well, for others (...) either more slowly or not at all so far. Of course, the managers are also extremely important, as they have to drive the process forward. And of course they also allocate the resources. That's why one of the main goals was to extend these changes only to certain departments to ensure success at least for this department, because you often can't influence other things (departments). That's because these changes were not initiated by the management, but by certain department heads. 15:20

I: What worked well? 15:27

R: It has always worked well when an employee (the person responsible for a particular region/country) has taken an interest in the technology on his or her own and introduced it in his or her department. 15:44

I: Were internal or external processes adapted to the augmented reality app? Were these process changes decisive for the success of the glasses? 16:15

R: This question is difficult to answer, because it worked well in some places and not so well in others. (...) Basically, of course, some changes had to be made. The order of some work steps was completely changed because both the app and the glasses simplify many steps or even make them redundant. Some things were set by the head of department, but many rules were set unofficially by the respective group leaders. Because the software tells you how to work to a certain extent, process applications were less crucial than, for example, staff training. 17:46

I: So was organisational restructuring more important then? 17:54

R: Absolutely. An important step was to make more resources and time available to staff members who take care of the administration of the new system. Accordingly, tasks were shifted to give more time to those responsible. One difficulty was to give these workers more responsibility and time without setting them apart from the rest of the workers. This should be avoided in small family businesses. By keeping this employee in his normal working environment, he can motivate others to use this new technology. A lot of it is about the employees themselves, and less about the management level. 18:36

I: What influence does the company culture have on the introduction of such a high-tech solution? 19:13

R: (...) Yes, the company culture has a big influence. It is important to work out the advantages for each individual. The aim of the glasses was to support employees who have less knowledge of the subject. But the ones who need to be convinced are the older professionals who have been with the company for a long time. And that turns out to be relatively difficult, because the company culture is already more firmly anchored among these employees. To get around this, the advantages for each individual employee would have to be worked out. 20:39

I: How could these cultural problems be solved to make the introduction of the technology easier and more efficient? 20:48

R: Probably these problems would have to be tackled on an emotional level. (...) Because many structures in our company are very loose and many different characters work in the company, you cannot solve this problem in general. (...) You need people with certain psychological traits who can work out how to motivate individual employees for certain things. But you have that everywhere, (...) whenever you have changes, you have to motivate certain employees so that the rest follow along. And in order to motivate these employees, (...) it's usually not facts that motivate you (...) but you have to motivate them emotionally. 22:03

I: Thank you, that was the part for the augmented reality software. Now come similar questions related to the service database. How is the database performing at the moment, and what problems have arisen during the product launch? 22:31

R: (...) So, database versus glasses (augmented reality). For the database, discipline is very important and building up a certain pressure so that it is used. With the glasses, on the other hand, it is more important for me that the individual user sees the advantage. With the database, you can proceed more with the mentality "this must be used now". Of course, the advantage must be visible to each individual, but with the database, discipline is more important. (...) Or in other words, with the database, discipline is more important to get the enable its advantages. 23:36

I: Ok, and where were the problems during the introduction? 23:45

R: In the beginning, there were purely technical problems, as the desired functionality was not given. In addition, determining the "power users" was a problem, because not everyone is able to maintain the database (...) who do not have the affinity for digital work. (...) And also do not have the understanding (...) what the added value is. This understanding of what the digital brings in terms of advantages and what the following steps could be. 24:31

I: Has the planned adaptation of the affected processes been successfully implemented? 24:49

R: Yes, processes have been adapted. Now plants are entered into the system earlier. The start of the history now begins, for example, with the acceptance of the plant at our company, which did not appear anywhere before. There was an acceptance protocol, but that only

ensured that everything was done. Now the recording process starts in "Halle 0", before there was no real starting point. The start used to be at the first problem that came up. The way the technicians work doesn't necessarily change, but the way the documentation is done does. (...) In any case, more things have to be documented now, because many things were not documented before. But the normal workflow remains the same. (...) Wrong, the person who provides the information has hardly experienced any changes, but the employees who need and enter the information have had to change their way of working. Instead of asking different people in the company to get certain information, the database can now be consulted. 27:15

I: Suppose new technologies are introduced in the future, what would you do differently? 27:48

R: Do not start without having already identified the future power users. Because these employees are important to kick-start the project. Without these power users, I would no longer start the project. 28:12

I: Would you consider hiring new staff who have this digital affinity? 28:36

R: Would I allocate a monthly budget to regularly review the company's processes and identify potential areas for improvement? Yes, I would. That doesn't necessarily mean that I have to hire someone, but simply that there is a budget. 29:24

I: Basically, the two processes are working now. Are there plans for other areas, in terms of digitalisation? 30:01

R: Yes, (...) and no. Those who are digitally minded are planning to install a DMS system in the next few years to improve the company's data structure. And those who are not digitally affine have goals that are necessary. But these are mostly reactions to things, for example programmes that no longer work or subscriptions that expire. There are things that need to be addressed and things that can be addressed. The ones that have to be addressed are more present than the ones that can be addressed. But both are necessary. 31:18

I: Is there a particular direction or department in which digitisation is pending? 31:29

R: The DMS system would be related to the whole company. The ERP system needs to be upgraded because it is no longer up to date. Nothing else is planned. 32:15

I: What tips would you give a manager of another medium-sized company to carry out digitisation in his company in a meaningful way? 32:53

R: The tip would be, (...) each department, or processes. (...). Most of the time, departments have goals. These are usually less waste, cost savings, or higher flexibility. Most of the time, these are quality assurance issues or economic issues. I would say that there should be an innovation goal in every department, and this can also be digital. (...) The difference is that these goals, compared to economic goals, are not immediately measurable. Every department should have innovation goals that should be reviewed and pushed forward at certain intervals. 35:03

Interview B

I: Have you already implemented digital technologies in your company in the past? 00:19

R: For the service department? 00:36

I: No generally for the whole company. 00:38

R: (...) Most of the programmes used in the company were introduced before I joined. (...) Microsoft Teams was introduced recently. And one or two smaller programmes, but they do very specific tasks. 01:15

I: What are the basic problems that prevent and hinder the introduction of new, digital technologies? 01:32

R: Definitely the structure (of the company) and the way of working (of the employees). The biggest problem, I think, is that if I use something in a certain way, my colleague will probably use it in a completely different way. For example, the data that is entered into Outlook - there is no structure. It's entered however you want. Or also in our Time-line (enterprise resource planning system). When I search for something or want to know

something (...) I often can't find it, because the terminology can be very different from department to department, or even between employees. Accordingly, I don't know what to look for. (...) There are no fixed rules. Furthermore, there is no one to teach the others the system properly. Basically, the different ways of working and views make it difficult to introduce certain technologies that would need fixed rules. 03:23

I: Is digitisation within the company, and especially in management, a core task, or is it done more on the side, when it is just necessary? 03:41

R: That is definitely done on the side. But what we are doing right now (the two technologies of this thesis) is the first project where we are working towards a goal. I don't think there was anything like that before. 03:57

I: Were there any attempts at digitisation that failed? 04:13

R: (...) In my time here, I am not aware of any of this. 04:40

I: Is there a main person responsible for digitalisation in the company? 04:53

R: No, there is not. In this case (the test technologies of this work) there is someone, but usually not. But this is now very specifically focused on the service department. If at all, it is done by the IT department, but that doesn't work very well because they have little to do with the core business. 05:11

I: Have processes and structures been adapted to the technologies introduced in the past? Or was nothing changed? 05:53

R: I can say little about that. But as far as I know, no. Only very small changes, if any. 06:10

I: All right. That was the first part of the interview. The next part is about the recently introduced technologies, the Augmented Reality Remote Service Application and the database system for the service. First, let's talk about the AR app. How is it performing at the moment? 06:24

R: Basically not bad, but there is definitely still room for improvement. For some people it works very well and they like to use the app. For others, it's the opposite, they simply have less desire. Age can also be a big problem, because it often makes it much harder to use digital products. This applies to both our internal users and external customers. (...) Another problem is the organisation of the glasses. It often happens that parts are bought and then misplaced, so that no one knows where they are. You have to organise it so that everyone knows where to find the glasses. There has to be a functioning system for that, and someone has to take care of that. It is also important to have proper user training, on our side, and standardised training for customers and external staff. Specific to the glasses, of course, the internet connection is also a problem, because unfortunately it is not always sufficient. 07:57

I: What processes have been changed to make efficient use of AR technology, and how?
08:17

R: (...) Can you please explain the question again? 08:38

I: When you introduce new technologies, you often have to change processes, or in general the way things are done. Was that done for this technology? 08:54

R: Yes, of course, for example new roles or positions are needed. As already mentioned, staff members have to be trained for this. At the moment, however, it is not possible to create special positions for this, but the new area of responsibility will be added to existing roles. The resources for new positions are still lacking. In fact, little needs to be changed for this technology, as it is already delivered as a finished product and fits our processes. Nevertheless, time will tell what changes still need to be made. 09:55

I: Does this also apply to organisational changes? 09:48

R: Yes, until now little has been changed here. 09:56

I: Has the company culture strongly influenced the introduction of this technology? 10:05

R: Absolutely. 10:11

I: Can anything be done about it? 10:16

R: Create incentives. For example, it must be made clearer what advantages these changes offer. It needs to be presented in a practical way, not just pretended. Explicit examples must be presented that explain the exact advantages. But for that you need staff who really want to do it. If someone has no interest at all, then even the best persuasion will be useless. Then you probably really have to think about hiring a new employee for this task. 11:11

I: Ok, those were the questions regarding the AR App. Now come some more similar questions for the database. What was important for the introduction of the database? 11:26

R: Structure. That is very important for the database. If that doesn't work, you can forget about the database. (...) Then there is discipline. (...) What happens when the main people responsible for the system are not there, for example when they are on holiday or sick? What happens then? Is it not done at all, or only a little bit? And if so, how is it done? If there is a lack of clarity, this can lead to huge problems and ultimately to the failure of the system. And in general, the structure of the database itself. If it is not practicable (then it doesn't help much). (...) If the new solution makes more work than the old way in many cases, then that is a huge problem. Continuous improvements are very important in any case. 13:00

I: What then is the most decisive criterion for a successful implementation? 13:10

R: It should be made as simple as possible. (...) And the inclusion of everyone involved. Everyone in the team must know what is being done and how. Otherwise there are phases in which processes are carried out differently, and especially for a database, consistency is extremely important. 13:56

I: What processes have been changed to use the database efficiently, and how? 14:18

R: The whole organisation has been changed. Who has what tasks and permissions. Some will only use the system as passive readers. Certain steps had to be added so that the system can show its added value. This was necessary both internally and in the field. (...) Also, many tasks that are no longer needed now fall away, as the digital solution automates many things. These had to be analysed over months and changed or removed if necessary. (...) Passing on

information is particularly important. If someone is not able or willing to use the system, they must at least make sure that the information is passed on to someone who is. 15:07

I: What has been changed organisationally to implement the technology effectively? 15:21

R: On the one hand, new roles had to be created within the system because different employees have different rights. For example, there are groups that can only read, but cannot make entries. On the one hand, this is due to the way of working, but also to the technical affinity. Furthermore, interfaces to other departments were created, both in the system and in the company hierarchy. Without these changes, the database would have added little value, as the knowledge is highly important for several departments. (...) New areas of responsibility were also created within the individual departments, which focus on maintaining the database. 16:02

I: How have cultural issues been resolved in relation to this technology? 16:10

R: It was important to involve everyone. The impulse from upper management was particularly important here. Databases in particular require a high degree of discipline and order, which can and must be demanded by management. 16:36

I: Ok, those were the questions regarding the two technologies introduced. Now a few more general questions. Are there other areas of the company where digitalisation is planned or at least necessary? 16:57

R: Yes, there is still a lot of potential, especially in storing and passing on information. But that doesn't mean that anything is planned in this direction (laughs). (...) The database we have just introduced only stores customer-specific information. But we would also need something similar for internal company data, for example for changes. So that you know when something was done, why and by whom. Until now, this information is often lost because it is not properly archived anywhere. (...) Often things happen in the company that only a small part of the employees know about, but which would also be relevant for many others. (...) Currently there are attempts to solve this without the use of digital technologies, but that doesn't mean that they are not helpful. Especially when information goes back a while, it is often forgotten. Another issue would be monitoring, which we want to introduce

as a new business process. Basically everything that has to do with information archiving and dissemination would need changes. 18:43

I: What would need to change about the company to make future implementations of digital technologies, or indeed other changes, more efficient and possible? 19:19

R: (sighs) (...) Very difficult question. (...) In my opinion, the problem starts at the top. It (digitalisation) is not on the management's radar. It is not even wanted. In general, also in other medium-sized companies in Germany, the main problem is that the benefits are not seen. 19:59

I: So one of the most important things would be to better demonstrate and understand the benefits of these technologies? 20:06

R: Exactly, and also easy to understand yourself. The problem is that for many managers the topic of "digital" is simply not interesting. They didn't grow up with it, like we did. There are simply too many changes in a short time, so they prefer not to start at all. And if I don't understand it myself, I can't pass it on to my employees. And although there are many young people in such companies, they usually don't have sufficient leadership positions to bring about change. 21:17

Interview C

I: Have any digital products been implemented in the past, and if so, which ones? 00:15

R: The most important was WhatsApp (laughs). Simply as a means of direct communication with the customer. Although it is a simple technology, it has helped us a lot. You can send pictures and text quickly, and of course you can make video calls. It has especially helped us because we can easily communicate with our customers even on weekends. Otherwise, of course, there were things like IT-servers and things like that, but that's pretty normal for a company like ours. 01:06

I: Why has digitizing processes and parts of the company so rarely been attempted? 01:23

R: The biggest problem is that everyone works the way they think is right. There are no rules about how you have to behave. When I came to the company, I asked how and where to file certain data. "Oh, do as you think" was the answer. Although I am also of the opinion that there should be certain rules. This would mean that all data would always be stored in the same way and would be easy to find. But that would have to be pushed more strongly by the management side. 02:20

I: Do you think that the way workers in this company work prevents the introduction of new technologies? What influence does the company culture have? 02:41

R: Certainly, it has a big influence. Especially in a company where it's mainly mechanics and electricians, who are generally less likely to work with digital products. If at all then very simple things are done with it, e.g. answering emails. (...) In our company, one of the biggest problems is the knowledge that our employees have. Everyone has acquired it over the years, but nowhere is this knowledge collected. As a result, many processes are not standardized, and everyone performs tasks in a certain way. Of course, this also has an impact on the company culture. (...) I have now made it my task to collect and process this knowledge, because I believe that this is important. Unfortunately, it's a never-ending task, because things change all the time. (...) 04:15

I: Are there technologies or digital products that have been introduced that are no longer used because the introduction was not done properly? 04:33

R: No, not that I know of. The problem with us is that these things are only introduced when there is a fire. But that also means that it is no longer possible without them. That's why these things are used in any case, no matter how good the implementation was. (...) 05:00

I: Is there a main person responsible for digitization in this company? 05:14

R: Everyone does it when they want and feel it's necessary. We are too small to have a real main person in charge. Sure, we have an IT department, but it doesn't really know what we're doing exactly. (...) We have so many problems that digitization itself has low priority. 05:34

I: Have processes and company structures been adapted during product launches in the past so that the technology can be used as efficiently as possible? 06:03

R: In most cases, work has continued in exactly the same way as before. Of course, some things have to be changed when you digitize processes, but these changes tend to be reactive. Real change from the upper management side rarely comes. (...) Changes usually only come when the employees themselves feel like dealing with the issue. The problem with us is that we have very loose rules and don't want to prescribe too much. Because this free way of working also has its advantages. Many of our employees already work more than is specified in their job description, but that is only possible with a very open system. (...) but if you would control and regulate better, you could also have more influence on the result. 07:37

I: Ok, that was the first part of the interview. The next one includes questions about the two technologies we have introduced recently - the Augmented Reality Remote Service Application and the database system for the service. We'll start with the AR app. What worked well in implementing the AR app, and the glasses that go with it, and what didn't? 08:09

R: On the one hand, the glasses have fixed many of the communication problems we've had since Corona. But it has also brought new problems. Often the initial use of the glasses turns out to be a big problem, as they are not too easy to use after all. It's not "plug and play." But basically it (Hololens 2) is much easier to use than others we had tested before. So communication is possible now, but not necessarily always easy. Especially if the person doesn't feel like it. Especially with external employees, of which we have many abroad, this is a problem because we can't necessarily dictate to them how they have to work. As long as the benefits of the glasses (and application) are not understood, it is often difficult to convince employees to use them. 09:21

I: So communication with external employees is a problem. What about within the company? 09:26

R: Many of the processes with customers who are far away are now much faster than before. Especially with our Asian customers, we have been able to work with them much faster than before, because the language barrier is not such a big problem anymore. 10:10

I: Have processes affected by the technology been restructured to ensure the highest possible efficiency? 10:24

R: (...) For the glasses, it's not so much the processes that determine success, but rather the mentality of the workers. The AR software actually dictates the work order very well. 10:53

I: Has anything been changed organizationally then to increase the benefits of the glasses? 11:23

R: Employees were selected who are very tech-savvy, who are now in charge of the glasses. They are also responsible for training others. They now also act as "promoters" so to speak, motivating others to use the glasses. Training and motivation are very important here, otherwise employees would not have switched from WhatsApp to the AR - glasses. It is also important to have pressure from upper management, which has been lacking until now. 12:12

I: Did company culture strongly influence the implementation of glasses? 12:42

R: (...) Yes, definitely. Basically, it was difficult to convince the masses of the benefits of the glasses. Since we don't work much with high-tech products, many of our employees have no desire to use them. Especially the "not seeing" the benefit stops many from trying them out. 13:05

I: What could be done about these problems in connection with the company culture? 13:12

R: The most important thing is a proper presentation with positive examples. You have to show exactly what benefits can come from it. It is also very important to make people understand that the technology is not complicated, but simple. You have to help people with the first overcoming. 13:38

I: That was the part about the AR app. Now here are a few more questions regarding the database. What worked out in the rollout of the database and where did problems arise? 13:55

R: A big problem was getting users to understand that certain new steps are now necessary, and that the short path can lead to problems. Information now has to be stored in a certain way so that it can be found later. This was especially difficult with workers who did not understand the big picture. It must be clear what the goal of this database is, and what steps must be taken to achieve that goal. A certain amount of control has helped us to ensure compliance with the new rules. At certain intervals, once a week, the new entries are checked. Carrot and stick was very effective for the introduction. During these weekly meetings, questions from users could then be answered. 15:04

I: Were processes affected by the technology restructured to ensure the highest possible efficiency? 15:22

R: The most important thing was to restructure all the processes so that all the information gets into the database. Every single process now starts and ends with an entry in the database. This was very important, because if there are exceptions, the database loses its meaning. Accordingly, new work rules were introduced to ensure that. 15:50

I: Now these are all changes for the people who work in the office. Were there also changes for the field workers? 16:09

R: A so-called post-processing time was introduced, which the technicians can and must use to properly enter the data. Again, it was important to make people aware of why data maintenance is so important. Before these changes were put in place, there were huge discrepancies between the data quality of field and inside staff. 16:54

I: Has anything been changed organizationally then to increase the usefulness of the glasses? 16:59

R: In any case, there needs to be a main person in charge of the system. This person is not necessarily higher in the hierarchy but is responsible for the database. His role as promoter is also very crucial. (...) It was particularly important that he accompanied the workers for the first few months, so that everyone knew what to do. Without this support, many would have quickly lost motivation. It was extremely important to show that these changes were wanted

and supported from the top management. This gave employees additional motivation to learn the system. 17:59

I: That's all the questions about the database. Now a few more general questions. Now that these two new systems are working, are there any other changes coming in the near future?
18:22

R: (...) One main problem that is currently being solved with WhatsApp is communication with customers. WhatsApp definitely has its advantages, as it is very easy and quick to use. At the same time, there is no central point of contact. Everyone uses this communication channel as they want. As a result, there are no fixed rules and hardly any traceability. Customers are helped with their problems, but the knowledge that is created is not stored anywhere. 19:20

I: What changes need to be undergone to further facilitate digital change in the company?
19:45

R: The most important thing is that the added value of such changes can be seen immediately. If this added value is not visible, most change attempts will fail immediately. At the same time, employees must be motivated to initiate such changes, since they are often not planned by upper management. Support is also very important, as changes are quickly abandoned if they turn out to be too complicated. 20:46

Resümee

Digitaalne transformatsioon – protsessi- ja organisatsioonilise innovatsiooni mõju digitaalsete tehnoloogiate rakendamisele

Dennis Hartmann

Muudatuste tegemine on alati ettevõtete jaoks suur probleem olnud. Sealhulgas just uute digitehnoloogiate rakendamine toob kaasa mitmesuguseid raskusi, kuna need nõuavad paljude olemasolevate protsesside ja struktuuride muutmist. Praeguses kirjanduses seostatakse ebaõnnestunud digiteerimisprojekte enamasti tervikliku lähenemisviisi puudumisega. Selle lõputöö andmed toetasid osaliselt seda leidu, aga teisalt ka seda, et tervikliku lähenemise nõue on sageli põhjus, miks digitaalset muutust ette ei võeta. Traditsioonilistel väiksematel ja keskmise suurusega ettevõtetel pole piisavalt aega, raha, oskusi ega kogemusi, et kogu oma ettevõtet ümber kujundada. Andmed rõhutavad ka seda, et kõik digitaaltehnoogiad ei vaja tõhusaks toimimiseks sama palju integreerimist ja rakendamist. See on eriti oluline, kuna juhid suudavad tuvastada vähem integreerimist nõudvaid tehnoloogiaid, säästes seejuures ressursse. Sellegipoolest on nende digitaalsete lahenduste korrektne liidestamine edukuse jaoks endiselt ülioluline. Protsessi- ja organisatsiooni innovatsiooni rakendamine võib oluliselt mõjutada tehnoloogiate toimimist, kuna see võib muuta ja parandada ümbritsevaid töövooge ja struktuure. Kuigi see pole täiesti uudne idee, on see lõputöö näidanud ka seda, et sõltuvalt tehnoloogiast on mõlemal innovatsioonitüübil erineva ulatusega mõju. Mõni tehnoloogia võib rohkem kasu saada protsessidega seotud muudatustest, nagu uued reeglid, regulatsioonid ja ülesannete ümberkorraldamine. Teised vajavad aga organisatsioonilist transformatsiooni suhtlemise, firma kultuuri või juhtimise osas. Teadmine, millist tüüpi innovatsioon tagab digitaalse tehnoloogia edukuse, võib suuresti mõjutada juhi lähenemisviisi ettevõtte digiteerimisele. Selle abil saab ressursse tõhusamalt kasutada, mis on just piiratud ressurssidega ettevõtete jaoks ülimalt oluline.

Digitaalne transformatsioon on üle-ettevõteline muutus, mille eesmärk on ümber kujundada kõiki ettevõtte osi. Kuigi see on ideaalsuse näide, takistab selle keerukus paljudel ettevõtetel seda isegi proovida. See lõputöö on näidanud, et digitaalset muutust saab rakendada samm-sammult, ning ka seda, et kõik digitehnoloogiad ei vaja sama palju ressursse teostamiseks. Meetodeid nagu protsessi- ja organisatsiooni innovatsioon saab kasutada mainitud lahenduste toetamiseks, kuid sõltuvalt tehnoloogiast võivad need väga erinevalt mõjuda. Seetõttu peaksid piiratud ressurssidega ettevõtted tuvastama oma konkreetset vajadused, et leida tehnoloogiad,

mis vajavad minimaalset integreerimist, lähtudes firma olemasolevast võimekusest. Digitaalse uuendamise aeglane teostamine on parem kui üldse mitte proovimine.

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