Strategic change through digital transformation -An investigation of a European manufacturing company

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Author's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas.

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Table of Contents

LIST OF FIGURES AND TABLES

ABSTR	АСТ	1
СНАРТ	ER ONE: INTRODUCTION TO THE STUDY	2
1.1	Research background	2
1.1.1	General background	2
1.1.2	Definition of context and scope of the study	8
1.2	Focus of the study	15
1.3	Research issue	20
1.3.1	The current state of research and identified gaps	20
1.3.2	Research questions and objectives	21
1.3.3	Outline of chapters	22
СНАРТ	ER TWO: DEFINITION AND LITERATURE REVIEW OF CONCEPTS USED	24
2.1	Positioning the study within the field of management	24
2.2	General change management literature	33
2.3	More specific digital transformation literature and definitions	39
2.3.1	Digital technologies	39
2.3.2	Digital transformation	40
2.3.3	Digitization	45
2.3.4	Digitalization	47
2.3.5	Link between digitization, digitalization and digital transformation	48
2.4	Definition and characteristics of digital business and transformation strategy	49
2.4.1	Digital business strategy	50
2.4.2	Digital transformation strategy	52
2.5	Barriers/Drivers/Success Factors of digital transformation	55
2.5.1	Drivers of digital transformation	57
2.5.2	Barriers towards digital transformation	60
2.5.3	Success factors for digital transformation	67
2.6	Literature on potential common themes	82
2.6.1	Technology acceptance models (TAMs)	82
2.6.2	The impact of COVID-19	83
2.7	Description of the research gap and conceptual framework for qualitative analysis	85

CHAPTER THREE: METHODOLOGY		94
3.1	Perspectives chosen from the philosophy of science standpoint	94
3.1.1	General considerations	94
3.1.2	Constructivist perspective in detail	103
3.1.3	Epistemology of constructivism	104
3.1.4	Discussion of potential methods that can be used in accordance with constructivism	105
3.1.5	Implications of the constructivist perspective on this research	106
3.1.6	Addressing researcher's bias /challenges of the qualitative approach	108
3.2	Qualitative research methodology	109
3.2.1	Definition of qualitative research	110
3.2.2	Potential designs to be used	112
3.3	Detailed discussion of the case study design in general and specific	116
3.3.1	Types of case studies	116
3.3.2	Methods of data collection	121
3.3.3	Interview	122
3.3.4	Participant selection	125
3.3.5	Defining an applied analytic strategy and techniques used	128
5.5.0	Data analysis and presentation using thematic analysis	129
3.4	Influences on the research by the researcher's experience	133
3.5	Ethical considerations	134
СНАРТ	ER FOUR: DATA COLLECTION AND FINDINGS	137
4.1	Introduction to company and context	137
4.2	Methods of data collection used in practice	139
4.2.1	Sampling of interview partners and projects	139
4.2.2	Hierarchy and broad job level/description and characteristics of interviewees	140
4.2.3	How general interview concerns were addressed	140
4.2.4	Conduct of interviews & interview guide	142
4.3	Methods of analysis used in practice	147
4.3.1	Description of analysis approach	147
4.3.2	Description of software used (NVivo)	148
4.3.3	Description of particular approach to coding in NVivo – Thematic analysis	148
4.3.4	Approach to cross-case analysis	150
4.3.5	Final comprehensive framework for analysis	150
СНАРТ	ER FIVE: DISCUSSION OF RESULTS	153
5.1	Project 1 – ANDON Boards	154
5.1.1	Project description	154
5.1.2	Interview results	156
5.2	Project 2 – Automated Microscope	163
5.2.1	Project description	163
5.2.2	Interview results	164

5.3	Project 3 – Artificial Intelligence Project	167
5.3.1	Project description	167
5.3.2	Interview results	168
5.4	Project 4 – Logistics and transport tracking system of samples	175
5.4.1	Project description	175
5.4.2	Interview results	176
5.5	Project 5 – Laboratory-specific SAP-like system	180
5.5.1	Project description	180
5.5.2	Interview results	182
5.6	General results	191
5.6.1	Drivers	191
5.6.2	Missing skills barrier	194
5.6.3	Technical barriers	195
5.6.4	Individual barriers	196
5.6.5	Organizational/cultural barriers	198
5.6.6	Customer-related barriers	205
5.6.7	General success factors	205
5.6.8	Common themes	206
5.7	Differences in perception	211
5.8	Additional insights relating to the COVID-19 pandemic	213
СНАРТ	ER SIX: CONCLUSION	217
6.1	Contributions to knowledge	217
6.1.1	Summary of methodology	217
6.1.2	Summary of results	218
6.1.3	Summary of research questions	232
6.1.4	Theoretical contributions	235
6.2	Generalizeability of results and limitations of research	240
6.3	Directions for future research	244
6.4	Implications for practice and managerial recommendations	245
6.5	Critical reflections on the study journey	246
BIBLIO	GRAPHY	249

List of Figures and Tables

Figure 1. Overview of the study.	19
Figure 2. Theoretical Streams of Management Literature. Reproduced from Guerras-Martín et al. (2014)	26
Figure 3. Hierarchy and relationship between resources, an organization's capabilities, and dynamic	
capabilities. Reproduced from Wójcik (2015)	30
Figure 4. Typology of digital transformation perspectives. Reproduced from Hanelt et al. (2021)	44
Figure 5. Summary of study results	224
Table 1. Overview of relations between barriers and success factors.	78

Table 2. Comparison of Constructionism and Strong Constructionism - General Factors	97
Table 3. Comparison of Constructionism and Strong Constructionism - Validity, Reliability, Generalizability	99
Table 4. Comparison between social constructivism and realism	105
Table 5. Overview of analyzed projects	154

Abstract

Recent studies, both in research and practice, have shown that moving an organization into the digital age by the means of digital transformation has become increasingly important in recent years for establishing and maintaining a competitive advantage. However, on the one hand there is limited research on factors that may contribute to the initiation, blocking or success of such a digital transformation. On the other hand, research so far has mainly considered the perspective of managers or higher-level employees for determining the factors that are crucial for the success or failure of such a transformation. Therefore, this study is focused on digitalization projects, set within the general digital transformation effort of a company. The projects are assessed for factors influencing a digital transformation. Additionally, the perceptions of employees on different hierarchical levels are observed.

This study yields multiple results. Firstly, existing categorizations of drivers, barriers, and success factors are largely validated. To these existing categorizations, more granularity is added by adding differentiating factors. Additionally, it shows that perceptions between employees and managers differ insofar as each group ties their perceptions to the immediate sphere that they may be able to influence. Furthermore, it is shown that overarching common themes are present, which can be defined as underlying factors influencing digital transformation, that may then be tied to existing research in other broad topic areas independent from digital transformation.

Limitations include the limited sample of one company, and the qualitative research approach, that is focused on data collected in semi-structured interviews and analysed by the means of a thematic analysis, which was not aimed at formulating generalized theories.

Chapter One: Introduction to the study

In recent years, it has become increasingly important for organizations to adopt digital technologies in order to stay competitive, according to both insights from research and practice. However, there is limited research on factors that may contribute to the initiation, blocking or success of a digital transformation. This study seeks to extend existing research by using a social constructivist approach to further understand the factors and the perceptions of those factors that are influencing digital transformations, and the conditions for the success of digital transformations.

The initial chapter gives an introduction to the research background of the study, starting with a general outline of the background and definition of the scope and context of the study. Then the focus of this study is defined, and the overall research issue highlighted. This section builds on the current state of research and research gaps that were identified. Finally, a brief discussion of the structure of the study is given.

1.1 Research background

1.1.1 General background

"Why do some companies survive while others fail?" and "Why are some companies more successful than others?" are two questions that have puzzled researchers in the field of management for the past decades and served as guiding questions for numerous research studies (Ghemawat, 2002). While many approaches to respond to these questions have been offered, ranging from profitability differences between industries, to differences in the microorganizational structure of firms, no single one has been found to be the "best" one that explains the most variation in outcomes.

The goal of this study was also not to find the "best" approach or factor to explain the most variance in profitability between firms. Rather it was decided in this study to focus on one of many factors that may be influencing differencing survival and profitability. The aim was to provide deep insights into a factor that is currently highly relevant both in practice and academic research – namely "digital transformation". To introduce it briefly, it speaks to the fact that in response to the development and spread of new digital technologies, such as new software or artificial intelligence, many companies need to change and adapt their whole

business models and organizational processes and structures to the new digital reality to meet internal and external demands. Digital transformation is defined, in the context of this work, as "[...] the profound and accelerating transformation of business activities, processes, competencies, and models to fully leverage the changes and opportunities brought by digital technologies and their impact across society in a strategic and prioritized way" (Demirkan et al., 2016). Having conducted a preliminary literature review, it became apparent that many different aspects of digital transformation are still not fully understood or researched in depth yet (Vogelsang et al., 2019). Therefore, this specific topic area presented itself as a fruitful ground for further study.

In the following, the topic of digital transformation will be introduced in more detail, its relevance highlighted, and the scope of this study clearly delineated. Starting from their initial development in the mid-twentieth century, digital technologies have now become commonplace and ever-present in our daily lives. Digital technologies can be understood as "[...] [referring to] a wide range of technologies, tools, services and applications using various types of hardware and software" (Tulinayo et al., 2018, p. 1). Merely considering more well-known phenomena or tools that are tied to digital technologies, such as social networks, e-commerce, or smartphone applications, should lead to the realization of how widespread and important digital technologies have become in society on an individual and collective level.

On an organizational level, benefits of introducing digital technologies may include "[...] increases in sales or productivity, innovation and value creation as well as novel forms of interaction with customers [...]" (Matt et al., 2015, p. 1). While some applications, uses, benefits and drawbacks of digital technologies have been fairly obvious, there have been also more hidden impacts: For example, one is relating to another trend that was observed in society in recent years, namely that there has been a general growth in complexity (Mocker et al., 2014, Nowotny, 2016). This development has been challenging for a diverse set of actors, for whom uncertainty increases (Nowotny, 2016). Digital technologies may help to tackle this complexity, in that they enable for example company actors to bridge "[...] creating value from complexity and benefiting from the efficiencies of simplicity," and thereby outperforming their competitors on profitability (Mocker et al., 2014, p. 73). So, there have been indications not only in practice but also based on scientific research that digital

technologies carry benefits for organizational actors, in that they help adapting to novel trends and creating a sustainable competitive advantage. Such technologies may on the one hand help companies to survive in their competitive environment, but on the other hand, also enable companies to outperform their competitors.

This example from research illustrates that with the fast rise and spread of digital technologies over the past years, also companies have had to follow quickly, to meet customer demands and stay competitive in their respective markets. The process of identifying and implementing these technologies in a sensible and targeted way has warranted however a more concerted and strategic effort, which has led to the concept of digital transformation, that will be discussed in the following.

In recent years, the topic of digital transformation has gained more and more attention in practice, as well as in management research. Fitzgerald et al. (2013) found in a survey in 2013 that 78% of respondents assumed that digital transformation would become critical to their organizations in the next two years. Appio et al. (2021) found that a significant portion of all technology spending of firms is invested into digital transformation initiatives. Also digital transformation was seen as one of the main concerns of senior executives facing their businesses in a survey conducted in 2019, but at the same time it was stated, that in a majority of cases, digital transformation initiatives did not reach their defined goals (Tabrizi et al., 2019). These initiatives were often implemented based on digital transformation strategies, that "[...] seek to coordinate and prioritize the many independent threads of digital transformation" (Matt et al., 2015, p. 1). According to a study done by McKinsey, approximately 70% of all digital transformations failed (Bucy et al., 2021). To understand the reasons behind those failures, Davenport & Westerman (2018) collected case-study based evidence from high-profile companies, such as GE, Lego and Burberry, in which digital transformation efforts had been aborted. What Davenport & Westerman (2018) found was that digital technologies are not simply something that one can plug into an organization and expect to work. Rather, for digital technologies to work successfully, there are multiple additional changes in the ways of doing business required.

Given these findings, it has become even more important to understand in more detail why digital transformations fail, and what can be done to raise the success rate of digital transformation initiatives. In general, research in this area has been still sparse as Hanelt et al. (2021) found in their review, as are connections between digital transformation and other fields of interest such as innovation management, as was discussed by Appio et al. (2021). This study aims to close these gaps and gain a better understanding of why digital transformations succeed or fail, providing insights that are interesting both in a research and practical context.

There are two relations involving digital transformation that are underlying this study.

The first relation relates to factors that are influencing whether a digital transformation gets initiated in the first place, and whether such a digital transformation turns out to be successful. More details on the definition of a successful digital transformation will be given later in this section.

The second relation is then that of digital transformation itself influencing different organizational aspects. For example, it has been assumed that on the one hand, digital transformation directly and positively influences firm performance. This could be for example due to the mechanism or fact that firms are able to improve the offering to their customers by greater customization, enabled through digital technologies (Mithas et al., 2005), which in turn lead to an increase in sales, and further, firm performance. On the other hand, there has been some evidence that digital transformation also indirectly influenced it through leading to more innovation, that may in turn also had a positive impact on firm performance, as Nwankpa and Roumani (2016) stated. Also, based on the notion that the degree of technology adoption may have affected individual employee-level job-related outcomes as found by Venkatesh et al. (2003), such as productivity or job satisfaction, an analogy may be drawn: digital transformation as a whole may have similarly influenced such employee-level outcomes, which then, aggregated to the company level, may have influenced overall firm performance. What became clear from all these mechanisms is that digital transformation has seemed to have helped to explain differences in profitability between firms, but also in survival of firms, since those two are closely related, as was established e.g. by Pearce (1997). The second relation is connected to the so-called "Technology Impact" view of digital transformation studies, as defined by Hanelt et al. (2021), which focused on the impact of specific digital technologies on parts of the organization. This perspective took a more granular look than at impacts of an entire digital transformation on the entire company. Rather, digital technologies were the focus, that may be elements of a digital transformation and parts of the organization are naturally a part of the whole. The perspective aimed to respond to the practical insight of "How are particular parts of firms affected by digital technologies?" (Hanelt et al., 2021). "Affected" was however a fairly broad term used, that included different aspects that could be analysed, going beyond organizational performance. One would need to narrow down the scope regarding this term to be able to arrive at meaningful insights both for science and practice, which will be done in one of the next sections.

However, in this study the main focus was put on the first relation, where the success or failure of a digital transformation served as the outcome variable. At the same time, it also served as the independent variable in the second relation, connecting digital transformation success or failure to organizational outcomes. In the following it will be described how this focus was defined. In short, it was chosen as it connects closely to the overall research mission of this study, namely contributing to explaining variation in profitability between firms through different digital transformation outcomes, while also being reflected in the data to which access was gained.

How the focus on the outcome variable of the first relation, namely "success" and "failure" of a digital transformation was determined, will be explained in more detail in the following. One could rely on asking how digital transformation most directly and closely affected the organizational goals, to determine the main areas and approaches of interest. Choosing the main organizational goals of interest, the most existential organizational goal is survival. Closely related to this goal is another important goal, namely, organizational performance, which was established in a study by Pearce (1997). Performance was understood in different ways: financially, as well as non-financially or even subjectively (Murphy et al., 1996). While financial performance might be measured in a standardized way, based on some commonly accepted KPIs, such as EBIT, non-financial performance, or success, such as employee satisfaction or employee skills, or such as innovative capabilities – for an overview see a paper by Chow and Van der Stede (2006) - was then more difficult to measure, and to compare among different firms, since often no standardized measures existed. What holds true for both types of performance, was that their interpretation may have been influenced by cognitive processes, that explain how different conclusions are drawn based on the same information. Schumacher et al. (2020) for example demonstrated that this notion also holds true for the interpretation of financial performance, which was shown to be influenced by the level of CEO overconfidence. When already having been shown to apply to financial performance, such a mechanism might even more apply to non-financial measures of firm performance.

While overall firm performance may be an interesting component to shed light on, and one that scholars in the field of management are often preoccupied with, there are drawbacks involved in relying on it. While Vogelsang et al. (2019) mentioned that more general approaches to achieve such a measurement in the context of digital transformation are still missing, a first approach was presented by Chen et al. (2016). However, this approach is very limited by focusing on implementing a web portal and therefore doesn't provide a generally applicable approach. Additionally, in general there are potentially numerous confounders that could be influencing this fairly high-level relation, and therefore taking away from the validity of the causal relationship that is aimed to be established. The larger the scope, the higher the chance that the mechanism of interest is influenced by unobserved confounders.

This is why this study then took a more micro-level focus on the measurement of success, namely that it focused on the success of projects that are introducing novel digital technologies. How this focus was derived, will be outlined in the next section. As a non-financial measurement of performance, it may be difficult to measure in easily quantifiable terms, in that no standardized measure exists. Additionally, linked to cognitive processes being at play, stakeholders may have different perceptions of the success of a project. What might seem to be a disadvantage or difficulty at first, has been turned in fact into one of the core goals and areas where value can be added in this study, based on prior research and the derived research gaps, that are presented in a later section. Also, the methodology that is used is based on the proposition that it may be insightful to add the perspective of employees

and different stakeholders to complement existing research on the topic of digital transformation.

In this section, a general background for the research study was given, and it was outlined how the relevant overall outcome variable of interest, namely "success/failure of a digital transformation" was derived. The focus of this study, in more detail, however, was put on the success/failure of a digital transformation as an outcome variable, since a successful digital transformation is hypothesized to lead to an increase in firm performance and positively affects firm survival, while a failed transformation will negatively affect it.

1.1.2 Definition of context and scope of the study

Now that the broad topic area of digital transformation and the relevant outcome variables were lined out, the context and scope of the study will be defined in more detail. The earlier definition of digital transformation already hinted at a fairly broad understanding, encompassing multiple observed phenomena and factors, therefore offering a wide array of potential directions that could have been taken in a research project.

What was important to consider here, was that digital transformation was not a single endeavour but rather a "multi-faceted journey", that has a different meaning for different parts of the organization (Furr et al., 2022). This idea was presented by Davenport & Westerman (2018) as well. To briefly introduce the framework by Furr et al. (2022), that also this study is building on: the framework contains four pillars, or areas of digital transformation, which entail different benefits, but also require different capabilities and different stages of digital maturity in the organization. In this study, the pillar "Digitizing operations" was the main focus. Digital transformation with respect to the focal pillar entails the optimizing of existing business and is aimed at achieving the benefits of cost reduction, efficiency, and optimization for the organization. This pillar is in general targeted by projects at earlier stages of the digital transformation journey of the whole organization, and focuses mainly on processes, in that existing processes are optimized, simplified and rationalized (Furr et al., 2022). To reach a scope that is manageable within the resource and time constraints of this research study, it was decided to adopt a narrower focus on particular aspects of digital transformation and its impacts. All this while operating in the pillar of "digitizing operations" as defined by Furr et al. (2022). So how was the particular focus then selected and the scope defined? The framework defined by Hanelt et al. (2021), that will be discussed in more detail in the following sections can guide the process of narrowing down, but will be complemented by further considerations of the author.

The first decision that was to be taken is whether to focus on a narrow or broad contextual scope, following Hanelt et al. (2021). When examining the impact that digital transformation has, multiple different scopes were available: a broad contextual scope, which may be an institutional system, like a country – or an entire ecosystem of companies, including the environment they are operating in and the related stakeholders in society. A similar categorization was also introduced by Appio et al. (2021), who considered it the "macrolevel", that seeks to understand competitive dynamics and relationships among the actors in the ecosystem. Alternatively, one could have chosen to include a narrower contextual scope, insofar as one could focus on a singular actor, such as an organization or an individual and their behaviour. Appio et al. (2021) considered this the "micro-level", where the focus lies on understanding how micro-foundations of digital transformation impact the behaviour of individuals and teams. This behaviour then may, in a further step, contribute to a successful or failed digital transformation. This "micro" level was also taken up by Trenerry et al. (2021) who further split it into an individual level and a group level. Between the "macro" and the "micro" level, Appio et al. (2021) defined the "meso" level on which the focus lies on understanding how macro-level changes impact "[...] firm-level capabilities, processes, routines, and business models" (p. 1), that could again contribute to the success or failure of a digital transformation. On this level, a mechanism might be that the "attitude" of a firm or its organizational adaptability leads to a successful digital transformation, that then influences one of many possible dependent variables of interest, such as firm performance and positioning (Appio et al., 2021).

For this study, a narrow contextual scope, in the form of a singular actor, namely an organization was chosen. An organization may be defined, following Puranam et al. (2014), as "[...] 1) a multi-agent system with 2) identifiable boundaries and 3) system level goals (purpose) towards which 4) the constituent agent's efforts are expected to make a contribution" (p. 4). While this term envelops also non-profit organizations or other forms of collaboration, in the context of this study, the focus lies on for-profit organizations. In particular a production and service company with over 2500 employees that is undergoing various processes of digital transformation was chosen as the environment in which this study is conducted.

The next decision was then whether to focus on digital transformation on the corporate, company-wide level, potentially giving the study a more strategic flavour, or the department level, leading to a more operational flavour. In terms of the definition by Appio et al. (2021) the decision can be rephrased to state whether the research should take place on the "meso" or the "micro" level. On a corporate level, one could potentially analyse a company's digital (transformation) strategy and its impact on digital transformation success, following the definition by Matt et al. (2015), or take a view that is focused on company-level processes. However, due to the resource restrictions of this study, in collaboration with the company, a department-level approach was deemed as more easily feasible, while also deemed to carry the potential to lead to new and interesting insights. In particular, the quality assurance department of the examined company was chosen as the focal department, since research access could be obtained and the requirements for this research study were fulfilled. Additionally, persons on upper hierarchy levels associated with this department were also taken into the scope of this project, even though they were not formally a part of it. The main source of data were interviews on the topic of several digitalization projects that are discussed and analysed in detail over the course of this study. These projects are or were aimed at the optimization of processes, which again speaks to the pillar of "digitizing operations", as per Furr et al. (2022), in which this project may be placed.

Following this focus on a particular department, the "micro" level approach following Appio et al. (2021) was chosen as the approach underlying this study. The chosen department had conducted several digitalization projects, is collaborating, and linked closely to other parts of

10

the organizations, both in hierarchical as well as functional terms, and carries out an important role, namely that of quality assurance. Additionally, the composition of the workforce in this department is fairly diverse, leading to potentially a variety of different perceptions and opinions. Within the "micro" level, both group-level as well as individual-level observations, following the classification by Trenerry et al. (2021) were considered.

Now that the scope for the study had been defined, the next step was to define what particular aspects of digital transformation were to be assessed in this study. Conducting research on the department-wide rather than the company-wide level would lead by design to a weaker focus on strategic or organizational design aspects. Rather the focus was more operational, with more attention lying on the implementation of digital technologies and their relation to the behaviour of individuals or groups in the company, that then may contribute to a successful digital transformation on a broader level. This relation might have been either that the behaviour of individuals or groups or in general, factors on this level, influence the initiation and implementation of digital technology projects, and their implementation progress and success.

While the focus was now defined to be operational and micro-level, implications for company-wide factors or the company-level digital (transformation) strategy might still be drawn, based on findings on the lower level. So in the words of the categorization introduced by Appio et al. (2021) - while the study was set mainly on the "micro" level, implications might be drawn for the "meso" level as well. How exactly these levels are related and influencing each other was however not clear from the paper by Appio et al. (2021). In more abstract terms, the relevant question is one of aggregation, namely how factors on the "micro" level could be aggregated to the "meso" level. Or more specifically, how an impact on the "micro" level might also trigger an impact on the "meso" level, therefore creating a multi-layer perspective of digital transformation. Since this question has, to the best of my knowledge, not been addressed extensively in literature yet, this study might provide some interesting insights, leads and hints on how these levels may be connected.

Since it was however decided to mainly follow the "micro" level approach, several digitalisation projects that were conducted over a period of approximately 10 years were analysed in more detail. By using a qualitative approach, grounded in a social constructivist perspective (Crotty, 1998), it was possible to get an in-depth understanding of already adopted projects, and challenges encountered in them, comprising the perception of their success or failure. The essence of social constructivism is to investigate and understand behavioural characteristics through providing meaning to individual's experiences and subjective realities (Easterby-Smith et al., 2015). This paradigm enables the exploration of personal perception of digital transformation in general, particular projects and the perceived impact on the organization. It was the intention of the study to concentrate on experiential knowledge of the employees and management by focusing on the social influences, meanings, and behaviour of the individual as to digitalization (Stake, 2005). In particular, the methodology of a case study, following the definition of Creswell (2013) and Yin (2018) was chosen. More specifically, a single embedded case study was selected as the methodology of choice, following the definition by Yin (2018). For this case study, 17 interviews were conducted in the focal company. The company is a World-market leader in some of the segments that it is operating in and is producing industrial goods.

While project success of particular projects that are introducing novel technologies was chosen as a focal point, drilling down even further into the determinants and drivers of it was deemed to yield additional meaningful insights. In particular, it was analysed in the study what factors lead to (1) the initiation of such projects and fuel them – so-called "drivers" of digital transformation following the definition by Liere-Netheler et al. (2018). This carries important practical implications, in that understanding and catering to these factors might help to successfully initiate more digital transformation projects and fuel them, so as to increase the success rate. As a second step, (2) so-called barriers and success factors to digital transformation were analysed, as defined by Vogelsang et al. (2019). A more detailed discussion on the nature and characteristics of the drivers, barriers and success factors will follow in a later section.

Again, understanding these factors and catering to them may help to achieve a higher success rate of digitalization projects and digital transformation initiatives. Thirdly (3), these factors were analysed for relations and linkages among each other, as well as identifying common

themes that might be underlying them. The fairly broad term of "common themes" was used on purpose, since it comprises abstract concepts, discussions and streams of literature that are implicitly underlying success factors and barriers in projects. They for example might relate to trade-offs that are connecting different barriers. To give a specific example: employee empowerment and involvement may fuel a digital transformation, however at the same time also top management might be required to lead to its success. To what extent what aspect is required for a digital transformation to be successful might then be a question that was discussed as a "common theme". Lastly, (4) the identified common themes were described and discussed in more detail, to understand how they may be characterised. Based on that discussion, it was attempted to formulate implications that then also help managerial practice when conducting digital transformations. Again, also when discussing these common themes, this study drew on the methodology outlined earlier, namely a social constructivist perspective, that takes into account the perspectives of different stakeholders that are involved. The identified features, both relating to particular drivers, barriers and success factors, as well as the common themes, were then discussed in the context of their effect on the team, the project, the departmental and organizational level.

Therefore, on a "micro"-level, following the categorization by Appio et al. (2021), this study contributed to answering questions of what barriers and success factors of digital transformation were present, that were particularly relevant at the department or team level, speaking to the aforementioned points (1)-(3). Furthermore, insights were gathered on how organizations could empower their employees to join in digital transformation efforts, or to what extent such an empowerment was even required for a successful digital transformation or implementation of new technologies, which speaks to the concept of common themes, so points (3)-(4). Lastly, the insights may help to devise different strategies of managing employees during the implementation of digital technologies, based on the type of technology or innovation that has been introduced. Appio et al. (2021) distinguished for example between radical/incremental innovation, and product/service innovation. Another distinction could be made based on the type of digitalization project, for example based on whether one or more departments were involved. Again, these insights might be categorized as relating to common themes. This strategic aspect could then be extended even further, so that it would lead to contributions on the "meso" level.

13

Even though the main focus of this study was put on a "micro" level, also insights for the "meso"-level could be collected. Some of the drivers, barriers and success factors of digital transformation that were assessed are not only relating to an individual, and not only to a team or even department but to the whole organization. An example of a barrier might be a lack of a digital vision, as analysed by Vogelsang et al. (2019), that then hinders the initiation and implementation of digital transformation in the entire company. Therefore, insights relating to the points (1)-(3) were by design also created on the "meso" level.

This study helped to gain insights for companies on how to improve their future transformation strategies to implement a digital transformation process in a more efficient and successful way. The following insights then refer to possible common themes that could potentially be identified, relating to points (3)-(4). Insights were collected for example on how multiple departments in an organization need to collaborate specifically in the context of digital transformation, so that success is the outcome of the transformation. Additionally, since at the time of conducting this study, the COVID-19 pandemic had hit with full force, and receded again, insights were generated on how the COVID-19 pandemic influenced projects and processes of digital transformation.

In even more general terms, separate from the "micro" and "meso" levels, the results derived from this study contributed to identifying transformational characteristics to improve existing knowledge about the impacts of a digital transformation process on organizations. The limitation of this study in this regard is that it is based on a case study of one particular organization, which needs to be considered when trying to generalize to other contexts. The generated knowledge can then be applied in practice and lead to improvements in the initiation and implementation of digital transformation. An important link between the "micro" and "meso" level may be a so-called digital business or transformation strategy that incorporates the low-level learnings and bears the sufficient level of generalization to elevate those findings to a company-level. Also, the digital business or digital transformation strategy might provide some general guidelines that are then relevant for the implementation or strategy at the "micro" level. In summary, they might help to ensure survival of organizations in the current environment, and even more, supporting them to create a sustainable competitive advantage and outperforming their peers. In this section, it was demonstrated how, from the general and broad topic of digital transformation, that has been highly relevant for organizations in the current organizational and corporate environment, a project scope for this research study was derived. Also, it was discussed what implications for research and practice may be drawn from this study. In the following, the project scope will be discussed and lined out in even more detail, and the current state of research will be briefly mentioned.

1.2 Focus of the study

In this section, the focus of the study that was already outlined roughly in the previous chapter, is discussed in more detail, particularly highlighting the operationalization and the conceptual model that is underlying this research.

While in general, the broad "mission" of this study was to ultimately generate insights on the determinants of the success or failure of a digital transformation on an organizational level, the research scope that was defined in the prior section points to a more focused approach. As mentioned, the main focus of analysis were the implications and determinants of the success of projects aimed at introducing digital technologies in the quality assurance department of a company. These projects were taken as a "proxy" for a potentially larger-scale digital transformation on a company level, since it was expected that similar phenomena may be observed on either level. However, the match was only a partial one, since a large-scale company-wide digital transformation was significantly more complex and possibly would encounter different roadblocks than a department-level initiative or project. Nevertheless, this study was based on the literature on digital transformation, for example the barriers of it, that were then analysed for their occurrence on a project or department-level.

Any project that has been undertaken could have either the outcome of being a clear success, a clear failure or a partial success or failure. Surely the definition of success and failure might lie in the eye of the beholder, yet it was attempted to create parameters, based on which a judgement shall be possible and reasonable. Following the perspective taken in this study, the definition of success was put more on a micro-level, focusing on the particular impact of

15

the introduction of a specific digital technology in a project. As such, success was defined, in the context of this study, as the implementation and adoption, in the day-to-day work environment, of a new digital technology or a new process that was to be introduced with the project. Failure was then, contrasting that, the lack of such implementation or adoption. Both the perspectives of the employees as well as from leadership were being considered, in line with the social constructivist methodology that was employed. As such, a project could also be a partial success or failure if leadership was content with the implementation and the technology as such was functional, but adoption by employees was lacking, and therefore no noticeable increase in employee productivity was observed. So, the dimensions of success or failure of a project or technology implementation that were evaluated were the implementation of the technology as such, the evaluation of the leadership or management team of the technology implementation, objective measurable criteria and lastly, the acceptance and adoption of a technology by employees.

For the last point of adoption of a technology by employees, one could consider drawing on literature discussing classical Technology Acceptance Models (TAM). However they, in their original form, were not as relevant, since they assume that the adoption of technology by employees is voluntary (Peslak et al., 2007; 2008). Rather, in an organisational context, the adoption of technology is oftentimes mandatory, which leads to different implications and benchmarks for the acceptance of new technologies (Brown et al., 2002). A more detailed discussion on Technology Acceptance Models was included in the literature review.

Another point that needed to be considered is the temporal perspective. In the prior section it was already discussed that the scope of the research focused mainly on a department level, and in particular on projects that have been introducing new technologies to optimize processes. The focus was put not only on the specific implementation phase of the projects, meaning the phase until a new technology was introduced and implemented, so it was ready for use. Rather, the focus in this study was broader and more holistic, looking at the initiation, the implementation phase as well as the phase after the technology has been implemented, and while being adopted by employees, integrated, and used in the day-to-day process. Now that the definition of a successful introduction of a new digital technology and the temporal setting have been established, it will be discussed how the analysis of the determinants of success was approached. Starting with the focal point of drivers, barriers and success factors of digital transformation, therefore with the points (1)-(3) that were introduced in the prior section: One aim of this study was to compare the main drivers, barriers and success factors of digital transformations that have come up in the case study, to the aspects which were mentioned in prior literature. This comparison brought additional insights to existing literature in several ways: One way is confirming and adding another view to the existence and contribution of aspects to the outcomes of a digital transformation, a second way adding boundary conditions under which certain aspects have a specific impact. Lastly, it was contributing by adding completely new aspects that haven't been identified and discussed in literature before. These contributions were illustrated by the following model, that was underlying one part of the analysis conducted in this study.

Firstly, the drivers that contribute to a digital transformation project being initiated were analysed. Drivers of digital transformation were defined by Liere-Netheler et al. (2018) as attributes and expectations about future benefits of the digital transformation that positively enable, trigger and influence the process of digital transformation. However, based on this definition a few factors were left open for interpretation. For example, it was not clear how these drivers emerge, and whether all of them emerge in the same way. It might be that some drivers are rooted in some objectively perceptible fact or attribute, e.g. a company doesn't have a technology that its competitors have. Still, for this driver to gain force, e.g. a manager would need to subjectively consider this technology as relevant for the success of his business. For some other drivers it might be that they emerge, even without an external comparison to a competitor, when only e.g. a manager considers them as important in his subjective view. Another open question was whether it is management who creates these expectations or whether these expectations need to emerge within employees for a driver to materialize. But, given the relative recency of the research area of drivers of digital transformation (Liere-Netheler et al., 2018), a more concise and detailed description has not been found and was yet to follow. Drivers are mainly of relevance in the "[...] pre-adoption processes because they are important before the use-phase" (Liere-Netheler et al., 2018, p. 3927). Still, they may also play a role in the later adoption phase in that they fuel the progress of a digital transformation.

Secondly, the factors contributing to each project being a success or a failure – these can be termed success factors, and barriers to digital transformation. Success factors were defined as "[...] those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise areas that must be given special and continual attention to bring about high performance" (Boynton & Zmud, 1984, p. 17). While this definition seems to be imprecise, it was adopted for its broadness, and will be further specified when discussing the success factors in the context of the projects. Depending on which of these factors were present, and if and how barriers have been counteracted with solutions, a different project outcome may have occurred.

The following diagram illustrates the logic and linkages between drivers, barriers, and success factors, that were evaluated in this study. Furthermore, the two relations that were defined in the introduction to this study are shown: the first relation looking at digital transformation/project success as the outcome variable, while the second relation then connects digital transformation/project success to company-based outcome variables, namely organizational performance, and survival.

Drivers were considered as mainly playing a role in the pre-adoption phase, in particular in the phase that leads to the initiation of a digital transformation project. They might however also play a role in the "core" project phase, where a technology is implemented, by speeding or slowing this process, therefore taking a mitigating role. In this phase, the main factors were however assumed to be the success factors, and barriers of digital transformation that contribute to the project outcome, that might be a (partial) success or failure. Success or failure was then defined based on the dimensions that were already mentioned earlier, namely the implementation of the technology as such, the evaluation of the leadership or management team of the technology implementation, objective measurable criteria and lastly, the acceptance and adoption of a technology by employees.



Figure 1. Overview of the study.

Thirdly, it was to be assessed to what extent success factors and barriers were interlinked with each other, speaking to the point (3) that was defined in the prior section. This assessment was conducted both within their own category, as well as across categories – meaning that linkages between different success factors and barriers were explored. They might have correlated in their appearance or might have reinforced each other positively or negatively in their impact. The analysis was conducted both on a project-level as well as across a set of projects. Based on this analysis common themes were identified.

Lastly, common themes were analysed in more detail, therefore relating to point (4). These themes were then independent from the project-specific context and therefore represented a higher level of abstraction and generalization. However, they were tied to specific drivers, barriers, and success factors.

Overall, this study contributed to literature that focuses on organizational change, digitization, digitalisation and digital transformation, more specifically highlighting important factors that characterize and drive it, that fuel it, and that slow it.

1.3 Research issue

1.3.1 The current state of research and identified gaps

The current state of research around digital transformation is in this section firstly illustrated based on several recent review articles, and secondly by the observations of the author when reviewing relevant literature.

Recent review articles, for example from Appio et al. (2021) or Vogelsang et al. (2019) came to the conclusion that research on the topic of digital transformation had only recently started to pick up and there were many potential avenues to be explored by further research. Vogelsang et al. (2019) recommended future investigations on the impact and necessary condition for a digital transformation to succeed in an organization. Looking at the arguments more in detail, Vogelsang et al. (2019) found that the strategic impact of digital transformation was still unclear, as were the conditions that were required for a successful digital transformation. Therefore, they suggested that particularly additional research on the "meso" or company-level was required. Appio et al. (2021) also took into account the "macro" or environment-inclusive, and the "micro" or individual/team-based level when suggested that employee-related factors, i.e. factors on the "micro" level have so far only seen modest coverage in digital transformation research.

In addition to drawing on review papers, observations on the current state of research were also made when establishing the literature review for this study. Firstly, from considering existing research it became clear that commonly and widely accepted definitions of many of the relevant terms, such as digital transformation or digitalization were missing. This was why in the literature review a focus was put on providing an overview of existing definitions that were used in past research. Based on them, fitting definitions that were then used in this study were formulated. Secondly, it has become clear that in general, research on barriers to digital transformation has been sparse (Vogelsang et al., 2019). Thirdly, research so far predominantly focused on research designs that take into account the perspective of (toplevel) managers or experts to generate insights on digital transformation and its determining factors. This study aimed to take a more diverse perspective, in that the main focus was put on the views of employees on lower levels of hierarchy, besides the views of (top-level) managers that were collected and analysed.

1.3.2 Research questions and objectives

Summing up, the research questions that this study wanted to make a contribution to, are as follows. Embedded within the general research puzzle of analysing what factors explain differences in profitability and ultimately survival of firms, there were multiple questions that this study aimed to speak to. The main overall focus was put on the factor of digital transformation, since a successful digital transformation might contribute to the creation of a sustainable competitive advantage, that then could help firm performance and survival. The research questions that guided this study were focused on explaining determinants of a successful digital transformation based on a social constructivist perspective:

- How does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of success factors and barriers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of leadership and communication regarding digital transformation vary, based on the hierarchical level of employees in an organization?
- How do changes in the organizational structure moderate the impact of barriers on digital transformation?
- What are drivers that are relevant for the successful initiation and progress of a digitalization project in a company, and digital transformation overall?
- What are barriers and success factors that are relevant for the successful completion of a digitalization project in a company, and digital transformation overall?
- How are barriers and success factors interlinked with each other?
- What are other influential themes or ideas that are underlying barriers and success factors?

The main goal of this study was to respond to these questions, from which implications might be drawn both for theory and managerial practice. Contributing practical insights, this study was geared at identifying the factors that were most relevant for a digital transformation to succeed. This included drivers that were required to initiate a digital transformation, barriers that needed to be overcome and success factors that helped with overcoming the barriers. With a clear understanding of these factors, managers are enabled to create digital business and transformation strategies, that pay particular attention to these and the related mechanisms.

1.3.3 Outline of chapters

This study was structured in the following way: In the first chapter a general background to the topic of the study was given, highlighting both its relevance for theory and practice. The scope and focus of the study, as well as the current state of research were briefly outlined. In the second chapter, an overview of relevant literature will be given, that touches upon theoretical streams of management literature, as well as literature that specifically relates to digital transformation and comprises relevant definitions that are used over the course of this study. In the third chapter, the overall research approach will be lined out - both in terms of the underlying philosophy of science as well as the specific research design that is chosen and applied. In the fourth chapter, the focus will lie on how this research philosophy and design is applied specifically in the context of this study. Thereby, a general introduction will be given to the specific research context as well as an outline of how the research study was conducted. In the fifth chapter, the collected results of the study will be discussed and tied back to the relevant literature. On the one hand, based on projects with which digital technologies were introduced. Each project and technology will be described in detail. On the other hand, based on the barriers to digital transformation that were introduced earlier, thereby abstracting from the level of individual projects. Lastly, in the sixth and concluding chapter, a summary of contributions, limitations of the study, and implications for future research and practice will be given.

To sum up, in the prior chapter, the background of the study was introduced, highlighting the importance of the topic of digital transformations. While they seem to be a necessity to maintain and keep an organization's competitive advantage, they also seem to fail often. This is why this study was targeted at understanding what factors determine whether a digital transformation gets initiated and succeeds or fails.

As such, a narrow contextual scope was chosen, focusing on one department in a for-profit organization that employs over 2500 people. In this department, several digitization projects had been undertaken. Also, a "micro" level approach was selected, meaning that the focus was put on understanding how so-called micro-foundations of digital transformation impact the behaviour of individuals and groups. The gained insights may then contribute to understanding factors leading to a successful digital transformation on a broader, companywide level.

The research approach that was used in this study, to fit the theoretical scope and approach, was qualitative, and used the perspective of social constructivism. This perspective can generate insights based on interpreting individuals' experiences and subjective realities. It was decided to use a single embedded case study approach as the research methodology of choice, with 17 interviews being conducted in the selected company.

These interviews were then analyzed based on a predefined analytical approach. This approach focuses on understanding the impact of different factors in the lifecycle of a project, from its initiation until the implementation of a digital technology.

Lastly, a brief overview of the current state of research was given that shows that in general, digital transformation research is a relatively new field, in which important contributions can still be made. More specifically, common definitions are lacking, and the perspective of operational-level employees is missing.

Chapter Two: Definition and literature review of concepts used

In the second chapter, the focus is put on reviewing existing literature in the area of digital transformation, and establishing definitions for the terms used in this study. The approach is that firstly, different fields of management research are highlighted and linked to the historic development of management research. The focus and topic of this study is then linked to the fields of management research. Secondly, existing research in the broad areas of transformation and digital transformation is critically summarized and definitions for the most relevant terms formulated. Thirdly, literature on so-called barriers, drivers and success factors to digital transformation is critically reviewed, and again definitions are formulated. Lastly, literature on common relevant themes that are identified in the collected interviews are also briefly discussed.

2.1 Positioning the study within the field of management

In the following, an attempt is made to place this study in the broad management and strategy theory literature, based on the guiding question of what the purpose of a digital transformation is, and how its main purpose might be viewed differently based on the theoretical lens that was chosen. The following overview of the historical development of the management and strategy sciences should firstly give an impression of the potential pool of theories. Drawing on the theories in this pool, it is then argued what specific theories are most suited for providing an explanatory framework to the phenomena observed in this research project. A detailed description of the suitable theories should then lay the basis for clearly highlighting the contribution that this study made to the existing literature.

Starting out with the question of the purpose of a digital transformation. On the one hand, the purpose of a digital transformation could be seen as creating a competitive advantage by enhancing certain product-dependent activities or internal capabilities that a firm has. On the other hand, it could be seen as a means or tool for the firm to remain adaptive and in line with its changing environment, and in this way being able to maintain its competitive advantage or even survival. These purposes are not necessarily mutually exclusive but can also be pursued at the same time. Therefore, digital transformation can be seen as both a necessity that is required for firms to survive, as well as an add-on that enables it to create a

distinctive competitive advantage (Adamik & Nowicki, 2018). What needs to be clarified here is the relationship of this defined purpose of a digital transformation to specific drivers of digital transformation, as defined by Vogelsang et al. (2019). It was stated earlier that the drivers materialize through subjective perceptions of the environment, that may either be based on an objective fact, or on a simple, again subjective, perception. In that sense, the purpose of a digital transformation may be seen again in terms of this distinction that was drawn earlier. The need for sustaining a competitive advantage or for adaptation may be objectively present, but only turns into a driver if it enters the subjective perception of a stakeholder.

This is a very general classification; a more detailed categorization will be given in the following. As such, the main focus of research regarding digital transformation should be concerned with the "how" and the details of firms employing and engaging with it.

Different sources of competitive advantage are mentioned in literature but have only been explicitly discovered and clearly identified over time with the development of the field of strategy and management. To clearly position this study in existing research, it is important to understand the historic development, as well as the current state of research in the field of management and strategy. The following overview will set the broad theoretical context in which this study is positioned, and clearly indicates what the theoretical views are, that are underlying the arguments in this study. An overview of different sources of competitive advantage will be included.

In general, the main question that research in the field of management and strategy is seeking to answer is why some firms are more successful than other firms. Approaches have been differing regarding the identification of the main drivers for these differences in success, often further specified as profitability. While in the early days of management research, the main focus was put on factors that trigger differences in profitability between industries, this focus has shifted to factors that influence profitability within industries. Therefore, a more microlevel approach, focusing on characteristics internal to a firm, in other words, on companylevel, has been adopted by more recent research. Figure 2 gives an overview of some of those approaches, in terms of streams of management research and also displays their evolution over time. The streams are furthermore characterized on the one hand based on their focus, either internal or external factors are the main tools to explain differences between companies. Internal factors can be strengths and weaknesses of individual companies, whereas external factors can be opportunities and threats in a company's environment. In contrast, the approaches are distinguished based on whether a macro or micro perspective is taken, macro meaning that the firm as a whole is analysed, and micro that specific aspects of the organization are linked to the behaviour of individuals in it (Guerras-Martín et al., 2014). The alignment between these two different perspectives is not without complication, and has been subject to diverse areas of research, for example on information aggregation (Czaszar & Eggers, 2013). A more detailed description of the historical development, and theoretical content of these approaches will be given in the following literature review.



Figure 2. Theoretical Streams of Management Literature. Reproduced from Guerras-Martín et al. (2014)

Historically, research in the field of management and strategy has evolved in line with the growth and development of firms in the economy (Ghemawat, 2002; Furrer et al., 2008). While until the 19th century, firms had had an incentive to remain small and had appeared to

lack influence on competitive outcomes, in the second half of the 19th century, an improved access to capital and credit encouraged the exploitation of economies of scale and scope. This led to the emergence of large corporations, which had the power to alter their competitive environments with and across their industries (Ghemawat, 2002). Following this change, the field of management research emerged, with the goal in mind to better understand the influence of such corporations on the whole economy, as well as to understand the determinants of their profitability (Ghemawat, 2002; Mahoney & McGahan, 2007).

At first, the main focus for explaining profitability differences between firms was put on analysing industry structure. It was argued that structural elements in certain industries permitted incumbent firms to earn positive economic profits over long periods of time (Bain, 1956). This notion was then deepened in the 1950s when the relation between industry structure and profitability of firms was shown through empirical tools. Also, three basic barriers to entry into an industry, namely absolute cost advantage, product differentiation and economies of scale, were identified (Bain, 1956). This early work by Bain laid the foundation for later works. For example, Porter famously built on the barriers to entry when developing the "Five Forces" framework to understand the industry attractiveness of a certain industry for the "average" competitor in it (Porter, 1980b). The Five Forces framework is still, until now, widely used in management research and practice.

So far, it is apparent that in the early days of management research a lot of focus has been put on external influences which influence firm profitability, such as industry attractiveness, rather than specifically analysing internal firm-related factors. In the 1960s strategic management first came up as a discipline and has been evolving since then (Guerras-Martín et al., 2014). Also, until then it was assumed that similar firms would only be able to draw temporary advantages from strategic positioning, a view that is stemming from the field of economics (Greve, 2020). For this study, this dated approach carries limited relevance, since the focus lies on factors that contribute to explaining sustainable within-industry profitability differences.

Starting from the 1970s however, research has moved to explaining profitability differences by factors which are mainly internal to the firm. The focus shifted from explaining profitability differences across industries to explaining profitability differences within industries. Importantly, these organizational differences were assumed to enable firms to create a sustainable competitive advantage (Greve, 2020). There has been an increased focus on customer analysis, highlighting that, contrary to earlier theories, low costs and offering low prices are not always the best way to compete. Rather, a differentiated way of competing may be needed, by relying on (product) differentiation (Ghemawat, 2002).

The notion that successful companies had to choose a "generic strategy", either competing on low costs or on differentiated products through quality and performance was then explicitly formulated by Porter, who also introduced the "value chain" as a tool for analysis (Porter, 1980a). Porter argues that the competitive advantage a certain firm has is rooted in the activities a firm performs in relation to their products, which can either contribute to a firm's cost position or create a basis for differentiation (Porter, 1980a). For this study, this approach may help in describing the company that is the subject of this research, which clearly is a quality leader in its industry. But, for conducting the main analysis of the relation between the success or failure of a digital transformation and its barriers, success factors and drivers, an approach that focuses even more in detail on firm-specific, or corporate-level characteristics needs to be taken.

There are several corporate-level factors which influence firm or business profitability and also reflect corporate strategy, such as scope of the firm, core competencies, organizational structures, organizational climate, planning and control, and corporate management, which includes managerial ability (Bowman & Helfat, 2001). It is stated that, in theory, corporate management and corporate strategy have some impact on, but not complete control of, corporate-level factors that influence profitability (Bowman & Helfat, 2001). A similarity between corporate strategy on the one hand and digital business- and transformation strategy on the other hand exists, since also digital transformation and the associated strategy may have some impact, but no complete control on changing corporate-level factors relating to digital technologies that influence profitability. While the concepts of corporate management or corporate strategy and digital business and transformation strategy are as such different, the mechanism of how they impact corporate-level factors is assumed to be similar. This is since both represent a higher-level theoretical strategic plan or construct that

is then broken down into smaller units when implemented in the company. Digital transformation and strategy can be seen as a special form of digital strategy, relating to digital technology. Due to these similarities, in the following, an overview of theories that explain differences between organizations in terms of success and profitability, by relying on corporate-level factors, will be given. It will then be argued how this study that focuses on the particular aspect of digital transformation can contribute to these streams of more general corporate strategy literature.

A view that relies on corporate-level factors, focusing on internal firm-related sources of competitive advantage is the resource-based view (RBV), that has been introduced by Wernerfelt (1984) who built on Edith Penrose's study from 1959 (Kor & Mahoney, 2003). Proponents of the RBV suggest that competitive advantage, defined as a superior product market position relative to other firms, depends on a firm owning firm-specific and scarce resources which are intrinsically inimitable (Ghemawat, 2002). These resources should in particular be valuable, rare, inimitable and non-substitutable (Barney, 1991), which can be abbreviated as VRIN resources. Resources that, as stated, are not easily reproducible and produce returns (Chi, 1994). Intangible resources are considered as the main source of competitive advantage due to being more difficult to transaction (Wójcik, 2015).

Two main processes can be analysed based on this view: creating and sustaining competitive advantage. Regarding the creation of competitive advantage, Penrose introduces the notion that competitive advantage is not only generated by a firm possessing resources, but due to the effective and innovative management thereof (Penrose, 1959). Furthermore, she causally links resources with the creation of productive opportunities, that in turn lead to growth and innovation by relying on managers as a crucial element that enables this conversion process (Penrose, 1959). She argues that when resources are combined in a new way, this may lead to the creation of innovation and therefore might be a source of competitive advantage (Penrose, 1959). The connection to digital transformation can be made insofar as the successful application of digital transformation could help firms to leverage the existing resources, and combinations thereof more effectively and therefore generate more revenue

(Westerman et al., 2014). As such a digital transformation may be seen as a tool or process that supports the recombination of resources.

Building on the resource-based view is the concept of dynamic capabilities. In today's economy many companies face a dynamic environment in which they are required to constantly develop new capabilities to survive and prosper (Markides, 2006). It seems that simply possessing VRIN resources doesn't ensure superior firm profits, rather a dynamic concept that explains strategic adaptation when the business environment changes needs to be developed (Wójcik, 2015). Such a concept is the concept of dynamic capabilities, being defined as "the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat, 2007). An even more broad understanding is given by Wójcik (2015) who states that dynamic capabilities are about changes in a company's resource base alteration, meaning that resources and capabilities are changed via routines, processes and capabilities. An interesting conceptualization of resources and capabilities was undertaken by Wang and Ahmed (2007), who create a hierarchy of resources and capabilities in an organization. The following diagram shall illustrate this hierarchy and was taken from Wójcik (2015). He describes the take-away from it as "[...] that dynamic capability is the organization's ability to transform resource base in an indirect way through strategic, functional and operational capabilities as a response to environmental changes" (Wójcik, 2015).



Figure 3. Hierarchy and relationship between resources, an organization's capabilities, and dynamic capabilities. Reproduced from Wójcik (2015)
Moving on to another stream of management literature, this study may also provide interesting insights for organizational learning theory. Some authors, such as Smith et al. (1996) argue that organizational learning can be considered as a strategic capability, and therefore can be integrated into the resource-based view – even though it might be more difficult to replicate than e.g. a tangible resource. The main aim of this theory is to explain sustainable organizational differences in terms of organizational behaviors. These are different to resources insofar as they focus on behaviors "[...] that form routines and are updated through problemistic search" (Greve, 2020). Learning theory then seeks to understand for example how firms can learn from their own experience, as well as from their peers and contextual factors in the environment (Greve, 2020). When an organization is undergoing a digital transformation, it may be aimed specifically at updating routines and may involve different forms of learning. Based on this notion, Dörner and Rundel (2021) have attempted to create a theoretical framework that is targeted at linking digital transformation to organizational learning. González-Varona et al. (2021) also observed an important link between digital transformation and organizational learning, when analyzing digital transformation and digital maturity regarding small and medium sized enterprises.

Lastly, yet another stream of management literature will be presented in the following, that is however not yet connected to the concept of strategic capabilities. This approach is an even more recent theoretical approach, the so-called "micro-structural" view that has been developed by Puranam (2018), who sees the micro-structures of organizations as important determinants that contribute to their sustained competitive advantage.

Puranam (2018) defines four universal problems of organizing that any organization needs to solve to become operational. Two of these problems relate to the division of labor, namely task division and task allocation. Whereas task division is concerned with mapping the goals of the organization into tasks and sub-tasks, task allocation is concerned with mapping the divided tasks to individual agents and groups of agents. The two other problems relate to the integration of effort, namely the provision of rewards and the provision of information. The problem of provision of rewards tackles the issue of organizations having to feature mechanisms for providing inducements to its members to motivate entry and continuance of membership and contribution (Simon, 1951). The problem of provision of information reflects the need of organizational agents to receive information to execute their own actions and

coordinate actions with others. By undertaking a digital transformation, a firm might change its prior solution to these problems of organizing and create a new or different form of competitive advantage. To give one example, a digital transformation might change the way in which agents communicate with each other to a digital way of interaction. The way the problem of the provision of information is solved, is therefore changed. This might then have implications for the result of those interactions - maybe they are more efficient and targeted, and enable faster processing of products. This could then lead to an efficiency and productivity gain in a company, which then leads to a competitive advantage. This example is of course just one possibility of the impacts of a digital transformation on a company, seen through the lens of the micro-structure of organizations.

What becomes clear following this brief theoretical overview is that this study on digital transformation cannot be clearly placed into one area of research or stream of literature. Rather, the generated insights can contribute to several streams of literature. The specific research gap that this study aims to address will be presented in a later section. In the following, a brief overview of possible broad contributions to the different fields that were presented before, will be given.

The RBV focuses on endogenous factors, such as a company's resources, capabilities and competencies, which are then internal sources of competitive advantage (Wójcik, 2015). This study can further help to understand whether and how exactly digital transformation enables the creation or recombination of resources. These resources in turn constitute the foundation of sustainable competitive advantage if they are VRIN, that in turn leads to sustained performance and organizational survival.

But also insights on a different causal relation may be generated: Penrose (1959) stated that the effective and innovative management of resources leads to competitive advantage. This may be related to the effective and innovative management of digital technologies in the context of a digital transformation. In this study, insights may be generated on what exactly the features of management need to be to achieve a successful digital transformation, that in turn leads to a competitive advantage for the organization arising. So, the initially suggested relation between management of resources and competitive advantage may be mediated by digital transformation. The study can contribute to the organizational learning perspective by highlighting which types of learning might be of particular importance in the context of digital transformation. It can in particular be analyzed if and whether digital transformation provides any different implications to organizational learning than another form of organizational change. Also, observations may be made on what forms of organizational learning are particularly relevant with regards to digital transformation.

Also, a contribution to the micro-structural view can be made. By observing when a special form of change, such as digital transformation, gets applied to an organization, changes in the organizational micro-structure may also become apparent. In particular, it may be observed to what extent digital transformation might enable new solutions to the fundamental problems of organizing, namely the division of labor and the integration of effort. An example for such a new solution may be that a new system for communication between departments is introduced, that then influences the process and structure of how information is shared, and therefore leads to changes in the integration of effort. These changes may then lead to a change in the organizational structure of an organization, that may then impact in turn organizational performance and survival.

2.2 General change management literature

In the prior chapter it was outlined how organizations aim to establish and maintain their competitive advantage and are adjusting to their environments by undertaking a digital transformation, drawing on theoretical management literature. Based on this aim, one could argue that digital transformation may be characterized as a special form of organizational change. This is reflected in current research, such as by Hanelt et al. (2021) who considered digital transformation "as organizational change that is triggered and shaped by the widespread diffusion of digital technologies" (p.1160). In their view, the trigger for change is one element that differentiates the special case of a digital transformation from a "general" transformation.

However, Hanelt et al. (2021) also found additional differences between general organizational change and digital transformation that support looking into digital transformation in more depth. Specifically, they argue for example that in a digital transformation, the required resources sometimes involve a wider ecosystem and the demand-side, rather than being restricted to the boundaries of a specific firm (Hanelt et al., 2021). This argument reflects statements mentioned earlier in this study, such as that of Davenport & Westerman (2018), who argue that many different resources and adaptations of processes are required for a digital transformation to succeed. Also, it reflects the idea that digital transformations might not only be driven by considerations of organizational development, but also by newly developed external technologies as well as demands of customers. By aligning themselves with those demands, and external environment, organizations may then maintain their competitive position.

This notion of including on an ecosystem-perspective will be left for further research, since the focus of this study was defined more narrowly as lying on a specific firm, enabling a more detailed assessment within the defined scope.

Based on a literature review, Hanelt et al. (2021) developed a framework of digital transformation. In conclusion, they find that digital transformation can be understood as continuous change, which is opposed to episodic or intermittent change (Hanelt et al., 2021). This distinction can be taken on different organizational levels. While on the level of the whole organization, the digital transformation may be characterized as continuous due to e.g., the organizational design being malleable, on the organizational department-level change may be characterized as more intentional, therefore episodic. Also, it is argued that episodic change may lead to phases of continuous change in organizations, something that is unique to digital transformation and facilitated through the particularities of new technologies as Hanelt et al. (2021) argue. Based on the original review article that first introduced the distinction between episodic and continuous change, written by Porras and Silvers (1991), further research thereafter largely followed it (Weick & Quinn, 1999), speaking to the pervasiveness of the concept. Also that the distinction is still used in more recent work, such as the article by Hanelt et al. (2021), speaks to its robust validity. Therefore, in the following brief overview of organizational change literature, this distinction is reflected, in that a

particular focus is put on the area of continuous change, since it best describes the processes associated with digital transformation. The overview of change literature is constructed, so that contributions and implications based on the research results of this study can also be made regarding this even broader body of work, rather than solely the specific area of digital transformation.

Continuous change can be understood as a type of change that is an open-ended, continuous process and rather independent from specific, isolated environmental shocks (Lawrence et al., 2006). Brown and Eisenhardt (1997) similarly define continuous change, by contrasting it with the punctuated equilibrium model of change. The latter model describes change processes as a sequence of long periods of small, incremental change, and brief periods of discontinuous, radical change. In contrast, continuous change can be described as the endemic capability of firms to adjust rapidly and continuously to fast-changing competitive environments, for example by developing new products (Brown & Eisenhardt, 1997). Weick and Quinn (1999) describe continuous change based on its sequence, which is freeze-rebalance-unfreeze of existing structures that is open-ended and stands in contrast to episodic change that follows the sequence unfreeze-transition-refreeze and is an on-off phenomenon.

Moving on from this definition of continuous change, the underlying structure of continuous change was used in research as a starting point to build a theoretical contribution, also to the broader literature of organizational learning and the resource-based view, that have been discussed in an earlier section. Feldman (2000) states that due to their internal dynamic of including routine participants as agents, organizational routines can promote continuous change. She generally highlights that understanding agency is key to understanding the role of organizational routines for learning and processes of institutionalization (Feldman, 2000).

In connection to organizational routines, Eisenhardt and Martin (2000), introduce the concept of dynamic capabilities, defined as a "set of specific and identifiable processes" (p.1105), that have different characteristics based on the level of dynamics of the markets they are in. Dynamic capabilities evolve through learning mechanisms (Eisenhardt & Martin, 2000). Zollo and Winter (2002) go into detail in how dynamic capabilities are shaped by a coevolution of

35

the different learning mechanisms of (1) experience accumulation, (2) knowledge articulation, and (3) knowledge codification processes. The aim of a firm developing dynamic capabilities is to be able to respond quickly to changes in technology and the market (Warner & Wäger, 2019). Providing an even more pronounced definition, Teece (2007) states that "dynamic capabilities can be disaggregated into the capacity (1) to sense and shape opportunities and threats, (2) to seize opportunities, and (3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets" (p. 1319). He further states that "[d]ynamic capabilities include difficult-to-replicate enterprise capabilities required to adapt to changing customer and technological opportunities" (Teece, 2007, p. 1319-1320).

Summarizing these definitions, continuous change can be understood as an ongoing, openended process. Furthermore, the ability to engage in continuous change seems to be connected to firm-specific internal capabilities, specifically to adapt rapidly to fast-changing environments. This is exactly what is required in the context of digital transformation. Drawing back to the theoretical overview given in the last chapter, this summary definition links to the RBV, in that firm-specific resources or even dynamic capabilities (Eisenhardt & Martin, 2000) are involved. It also links well to the organizational learning view, in that the process of how these resources and capabilities are acquired also holds relevance, as Feldman (2000) put forward.

While in the past section, a definition of change and its sub-categories and its link to theoretical literature was given, in this section, general factors of success and failure and process of organizational change will be detailed from a more practical point of view.

Firstly, general factors of success and failure for organizational change are discussed. Kotter (1996) provides an often-quoted discussion of eight key reasons why most change efforts fail, as well as eight stages of a successful change process. They have been formulated based on Kotter observing and conducting interviews in a sample of more than 100 companies that are undergoing or have recently undergone change. To understand more recent research in this field, it is important to know the still highly influential thoughts of Kotter. He formulated eight

reasons why most change efforts fail in a best-selling book, they are defined as follows (Kotter, 1996):

- Complacency There isn't enough of a sense of urgency for stakeholders in a company to see the need for change and invest sufficient resources in it.
- (2) Failure to Create a Powerful Guiding Coalition There is a need for an organization's leadership to involve other key stakeholders to manage and lead the transition
- (3) Underestimating the Power of Vision A vision helps to keep the change process streamlined, since they know the direction of the transition on a large scale
- (4) Under-Communicating the Vision A lack of consistent and repeated communication can lead to a lack of employees being engaged in the change effort with their hearts and minds
- (5) Permitting Obstacles to Block the New Vision Existing obstacles in a company, such as narrow job descriptions or compensation and performance systems may lead to behavior of employees that is futile to the transition efforts
- (6) Failing to Create Short-Term Wins Missing out on unambiguously proving that progress was made in a change effort can lead to the project being challenged and ultimately, in the worst case, abolished by skeptics
- (7) Declaring Victory Too Soon Celebrating the success of a change project too soon may lead to losing momentum for further steps that still would need to be taken to ensure consolidated success
- (8) Neglecting to Anchor Changes Firmly in Organizational Culture If a company's culture is not changed in line with the goals of the change project, for example in that the promotion and hiring criteria are not modified, the introduced change effort will not last

Secondly, the underlying structure or process of change is discussed in the following. Based on the aforementioned eight factors of failure, Kotter has formulated eight stages of a successful change process, which are defined as follows (Kotter, 1996):

- (1) Establish a Sense of Urgency This can be done by finding and discussing crises, that exist or potentially arise, as well as opportunities in general.
- (2) Create the Guiding Coalition A powerful group should be formed, with enough force to lead the change
- (3) Create a Vision A clear vision, and fitting strategies should be developed
- (4) Communicate the Change Vision Every vehicle and channel that is available should be used to communicate the vision
- (5) Empower Broad-Based Action Employees should be embedded in systems and structures, where they are unobstructed in following the new vision
- (6) Generate Short-Term Wins The change should create results that are achievable on a short time frame, as well as be visible and unambiguous
- (7) Consolidate Gains and Produce More Change Based on the short-term wins, that have shown that the change is a success, further steps can be taken to achieve even more progress in change efforts
- (8) Anchor New Approaches in the Culture Ensure that a company's structure and system is tailored at maintaining the change efforts

Criticisms on Kotter's change model include that it is a series of recommendations, rather than a clear roadmap that should be followed sequentially when undergoing change (Bucciarelli, 2015). Furthermore, it was mentioned that it implies a governance of the change effort that is very much top-down, with top-management initiating change, and middle management executing it (Heyden et al., 2017). Despite the critiques, a review of news coverage (Lestage, 2015), as well as academic literature (Appelbaum et al., 2012) shows that Kotter's change model is largely still deemed to be relevant in today's environment, which is why it was included in this overview. A further argument for its inclusion is found in a review article by Appelbaum et al. (2012) where they conclude that there was no evidence available against Kotter's model, and it therefore remains a recommendable reference, but should in practice be used with complementary tools during the implementation process.

2.3 More specific digital transformation literature and definitions

As mentioned earlier, Hanelt et al. (2021) argue that even though digital transformation bears close resemblance to continuous organizational change, but also incorporates elements of episodic change, there are still particularities to digital transformation that need to be further examined and analysed. Catering to these aspects, there is an extensive field of literature concerned with digital transformation in particular. Therefore, in the next section a specific focus is put on literature that is specifically focused on the theme of digital transformation. The following literature review builds the base for the research and gives an overview of the current knowledge in this field. Also, clear definitions for the most relevant terms used in this study are provided.

2.3.1 Digital technologies

In this study, a focus is put specifically on analysing the implications of the introduction of new digital technologies in a department of an industrial company. Technologies are hereby understood as "scientific knowledge used in practical ways in industry, for example in designing new machines" (Hornby et al., 2000). While the specifics of these technologies are discussed in later parts, in this section a general description of the main characteristics and potential implications of the introduction of digital technologies will be given.

Firstly, the question arises of which new technologies will have the biggest impact on organizations. The "Digital Transformation Initiative", launched by the World Economic Forum identified seven key technologies that are expected to have the most impact on various industries: artificial intelligence, autonomous vehicles, big data analytics and cloud,

internet of things and connected devices, robots and drones, 3D printing, social media and platforms (World-Economic-Forum, 2018). Other digital technologies with high impact identified by literature are blockchain, cyber-physical production systems, semantic technologies, simulation and modelling (Ghobakhloo, 2020).

The impact of new technologies can be observed both in that there are disruptions created on the society in general as well as on the industry level. On the industry level, these disruptions may trigger increased competition in the market (Ubiparipović et al., 2020). Therefore, to create or maintain their competitive advantage (Vial, 2019) and stay aligned with their environment, a need arises for organizations to introduce these technologies. On the one hand, new technologies are challenging to handle and may require substantial resources to be implemented, but on the other hand, they bear the potential to generate a sustainable positive impact for organizations.

As a consequence of the introduction of new technologies into society, less skilled and educated individuals are being replaced by technology, while highly skilled and educated individuals win the race and profit from digital disruption (Balsmeier & Woerter, 2019). In business and on the industry level, the same scheme appears to apply, and the organizations which properly adopt new technologies in this new era are the winners in terms of sustained profits, and those who keep traditional business methods are losing market share (Monger, 2015). History provides famous examples of companies that missed new technology trends like Kodak (Lucas & Goh, 2009) and Nokia (Lamberg et al., 2019) or winners that successfully implemented new technologies like Uber (Min et al., 2018) and Amazon (Kimble & Bourdon, 2013). Therefore, history has shown that not every firm succeeds in harnessing the power of digital technologies.

2.3.2 Digital transformation

Digital transformation is a current and much-debated topic in academia and industry. This two-fold interest in both practice and theory can be seen as triggered by the fact that digital transformation is strongly connected to industry. Especially in the context of industrial organizations, digital transformation helps companies to remain competitive in the new era

of the so-called Industry 4.0 (Reis et al., 2018). While Industry 3.0, or the third industrial revolution, focused on automation of processes and machines, the fourth industrial revolution, or Industry 4.0 focuses on the holistic end-to-end digitization of physical assets and integration into digital ecosystems (Lee et al., 2017).

Interest in academic research in the field of digital transformation has only recently developed, as illustrated by Reis et al. (2018), who found that, while seeing a steady growth, the number of academic papers on digital transformation increased significantly only after 2014. Therefore, in the following it is attempted to provide a concise overview of definitions of digital transformation and develop the definition that is being followed over the course of this study.

Westerman et al. (2011) and Karagiannaki et al. (2017) use a technology-based definition and define digital transformation as "The use of technology to radically improve performance or reach of enterprises."

Berghaus and Back (2016) state a more outcome-based view that is very close to that of Yoo et al. (2012): "Digital Transformation encompasses both process digitization with focus on efficiency, and digital innovation with a focus on enhancing existing physical products with digital capabilities" (p. 3).

Both definitions are only partly sufficient, since the proposed research requires a more holistic view about digital transformation through all areas of an organization. Demirkan et al. (2016) provide a potentially more suitable definition and state: "Digital transformation is the profound and accelerating transformation of business activities, processes, competencies, and models to fully leverage the changes and opportunities brought by digital technologies and their impact across society in a strategic and prioritized way" (p. 14).

To get a more comprehensive and structured overview of all existing definitions for digital transformation, in the following, review articles are discussed, that examined and summarized these definitions. Reis et al. (2018) review definitions for digital transformation and categorize them according to three distinct elements, (1) technological, in that it is based on the use of new technologies, (2) organizational, in that organizational processes or business models need to be changed or created, (3) social, meaning that all aspects of human

life are influenced. In summary, they define digital transformation as using new digital technologies to enable business improvements which influence all aspects of customers' lives (Reis et al., 2018). Despite being formulated differently to the definition given by Demirkan et al. (2016), both definitions contain very similar elements. In summary, both definitions contain the statement that digital transformations lead to changes in business processes and models, using digital technologies.

Drawing on more recent work, Vial (2019) provides a summary of 23 different definitions by reviewing 282 works about digital transformation in current literature and synthesized them to one conceptual definition: "Digital transformation is a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (p. 121). This definition by Vial (2019) is solid and based on technologies but not holistic; the strategic and organizational context is missing.

Hanelt et al. (2021) conducted a further review on 279 articles and developed a definition of digital transformation and a framework that outlines four distinct perspectives on Digital Transformation. They define digital transformation as "[...] organizational change triggered and shaped by the widespread diffusion of digital technology" (p. 1187). Compared to the definition of Demirkan et al. (2016), this definition is formulated in a more general way, in that it doesn't specify exactly which components of an organization are being transformed and also doesn't explicitly refer to the spread of the technology in society. Therefore, in this direct comparison, the definition by Demirkan et al. (2016) more clearly and explicitly maps out what can be understood as a digital transformation.

Hanelt et al. (2021) however then proceed to specify the content of organizational change, which they define as the company moving "[...] towards malleable organizational designs that are embedded in and driven by digital business ecosystems" (p. 1187). To analyse their contribution, they particularly add the aspect of organizational design, that gets changed, and the driver of digital business ecosystems to the definition. In this regard, it can be seen as a further specification of the definition given by Demirkan et al. (2016). While it may be important to have a complete and detailed understanding of digital transformation to build

further research on it, at this point the aim is to find a parsimonious definition of digital transformation. Parsimonious is understood in the sense of Simon (2002) who states the following: "We do not seek the absolutely simplest law but the law that is simplest in relation to the range of phenomena it explains, that is most parsimonious" (p. 36). Following this principle, the definition by Demirkan et al. (2016) is found by the author to still be the parsimonious definition. It covers all relevant aspects found in other definitions, namely that of digital transformation involving changes in business processes, activities, and models and using digital technologies in a strategic way - and is being formulated in the most concise way.

In their review paper, Hanelt et al. (2021) then develop a framework in which they specify and categorize the content of digital transformation by using a two-by-two typology, based on the dimensions of contextual scope and intra-organizational change process. Contextual scope is defined as the breadth of the perspective that is taken, with either focusing on specific aspects or observing a phenomenon in a broader context. Intra-organizational change process on the other hand is defined as the "[...] extent to which intra-organizational processes of change are accounted for in studies [...]" (p. 1173), and it varies based on the emphasis that is placed on organizations' innovation and integration mechanisms that drive change (Hanelt et al., 2021). The four perspectives they define based on the intersections of the two concepts are technology impact perspective, compartmentalized adaptation, systemic shift and holistic co-evolution. A detailed description of these perspectives can be found in the diagram below.



Figure 4. Typology of digital transformation perspectives. Reproduced from Hanelt et al. (2021)

These perspectives have in common that they link the nature of digital technologies (pervasiveness and dynamics) with organizational change. The Compartmentalized Adaptation and the Holistic Co-Evolution perspectives strongly focus on intra-organizational processes, constituting the first axis of the matrix, such as assessing how organizations fully or partly adapt to changing circumstances. The Technology Impact and Systemic Shift perspectives only focus weakly on evaluating those processes. The contextual environment then constitutes the second axis of the matrix, defining to what extent environmental factors and a company's adaptation to them are included in the perspectives. To give a preview of the direction that this study will take, following the typology, this study can be understood as taking the technology impact perspective. In particular, the impact of the introduction of new technologies on a department of the organization is analysed. The contextual scope is narrow, in that the focus lies on organizational processes itself rather than the adaptation of the organization with the environment. There is a weak focus on intra-organizational processes,

since the changes in organizational design are less of a focus, than the specific analysis of the organizational consequences.

Hanelt et al. (2021) further characterize digital transformation by stating that it "[...] can be best understood as continuous change that can be triggered and shaped by episodic bursts, while the latter are further inducing continuous change" (p.1187). This understanding is reflected in earlier sections of the literature review that includes both literature specific to digital transformation as well as more general organizational change literature.

According to the research's aim and objectives, and in the spirit of finding a parsimonious definition, the general definition of Demirkan et al. (2016) fits best and is used when defining digital transformation for this work. To cite it again: "Digital transformation is the profound and accelerating transformation of business activities, processes, competencies, and models to fully leverage the changes and opportunities brought by digital technologies and their impact across society in a strategic and prioritized way" (Demirkan et al. 2016, p. 14). However, adding insights by Hanelt et al. (2021), that digital transformation can be understood "[...] as continuous change [...]" (p. 1887) and that this research can be categorized as belonging to the technology impact perspective of digital transformation.

Frequently used keywords connected to digital transformation are digitalization, digitization, and digital technologies. However, often the definitions of these terms are not clear, as Reis et al. (2018) also highlight, or they are used as synonyms. For this work, it's important to define the terms as further subjects under the theme of digital transformation, to create a clear basis for this research, which will be done in the following.

2.3.3 Digitization

In the following, an attempt will be made to clearly define the term "digitization". That this is necessary is underlined by a review article by Bockshecker et al. (2018) that finds that often research articles use the term digitization without defining it (e.g., Xue et al., 2013). A first starting point to find a definition, and commonality between the reviewed papers is that they

link digitization to processes (Bockshecker et al., 2018). Further papers extend this view, and find that not only processes are able to be digitized, but also products and services (e.g., Smith et al., 1996, Haffke et al., 2016), yet still without defining the term.

Fairly surprising, Bockshecker et al. (2018) find that only a small number of the papers they reviewed actually include a definition of digitization. One such paper was formulated by Freitas Junior et al. (2016), who define digitization in a direct and easy-to-understand way as "The encoding of analog information into digital format" (p. 2). For example, when one scans a photo with a scanner and stores it on their computer (Mahraz et al., 2019) or uploads it to an internet platform, one has digitized a photo. As such, the process of digitizing is aimed at computers storing, processing and transmitting information – but it does not aim to change activities that are targeted directly at value creation, rather it focuses on cost savings (Verhoef et al., 2021). This view is supported by Tilson et al. (2010) who define digitizing itself as a technical process, with the level of digitization describing how advanced the organization is, from a technical view (Tilson et al., 2010). Their idea is then further developed in subsequent papers, with digitizing described as involving representing, communicating, storing, and processing the broadest possible range of information, energy and matter (Lyytinen et al., 2016, Yoo et al., 2012). Verhoef et al. (2021) give further examples for digitization, stating that it may include the use of digital forms, applications, or surveys in internal or external documentation processes.

Based on the papers included in their review, Bockshecker et al. (2018) then suggest that digitization is the transformation of analog information into digital format. This includes the development of digital infrastructure. Objects of digitization are technological processes and so-called artefacts and its related features. A digital artefact can thereby be understood as any type of item produced and stored in a digital or electronic version (WikiEducator, 2023).

For the purposes of this study, it was decided to follow the definition created by Bockshecker et al. (2018), since it was found to offer the most comprehensive and complete representation of digitization.

2.3.4 Digitalization

In the next section another frequently used term, namely digitalization, will be defined. Bockshecker et al. (2018) find in their review paper, that similar to what was observed for digitization, namely that papers often use the term but don't define it explicitly, was also observed for digitalization.

Digitalization is understood to go beyond the technical process of digitization and includes the social network and structures around a digitization process (Klötzer and Pflaum, 2017). The notion of Klötzer and Pflaum (2017) is supported implicitly by further papers, since digitalization is used to describe the change in business models of organizations, moving from a focus on physical aspects to hybrid products, that facilitate the introduction of digital business models (Brenner et al., 2014). In contrast to the term digitization, digitalization adds the aspect of a change in business models, and the network and social structure around it are included in the analysis. But not only the type of product may change in digitalization efforts, but also the organizational strategy, interactions with customers as well as the internal organization structures (Schmidt et al., 2017). Verhoef et al. (2021) also focus on customer interactions in their definition but see the development of new business models as part of the broader concept of digital transformation. They state that digitalization, i.e., using IT as an enabler to change and optimize existing business processes, is also geared at enhancing customer experiences, and not only focused on cost savings, as digitization mainly is (Verhoef et al., 2021).

The transformation of organization structures mentioned by Schmidt et al. (2017) is also the focus of another definition, provided by Yoo et al. (2010). They state that digitalization can be understood as a socio-technical transformation of structures mediated by analogue artefacts and relationships in the past into new ones that are mediated by digitized artefacts and relationships (Yoo et al., 2010). This transformation of structures is further specified in the definitions provided by Mahraz et al. (2019) and Tilson et al. (2010). They find that digitalization applies digital data and technologies to social and institutional structures to implement digital technologies in an infrastructural way to automate, optimize and connect processes (Mahraz et al., 2019, Tilson et al., 2010).

Providing yet another definition, Bockshecker et al. (2018) see digitalization as "[...] the state of an organization or a society referring to its current digital development and the usage of ICT [information and communication technologies] innovations. Digitalization takes into account social as well as technical elements" (p. 8). This definition adds a temporal aspect to the term of digitalization, namely that a current state is referred to rather than a possible future state or process. The definition is however different to the majority of definitions in that respect, and it was decided to forgo this aspect in favour of a more widely accepted definition. However, it is similar to other definitions in taking into account further elements than simply a process that is transformed from analogue to digital format.

Summing up the definitions given so far, the cited researchers largely agree that digitalization refers to structures, products, interactions and processes being transformed by the use of digital technologies. Also, the researchers consider improving the customer experience and generating additional customer value as an aim and characteristic of digitalization. There is however no consensus on whether the development of new business models is already included in the phase of digitalization, or only in the more advanced, broad, and subsequent phase of digital transformation. This again illustrates that it should be explicitly stated which definition is being followed. In this study, the creation of new business models is seen as part of digital transformation rather than digitalization.

2.3.5 Link between digitization, digitalization and digital transformation

Some researchers opt for a definition that links the terms of digitization, digitalization and in some cases also digital transformation. Rachinger et al. (2019) link the concepts of digitization and digitalization insofar as they define digitalization, i.e., the exploitation of digital opportunities, as a framework to enable digitization, i.e., moving from analogue to digital. Also Verhoef et al. (2021) see digitization, digitalization and digital transformation as three different phases of digital transformation. The first two phases are seen as incremental and necessary to achieve the most pervasive phase of digital transformation (Verhoef et al., 2021). Digitization, as defined earlier, is focused on converting analog information into digital information, as such no value creation activities are changed. This however may happen in the next phase of digitalization through process improvements, that besides leading to cost savings, may also enhance customer experiences. Finally, in the most pervasive phase of

digital transformation, the way of doing business of a firm is changed by the implementation of a new business logic (Verhoef et al., 2021).

This linked understanding of digitization, digitalization and digital transformation further helps to distinguish these three terms. In the following, the definitions that were developed in this section are summed up. Digitization is, in the context of this study, defined, following Bockshecker et al. (2018) who state it is the transformation of analog information into digital format. Digitalization can be understood as structures, products, interactions and processes being transformed by the use of digital technologies. The effect is mainly that of cost savings, but also customer value might additionally be created. Digital transformation is then involving an even greater scope by introducing a new business logic or business model to the company, that is based on digital technologies.

2.4 Definition and characteristics of digital business and transformation strategy

As stated earlier, in this study a "micro" perspective following Appio et al. (2021) and Trenerry et al. (2021) to understanding factors determining the success or failure of a digital transformation will be taken. However, an aim is also to generate insights speaking to the "meso" or organizational level and its relevance for the success/failure of a digital transformation. These levels shouldn't be seen in isolation, rather the "meso" might influence the "micro" level, and the other way round. Both for the isolated levels as well as the connections between levels, digital business and transformation strategy may play an important role in guiding a digital transformation effort. This is why definitions and their characteristics are described in the following section. The strategy itself is placed on the "meso" level and its formulation, existence, and content may constitute a success factor or barrier for digital transformation. Additionally, its content may influence the occurrence of drivers, barriers, and success factors on the "micro" level.

In general, a strategy is required to implement digital technologies, since oftentimes not a singular action by one single stakeholder in a company is enough for implementation. Rather, a concerted action by multiple stakeholders in a firm is necessary for the technology to be implemented. Particularly, since companies try to transform the crucial and comprehensive

49

areas of their business operations, processes, products and organizational structures to enlarge digital capabilities (Matt, Hess et al. 2015, Reis, Amorim et al. 2018). Therefore, a strategy that is formulated can serve as a helpful tool to guide and implement these digital transformations. In the following, the theoretical literature that is concerned with digital strategies in different areas will be discussed.

Digitalization or digital transformation impacts the strategy development of companies fundamentally (Holotiuk & Beimborn, 2017) and pressures organizations to react and reflect on their current strategies to explore new opportunities at early stages (Rachinger et al., 2019). Organizations are encouraged to continually renew themselves, also in terms of their strategies, to survive and remain competitive in the market (Fuchs et al., 2019). This notion bears resemblance to the theory of dynamic capabilities that was put forward by Eisenhardt and Martin (2000).

The literature offers two main strategic concepts related to digital transformation: *Digital Business Strategy* and *Digital Transformation strategy* (Vial, 2019). While a digital business strategy combines business strategies and digital resources to illustrate future digital business models, it typically does not guide on transformational steps. The digital transformation strategy should then guide through the transformation itself, resulting from the use and integration of digital technologies (Hess et al., 2016). In the following these two main concepts will be described in more detail.

2.4.1 Digital business strategy

Bharadwaj et al. (2013) focus on the fusion of information technology and business strategy, and they define digital business strategy as an "[...] organizational strategy formulated and executed by leveraging digital resources to create differential value" (p. 472). Bharadwaj et al. (2013) identify four key themes that can be used to understand the creation and implementation of a digital business strategy. scope, scale, speed and sources of value creation and capture in business strategy. Scope is defined as "[...] the portfolio of products and businesses as well as activities that are carried out within a company's direct control and ownership" (Bharadwaj et al., 2013, p. 473). Scale means that unit costs can be lowered by

increasing the produced quantity, speed refers obviously to the time needed to perform a certain task, and sources of value creation describe what source of value the business model is based on, e.g., information (Bharadwaj et al., 2013).

Holotiuk and Beimborn (2017) expand the concept of categorizing and understanding different digital business strategies by identifying critical success factors for digital business strategies, that can serve as a framework to design digital business models. Their framework includes eight dimensions for the strategy development and development of business models, in which then forty success factors are placed. The eight dimensions are as follows: organization, sales and customer experience, culture and leadership, capabilities and human resources competencies, foresight and vision, data and information technologies, operations and partners (Holotiuk & Beimborn, 2017). To name just one success factor as an example, in the dimension of organization "Agility to reallocate resources and reorganize rapidly" is listed as one (Holotiuk & Beimborn, 2017).

In another study, Sia et al. (2016) also focus on success factors and find, by looking at the case of a bank, that a successful digital business strategy needs to build up digital capabilities by the following recommended actions: cultivating leadership for digital transformation, developing agile and scalable digital operations, designing new digitally enabled customer experiences, and incubating and accelerating emerging digital innovations. Therefore, compared to Holotiuk and Beimborn (2017), who focus on capabilities as success factors and go very much into detail, Sia et al. (2016) focus on actions that are required to develop these capabilities. The authors state that the building of each capability requires a full organisational approach to reorganise structures, processes, technologies, and people elements (Sia et al., 2016), and provide a broader and more holistic view about a digital business strategy than Bharadwaj et al. (2013).

Another perspective of a digital business strategy that builds on the idea of Bharadwaj et al. (2013) is from Sebastian et al. (2017). They describe a digital strategy as a business strategy that is inspired by the capabilities of powerful and readily accessible technologies. Their study investigated 25 companies that embarked on a digital transformation journey and found that leaders formulate two types of digital strategies: customer engagement or digitized solutions.

51

Two assets are then essential to execute these strategies, a digital service platform and an operational backbone. Based on these assets, different management practices are required, for example in terms of funding, one-time investments or continuous funding, or delivery method, regular software releases or agile/DevOps concepts (Sebastian et al., 2017).

Another relevant aspect of digital business strategy is its implementation in a company. By investigating the process of integrating a digital business strategy into an existing business, Yeow et al. (2018) discovered that tensions could arise from misalignment of companies' existing resources and strategies with the new digital business strategy. Therefore, they provide an alignment process with organizational actions comprised of three phases (exploratory, building, extending) to reconfigure strategies and organizational resources to respond to internal tensions and environmental changes (Yeow et al., 2018). Relating to a holistic approach of a digital business strategy, both Yeow et al. (2018) and Sebastian et al. (2017), contribute only a part of an integral concept.

Reflecting the above, the literature lines out the concept of a digital business strategy in several different directions. The core statement is that a business strategy is extended, modified, or merged with digital capabilities and digital strategies to respond to challenges and opportunities in the new digital era. This strategic concept may then describe a future state of an organization that uses and integrates new digital technologies to stay competitive, increase effectiveness and leverage its impact on the market. In this section, a digital business strategy was described, based on multiple perspectives.

2.4.2 Digital transformation strategy

In contrast to a digital business strategy that describes future business opportunities and strategies that are based on digital technologies, that typically do not include transformational guidelines on how to achieve this future scenario, a digital transformation strategy can support organizations in managing the transformations that arise from the use of digital technologies, during the integration process and after that (Matt et al., 2015). This distinction is however not always clear-cut, when considering the work by Yeow et al. (2018) who analyse the implementation of a digital business strategy into an existing company.

However, it is possible to generalize by finding that digital transformation strategies focus more on the transformation process and the roadmap (Vial, 2019), while digital business strategies are more focused on the necessary capabilities. A digital transformation strategy may be formulated in a bottom-up or a top-down fashion, which will be discussed in more detail later (Chanias et al., 2019).

Matt et al. (2015) state that independent of industry sectors, digital transformation strategies have specific characteristics in common. Building on these characteristics, the authors developed a digital transformation framework with four dimensions that help to describe these strategies: the use of technologies, changes in value creation, structural changes, and financial aspects. The dimension of financial aspects constitutes the first considerable point and acts as a driver for transforming the other three dimensions (Matt et al., 2015).

Building on the 4-dimensional digital transformation framework from Matt et al. (2015), Hess et al. (2016) contribute a guideline with 11 strategic questions and possible answers to help managers formulating their digital transformation strategy. However, they also state that academia has not addressed a holistic approach to developing a company-wide digital transformation strategy yet but argue that the digital transformation framework is one first step in this direction.

Tekic and Koroteev (2019) provide another view about digital transformation strategies and characterize them into two dimensions: usage of technologies and readiness of a business model for digital operations. Their result is a typology of four generic digital transformation strategies: disruptive, business model led, technology-led, and proud to be analogue - including recommendations for each strategy. However, it's unclear if these strategies fit across sectors and different types of organizations, further Tekic and Koroteev (2019) state that their framework needs empirical research to test the robustness and generalizability. Another point is that this framework is not clearly speaking to the area of transformation strategy. It provides few insights about the digital transformation journey itself; therefore, it's unclear if this concept belongs to the already discussed area of digital business strategy or digital transformation strategy.

Not only the characterisation of digital transformation strategies is of interest to research, but also their emergence, formulation and revision have been evaluated. Contrary to the requirement of a holistic approach, but confirming the lack of a holistic concept, Chanias and Hess (2016) provide insights that describe the formulation of a digital transformation strategy as a bottom-up process. They investigated the formation of digital transformation strategies at European car manufacturers and found that they implemented a diversity of emergent strategic activities from separate organizational sub-departments prior to a holistic transformation strategy from the top management. Chanias et al. (2019) reported similar findings in their in-depth case study about digital transformation strategy formulation and implementation in the case of a European financial service provider. The study shows that informal, bottom-up strategic planning was more productive for the transformation than formal top-down planning. However, they conclude that digital transformation strategies also need support and guidance from the top management and recommend a mix of top-down and bottom-up strategizing. Further, the authors state: "A digital transformation strategy is always in the making, with no foreseeable end. It is always a moving target and needs to be continually revised and reworked by incorporating new learnings and insights from ongoing implementation efforts" (Chanias et al., 2019, p. 15).

Adding to this direction of research, Korachi and Bounabat (2020) evaluated 27 existing approaches of digital strategies in their work by comprehensive, systematic literature research. They analysed common elements, strengths and weaknesses of these strategies and synthesized a general approach that frame and drive a digital transformation strategy formulation. This approach is structured as a cycle of elements that follow one another, starting with strategic awareness to formulate a digital transformation strategy, move on to the implementation phase of the strategy and finally to digital transformation management, where the process starts again by controlling and adjusting the digital transformation strategy is an ongoing process with no foreseeable end. However, this concept is, for the purposes of this study, too detailed, and would also need further empirical testing and more detailed guidelines on how to approach the analysis of all the elements. Due to the scope of research

access and availability of data, it was chosen to focus on the implementation phase of digital transformation.

The findings from Chanias and Hess (2016) and Chanias et al. (2019) guide the assumption that knowledge about the emergence and formulation of digital transformation strategies is needed to continuously improve digital transformation strategies and develop it further from stage to stage. Underpinning this, Matt et al. (2015) state: "Owing to limited empirical evidence, ambiguity about conventions on how to formulate and reassess digital transformation strategies remains. This is reinforced by the considerable uncertainty that results from swift technological changes and makes necessary adjustments to digital transformation strategies at a later stage more likely" (p. 342) and call for further research in this direction. However, as stated in the prior paragraph, the emergence and formulation of digital transformation strategies was not the focus of this study, due the scope of research access gained, that mainly aids insights in the phase of strategy formulation.

In this section, different strategies relating to digital technologies were presented, digital business strategy and digital transformation strategy (Vial, 2019). A digital business strategy is a business strategy that is extended, modified, or merged with digital capabilities and digital strategies to respond to challenges and opportunities in the new digital era. It can be seen to guide the implementation of digital technologies so as to reach a future state of an organization that helps maintain its competitiveness. However, it does not guide on the steps of a transformation, which is what a digital transformation strategy does. A digital transformation strategy then provides a roadmap for the implementation of digital technologies, and is always changing according to external developments. However, while this study might make contributions to the literature on these topics, it was not defined as the main focus.

2.5 Barriers/Drivers/Success Factors of digital transformation

In the last section, insights on the characteristics and the formulation of digital business and digital transformation strategy were highlighted. In this section, the focus is shifting towards the actual implementation phase of a digital transformation, possibly also based on a pre-

defined strategy. This is rooted in the fact that a digital or digital transformation strategy's success depends understandably neither only on the formation of it, nor only on the actions that are taken before the digital business and transformation strategies are then implemented. It is the actual implementation phase that presents many opportunities for the eventual success or failure of a digital transformation.

In this light, the management of an organization should consider resources, structures, processes, skills, environment, technologies, and culture to on the one hand identify drivers that could help initiate and fuel the transformation process. On the other hand, a focus should be put on barriers that hinder or block the transformation, as well as success factors that help to overcome these barriers to achieve a successful digital transformation.

A question that may be asked is whether drivers, barriers or success factors are simply existent in the subjective perception of subjects, or whether there is some objective substance to them. For drivers, they relate to the perceived or expected advantages of technology use (Liere-Netheler et al., 2018), so they are highly subjective to each individual. While Liere-Netheler et al. (2018) argue that barriers and success factors are different to drivers, in that they must be objectively present, the author takes a more differentiated view. While some barriers and success factors truly carry objective substance, e.g., in terms of missing resources, still there is a subjective element to them, that determines whether a circumstance is perceived as a barrier and more specifically, what its true impact on the success or failure is. So different conceptual constructs might be at play: The subjective existence of a barrier or success factor and the project success or failure, or there could be a direct relation between a subjectively perceived barrier or success factor and project success or failure.

Many companies still struggle to pursue their digital transformation; therefore, understanding drivers, barriers and success factors is essential for a successful digital transformation (Vogelsang et al., 2019). The lack of clarity regarding both the content as well as the process of digital transformation often results in missed opportunities, wrong initiatives, and false starts in an organisation's digitalization (El Sawy et al., 2016).

56

2.5.1 Drivers of digital transformation

To obtain a deeper understanding of how a digital transformation is started and gaining momentum in the first place, so-called drivers of digital transformation are identified and analysed in the following.

As already mentioned earlier, drivers of digital transformation are attributes and expectations about future benefits of the digital transformation that positively enable, trigger and influence the process of digital transformation (Liere-Netheler et al., 2018), so they are subjective to the perception of an individual or team. Hrustek et al. (2019) define digital transformation drivers in their work as influential factors or ideas for digital organizational innovations that arise from innovative ideas within the organization or trends in the corporate environment. The authors categorize digital transformations as being technology, customer or organizational development driven. The same categorization is used by Tomičić Furjan et al. (2020), further it's close to the concept of building blocks for shared value innovations by Lichtenthaler (2017). In this approach of classification for digital transformation initiators, the drive can come from new technologies that possibly enable opportunities and benefits (technology driven), the wish to adopt new customer needs or to exploit new target groups (customer driven), and the intention to develop the organization to improve the way how working is done (internal development driven) (Hrustek et al., 2019). The results of Tomičić Furjan et al. (2020) describe the main drivers of digital transformation as business-related goals of process improvement, introducing new products or services, reacting to disruptive competition – related to organizational development-driven; ensuring proper technology support for realizing new business models - related to technology-driven; and goals to increase the customer value – related to customer-driven. While the categorizations by Hrustek et al. (2019) and Tomičić Furjan et al. (2020) cover a broad array of potential drivers, it can be criticized that with the dimension of customer and technology driven digital transformations only two of many drivers that originate outside the organization are covered, meaning that their split is too granular. Also, they don't consider drivers that originate on the employee level separately from the driver of internal development. Since a focus of this study lies in particular on taking a "micro" level as per Appio et al. (2021) focusing on individuals/teams/a department, and also taking a holistic perspective on involving different stakeholders, therefore also employees, this categorization may need to be complemented by other authors to establish a complete picture of drivers.

In a study about digital transformation in the manufacturing industry, Liere-Netheler et al. (2018) identified 12 drivers of digital transformation. Different from the categorization used by Hrustek et al. (2019) and Tomičić Furjan et al. (2020) the authors divide into organizational, external or individual drivers. Identified drivers at the organizational level are process improvement, workplace improvement, vertical integration, management support, horizontal integration, and cost reduction; the drivers at the external level: customer demands, supply chain, innovation push, market pressure. Employee support refers as a single driver to the individual level (Liere-Netheler et al., 2018). This categorization can be used to complement the categorization of drivers by Hrustek et al. (2019), since it allows to sufficiently highlight different stakeholder perspectives in the category of individual level drivers. This categorization alone is however not sufficient to reflect the full variety of drivers - since it may give the study a sharper focus to further specify the external drivers into technology and customer-based drivers as was done by Hrustek et al. (2019). Overall, however, the study provides similar findings to Tomičić Furjan et al. (2020) and concludes that process improvement in the organization and demands communicated by customers were the most influential drivers to motivate a digital transformation.

Morakanyane et al. (2017) have a different view of digital transformation drivers and argue that skill set, mindset, and a digital culture fuel the digital transformation journey. Further, they identify digital technologies as a key driver and argue that new digital technologies create new business opportunities for organizations. These opportunities potentially transform business models, operational processes, customer experiences, and certain other aspects of an organization (Morakanyane et al., 2017). Even if this view does not match with the concept of Hrustek et al. (2019) or Liere-Netheler et al. (2018), the source and core of driving motivation for digital transformation is similar, with there being plenty of evidence that a significant fraction of digital transformation drivers emerges within the organizational and structural context. However, once the digital transformation is initiated, additional factors such as appropriate structural and functional changes in the organization are required to realize the benefits of digitalization (Davydenko et al., 2020). While Liere-Netheler et al.

(2018) originally introduced the category of individual drivers, the work by Morakanyane et al. (2017) can be used to further detail the category, by considering skill and mindset of employees as drivers.

To sum up, the research evidence that is collected in the form of a case study is analysed along the following drivers and categories of drivers. Based on the above discussion a list was compiled. The categorization of Liere-Netheler et al. (2018) is taken as a starting point, to which further specifications, that were developed by other authors, were added:

- External drivers (Liere-Netheler et al., 2018)
 - Technology-driven, such as innovation push, technology for new business models (Hrustek et al., 2019, Liere-Netheler et al., 2018, Tomičić Furjan et al., 2020)
 - Customer-driven, such as customer demands, supply chain, increase of customer value (Hrustek et al., 2019, Liere-Netheler et al., 2018, Tomičić Furjan et al., 2020)
- Organizational development drivers (Liere-Netheler et al., 2018)
 - Process and workplace improvement, management support, horizontal or vertical integration, cost reduction, introduction of new products and services, reaction to disruptive competition (Hrustek et al., 2019, Liere-Netheler et al., 2018, Tomičić Furjan et al., 2020)
- Individual drivers (Liere-Netheler et al., 2018)
 - Employee support (Liere-Netheler et al., 2018)
 - Skill set and mindset of employees (Morakanyane et al., 2017)

Reflecting the categorization of drivers, it appears that drivers that can be categorized as external to the firm play an equally important role for the initiation of digital transformation

as internal or organizational drivers. Thus, based on this literature review, a conclusive evaluation of whether the most important drivers of digital transformation are external, organizational or internal, following the classification of Liere-Netheler et al. (2018), cannot be made.

Having critically reviewed drivers of digital transformation in this section, another important factor related to understanding digital transformation processes is understanding the barriers that hinder or block digital transformations. These barriers will be discussed in the following section.

2.5.2 Barriers towards digital transformation

While the drivers discussed in the previous section describe the factors that are mainly contributing to the successful initiation of a digital transformation, in the following, barriers that need to be overcome to achieve a successful completion are discussed. Therefore, they are assumed to be relevant mainly during the implementation phase of a new digital technology.

Undergoing a digitalization or digital transformation process is complex and accompanies various barriers that may hinder the transformation or limit its success. To counteract, it's important to identify obstacles on the road and understand their nature (Cichosz et al., 2020). Applying knowledge about the barriers of digital transformation early in the process may increase the chance to succeed significantly. In the following, several approaches to categorize barriers in digital transformation are presented, so that based on them, a comprehensive and sensible categorization of potential barriers can be established that is then used for further analysis in this study.

Starting with the approach by Vogelsang et al. (2019), they investigated barriers to digital transformation in manufacturing and provided a classification with five different categories: missing skills, technical barriers, individual barriers, organizational and cultural barriers, and environmental barriers. Vogelsang et al. (2019) described several significant barriers to digital transformation within this classification, formulated research questions catering to each

60

barrier, and provided a research agenda for future investigations. Since the categorization of Vogelsang et al. (2019) covered a broad array of potential barriers, each independent from each other, it is taken as a starting point for establishing an overall categorization. Three research questions from their formulated agenda underpin the relevance of gathering more in-depth knowledge about the characteristics of digital transformation and are also touched upon in this study:

- Organizational Barriers Which kinds of collaboration will arise considering technical, social and legal aspects?
- Individual Barriers Which factors foster the acceptance and lower the uncertainty of digital transformation? Which tools and methods are useful to integrate employees in change processes?

Vogelsang et al. (2019) state that responsibilities and strategic impact are still unclear and recommend future investigations on the impact and necessary condition for a digital transformation to succeed in an organization. Further, the authors propose to combine their outcomes with case study research about the development of best practices and overcoming barriers of digital transformation. This suggestion is followed in this study, due to the scope of research access.

In another study about barriers to the digital service economy in manufacturing, Peillon and Dubruc (2019) categorize the barriers into technological barriers, organizational barriers, human resources related barriers, and customer-related barriers. This classification has many overlapping points with the contribution by Vogelsang et al. (2019) but considers additionally the dimension of the customer that is missing in the other classification. This barrier will therefore be added in the overall overview since it seems to carry the potential to show important insights. By customer-related, Peillon and Dubruc (2019) refer to "ambiguous customer needs, hazy value propositions and difficulties conveying benefits to customers" as a barrier to digital transformation. Thereby, they draw on the insights of Klein et al. (2018) who found this barrier when examining the introduction of smart services in the capital goods industry. The findings of Peillon and Dubruc (2019) illustrate that significant issues regarding

digitalization are customer-related and arise with the use and development of customer relationship management (CRM) software. Thereby, technical and organizational difficulties occur. From the organizational perspective, the use and extension of CRM mean that customers expect very quick and extensive service from the organization. Often, there are not enough material and human resources available to meet these expectations, which overlaps with Vogelsang et al. (2019) who mention this point in the category of organizational and cultural barriers. This example shows that customer-related barriers can result from organizational problems and insufficient preparation; therefore, the authors state: "Organizational and cultural barriers may be the first that should be overcome." (Peillon & Dubruc, 2019). This example also highlights the importance of looking at barriers not only in isolation, but in relation to each other.

As also mentioned by Peillon and Dubruc (2019) when describing the customer-related barriers, a further organizational related barrier of digital transformation identified by literature is the lack of resources. Again, this barrier is already reflected in the categorization of Vogelsang et al. (2019), however, the frequency with which it is mentioned in research points to the sustained importance of it, and therefore warrants highlighting it as a separated category in the overall categorization of barriers. Cichosz et al. (2020) describe five major barriers in their study about the digital transformation at logistics service providers and state that the lack of resources, including skilled resources, is the second biggest problem that arises during a digital transformation process. This outcome matches the contribution from Hjalmarsson et al. (2014) where the lack of money or time is identified as one of the highest impactive barriers for digital services. Organizations suffer from a lack of financial resources, especially smaller players on the market, but foremost, independent from the company size, they struggle with the availability of digitally skilled employees.

Yet another different view on this topic is provided by Töytäri et al. (2017). In their qualitative multi-case study within six globally acting industrial companies, the authors identified sixteen barriers to adopting smart services and divided them into internal barriers, resource and capability gaps, and external barriers. The study's outcome shows similar barriers as already described, for example, lack of resources, high costs, and people's resistance, but identifies governance infrastructure and identity as further relevant barriers. Many companies have a

strong identity in their current business and a successful history; therefore, it's challenging to convince people about new services and ways of working (Töytäri et al., 2017). This identity aspect may be seen in line with organizational barriers, as defined by Vogelsang et al. (2019). The heritage of long-established companies consists of values, traditional distribution of responsibility, historical norms, the existing configuration of assets, and management style that can block organizational change; therefore, an organization's ability to undergo a digital transformation will depend on its capability to reshape its internal and external resource base and heritage – already foreshadowing a success factor that may be required to overcome this barrier (Bartlett and Ghoshal, 1988, Sklyar et al., 2019).

Deeply connected with the identity and the heritage of a company is the governance structure. Management systems and IT systems and organizational structures and incentives are developed and optimized over time to serve the existing business model. New technologies may need different capabilities and practices or develop entirely new business models; therefore, the existing governance infrastructure may not fit anymore. In concurrence with the governance structure, the organizational structure can also be a barrier. The use of strong hierarchical structures, and a strict top-down driven approach, may hinder progress in digital, fast-changing environments, since bureaucracy limits innovations and decrease response speed (Verhoef et al., 2019). While the initial category of organizational and cultural barriers as defined by Vogelsang et al. (2019) does not comprise governance or organizational structure, in this study, the category is extended and barriers relating to these topics are also included.

In addition to categorizing barriers based on their content, they may be assessed and categorized based on their strength. In that regard, Agrawal et al. (2019) contribute a classification of barriers related to digital transformation and use a cross-impact matrix to classify them according to their driving and dependence power into *autonomous barriers* – less driving and dependence power, *dependent barriers* – weak driving power and strong dependence, *linkage barriers* – strong driving power and dependence. The authors identified 12 digital transformation barriers and provided a hierarchical structure model to demonstrate interrelations and dependencies. The model on the one hand confirms the relevance of a part

of the already above identified barriers (Cichosz et al., 2020; Vogelsang et al., 2019). Additionally, the study describes high implementation and running costs, shortage of digital skills and talent, and lack of support from top management as the three significant barriers that are independent and have a high driving power. These barriers drive other barriers and can lead, among other barriers, to misaligned business objectives, lack of strategic orientation, inappropriate organizational structures, or inflexible business processes. For success on the road to digital transformation, barriers with a high driving power need to be eliminated before they affect other parts of the organization or lead to other barriers arising (Agrawal et al., 2019).

The study by Agrawal et al. (2019) already shows that barriers to digital transformation should not be seen as isolated aspects, but also their interplay and relations should be considered to gain an even more comprehensive understanding. It's possible that barriers reinforce each other (Agrawal et al., 2019) and may lead to new further challenges for an organization. One example found in literature is that the barrier of missing skills (Jakob & Krcmar, 2018; Kane et al., 2018; Vogelsang et al., 2019) correlates highly with the barrier of people's resistance to change (Cichosz et al., 2020). Employees can demonstrate and refuse new disruptive technologies if there is a lack of visibility on the benefits of digital transformation or the way in which digital technologies should be used is not reflected in the established organizational culture (Cichosz et al., 2020).

Reflecting above, most of the described barriers of digital transformation have an internal origin in an organization, and the responsibility for it lies with the companies themselves, but some barriers may also arise outside of an organization. The most significant external barriers identified by literature are lack of industry-specific guidelines (Agrawal et al., 2019), high market competition and saturation, lack of external funding, uncertain product demand (Hjalmarsson et al., 2014), regulation (Westerman & Bonnet, 2015), industrial buying culture and relationships (Töytäri et al., 2017), lack of standards and laws (Vogelsang et al., 2019), lack of IT experts on the market (Kutnjak & Pihir, 2019). In contrast to internal barriers, it seems that external environmental obstacles form a much smaller part of the challenges of digital transformation than internal barriers, which is why they are not the main focus of this study. Therefore, when comparing the categorizations of barriers with that of drivers, it seems

that barriers are predominantly of internal origin, whereas drivers have a more balanced origin, equally stemming from external or internal influences.

To facilitate the analysis of the case studies with regards to barriers, a list of barriers and categories of barriers is compiled in the following. The categorization of Vogelsang et al. (2019) who introduced five categories of barriers will be taken as a starting point, since it is also reflected in categorizations of other authors. To it, barriers that haven't been included or were deemed to be better captured by other authors, were added. External barriers were deliberately excluded since this study mainly focuses on company-internal barriers to digital transformation. Additionally, this list doesn't aim to provide a mutually exclusive and collectively exhaustive overview, due to sometimes obfuscated definitions, therefore, overlaps between the different barriers and categorizations are still possible. The authors who introduced each category are cited. As for the first four barriers, they were mentioned not only by Vogelsang et al. (2019), but also by other authors, as stated in the extensive discussion on barriers earlier in this section. The categorization by Vogelsang et al. (2019) was deemed however as best meeting the aim of this list, being, in the opinion of the author mutually exclusive and collectively exhaustive with regards to the four barriers. For purposes of better readability only Vogelsang et al. (2019) are cited for the first four barriers in this overview, even though authors have mentioned similar barriers as well. Resistance to change as introduced by Cichosz et al. (2020) was not subsumed under the categories defined by Vogelsang et al. (2019), since it relates to both individual and organizational barriers, and may therefore be seen as a separate category of barriers. The barriers that are assessed are in particular:

- missing skills, such as IT, technology, technology decision or process knowledge (Vogelsang et al., 2019)
- technical barriers, such as dependency on other technologies, security (data exchange), or current infrastructure (Vogelsang et al., 2019)

- individual barriers, such as fear of data loss of control, transparency/acceptance or job loss (Vogelsang et al., 2019)
- organizational and cultural barriers, such as keeping traditional roles/principles, no clear vision/strategy, resistance to cultural change/mistake culture, risk aversion, lack of financial resources and time (Vogelsang et al., 2019)
 - organizational structure, such as a strong top-down hierarchical structure (Verhoef et al., 2019)
 - o governance infrastructure and identity (Töytäri et al., 2017)
 - lack of support from top management (Agrawal et al., 2019)
- customer-related barriers, such as ambiguous customer needs, hazy value propositions and difficulties conveying benefits to customers (Peillon & Dubruc, 2019)
- resistance to change, on an institutional as well as on an individual level (Cichosz, Wallenburg et al., 2020)

This list of barriers was compiled for further use in the analysis of the case study. What is however not clear from this overview however is on which level each of these barriers is located, which might bring additional clarity for the analysis of results. The level is determined by the unit on which variation is likely to be observed. Missing skills, technical barriers and resistance to change might be relevant at the "meso", organizational level, as well as on the "micro" or individual/team level. Individual barriers can be clearly allocated to the "micro"/individual level and organizational/cultural and customer-related barriers can be
clearly attributed to the "meso" level. More details on the specific process of analysis will be given in the methodology section.

Also, an aspect that is not included in current literature, is an assessment of the relative strength of each of the barriers. Questions that may be asked in this context are as follows: Does a barrier have a strong impact on its own on the outcome of a digital transformation project, or does it require other factors to be present at the same time to be observable? If so, what are those factors?

2.5.3 Success factors for digital transformation

In the following, success factors that contribute to the successful completion of digital transformation are discussed. These are factors that are required to realize the benefits of digitalization, or even of a digital transformation. Therefore, they are relevant mainly during the implementation phase, as opposed to the drivers which are relevant mainly in the initiation phase. Furthermore, compared to digital transformation drivers, success factors go beyond expectations, ideas and motivational aspects and refer to essential organizational elements and characteristics that are required to ensure a successful transformation (Osmundsen et al., 2018). In the current literature, due to the relative recency of new digital technologies, far-reaching insights into successful digital transformation processes are scarce. Further, as already discussed, a digital transformation process is a long-running, ongoing shift in an organization, and most of the companies have just started with the first steps. The following section discusses nevertheless concepts found in the literature, synthesized with the insights discussed above, to get more insights on approaches for overcoming organizational barriers of digital transformation and insights on what additional factors for success should be present.

More specifically, in the following, success factors will be presented in a way that they are linked to the barriers mentioned in the prior section, or in other words, may even serve as a way of overcoming these particular barriers. This section is therefore structured along selected barriers to digital transformation that were introduced in the prior section. All barriers were included on which sufficient content on related success factors could be found

67

in literature. Since the linkage between barriers and success factors is not possible in all cases, also success factors that were found in literature that are independent of individual barriers are presented. The specific process of analysis with regards to the case study that is the analytical framework of choice, will be lined out in the methodology section.

2.5.3.1 Addressing the barrier of missing skills

The barrier of missing skills may be addressed on the organizational, "meso" level as well as on the "micro"/individual level.

On the organizational level, the build-up of dynamic and digital capabilities (Freitas Junior et al., 2016; Sebastian et al., 2017; Vial, 2019; Warner & Wäger, 2019; Westerman, Bonnet, & McAfee, 2014; Yeow et al., 2018) to overcome barriers of digital transformation is often discussed in the literature and provides a generally applicable, solid base. Digital capabilities were already mentioned in an earlier section when assessing the relation between organizational change and digital transformation. In the common understanding of prior research, these capabilities are seen as pertaining to an organization as a whole, representing a holistic approach. Therefore, they are assessed from a meso-perspective, and not from a micro-perspective in terms of specific capabilities that an individual employee possesses. However, possibly a "meso" level strategy or initiative is required, that is then implemented on the "micro" level. Such a strategy or initiative needs to define the skills that are required for the overall build-up of digital capabilities, and tailor them to the pre-existing skills and capabilities of employees. Concerning the content of such initiatives they could include investment in training programs and well-considered recruiting, that can then produce employees with digital capabilities and profound IT skills that fulfil the demands for new digital projects (Cichosz et al., 2020).

2.5.3.2 Addressing individual barriers (and resistance to change on an individual level)

Organizational culture arises from social behaviour and the behaviour of each individual in an organization. Without consideration of the individual's needs, holistic change through the organization is difficult to implement. Individual barriers, as identified by Vogelsang et al. (2019), can hinder digital transformation and may lead to cultural problems. Digital transformation causes uncertainty, and thereby fears can arise in employees. Specifically, the fear of job loss and being replaced by robots or other new technologies will require new human resource management practices and trust to overcome (Calitz et al., 2017). Further, research shows that these fears are partly legitimate; many professions are at high risk to be changed or replaced by digitalization in the near future (Frey & Osborne, 2017).

Overcoming individual resistance to change and training employees in creative thinking, imagination, brainstorming, and teamwork is critical to overcoming barriers to innovation (Zeleny, 2012). This notion was also supported in a study by Alcover et al. (2022). However, best practices and guidelines on how to deal with this fearfulness are fairly limited in the field of management research. Vogelsang et al. (2019) underpin the relevance of participation of individuals for a successful change process and call for future research on factors that lower the uncertainty and promote the acceptance of digital transformation as well as on appropriate tools and methods to integrate employees in the digital change process. In psychology research there are recent works, such as by Wang (2022) that aim to shed more light on resistance to change and overall, the importance of employee capabilities in the context of digital transformation. Wang (2022) suggests that "[...] training programs to educate and inform staff about innovation's benefits should help lessen resistance to change." Additionally, he states that managers should create an environment that enables active dialogue about new ideas in the workplace, and establish systems that reward innovative employees within the organization (Wang, 2022). In general, workshops with organizational actors that will be affected by the use of new technologies can help to prevent resistance and increase acceptance for new ways of working to enable flexibility and open mindsets in the face of change (Vial, 2019). These measures could therefore serve as success factors.

A more specific and elaborate approach to tackle individual resistance to change was developed by Solberg et al. (2020). Conducting a study about digital mindsets, they contribute an approach to managing individual beliefs on digital transformation. The authors classify an individuals' beliefs regarding situational resources as expandable or limited, and technological ability as fixed or formable. The result is a digital mindset matrix that divides into expandablesum or zero-sum beliefs on one axis and growth-oriented or fixed belief on the other axis. The four quadrants of the matrix are then as follows: Quadrant 1 describes a digital mindset on the intersection of limited resources and a fixed technological ability. People in this quadrant would most likely view digital transformation in a negative frame and not be open to engage in digital initiatives. Quadrant 2 is then again based on a fixed technological ability, but disposes of expandable resources, therefore people in this quadrant are assumed to be more open to perceive opportunities that are created through digital transformation. However, they might not be able to drive a digital transformation, since they don't believe in their abilities, but are open to working with others who possess these abilities. Quadrant 3 carries the notion of limited resources, but a formable technological ability, meaning that people in this quadrant think they can learn and enjoy participating in the challenges that digital transformation brings with it. Yet, people see the build-up of capabilities as competitive, and as a chance to win, so others might not benefit as much, since they are seen as competitors. Lastly, Quadrant 4 describes the idea of a formable ability and expandable resources, with people in this quadrant seeing themselves as being able to learn and, seeing opportunities rather than limitations that come with digital transformation. People in this quadrant would engage in a collaborative digital transformation, also encouraging their co-workers, and as such would be suitable to drive the projects and efforts. Each quadrant not only contains a description but also recommendations on how to deal with each type as a manager (Solberg et al., 2020). This approach on how to deal with the individual's digital mindset contributes beneficial insights on this relatively new topic. It represents a helpful tool that organizations can use to shape digital culture. However, it is questionable if companies can provide enough resources for its implementation, since each person would need to be classified and actions taken according to their placement in the matrix. Furthermore, it is unlikely that employees would permit their employer to gain such deep insights to each individual's mind and convictions to get sufficient information for the steps required for classification, which is needed to take the recommended aligned actions.

2.5.3.3 Addressing organizational/cultural barriers (and resistance to change on an organizational level)

As already mentioned in an earlier section, an organizations' culture and the engrained resistance to change can be a strong barrier on the digital journey. If established culture opposes change, one part of the organization may move towards digital transformation, while the other part stays in traditional ways of working and culture with the result of a split organization (Agrawal et al., 2019). Contrary to Agrawal et al. (2019) and Lee et al. (2017) who see the split organization as undesirable, is the concept of ambidextrous organizations that build dual structures that split the organizational structure into two parts and see it as a beneficial concept (Duerr et al., 2018). One part focuses on the development of the traditional core business, the other part on digital innovations. The traditional part requires a low speed of change and adaption compared to the innovative part, where agile development approaches and constant change lead to largely increased speed. The result is that organizations bet on two strategies at the same time and work at two speeds (Duerr et al., 2018). Based on literature it is therefore not clear whether a split or ambidextrous organizations organization is a success factor in digital transformation.

A way to bridge this divide in literature is suggested implicitly by Kane et al. (2018), who introduce a strategy to address organizational/cultural barriers, that involves establishing a culture of experimentation.

The general assumption is that all employees inside the organization need the willingness for new ways of working and to experiment with new digital technologies, in order for a digital transformation to be successful. The development of a mindset to think and act like digital natives are essential (Lee et al., 2017). By developing a culture of experimentation, new business ideas and technologies can be tried and tested continually to build on successes and learn from failures. Small experimental groups that focus on areas of least digital maturity can be a key for more digital maturity in the organization and cultural acceptance. But what, specifically can be understood as digital maturity? Due to the relative recency of the phenomenon a streamlined and commonly accepted definition of digital maturity doesn't exist yet (Aslanova & Kulichkina, 2020). Aslanova and Kulichkina (2020), based on a literature review define digital maturity based on "[...] three scales by which organizations are classified – the digitalization strategy, the level of digitalization of the organization, and its readiness for digitalization. Based on three scales, four levels of digital maturity are presented: "beginners", "catching ups", "off-track" and "leaders"". The presence of the scale elements, as well as the level of sophistication of these present elements increases gradually with ascending levels of digital maturity. Once the first experimental groups have slight successes, they can positively influence the core business by sharing their success stories to others across the organization and thereby may enable new, further groups that take up the digital innovation cause (Kane et al., 2018). To support this, acceptance of mistakes is essential to create a supportive organizational culture for digital transformation (Cichosz et al., 2020). The success factors that may be identified based on this stream of literature is therefore a culture of experimentation and a culture that is accepting of mistakes.

In a study about digital organizational culture, Duerr et al. (2018) show results that partly match the above-identified approaches to transforming corporate culture. The following identified artefacts and values underpin the contributions of Cichosz et al. (2020); Kane et al. (2018); M.-X. Lee et al. (2017); Robertson (2015); Verhoef et al. (2019); Warner and Wäger (2019): cross-functional teams, start-up mentality, failure culture, mutual decision-making, power equality, and embracing digital skills. As such, these artefacts may also be considered success factors.

Another lever for changing the organizational culture is to hire new leaders and go beyond the recommendation of hiring a chief digital officer. New leaders can bring required skills for the digital journey, including a new vision and mindset that push the cultural change. Often, existing managers cannot think differently about the way of working and their decision making (Westerman et al., 2011). However, it's not always possible to simply change the managers of several positions in the company. Coaching, mentoring, and workshops may provide another option to get leaders ready to promote digital transformation within the organizational culture.

Lastly, to strengthen teamwork and enable the creation of an innovative culture, physical and virtual collaboration is essential. Restructuring the office by creating wide spaces where everyone sits together without boundaries makes knowledge sharing easily and promote physical cooperation. Employees in the home office and remote workers need to collaborate

virtually (Duerr et al., 2018). Therefore, a reliable IT solution is required to strengthen virtual collaboration and enable interactions through the organization.

2.5.3.3.1 Addressing organizational structure barriers

As a baseline, literature suggests that a flexible and agile organizational structure composed of separate business units and digital functional areas may lead to the success of a digital transformation. New separate business units can help to develop new business models related to new digital technologies and provide a sphere for quick learning and experimentation; further, separate business units reduce the risk of conflicts and cannibalization (Broekhuizen et al., 2018).

But while new business units might help to develop new business models, also the current resources need to be considered when undertaking a digital transformation. An important concept in this context is IT ambidexterity, meaning "[...] the dual capacity to explore and exploit IT resources and practices." (Lee et al., 2015). IT ambidexterity is needed to experiment with new technologies, while at the same time effectively and efficiently improving current IT resources to best use their capacities for digitization (Leonhardt et al., 2017). This concept bears resemblance to the more general concept of ambidexterity for which the definition by Duerr et al. (2018) was introduced in this study.

Relating to the question of whether a hierarchical or a flat structure helps a digital transformation, a mixed picture arises based on existing literature. What is clear is that fast and explorative responsive digital functions play a leading role in the support of digitization initiatives. To stimulate digital agility, companies need to develop flexible organization forms with agile structures and low hierarchical levels, including digital and analytical functional skills, to respond fast to digital change (Verhoef et al., 2019). Hierarchical structures and responsibilities are nevertheless crucial for the response speed and flexibility of an organization and need to be set by the top management in the initial phase of the transformation. Literature shows then that digital transformation needs flat organizational structures (Verhoef et al., 2019), but also strong support and guidance from the top management (Agrawal et al., 2019, Bughin et al., 2015). This required mixture of top-down

73

and bottom-up decision making could be realized for example based on the concept of a holacratic organization, and therefore represent a success factor.

The concept of holacracy creates a natural hierarchy on the basis of work instead of individuals and provides a self-management practice for an organization (Robertson, 2007). Decentralized management and decision-making through self-organizing teams should enable agility and purpose-driven process of working (Morgan, 2014, Robertson, 2015). Underpinning the idea of a holacratic organizational structure for digital transformation, Warner and Wäger (2019) identified in their study about building dynamic capabilities for digital transformation that designing team-based structures in the internal company structure may be an essential sub capability. In another study, Cichosz et al. (2020) state that bottomup initiatives and agile organization structures with flexible processes, fluid teams, and people's openness to change can in turn lead to a supportive organizational culture for digital transformation, therefore solving another barrier. However, holacracy is a relatively new approach, and future research is needed to confirm its promising claims and advantages (Lee and Edmondson, 2017; Van De Kamp, 2014). Further, this concept needs also testing along a digital transformation journey to get insights if it's a suitable approach to structure the organization for digital transformation. In this study, it is not possible to conduct the testing of such an approach due to the lack of holacratic or other structures that can be defined as flat being present in the focal organization. What can be tested as a success factor is however the presence of a mix of top-down and bottom-up elements of decision-making and governance in the projects.

2.5.3.3.2 Addressing governance infrastructure

Regarding the existing governance infrastructure, new roles and responsibilities should be defined early, management systems must be adapted, and different wages and incentives need to be fixed in order for a digital transformation to be successful (Töytäri et al., 2017).

Another approach to overcoming barriers related to governance infrastructure was described by Westerman et al. (2014) and could be to introduce so-called digital governance. To give a practical example of benefits of such a governance for digital transformation in the company Procter & Gamble (P&G), "With the right governance mechanisms in place, P&G could allocate digital funding wisely, promote sharing across business units, provide centralized tools and skills to help business units innovate, and start to build a digital culture across P&G" (Westerman et al., 2014, p. 134). The governance system was structured in a way that a centralized team provided end-to-end support to operating units and brands, developing innovation, monitoring quality and also setting internal prices (Westerman et al., 2014). In addition, also the importance of developing a digital governance culture was highlighted, including the aspect that leaders become comfortable with ambiguity and risk with regards to digital transformation initiatives (Westerman et al., 2014). How to specifically implement digital governance in a company? Westerman et al. (2014) mention two key goals, for which governance needs to be defined: coordination, referring to the coordination/alignment of initiatives across the company and sharing, referring to the use of capabilities and resources across the enterprise.

2.5.3.4 Addressing lack of support from top management

Based on the assumption that digital transformation is a planned operation under the management of a company, the first steps towards implementation should take place in terms of leadership and strategic orientation. The leader of an organization needs to develop and communicate a digital vision and goals to inspire employees to promote a digital mindset and culture (Cichosz et al., 2020), which constitutes a success factor. Strategies for digital transformation are already discussed in an earlier section. Many companies need a guide through their digital transformation journey and onboard a chief digital officer to help to develop and implement digital strategies (Singh & Hess, 2017; Vial, 2019). This especially important since the CEO commitment, employee commitment and effectiveness of change management programs are interrelated closely (Soltani et al., 2005). The right setup at the top of the organization is therefore required to enable an agile and flexible organization, identified by literature, one of the most important capabilities for digital transformation (Agrawal et al., 2019; Fuchs & Hess, 2018; Kane et al., 2018; Porter & Heppelmann, 2015; Rogers, 2016). If this support from top management is not given, consideration can be given to for example, whether and how it can be compensated by a good organizational climate as assessed in Rodríguez et al. (2008). They find that the cooperation that is required between departments for project success may still emerge if the organizational environment fuels an effective communication exchange (Rodríguez et al., 2008). In summary, therefore, support by top management may be considered and tested as a success factor.

2.5.3.5 General success factors

While in the prior sections, success factors were tied directly to barriers to digital transformation, in this section success factors are highlighted that may be analysed independently from barriers. These general success factors can be seen in close conjunction with digital business and transformation strategy formulation and are therefore located on the "meso" level. As such, they can't be attributed directly to individual employees or teams which are rather on the "micro" level, which nevertheless may be influenced indirectly by the resulting strategy.

Success factors that relate to digital transformation cannot only be found in the digital transformation literature, but also in the literature on digital business strategy, since the difference between these two streams of literature is not always clear-cut. In a study about critical success factors of digital business strategy, Holotiuk and Beimborn (2017) identified 40 success factors within eight generic dimensions. The seven most influential factors across these eight generic dimensions are: seamlessly integrated off- and online channels, the use of information and date from a central source, digitally automated and data-driven processes, agility to reorganize rapidly and reallocate resources, digitalization of customer interaction and product and services, create a digital mindset, and a standard set of values with digital as value creation. Further, the authors describe the organizational dimension and the sales and customer experience dimension as the largest subjects of critical success factors related to a digital business strategy. However, this study is limited to the context of a digital business strategy and does not have a holistic view of digital transformation. Synthesizing these results of Holotiuk and Beimborn (2017) with the contributions from Hrustek et al. (2019) and Liere-Netheler et al. (2018), it becomes clear that a range of factors, also on the company level or "meso" level, such as for example organizational structure, are subjects that drive and enable not only successful digital business strategy but also a successful digital transformation.

A more holistic view on digital transformation success factors is given by Morakanyane et al. (2020), who provide a list of seven main success factors divided into 23 subfactors. The main success factors are "determine digital trigger, cultivate digital culture, develop digital vision, determine digital drivers, establish digital organization, determine transformed areas, and determine impacts" (Morakanyane et al. 2020, p. 4362). The main success factors vary in strength, and the authors applied a cross-case analysis process to rank them. The result is that "determine digital drivers" and "determine impacts of digital transformation" are by far the strongest success factors. Primarily, "determine the impacts of digital transformation" is essential for this work, subdivided by Morakanyane et al. (2020) in:

- Define expected customer-facing impacts.
- Determine realized customer-facing impacts.
- Define expected organizational facing impacts.
- Determine realized organization facing impacts.
- Determine the measure of impacts.

The subfactor *"determine realized organization facing impacts"* is the second strongest of all 23 subfactors according to the cross-case analysis and underpins the importance of research to better understand the impacts and characteristics of digital transformation. In particular, these success factors point to the importance of clearly determining and formulating the consequences of digital transformation in detail.

2.5.3.6 Summary of success factors

Similar to the identified barriers, in the following a brief summary will be given of identified success factors to digital transformation. They will however be presented in different formats, due to the different associations of the success factors to barriers, digital business strategy, and digital transformation. Firstly, success factors attributed to specific barriers will be presented in the format of a table, to establish a clear link between barriers and related

success factors of digital transformation. A distinction will be made on which level, either the "meso" or the "micro" level, the success factor can be located.

Barrier	Related success factor(s) "meso" level	Related success factor(s) "micro" level
Missing skills (Vogelsang et al., 2019)	Formulation of strategy targeted at building up dynamic capabilities (Eisenhardt & Martin, 2000)	Training programs and recruiting to build up digital capabilities (Cichosz et al., 2020)
Individual barriers (Vogelsang et al., 2019)	Creation of an environment that enables active dialogue about new ideas, and reward systems for innovative employees (Wang, 2022)	Training programs and workshops to educate and inform staff about innovation's benefits and train them in creative thinking, brainstorming and teamwork (Wang, 2022; Vial, 2019; Zeleny, 2012)
		Tailored approach to each individual based on framework by Solberg et al. (2020)
Organizational/cultural barriers <mark>(</mark> Vogelsang et al., 2019)	Ambidextrous organization with two parts (innovative/traditional) developing with two speeds (Duerr et al., 2018)	
	Establishment of a culture of experimentation that is accepting of mistakes and supportive for digital transformation (Kane et al., 2018, Cichosz et al., 2020)	
	Establishment of cross-functional teams, start-up mentality, mutual decision-making, power equality and embracing digital skills (Cichosz et al., 2020; Kane et al., 2018; Lee et al., 2017; Robertson, 2015; Verhoef et al., 2021)	
	Hiring of new leaders with the required skills to push cultural change (Westerman et al., 2011)	Introduction of coaching and mentoring workshops for leadership (Westerman et al., 2011)
	Creation of collaborative spaces (physically and remotely) supported by a reliable IT solution (Duerr et al., 2018)	

Table 1. Overview of relations between barriers and success factors.

Organizational structure barriers (Verhoef et al	Creation of new separate business units and digital functional areas	
2021)	(Broekhuizen et al., 2018)	
	Development of flexible organization forms with agile structures and flat hierarchical levels to respond fast to digital change, in conjunction with classic hierarchical structures that are important for guidance in the initial phase (Verhoef et al., 2021; Bughin et al., 2015)	
Governance infrastructure (Töytäri et al., 2017)	Definition of new roles and responsibilities in conjunction with management systems (incl wages and incentives) (Töytäri et al., 2017)	
	Introduction of digital governance mechanisms – coordination and sharing (Westerman et al., 2014)	
	Development of a digital governance culture (Westerman et al., 2014)	Support for leaders to get comfortable with ambiguity and risk regarding DT initiatives (Westerman et al., 2014)
Lack of support from top management (Agrawal et al., 2019)	Development and communication of digital vision and goals to promote digital mindset and culture (Cichosz et al., 2020)	
	Onboarding of chief digital officer (Singh & Hess, 2017) together with right setup at the top of the organization (Agrawal et al., 2019)	
	Establishment of good, cooperative (between departments) organizational climate (Rodríguez et al., 2008)	

Additionally, the following general success factors that are not attributable to specific barriers were identified, rather they speak to the aspects that should be considered when formulating a digital business strategy, which may, as stated earlier, serve as a link between the "meso" and "micro" level and were formulated by Holotiuk and Beimborn (2017):

- seamlessly integrated off- and online channels
- use of information and date from a central source
- digitally automated and data-driven processes
- agility to reorganize rapidly and reallocate resources
- digitalization of customer interaction and product and services
- create a digital mindset
- standard set of values with digital as value creation (Holotiuk & Beimborn, 2017)

Morakanyane et al. (2020) formulated further success factors relevant in particular for digital transformation. The focus in this study lies on the sub-factors of the category "determine impacts of digital transformation":

- determine digital trigger
- cultivate digital culture
- develop digital vision
- determine digital drivers
- establish digital organization
- determine transformed areas
- determine impacts of digital transformation

- Define expected customer-facing impacts.
- Determine realized customer-facing impacts.
- Define expected organizational facing impacts.
- Determine realized organization facing impacts.
- Determine the measure of impacts.

While they were presented separately, all these success factors will be considered separately and in conjunction when analyzing the interviews and projects in the results section.

To sum up, this section gave an overview of different categories of factors that influence the initiation and outcomes of digital transformations. The categories of factors are drivers, barriers and success factors. Firstly, definitions for these categories were given, and then lists for each of the categories compiled. It was attempted for the items in the lists to not be overlapping, but still covering the most relevant factors. Drivers were defined as attributes and expectations about future benefits of a digital transformation that positively enable, trigger and influence the process of digital transformation (Liere-Netheler et al., 2018). Drivers were considered to be mainly relevant in the initiation phase of a digital transformation, but also carried some relevance during the implementation phase. They were listed in three categories: external drivers, organizational development drivers and individual drivers. Based on the review of literature, a judgement on which of those are projected to be the most important drivers could not be made.

Barriers to digital transformation were defined as factors that hinder the transformation or limit its success. Also, a list of the barriers mentioned in prior literature was established. They were found to be relevant during the implementation phase of a digital transformation. Success factors to digital transformation were mainly tied to barriers of digital transformation, as factors that help to counteract them. Again, a list of such success factors was compiled. Additionally, general success factors were found that, independent from the presence of a barrier, were assumed to help the success of a digital transformation.

2.6 Literature on potential common themes

While the prior sections were focused on highlighting specific drivers, barriers and success factors that contribute to the initiation, failure, or success of a digital transformation, in the following section, literature on common themes that may be identified are highlighted. Common themes thereby represent concepts or streams of literature that are not directly associated with digital transformation literature, but nevertheless carry some abstract relevance. This may then help to identify and generalize insights from individual projects.

2.6.1 Technology acceptance models (TAMs)

While in an earlier section the adoption of a digital technology by employees was taken as a measure of the success or failure of a digital transformation, interesting insights may be generated from the adoption process in more depth. This understanding may be relevant also for understanding the workings of barriers and success factors in more detail.

Therefore, in the following, an overview of literature on Technology Acceptance Models will be given. Davis (1989) initially developed a model that drew on perceived ease of use and perceived usefulness to predict user acceptance of information technology. Further research extended this model, by also taking into account factors such as beliefs, attitudes, and usage behavior (Brown et al., 2002).

However, the assumption in these models was that the take-up of technology was voluntary – which was often not the case in digital transformation projects (Peslak et al., 2007; 2008), that mandate technology adoption in order for an employee to maintain their position. The legitimate question was then, with technology adoption being often mandatory, why does user acceptance still matter?

There are two reasons why this is the case: Firstly, while in general, in the context of digital transformation technology adoption has been most often mandatory, in some cases, there may still be room for decision makers to oppose and stop the implementation of a new digital technology. This was for example the case in a project in the focal company, that involved the introduction of a relatively novel digital technology. Secondly, even if this possibility didn't exist, following the argumentation of Brown et al. (2002), a lack of perceived or felt acceptance might lead to sabotaging behavior that then leads to costs for the organization.

In summary, Brown et al. (2002) found that highlighting the usefulness of a new digital technology contributes to creating a positive attitude among employees, if at the same time take-up is facilitated. Measures to achieve this could include "training, formation of user groups, formal announcements, testimonials and managerial support" (Brown et al., 2002).

A model that takes into account both the voluntary and mandated technology acceptance, that has been widely adopted, was formulated by Venkatesh et al. (2003) who created the Unified Theory of Acceptance and Use of Technology (UTAUT), that has been drawing on prior theories and is empirically validated. They found that Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions act as the key factors that determine technology adoption, being moderated by Gender, Age, Experience and Voluntariness of Use (Venkatesh et al., 2003). Social Influence was for example found to have a significant effect on behavioral intention for technology use, more so when the use was mandatory (Venkatesh et al., 2003). These factors might be additionally considered when assessing barriers or success factors leading to digital transformation success or failure.

2.6.2 The impact of COVID-19

As an additional point, it was investigated whether and to what extent the interviewees thought that the COVID-19 pandemic had an impact on digital transformation in the company. Or, to possibly speak to a broader research question, what characteristics of an external shock, that this pandemic was, can be classified as a driver, barrier, or a success factor with regards to digital transformation. Or also a different perspective may be taken, in that it can

be asked to what extent an external shock in general, and particularly COVID-19 influences drivers, barriers or success factors.

Drawing on the definition by Fligstein and McAdam (2011), an external shock might be defined as "[...] a period of prolonged and widespread crisis in which actors struggle to reconstitute all aspects of social life" (p. 32). Such shocks might be natural catastrophes, wars, financial crises, or public health crises, so clearly the COVID-19 pandemic can be categorized as one. On the one hand they can serve as drivers for organizational transformation, since they lead to a loss and need for recombination of the resource base of a company (Corbo et al., 2015). On the other hand, they might threaten an organization in its existence, and simply drain its resource base (James et al., 2011). Both views are in line with the resource-based view of management that was mentioned in the literature review section earlier and chosen as the mainstream of management theory guiding this study.

While there is a broad literature on general external shocks, due to the relative recency of the COVID-19 pandemic, research on this specific topic area has been still sparse. Yet, an increasing number of studies on how the COVID-19 pandemic has been affecting digital transformation have recently been published. The focus of many of these studies was whether and how processes of digital transformation were impacted through this external shock. However, based on a literature review conducted by the author, high quality articles with a substantial theoretical contribution published in respectable journals were still missing.

Nagel (2020) found, based on an online survey, that employees perceived that digital transformation was accelerated due to COVID-19, since they were required to pick up new technologies to perform their work from home. Priyono et al. (2020) added the differentiating variable of digital maturity of the companies to their study. They observe, based on a case study of Indonesian manufacturing SMEs during the COVID-19 pandemic, that in response to the pandemic, firms with a high degree of digital maturity accelerate the digital transformation, whereas firms with lower capabilities either only digitize specific functions or find highly specialized and competent partners with excellent digital capabilities.

84

Soluk (2022) then went even a step further and developed a framework that explained how an external shock influences motives in family firms, that then might be the trigger for changes in the resource allocation, which ultimately leads to digital innovation. While the study by Soluk (2022) focused on family firms, it could still be argued that parallels might be drawn to organizations in general, since the general purpose of the company, i.e. making profit stays the same, yet the mode of governance and ownership was different.

Summing up, in the prior section, additional literature that might potentially become relevant and is connected to the overall topic of digital transformation was reviewed. The discussed literature particularly included Technology Acceptance Models (TAMs) that are concerned with the adoption of technology by employees. Additionally, literature that might contribute to understanding the potential impact of the COVID-19 pandemic on digital transformation was reviewed.

2.7 Description of the research gap and conceptual framework for qualitative analysis

In the following, the findings of the literature review are summarized, and critically evaluated. It is then highlighted how exactly the research gap is defined that this research project attempts to target. The research gap is composed of several elements, therefore there are multiple research gaps that this study caters to, that are described in the following.

Firstly, it has been found in a review article by Vogelsang et al. (2019) that research on barriers of digital transformation is less frequent than research on successes. Therefore, the research project aims to cater to the perceived lack of literature on this aspect of digital transformation. In particular, the focus in the data collected in interviews was put on the interview partners' perception of barriers encountered during digital transformation projects. By following this approach, the pursued aim in this study is to further complement existing literature in this area and contribute to closing the identified research gap.

Secondly, a holistic perspective is lacking in existing literature. The term "holistic" can be defined in different ways, depending on the context in which it is used. In this study it is interpreted in three ways. Firstly, it refers to generalizable results with regards to barriers of

digital transformation that are independent of specific contexts and technologies. This understanding of the term has been coined by Vogelsang et al. (2019). Secondly, it refers to the inclusion of perspectives from different stakeholders along the entire hierarchy, i.e., also including "regular" operational employees with a lower hierarchical position, rather than relying on opinions and interview contributions from experts or leadership only. Thirdly, it refers to a view that analyses a project in the context of digital transformation based on its multiple stages and based on linkages among and between different types of factors.

Regarding the first understanding of holistic, namely generalizability independent from context and technologies, the following research gap has been found. Although the opinion of some researchers is that the effects of digital transformation on organization and culture have been extensively researched (Chen et al., 2016), in reviewing existing literature it is notable that there still remains a gap in academic knowledge about the effects of digital transformation in organisations and the challenges of implementation. In particular, holistic approaches are still relatively under researched and therefore responsibilities and strategic impacts that are valid for a broad array of companies remain unclear (Vogelsang et al., 2019). Vogelsang et al. (2019) define a holistic perspective as focusing on barriers that are not only tied to specific technologies, but rather apply to a broad array of companies within the area of digital transformation. To attain this perspective, they collect insights from expert interviews with decision-makers from different industries (Vogelsang et al., 2019).

In contrast to Vogelsang et al. (2019), this research project is constrained to one industry by design and can therefore obtain only a limited breadth in this regard. However, generalizability, independent from specific technologies is ensured by other means. In this study at first barriers and success factors are analysed based on a sample of specific projects or technologies. In a next step of analysis, they are analysed across specific projects and technologies. For example, at first the project that introduces the technology "ANDON boards" is analysed, and barriers and success factors are attributed to it. The same structure is followed with other projects. In the subsequent section the barrier "Resistance to change" (ANDON boards" are included, along with insights from other technologies and projects. The same steps are undertaken again with other barriers that were identified. Therefore, this

study can be seen as a further contribution to closing the research gap of creating generalizable insights on digital transformation barriers across technologies. Just to make explicit, only part of the initially identified research gap by Vogelsang et al. (2019) is addressed by this study, namely that of generalizability across technologies, rather than generalizability across contexts, which would potentially require the inclusion of more than one company in the sample.

Referring to the second understanding of a holistic approach, namely that of including a sample of diverse stakeholders' perspectives, in this research project the issue is addressed that mostly the perspective of decision makers is surveyed in existing literature. For example, Tomičić Furjan et al. (2020) conducted expert interviews when establishing their categorization of digital transformation drivers. Liere-Netheler et al. (2018) also relied on 16 semi-structured interviews with experts found when working on the topic of drivers of digital transformation. Liere-Netheler et al. (2018) investigated digital transformation projects applied and implemented in the manufacturing industry and identified 12 drivers which determine and influence the adaptation of digital technologies. What strikes as interesting is the lack of inclusion of other potentially influential parties in the interview sample, despite the fact that "Employee support" was identified frequently as a driver of digital transformation (Liere-Netheler et al., 2018). Consequently, if the aim is to understand this particular driver in even more detail, this aim can, in the opinion of the author be best achieved by including more diverse stakeholders, in terms of their hierarchical position, in the sample. Employees could for example be able to provide insights or perceptions on what the root causes or mechanisms are that lead to a build-up or lack of employee support. But not only for this particular driver, the inclusion of other types of stakeholders can yield interesting insights, also for other drivers, a broader and deeper understanding can be obtained when including more diverse stakeholder perspectives. Based on this research gap, the following research question can be formulated: In what way does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?

However, not only regarding digital transformation drivers there is a lack of diverse stakeholders, with regards to their hierarchical position, in existing research. Also, regarding barriers and success factors of digital transformation, a research gap was identified. When identifying and categorizing barriers to digital transformation, Vogelsang et al. (2019) rely on expert interviews. Similarly, Cichosz et al. (2020) conduct interviews with subject matter experts when identifying barriers, as well as Töytäri et al. (2017) who interview experienced senior managers. Lastly, also Agrawal et al. (2019) rely on a panel of experts to validate identified barriers.

The same research gap was identified for success factors, where Holotiuk and Beimborn (2017) relied on industry reports to establish a categorization, similar to Morakanyane et al. (2020) who performed an extensive literature search. Leonhardt et al. (2017) conducted interviews with CIOs and then collected data from IT executives. Lastly, also Broekhuizen et al. (2018) conducted interviews with CEOs, directors, or business unit managers to generate data points on success factors. Again, the perspectives of stakeholders on lower levels of the hierarchy are not reflected.

Based on this research gap, the following research question can be formulated: In what way does the perception of success factors and barriers of digital transformation vary, based on the hierarchical level of employees in an organization?

Regarding the third understanding of holistic, it seems that in existing literature, to the best of the researcher's knowledge, a comprehensive overview that clearly shows what factors influence what specific outcome, at what specific stage of a digital transformation project, is missing. Rather, research has focused on identifying relevant barriers, such as Vogelsang et al. (2019) or relevant success factors (Holotiuk & Beimborn, 2017) mostly in isolation. In particular linkages and relations between factors that can be defined as drivers, barriers and success factors, but also including potential other factors or characteristics weren't subject to a thorough and comprehensive assessment yet.

Therefore, a research gap regarding the general theme of a holistic approach was identified insofar as the perspective of a diverse sample of stakeholders, in terms of their perception of drivers, barriers and success factors of digital transformation is missing. This study attempts to close this research gap by including interviews with stakeholders that are representative of the entire hierarchical structure of the company. Therefore, low-level "operational" employees are interviewed as well as middle and top managers of the focal company. Regarding the research gap of the holistic approach including linkages, this study aims to establish an overview that facilitates the making of connections between the different relevant factors influencing a project in the context of a digital transformation.

Thirdly, another research gap that was identified by Hesse (2018) is that the impact of digitalisation on employee and leadership behaviour still needs to be studied in more detail from a qualitative perspective. This would then contribute further to the debate on whether assumptions that have been taken on leadership in the non-internet era are still valid in today's digital world (Hesse, 2018). Ghosh et al. (2022) developed a theory of digital transformative capabilities of industrial business and recommends future research in the same area as Hesse (2018). While Hesse (2018) has assessed the impact of digitalisation on leadership behaviour in his work, he specifically asks to include the perspective of the, as he calls them, followers. In particular Hesse (2018) sees an opportunity for research especially regarding how the followers interpret the daily realities in a digital world, and their perceptions towards changes in leadership (Hesse, 2018). The main focus of this study however doesn't lie solely on the details of leadership, rather it lies on providing a holistic perspective on digital transformation. Nevertheless elements of the call of Hesse (2018) are addressed, in particular regarding the broad idea of including the "followers'" perspective, that is covered by the holistic approach described earlier. In particular, insights can be collected and analysed regarding the follower's perception of leadership and communication. Based on this research gap, the following research question can be formulated: In what way does the perception of leadership and communication regarding digital transformation vary, based on the hierarchical level of employees in an organization?

Fourthly, Verhoef et al. (2021) state that empirical research on organization structure within digital firms is missing. They state the need for research that focuses on identifying the optimal forms of organizational structures that are best suited for enabling the execution of digital transformation strategies (Verhoef et al., 2021). From an organisational perspective, Schmidt et al. (2017) investigated the extent to which digitalisation has transformed businesses, whilst highlighting the disruptive effects of digital technologies on business, economy, and society. From the study of Schmidt et al. (2017) it is possible to surmise that digitalisation encompasses for an organisation challenge beyond technological problems. As

a concept, digitalisation can potentially transform the entire value chain therefore requiring a complete integration throughout the business strategy and organisational structure. However, Schmidt et al. (2017) did not study this complete integration, therefore underlining the need for a study that includes the aspect of organizational structure.

While this study does not focus purely on organizational structure, still valuable empirical evidence is collected on what barriers are observed that are rooted in or connected to the organizational structure. Also, it may be relevant especially for practice how different barriers to digital transformation can be targeted using the lever of organizational structure, which is also a point of discussion in this work.

Based on this research gap, the following research question can be formulated: How do changes in the organizational structure moderate the impact of barriers on digital transformation?

In addition, this research project can also be seen as contributing to a gap that exists within the area of digital business strategies. Researchers in the field of digital transformation such as Matt et al. (2015) argue that digital business strategies are often seen as a means to generate future business opportunities. There is no single successful business strategy or process however, more so the strategies and processes that are adopted and implemented vary both in their content and eventual success. The result is that, lacking a fitting blueprint, in many companies it is unclear how to best to formulate a digital business strategy and implement a digital transformation process based on it. Increasingly there are calls for research to be conducted, with a specific focus on three key areas: how successful digital transformation strategies can be implemented, in terms of common elements and success patterns of digital transformation strategy, the procedures and responsibilities required to continuously refine and eventually deploy these digital transformation strategies, and finally, how digital transformation strategies can be integrated into existing strategies (Matt et al., 2015), but this call has yet to be addressed.

While the main focus of this study lies on the implementation phase of a digital transformation rather than focusing on digital strategy, still the call for research is partly addressed. In particular, generated insights from the implementation phase can then, in the

spirit of a transactive mode of strategy making that involves an iterative process between strategy formulation and implementation (Hart & Banbury, 1994), be fed back to generate and apply insights in the stage of strategy formulation. Specifically, this research project addresses the identified gap of common elements and success patterns as well as the procedures and responsibilities required for continuous refinement of digital strategies.

In summary, this study attempts to contribute to multiple research gaps identified in digital transformation research. Most importantly, it provides a holistic approach in terms of including the perspective on drivers, barriers, and success factors of digital transformation of stakeholders on a diverse set of hierarchy levels in the company. Further research gaps that are addressed are that this study contributes of the relatively under-researched area of barriers to digital transformation, that the impact of digitalisation on employee behaviour from the employees' perspective is analysed, that aspects regarding the influence of organizational structure are taken into consideration and lastly, that implications can be drawn for the formulation of digital business strategies.

The selected company provides a suitable environment for the research that aims to address these identified gaps. The hierarchical evolution of a chain of technological and scientific knowledge generates economic development. Apart from that, the company is in the midst of a digital transformation process and implements industry 4.0 through the whole organisational structure, including the construction of a new full digitalised plant. Therefore, the organisation provides an appropriate case for the study and allows to investigate the characteristics of a digital transformation process (Hesse, 2018). Based on the large size of the company and the broadly diversified value chain, the findings will not only be relevant within a particular industry the company is operating in, it will be also transferable to other larger sized organisations in other sectors.

The management of resources, including that of knowledge is often company specific, reflecting the often-unique combination of resources and the external environment. This justifies the research approach here; but it is expected that such studies will produce elements of more generalised knowledge. The proposed research method will provide insights into the particular challenges occurring, but also aims to contribute to existing

knowledge about organisational transformation strategies through a process of what can be called interpretive sensemaking (Welch et al., 2011).

To compile them for a better overview, the following specific research questions were formulated based on the identified research gaps, to guide this work:

- How does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of success factors and barriers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of leadership and communication regarding digital transformation vary, based on the hierarchical level of employees in an organization?
- How do changes in the organizational structure moderate the impact of barriers on digital transformation?

Based on the general purpose and the model underlying this research, two more general and broader research questions are also addressed, namely:

- What are drivers that are relevant for the successful initiation and progress of a digitalization project in a company, and digital transformation overall?
- What are barriers and success factors that are relevant for the successful completion of a digitalization project in a company, and digital transformation overall?
- How are barriers and success factors interlinked with each other?
- What are other influential themes or ideas that are underlying barriers and success factors?

To sum up, in the previous chapter, definitions were formulated for the most relevant concepts used in this study. Drivers were presented that contribute to the initiation and general progress of a digital transformation. Furthermore, barriers were highlighted that may hinder the progress or even lead to the failure of a digital transformation. Additionally, success factors were attributed to each barrier that may help to counteract it, and eventually lead to a successful digital transformation. Lastly, literature on potential common themes that could come up in the interviews was also included. Finally, insights that were generated from the literature review were further processed in terms of formulating a research gap and research questions that were guiding this study.

Chapter Three: Methodology

In this chapter, the overall research approach that is required for discovering an answer to the research questions is lined out, starting from a theoretical philosophy of science perspective, moving on to the definition of a research framework and ending with justifying the choice of a data collection method. It is discussed what research approach was chosen in terms of methodology. Regarding its structure, possible methodological choices are described, going in depth on the chosen approaches, also providing reasons for justifying the choice of these approaches. The underlying philosophy of science is discussed broadly, then the qualitative research methods are discussed in more detail and the chapter then narrows down to the method of data collection and analytical approach used.

3.1 Perspectives chosen from the philosophy of science standpoint

In the following section, different perspectives that can be adopted for this study based on the philosophy of science are described, and the choice of a perspective for this study is justified. Firstly, general considerations for the choice of a perspective are discussed, then the constructivist perspective is discussed in more detail, also focusing on its epistemology. Finally, potential research methods that can be used with constructivism, the implications of the constructivist perspective on this study are included and any potential bias of the researcher addressed.

3.1.1 General considerations

To illustrate a research process, Easterby-Smith et al. (2015) use the metaphor of a tree. This metaphor was also used in this work of research to give structure to the methodology section. "The key elements of the tree are the roots, the trunk and branches, the leaves, and the fruit – and each of these parallels an aspect of conducting research" (Easterby-Smith et al., 2015). The roots of a tree would then stand for research traditions, which constitute the basis of a researcher's ideas and influence design, methods or forms of analysis. The trunk would then be composed of the "tree rings" – hidden from the eye of an external observer, but making a critical contribution to a research project - of ontology, epistemology, methodology and lastly, individual methods and techniques that are employed for the purposes of data collection and analysis (Easterby-Smith et al., 2015). The trunk then branches out, and ends in leaves, which

represent the collection and analysis of data in a research project – these are split into three different types, positivist, constructionist, and hybrid approaches. The fruits of the tree then represent the output, or the way in which research is formulated and presented to third parties (Easterby-Smith et al., 2015).

Therefore, in a first step, ontology, epistemology, methodology and axiology needed to be taken into consideration. They describe key philosophical premises, or paradigms, on which interpretive frameworks such as positivism or constructivism are then based, that then recommend the use of qualitative or quantitative strategies (Creswell, 2013). These paradigms could be seen as a set of basic beliefs that target first principles, represent a certain worldview, and represent a faith rather than an ultimate truth (Guba & Lincoln, 1994). Each interpretive framework that is based on these paradigms then disposes of a predominantly used or fitting methodology, that may be quantitative or qualitative or a mix of the two, as for example seen in the overviews by Denzin and Lincoln (2017) below.

Ontology describes the philosophy of science that informs about the nature of the examined phenomenon. The main question in this context is "What is the nature of reality?", therefore considering through which view reality is being seen (Creswell, 2013). When employing qualitative research, the assumption is that different researchers encounter different realities, same as the subjects in the study as well as the readers of it do (Creswell, 2013). When, on the contrary a "real" world would be assumed, then only a relation to "real" existence and actions would be admissible (Guba & Lincoln, 1994), which may be the case for a quantitative study. This idea is reflected in the thesis insofar, as different realities are captured by interviewing different subjects on different hierarchy levels. Additionally, the underlying perceptions and background of the researcher were described and taken into consideration when interpreting the results. Easterby-Smith et al. (2015) provide further clarity by presenting four different ontologies, namely that of (1) realism, where a single truth, that can be observed by facts exists, that of (2) internal realism, where a truth exists but is obscure, and cannot be observed by facts directly, (3) relativism, where many truths are assumed to exist, and facts would depend on an observer's viewpoint, and lastly (4) nominalism where there is no truth, and facts are assumed to be human creations. Following this distinction, this research followed a relativist ontological position, since there were assumed to be many truths on the factors influencing the success of a digital transformation, and the viewpoints of different stakeholders were factored in with equal relevance.

Epistemology has been defined as the theory of knowledge (Maynard & Purvis, 1994). Main questions of epistemology are "How do I know the world?", "What is the relationship between the inquirer and the known?" (Denzin & Lincoln, 2017), and also "What counts as knowledge?", "How are knowledge claims justified?" (Creswell, 2013). Considerations relating to epistemology are what constitutes a knowledge claim, also referring to the included assumptions; the production and acquisition of knowledge, and how the range of its application may be developed (Maynard & Purvis, 1994).

For qualitative research, knowledge has been defined as subjective evidence from participants, and the distance between the researcher and the subject is aimed to be narrowed (Creswell, 2013). If one would choose to pursue quantitative research, on the contrary, the researcher would need to objectively detach themselves (Guba & Lincoln, 1994). This notion can be linked to one goal of quantitative research that is to create "objective" results that are generalizable to the whole population, and are based on a strong positivist paradigm (Easterby-Smith et al., 2015). To create such results, all influences that can contribute to a reduced validity of the study, and therefore a reduced generalizability, should be excluded. While some influences could be external contextual factors, factors could also be related to the researcher him- or herself. Therefore, to ensure those factors are not distorting or biasing results, therefore barring them from being generalizable, the researcher is required to detach themselves in quantitative research.

By using interviews, in this study, the researcher put himself directly in contact with the subjects that were studied, and therefore chose to narrow the distance. Easterby-Smith et al. (2015) again provided two different views on epistemology: The first view is positivism puts forward the idea, that the social world exists externally, and can be measured objectively. The second view is social constructionism, which was developed due to only limited success when applying the principle of positivism in the social science field and puts forward the view that reality is socially constructed, and meaning is assigned to it in daily interactions by other people. The focus of social constructionism lies on the thinking or feeling of people, both individually as well as collectively (Easterby-Smith et al., 2015). Easterby-Smith et al. (2015) then distinguished again between simply the epistemology of weak constructionism and the

one of strong constructionism – while the former may include a mixture of qualitative and quantitative methods, the latter focuses on interpretive qualitative methods. Constructionism focuses on cases and surveys as designs, strong constructionism on engagement and reflexivity (Easterby-Smith et al., 2015).

This research followed a social constructionist approach in terms of epistemology since the perspective and thoughts of employees towards digital transformation were at the centre of the investigation. It couldn't however be clearly placed within either weak constructionism or strong constructionism, when considering the distinctions introduced in the table, replicated from Easterby-Smith et al. (2015), that will be shown in the following. While this study both tried to add to existing literature, which can be defined as convergence, as well as introducing novel thoughts and ideas, which can be seen as invention, in terms of designs it was rather geared towards cases, a characteristic of weak constructionism. In the analysis and interpretation both elements of comparison as well as understanding were included, and the focus was put on both theory generation as well as new insights. What could see it leaning towards a weaker form of constructionism is that language and discourse were not given as much attention as strong constructionism would require. Therefore, it became clear that this study drew on elements both from constructionism and strong constructionism, but it was leaning slightly towards a weaker form of constructionism. This approach was also reflected in a large part of business and management research, since by combining approaches, it was sought to alleviate the weaknesses of each of the approaches (Easterby-Smith et al., 2015).

	Constructionism	Strong constructionism
Aims	Convergence	Invention
Starting points	Questions	Critiques
Designs	Cases and surveys	Engagement and reflexivity
Data types	Mainly words with some numbers	Discourse and experiences
Analysis/interpretation	Triangulation and comparison	Sense-making; understanding
Outcomes	Theory generation	New insights and actions

Table 2. Comparison of Constructionism and Strong Constructionism - General Factors

Source: Adapted from Easterby-Smith et al. (2015)

Focusing on the weak constructionist view, the strengths are that generalizations beyond a small sample may be drawn – weaknesses are that it may be difficult for to include institutional as well as cultural differences (Easterby-Smith et al., 2015).

Based on the view that would be chosen, different perspectives on validity, reliability and generalizability apply. A general overview was provided in the following table. It should be stated here that validity in the context of qualitative research has a different meaning to that in quantitative research (Thomson, 2011). For example, Maxwell (1992) developed five categories to assess the validity of a qualitative research study, namely descriptive, interpretive, theoretical and evaluative validity, as well as generalizability. While in weak constructionism, validity can be achieved by including a sufficient quantity of perspectives, strong constructionism assesses this criterion based on the quality of access to the study participants. The validity was ensured in this study for both variants of constructionism. A sufficient number of perspectives were included both based on the quantity (17 interviews) and the diversity of perspectives (interviewees from all levels of hierarchy), which ensured validity for the weak form of constructionism. Also, the study gained access to the experiences of those in the research setting, through interviews that were conducted in a trusting atmosphere and where confidentiality was ensured, therefore ensuring validity for strong constructionism. As for reliability, transparency was established by describing data collection and interpretation in detail in this work of research, meeting the requirements of strong constructionism. This should then also enable the replication of research, leading to similar observations by other observers, a requirement of weak constructionism.

Lastly, the question on whether the findings also needed to be generalizable to other contexts or settings was linked to the general purpose of a constructionist case study, or even more general of a case study. While some authors argued that generalizability needed to be ensured, and therefore introduced a rigorous methodology, some other authors argued that cases may or may not need to be generalizable to other contexts, as long as they provided a rich picture of a unique case (Easterby-Smith et al., 2015). In this study the latter perspective was followed. Therefore, generalizability to other contexts wasn't the main goal, even though some implications and findings may be applicable to other contexts.

98

	Constructionism	Strong constructionism
Validity	Have a sufficient number of perspectives been included?	Does the study clearly gain access to the experiences of those in the research setting?
Reliability	Will similar observations be reached by other observers?	Is there transparency about data collection and interpretation?
Generalizability	Is the sample sufficiently diverse to allow inferences to other contexts?	Do the concepts and constructs derived from this study have any relevance to other settings?
Source: Adapted from Easterby-Smith et al. (2015)		

Table 3. Comparison of Constructionism and Strong Constructionism - Validity, Reliability, Generalizability

Source: Adapted from Easterby-Smith et al. (2015)

While in the previous paragraphs the term "constructionism" was used, earlier it was mentioned that this research builds on the framework of "social constructivism". To understand and characterize the difference between these two terms, work by Fletcher (2007) was considered. She concedes that the terms are often used interchangeably. While she sees some similarities between the term, she also highlights the differences between them. In summary, she states that social constructivism and constructionism are two emphases in the broader category of social constructionist thinking, rather than two camps which can be clearly distinguished (Fletcher, 2007). The main difference that can be drawn from the comparison of Fletcher (2007) is that constructivism focuses more on the processes that occur inside of human beings, such that knowledge is constructed in their mind, rather than looking at relational processes that can include the external environment as is the case in social constructionism. Consequently, also the methods that can be used in social constructivism are more centred on the feelings and impressions of the subjects, while in social constructionism, also observational and narrative techniques can be employed. From this overview, it appears that this study was leaning more towards what can be termed as "social constructionism", since a focus was put on the relationship between individual perceptions of changes or modifications of an external environment. However, from a review of literature it appears that the distinction put forward by Fletcher (2007) wasn't broadly accepted. Based on this fact as well as the fact that Fletcher (2007) stated that the schools of thought are largely similar and can't be clearly distinguished, the terms of social constructionism and social constructivism will be used interchangeably in this work.

Focusing on the next area of axiology, also described as ethics and values, then poses the question of "What is the role of values?" with the researcher employing qualitative methodologies acknowledging that biases are present and research is value-laden (Creswell, 2013). Contrasting that, in quantitative research, the researcher can be considered as independent from the data and maintaining their distance to the assessed subjects therefore separating the research from their own values. "How will I be as a moral person in the world?" is another question that may be asked in this relation (Denzin & Lincoln, 2017).

Lastly, methodology focuses on what the best tools and means are to acquire knowledge about the world (Denzin & Lincoln, 2017). Questions include "How can the inquirer [...] go about finding out whatever he or she believes can be known?" (Guba & Lincoln, 1994) or "What is the process of research?" (Creswell, 2013). What characterizes qualitative methodology is that researchers would use inductive designs, and study the topic within the context, as well as being responsive to emerging designs (Creswell, 2013). In quantitative research the approach would be to obtain control of possible confounding variables and factors (Guba & Lincoln, 1994).

Assumptions along these four fundamental premises, and the linkages between them, are then the basis for several different interpretive frameworks. Creswell (2013) suggested that they may be characterized as either social science or social justice theories. In a table, that could be found in the work of Denzin and Lincoln (2017), the interpretive frameworks of positivism, post-positivism, critical theory and constructivism are presented and compared. Items of comparison include the four fundamental premises, namely ontology, epistemology and methodology, and reflected by the values and ethics section, axiology. Based on the information contained in the table, a brief overview of the different interpretive frameworks, also called inquiry paradigms by Guba and Lincoln (1994) will be given in the following, to better be able to justify the choice for one.

Positivism assumes a "real" reality in terms of ontology, on which the understanding is that it can be grasped; this is also known as naïve realism (Guba and Lincoln, 1994; Easterby-Smith et al., 2015). The underlying epistemology consequently sees the investigator and the subject as two separate parties, that are not influencing each other (Guba & Lincoln, 1994). The

axiological beliefs are that the researcher's biases, views and attitudes need to be controlled for and not explicitly expressed in a research study (Creswell, 2013). Lastly, the methodology is based on questions or hypotheses that are put to test using empirical tools to verify them, thereby controlling for possible confounders (Guba & Lincoln, 1994).

Postpositivism, in contrast to positivism, assumes a "real" reality, but states that it can only be grasped imperfectly, due to humans disposing of faulty intellectual mechanisms and due to the very nature of the phenomena; this is also known as critical realism (Guba and Lincoln, 1994; Easterby-Smith et al., 2015). The epistemology that follows from this ontological view, again aims to establish objectivity, but concedes that it is not possible to obtain complete dualism, which would be characteristic of the positivist view (Guba & Lincoln, 1994). Similar to positivism, also in post-positivism, regarding axiology, a researcher's biases, views and attitudes need to be controlled for and not explicitly expressed in a research study (Creswell, 2013). The methodology is then aimed at falsifying hypotheses, and including more natural settings in inquiry, as well as including other viewpoints; thereby increasingly employing qualitative techniques (Guba & Lincoln, 1994). In practice, this means that inquiry is seen as a series of logically related steps, it is assumed that multiple perspectives from participants exist, and that rigorous methods of qualitative data collection and analysis are used, employing computer programs (Creswell, 2013). This framework is for example reflected in procedures of grounded theory (Creswell, 2013).

Critical theory then assumes what is called "historical realism", in that a reality is assumed, that was plastic "back in the days" but has developed, through the influences of social, political and other factors, into something that is perceived to be real, but isn't (Guba & Lincoln, 1994). In terms of epistemology, the viewpoint is that the interviewer and subject are seen as linked, with the investigator and his values influencing the inquiry, so that any findings are mediated by these values (Guba & Lincoln, 1994). The axiology is that it is accepted and emphasized that diversity of values exist on a community level (Creswell, 2013). The fitting methodology then is dialogic and dialectical, meaning that a dialogue between researcher and subjects is required (Guba & Lincoln, 1994). In practice this means that an intensive case study or comparison of cases, or ethnography is recommended to be employed (Creswell, 2013).

Lastly, in constructivism, the underlying ontology is a "relativist" view (Guba & Lincoln, 1994). There are multiple and varied realities, and this complexity of views is specifically sought out by the researcher (Creswell, 2013). They can be grasped and are expressed through intangible mental constructions, that developed based on social and experiential circumstances that an individual person or group has (Guba & Lincoln, 1994). None of the realities may be assumed to be more or less "true", since there is no absolute reality, that can't be altered (Guba & Lincoln, 1994). From an epistemological perspective, the researcher and subjects are assumed to be linked, since the findings are created over the research process (Guba & Lincoln, 1994). In other words, the reality is "co-constructed between the researcher and the researched and shaped by individual experiences" (Creswell, 2013). This in turn means for axiology that the values that individuals hold are considered, in that they are also negotiated among individuals (Creswell, 2013). The methodology that is employed in this framework is then hermeneutical and dialectical, in that individual constructions are identified and refined in a dialectical dialogue between researcher and subjects (Guba & Lincoln, 1994). In other words, the research process doesn't start with a theory, but a theory or pattern of meaning is developed inductively (Creswell, 2013). For the actual research practice this implies that questions in the data collection stage should be formulated as broadly and as open-ended as possible, so that the participants may construct their view or assign a meaning to a particular situation (Creswell, 2013). This is reflected in a more literary style of writing when reporting research outcomes, that sums up the results from an inductive method of combining interviewing, observing and text analysis (Creswell, 2013).

Constructivism will be discussed in more detail in the following section since this research investigation was based on the perspective of social constructivism. This paradigm allows for the examination of the people's reaction and perspectives to digital transformation, based on a study of different projects. In this work of research, it was of high importance to understand the unseen effects and their influence and not only numbers and facts. This approach was most in line with the proposed research aim and topic.
3.1.2 Constructivist perspective in detail

Before going into depth on the history of social constructivism, summed up briefly, the focus of this perspective lies on how humans sense the world and how they share their experiences with others through the medium of language. This paradigm claims that reality is not objective, what this means will be described in the following. The essence of social constructivism is that social science should not only pay attention to the frequency of behavioural patterns and objective facts of society, but also to the meaning that people ascribe to their experiences and the different conclusions they draw from them because many facets of social reality are determined by people's subjective experience and not by objective and external factors. People's actions are driven by the emotions that people experience in different situations and not as a direct response from external factors or stimuli (Easterby-Smith et al., 2015).

In contrast to positivism, which has a very long tradition in science, a newer perspective was created because of limited success in applying realism and positivism in social sciences. During the last half-century, philosophers have developed the idea of social constructivism. To characterize it, it is placed at the intersection of two streams of sociology research: the sociology of knowledge on the one hand, that was influenced by Marx, Mannheim and Durkheim, and the sociology of science on the other hand (Kukla, 2013). Social constructivism as such was then introduced by Peter L. Berger and Thomas Luckmann in their book "The Social Construction of Reality", published in 1967. But even though the work carries the ideas of social constructivism, the authors didn't want the term to be associated with their work (Pfadenhauer & Knoblauch, 2019). Still, Pfadenhauer and Knoblauch (2019) argue that their approach should be labelled as "social constructivism", and characterize it based on the following five points:

- (a) social constructivism carries the view that the nature of social reality but also reality per se is a constructed one
- (b) construction is an infinite, never-ending process
- (c) this construction process is interactive

- (d) any claim that can be made in absolute or total terms, is to be rejected, since reality is simply a construction
- (e) refusing to abandon the claim of truth of science.

3.1.3 Epistemology of constructivism

In terms of epistemology, constructivism is closely linked to interpretivism and focuses on details of social phenomena and the subjective reality behind these details (Moses & Knutsen, 2012, p. 9). Constructivists, including interpretivists, recognise that people can look at the same thing while perceiving it in different ways. Individual characteristics like gender, age and origin or social characteristics like culture, language and generation can influence one's perception of the world. As human's ability to act wilfully and their subjective perception of their actions, it is hard to create simple social laws. In the past, when a social law was discovered and became widely known, people exploited it to undermine its features. To make it even more complicated, humans create things that have a different ontological status in the world than the objects that are studied by natural scientists. The former ones do not objectively exist in the physical world. Likewise, the facts that are attributed to those objects cannot be found as physically existent either. Money serves as a prime example here, as the bank notes do not have an intrinsic value to them. They only acquire their value through people's belief in it. The same goes for the concepts of superiority or property rights, as their existence too is based on human agreement. Usually, constructivism has a broader set of epistemological tools, such as empathy, experience, reason, myths and many more. However, they cannot be used with the realist perspective. Constructivists do realise that the tools mentioned can be influenced by the aspects mentioned above. Therefore, it is difficult to lay claim on a single objective truth. Constructivism therefore tries to integrate many different sources, generating diverse types of evidence (Moses & Knutsen, 2012, p. 10)

3.1.4 Discussion of potential methods that can be used in accordance with constructivism

The constructivist and interpretivist perspective usually applies a qualitative strategy to its research. Because it is assumed that there may be many different realities of the world, the researcher needs to integrate multiple perspectives to collect the data, for example in the form of experiences and opinions of individuals and observers. The constructivist researcher tries to understand how people create structures that help them to influence events taking place around them and, additionally, help them make sense of their experiences. In the constructivist paradigm, much attention is given to how language and communication performs both of these functions (Easterby-Smith et al., 2015).

Qualitative strategies use an inductive logic and start by collecting data from theoretical ideas. There is no or little use of statistical analysis and numbers, as the focus is instead on meanings and contexts. Data collection can be performed via interviews, focus groups, observations or other tools that require the researcher to be close to the participant. Sample sizes are much smaller than for quantitative studies. Moreover, the survey may be biased more easily, due to the researchers' closeness to their participants (Robson & McCartan, 2016). One additional disadvantage of a qualitative study is that it is difficult to acquire truly objective results, due to the small sample size and the great number of factors that can often not be easily measured.

The following table compares the social constructivist and the realist perspective and presents some of their differences.

	Social constructionism	Realism
Human interests	Are the essence of science	Are irrelevant
The observer	Is part of the observation	Must be independent
Explanations	Aim at increasing general understanding	Must demonstrate causality

Table 4. Comparison between social constructivism and realism

Research methods	Collecting rich data with induction	Hypotheses and deduction
Concepts	Incorporate stakeholder	Must be measurable
Units of analysis	Include the whole complex situation	Are reduced to simple terms
Modes of generalisation	Theoretical abstraction	Statistical probability
Sample requirements	Small number of specifically selected participants	Large number of participants selected randomly
Designs	Cases and surveys with engagement	Large surveys and experiments
Data types	Mainly words and experiences	Numbers, facts and some words
Interpretation	Understanding and sense making	Verification and falsification
Researchers value	Researchers value is important	Value free from the researcher
Starting points	Questions	Hypotheses
Outcomes	New theories, insights and actions	Confirmation of theories
Main strategy	Qualitative	Quantitative

Source: Adapted from Easterby-Smith et al. (2015) and Saunders et al. (2016)

3.1.5 Implications of the constructivist perspective on this research

Based on choosing the constructivist perspective, implications for the further course of this research study were derived. This section should however only give a rough outline of the implications following from the constructivist perspective, since this will be discussed in more detail in a later chapter.

Since this research study was based on the constructivist paradigm and its qualitative strategy, the digital transformation process on organisations was investigated by collecting and interpreting data. Usually, an inductive process implements qualitative strategies. This process would start with literature research and an examination of the most current findings in the field. This would then be followed by conducting a case study, which seemed especially useful for this topic of research. The case study was based on the literature on digital transformation processes.

Interviews with affected employees and managers of the company were conducted. These interviews, paired with making observations of the company's workings as a whole, functioned as a way to collect data for the research questions. Through both of those methods, the researcher should be able to acquire enough impressions and insight to develop suitable research questions. Furthermore, based on the interpretations of these insights, new hypotheses were then developed. Finally, based on these new hypotheses, new theories could be formulated and tested. Also, the gained knowledge could be implemented in the company which would then further expand the theoretical literature of this research topic when results are observed.

Digital transformation is a current and rather new topic, and there is little existing literature on it, as outlined in the literature review. In particular, it was found that the inclusion of the perspective on digital transformation of a diverse set of stakeholders, in terms of their hierarchical position, has been still missing in existing research. Therefore, constructivism poses itself as a suitable philosophical position for the research because, using an inductive method, less already existing knowledge was needed than would be the case for working with the realist or positivist paradigm. For this research study, only one organisation was studied, causing a greater bias than if a higher number of different organisations would be examined. Constructivism allows for biased outcomes, however, and smaller sample sizes, even if these result in less objective findings than if one was to base the study on realism. Nonetheless, there are different tools, in addition to an informal language, that help constructivists to obtain a reliable outcome of the research. Reasons and characteristics mentioned above describe why a constructivist lens was suitable for the investigation and why the aim of the research could more easily be reached with this philosophical position, rather than with other paradigms.

3.1.6 Addressing researcher's bias /challenges of the qualitative approach

When employing qualitative methodology, the researcher becomes the research instrument (Denzin & Lincoln, 2017). As a consequence, there is a risk of qualitative research being biased, small scale, anecdotal or lacking rigor (Anderson, 2010). Therefore, a potential bias of the researcher may influence the research results. A reason for a researcher's bias could for example include that a researcher is not being sufficiently prepared to conduct the research, or experience mental discomfort (Chenail, 2011). The issue was addressed by diligent preparation of the interview guidelines for semi-structured interviews and reviewing the details of the interviewees in advance. Also, no mental discomfort was experienced during the interviews.

Additionally, a researcher might experience a bias due to a high degree of affinity with the population under study (Mehra, 2002). To address this bias, piloting the study may be an option (Chenail, 2011). However, since the sample of research participants in this project was limited, the value of their input was rated as more valuable than the potential benefit of a pilot study.

Another strategy to counter bias is to seek out contradictory evidence and account for it (Anderson, 2010). This strategy was integrated in the research project, by comparing statements from different stakeholders with different characteristics and different opinions when analysing statements on projects. Also another strategy, namely that of constant comparison, was used, when the collected evidence was compared to earlier pieces of work, therefore enabling researchers to see the data as a whole, and identify emerging themes (Anderson, 2010).

To provide the readers with the researcher's view, a semi-quantified interpretation was provided, following Anderson (2010). This may help to make statements more precise, increase clarity with regards to identified patterns and a better focus (Neale et al., 2014).

However, the use of such semi-quantitative information in qualitative research has been controversially discussed, since it might suggest that generalizations beyond the studied sample are attempted to be drawn (Neale et al., 2014). Therefore, the author clearly states that no inferences should and can be drawn from this study beyond the studied sample, and non-specific terms rather than specific percentages were used.

This means that in the "Results" part an indication of whether the quoted response was reflected by some or a few of the respondents, will be given. Also, if quotes are included, they are discussed and analysed.

To sum up, in the last section, the methodological choices for this study, in terms of philosophy of science, were lined out. It was described that a relativist ontological position was followed, since there were assumed to be many truths, rather than a single truth. In terms of epistemology, a social constructionist approach was followed, since the perspective and thoughts of employees towards digital transformation were relevant to this study. This study couldn't be clearly placed within weak constructionism or strong constructionism, however it is found to be rather leaning towards weak constructionism. In particular, the stream of "social constructionism" was selected, where the relationship between individual perceptions of changes or modifications of an external environment are assessed. In line with these choices, a qualitative research methodology was chosen. Finally, it was shown that the methodological choices are complementing each other, and it was discussed how potential biases that might arise in connection with the research methodology are counteracted.

3.2 Qualitative research methodology

So far it has been argued why a constructivist view was found as being most appropriate for this research study. The research methodology, often called research design, is then the link between the philosophical view and methods for data collection and analysis, and is discussed in this next section. It is important to formulate a plan to answer the research questions and determine what will be observed, where and how (Saunders et al., 2016).

3.2.1 Definition of qualitative research

One practical approach to decide which methodology and methods should be chosen, may be whether a "[...] detailed understanding of a process or experience is wanted, where more information is needed to determine the boundaries or characteristics of the issue being investigated, or where the only information available is in non-numeric (e.g., text or visual) form" (Bazeley & Jackson, 2013). If these are the goals and characteristics present in the research setting, qualitative methods should be chosen, which was the case in this study. In this specific case, qualitative research methodology and design enabled a deep understanding of the digital transformation process in a company. Furthermore, it allowed for new theories to be generated for the implementation of digital transformation. With the use of the social constructivism lens, a qualitative research framework was the most suitable approach for the investigation.

Adding to the practical guidelines, a theoretical lens could be used when deciding which methodology should be used. One could simply look at the definition of qualitative research. Generally, "qualitative research" is used as an overall umbrella term that comprises various approaches to research in the social sciences (Flick, 2002). Drawing on a review article by Aspers and Corte (2019), it became apparent that a clear and unique definition of "qualitative research" was missing. They noticed however that in prior definitions, there were some recurring thoughts, such that the research is aimed at "[...] understanding, interpretation, "getting close" and making distinctions" (Aspers & Corte, 2019). Elaborating on these thoughts, they stated that the possibility of making new distinctions sets qualitative research apart from quantitative research, since in the latter field, mostly variables that were taken for granted were employed. Another characteristic of qualitative research was that new knowledge results from an iterating process, between theory and evidence, that may involve several phases. Furthermore, qualitative researchers were also getting closer to the phenomenon that they study, for example by conducting interviews and when analysing them. Lastly, understanding, and not purely explaining a phenomenon characterizes this field of research. The concept of understanding is closely linked with the iterative process mentioned earlier, in that it should involve questioning and challenging one's assumptions to gain a deep understanding of something that the scholarly community didn't know before or wants to know better. To sum up, the definition that the authors provided, considered "qualitative research as an iterative process in which improved understanding to the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied" (Aspers & Corte, 2019). Also based on this definition it became clear that the methodology closely aligned with the aims of research that were followed with this study.

Bryman and Bell (2007) established a clear terminology, by stating that research methods were a technique for collecting data, whereas a research design defined the structure that was used to guide the execution of a research method. Examples for research designs were an experimental design, a cross-sectional design, a case study design or a longitudinal design (Bryman & Bell, 2007). When a research design has been selected, such as a case study design, then the research methods that were required to collect data need to be defined, such as doing interviews, or observations, or an examination of documents.

To therefore choose a specific method of data collection, an understanding of possible research designs would need to be built up. In general, a research "[...] design is the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions." (Yin 2018). One such design could be an experimental design, for example a treatment is administered by a researcher in a laboratory or in a field experiment (Bryman & Bell, 2007). Advantages of such a design could be that the researcher could ensure "control of treatment", in that the mechanism of interest could clearly be isolated, and that new phenomena to which no secondary data exists, could be analysed. Disadvantages could be, that it might be artificial, and therefore only would carry a limited external validity (Bryman & Bell, 2007). In a case study design, one option would be to analyse a case in detail. This case then focuses on a situation where boundaries are clearly defined, and intensively examines this setting, illustrating the specific features of the case (Bryman & Bell, 2007). Since also a case study tends to rely on an inductive approach, relying on qualitative methodologies, it seemed fitting in our context. A downside to using such a design is that relying on a single case study, may not be representative or generalizable, in other words, disposing of limited external validity. While this may seem like a downside at first, and researchers have made attempts to generalize, the strength of the case study lies in developing a deep understanding of the complexity of a single case (Bryman & Bell, 2007).

A group of research designs that may be applied in concurrence with a constructivist perspective are narrative methods, which cater to the ontology that reality is created by stories and myths, and the epistemology that the researcher may gain insights into the processes by collecting stories, for example through interviews (Easterby-Smith et al., 2015). As such, they would provide a holistic view on organizational behaviour (Easterby-Smith et al., 2015). Yet another research design, that is not exclusive to be used by constructivists, is the case method: while a constructionist epistemology more frequently employs single cases to generate an insightful picture of a phenomenon, a positivist epistemology uses multiple cases to create generalizability (Easterby-Smith et al., 2015). Particular characteristics of constructionist case studies are that data is generated through interviews, and that they are conducted in a single organization. The unit of analysis thereby are either the individual or particular events happening – in this research it was the latter – with specifically projects in the digital area being implemented.

A qualitative research framework can therefore be accomplished by employing different research designs, and a broad set of possible tools for data collection is available. Suitable tools for data collection are identified in the following section. To justify which specific research design was most appropriate for this study, a brief overview of four common qualitative research designs, also known as research strategy (Bryman & Bell, 2007), namely ethnography, grounded theory, case study and action research is given.

3.2.2 Potential designs to be used

In the following, designs that could have been potentially used in this research study will be briefly introduced, and the associated benefits and drawbacks are presented. Then, based on the weighting of those factors, a design was chosen that was applied in this research study.

As the first potential design, an ethnographic design could be used to get insights into both an area which is very familiar to the researcher and into a new and different area. Ethnographic studies focus on very in-depth insights rather than on a wide coverage. Additionally, the focus is on a small number of cases (Robson & McCartan, 2016). The essence of ethnography is that the researcher becomes a part of the observed sphere. For a longer period of time, the researcher involves him or herself in the observed group and listens to conversations, asks questions and observes behaviour to find unseen characteristics and generate data. Typically, after the period in the group, the ethnographers collect further insights and data through interviews or collection of documents. Ethnography allows a wide range of methods of collecting data and different sources. Ethnographic studies are often used when the primary data collection method is observation, or the focus of the research is on the behaviour of a group or organisational culture. One of the essential requirements for Ethnography is access. This is, however, often difficult to obtain. The researcher needs access to participate in the social group or organisation that is relevant for the research (Bryman & Bell, 2007). This requirement would have been especially difficult to fulfil for the proposed investigation. The research should take place in an industrial organisation and should involve all hierarchical levels; however, it was not possible to get the access required to have sufficient insight into the organisational structure. Another issue was that the presence of the researcher would have influenced the participants in the observed group. Furthermore, as the main focus of the study was not on culture and data collection, mere observation would not bring about tangible insights into the digital transformation process.

Next comes grounded theory, which essentially is a set of flexible guidelines and analytical tools that help the researcher to focus on data collection, to build middle range theories through conceptual development and successive stages of data analysis (Charmaz, 2014). Initially it was formulated by Glaser and Strauss (1967). In general, grounded theory is abductive, but it is closer to inductive processes than it is to deductive ones. The two primary procedures in grounded theory are continuous comparing of data with resulting information categories and theoretical sampling to show similarities and differences in the collected data. Easterby-Smith et al. (2015) give the example of a study in which a researcher is interested in performance appraisal interviews, and therefore studies interviews that are handled by different managers, in different organizations or departments. This theory repeatedly and systematically reviews the conceptual development and its relationship to the data. This includes systematic asking, theoretical sampling, making comparisons, systematic coding of processes, the use of guidelines to attain conceptual density, implementing modifications and

conceptual integration. Research based on grounded theory starts out differently than the abductive process; one possibility is to start by identifying the general themes through several qualitative data sources. Following this is the development of ideas (data-based hypotheses). Afterwards, data-based hypotheses are tested and possibly modified by integrating the findings of the new data. Finally, the revised hypotheses are tested again, resulting in the obtainment of the final outcome of the research (Tharenou et al., 2007).

In summary, grounded theory induces themes in processes within and between their theorised constructs. Comparing grounded theory to action research, many similarities can be found. However, it is less driven by obtaining a practical output. Grounded theory could be an option for the proposed research, but usually this method would have needed a lot of time and resources, which would have been difficult to get from the organization (Robson & McCartan, 2016). This was also highlighted by Easterby-Smith et al. (2015) who state that access to the required data and interview partners is difficult in commercial organizations. This would be especially so when examining digital transformation in an industrial company. Therefore, grounded theory did not seem to be perfectly suited for this study.

Another research methodology that has been considered is action research. Usually, action research provides practical implications for the organisation and the participants beyond the research investigation. For example, a common purpose of action research is to generate a practical outcome for the development of organisational learning by identifying issues within the organisation's workings. Action research is a research investigation in action and not an investigation of action. In contrast to other methods that are collect and analyse data, action research first implements changes to create new data and only then does the researcher collect and analyse this new data. Like other research strategies, action research starts by posing research questions and gaining an overview of the specific context of the topic. However, the focus can change as the investigation proceeds. Because this process goes through several stages, it is more extensive than most other research strategies. Action research works in cycles, with each cycle including the tasks of diagnosing issues, planning actions, employing them, and finally evaluating and interpreting the results (Saunders et al., 2016).

The outcomes of the first cycle provide the points of focus for the second cycle, the second cycle for the third, and so on. This action research spiral therefore includes as many cycles as

are needed in order for the findings and implications to be sufficient for the organisation and the researcher. Action research usually uses an abductive research process and switches between an inductive and a deductive style or may combine both (Lorino, 2018).

Action research would be an interesting approach for the chosen topic, but the main advantage of this methodology would be to intervene in an organisation and bring out a practical output or change in the chosen company. The researcher could introduce new ideas and test whether they work.

All in all, this approach did not fit with the aims of the research investigation. The reason was that an organisation changes slowly and requires many years for a thorough transformation. Therefore, the risk was high that the investigation would have to be conducted over a longer time period than would have been practicable for both the researcher and the company. Also, the researcher would have needed to be actively engaged in an intervening position, which was also not practicable for the researcher. Additionally, such an understanding of the role of the researcher would have likely influenced the results, which was contrary to the aim of this research and the personal views of the researcher. The researcher aimed to be close to the subjects, to get insightful results, yet wanted to maintain a degree of objectivity to represent the employee's perspectives.

As the last research design presented here, case studies are common in management and business research. A case study can be combined with other research methods, for example: action research as a case study.

This methodological approach focuses on what is studied and where the study takes place. Concerning this type of research, case studies are defined by examining a specific and individual case, rather than using a collection of methods. By integrating a case study into this research, the framework of the methodology becomes narrower. In general, case studies are used to do research on a particular case or on a specific subject, and the chosen case enables suitable conditions for surveys. Case studies mainly employ a qualitative strategy; however, they can also use quantitative strategies or a combination of the two. Based on the social constructivist perspective, the focus is on qualitative strategies and concentrates on experiential knowledge gained through the specific case, paying close attention to social influences, meanings, and behaviour (Stake, 2005).

To sum up, the past section discussed the characteristics of the qualitative research method, and provided definitions. Then potential designs for data collection were presented, and the choice of the case study method justified. More details on this research design will be given in the following section.

3.3 Detailed discussion of the case study design in general and specific

Based on the overview in the previous section, it was decided that a case study design would be the most fitting for the objectives of this study, and most in line with the convictions of the researchers. In the following section this design and associated considerations are presented in more detail. Methods of data collection are discussed, then interviews as the chosen method are described in more depth, as well as the techniques for participant selection and data analysis.

3.3.1 Types of case studies

This choice for a case study was founded on the criteria that Yin (2018) put forward for choosing case study research, namely firstly, that the main research questions were "how" or "why" questions. In the case of this research, the main research questions were "how" questions. Secondly, the researcher should have little or no control over behavioural events, which was also the case in this study, where the researcher only came in contact with the company department and the subject area after the implementation of the projects and technologies had started. Thirdly, Yin (2018) put forward that a case study should have a focus on contemporary events, contemporary thereby being understood as "[...] a fluid rendition of the recent past and the present, not just the present" (p. 43). This was also the case in this study, since on the one hand, the projects in which digital technologies were implemented were conducted in the past and the recent past. On the other hand, general digital transformation efforts in the company were still ongoing, and new technologies were constantly implemented.

The essence of case studies was already briefly described in the previous section about research methods. While in early textbooks, the case study was considered as part of other research methods and was not further detailed, in later research a definition was found, as formulated by Yin (2018). The definition is twofold, with the first part defining the scope of a case study, and the second one the features. Firstly, the scope of a case study refers to the fact that a "[...] case study is an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between the phenomenon and context may not be clearly evident" (Yin, 2018, p. 45). In this particular case, the phenomenon that was supposed to be studied is digital transformation. The context depends then on the exact definition of digital transformation, but in general it is a company, and more broadly, the environment the company is operating in. Based on the exact definition of digital transformation and how it was being studied, the boundaries between the phenomenon and context may be drawn more clearly. Secondly, the features of a case study are that there are more variables of interest than data points, that developing theoretical propositions can help the design, data collection and analysis, and that multiple sources of evidence are included (Yin, 2018).

To develop a solid research design that was underlying this study, the components of a research design, as outlined by Yin (2018), will be discussed in the following with regards to case study research. At first, a case study's questions would need to be defined in the form of research questions. This was done in the literature review chapter, however, to remind the reader of them, they are reproduced here again:

To compile them for a better overview, the following specific research questions were formulated based on the identified research gaps, to guide this work:

- How does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of success factors and barriers of digital transformation vary, based on the hierarchical level of employees in an organization?

- How does the perception of leadership and communication regarding digital transformation vary, based on the hierarchical level of employees in an organization?
- How do changes in the organizational structure moderate the impact of barriers on digital transformation?

Based on the general purpose and the model underlying this research, a few more general and broader research questions were also addressed, namely:

- What are drivers that are relevant for the successful initiation and progress of a digitalization project in a company, and digital transformation overall?
- What are barriers and success factors that are relevant for the successful completion of a digitalization project in a company, and digital transformation overall?
- How are barriers and success factors interlinked with each other?
- What are other influential themes or ideas that are underlying barriers and success factors?

After the study questions were clear, study propositions needed to be defined, in the sense that a proposition should highlight the focus of a study. Study propositions were indirectly defined for the second category of broader research questions, in that an overview of drivers, barriers and success factors that have been found in literature was given, that were proposed to influence digital transformation. For the first category of research question, this study had an exploratory character. Therefore, the purpose of this study was also exploratory, in that the aim was to obtain insights on differences in perception between stakeholders on different hierarchy level with regards to drivers, barriers and success factors of digital transformation.

In a next step, the "case" that was the focus of the study was to be identified, defined and bounded (Yin, 2018). First, identifying and defining a case: Typically, case studies can be

distinguished according to two main strategies: single case and multiple case. A single case represents a unique case or, for example, a single organisation that provides the required conditions for the research. In contrast, the multiple case strategy focuses on findings that can be replicated across several cases (Saunders et al., 2016). For example, 5-10 different organisations in the same business field are examined which deal with the same challenge or provide comparable conditions for the research.

For this research investigation, a so-called embedded single case strategy was used, which will be described in more detail in the following. Yin (2018) described five rationales that warrant the use of a single case, namely that the case is critical, unusual, common, revelatory, or longitudinal. The company studied for this research was mainly used as a common or representative case, therefore the use of a single case study was admissible. The representative case exemplifies an everyday situation, a process or a form of organisation and was used in the study to illustrate the transformation of an organisation due to digitalisation (Bryman & Bell, 2007). Digital transformation is a new, challenging topic and companies invest much time and money in the process. Therefore, they keep as much as possible secret and most of the companies will not give permission for the investigation if the researcher examines other companies at the same time. Therefore, in the interest of collecting as specific information of as high quality as possible, it was decided to stick to a department in a single company leading to a single case study. While the company, or more specific, the department in the company and its attempt on digital transformation represented a single case, within this single case, multiple projects aimed at introducing new technologies were analysed. Therefore, on company-level or rather department-level the case study was a single case study, on project-level it was a multiple or collective case study, following the distinction made by Creswell (2013). As stated by Yin (2018), it is admissible for a case to be a project, or an event. Further building on this description, based on Yin (2018) one can proceed to categorize the single case study design, into either a holistic or an embedded design. In particular, the research setting described above can be categorized as a single-case (embedded) design. In such a setting the case study would be about a single organization, which is the first level, but would include data from an element or subunit within this single organization as the second level (Yin, 2018). In this study, the company would be the first level, and the projects introducing digital technologies the second level.

Second, bounding the case as per Yin (2018): As stated, the case or phenomenon must be distinguished from its context, that includes data that is external to the case. In this study, a sample of five different projects that were aimed to introduce digital technologies within a specific company, and focused on a specific department was assessed. Any additional project conducted in the company or primarily focused on a different department would be outside the boundaries. Additionally, as a time boundary, the approximate start and end points of projects were defined. To sum up, a case which has clearly identifiable boundaries was defined by selecting the focal point of a department in a company, which makes the case study a good and fitting approach to be employed (Creswell, 2013).

The goal that was aimed to be accomplished by the use of this type of case was to create a suitable research space to collect data and interpret it for a deep understanding of the research subject. In general, researchers employing qualitative methodology were reluctant to generalize among cases, since the contexts of cases were argued to be different (Creswell, 2013). This critique was one that positivist researchers put forward, and tried to address by having a clear design produced before data was collected, therefore aiming for case studies to have the same degree of validity as other positivist studies (Easterby-Smith et al., 2015). So, even though most case study research seemed to be oriented towards a realist or positivist epistemology, it has also been found to be suitable to a relativist or constructivist perspective (Yin, 2018).

Constructionist researchers were more concerned with providing a fully-fledged and diverse impression of organizational phenomena, rather than aiming for validity (Easterby-Smith et al., 2015). The first obligation of a researcher employing a case study is to understand the one focal case, which then influences the selection of a case (Stake, 1995). In particular, an important criterion for selection is that the case offers the possibility to learn as much as possible from it, therefore very unique or contextual-dependent environments or companies may not be perfectly suitable (Stake, 1995). When these criteria are employed, a case might be especially useful for developing innovative new ideas or highlighting the importance of specific research questions, or even to disprove a theory by providing an instance or case that doesn't fit it (Easterby-Smith et al., 2015). Additionally, the accessibility of the focal company as well as the representatives should be considered when choosing the case (Stake, 1995). As

mentioned earlier, this reasoning was also instrumental in the selection of the company and the specific department in this study since access was obtained through personal connections of the researcher.

3.3.2 Methods of data collection

In the research design of a case study, there are several different methods for data collection, also called six sources of evidence by Yin (2018), that are available to use. Especially in a fixed research design, the data collection method had to be chosen before the start of the investigation. Even in flexible designs, however, it had to be decided which method would be used for the start of the research. It was necessary to choose a method that could answer the research questions in the best way and also aligns with the philosophical perspective and research design. Furthermore, it was important to include available resources, time period, ethics and access possibilities in the consideration (Robson & McCartan, 2016). The literature offers several qualitative methods for data collection, for example: direct observations, archival records, participant observations, interviews, focus groups, physical artifacts, document analysis, action learning, narrative research, scenarios and more, as stated by Creswell (2013) and Yin (2018).

Documentation and archival records, that could constitute a retrospective view, were not taken into consideration for this study, since records of this kind were not available and accessible to the researcher. As for observational methods, they were not possible to be implemented in this study, since the events or projects of interest were mostly set in the past. Therefore, coverage of the case in real time that would be required in these methods, was impossible.

In general, an interview should be the method of choice, when the interviewee's 'world' should be understood, and the information that is shared is a sensitive matter requiring a confidential one-on-one setting to obtain truthful information (Easterby-Smith et al., 2015). They enable the researcher to focus directly on the topic of the case study and can provide insightful explanations on personal views of the subjects on this topic (Yin, 2018).

121

Disadvantages include that biases or conceptions which the interviewer holds may be difficult to rule out, since there is a lack of standardization (Robson & McCartan, 2016). In particular this bias may arise through poorly articulated questions or reflexivity, meaning that the interviewee is saying what they want the interviewer to hear (Yin, 2018). Therefore, the interviewer would need to possess a high degree of self-reflection and professionalism to counteract the rise of such biases, and allow interviewees to talk freely and openly, for example following the advice that Robson and McCartan (2016) give, to listen more than speaking or to enjoy the interviews.

Taking into consideration the advantages, disadvantages and the research access to data, interviews were found to be the most relevant method for this topic and will be described in more detail in the following.

3.3.3 Interview

Interviews are one of the most common methods in qualitative research to generate data. Social scientists especially rely on this method. Interviews can be conducted one-on-one or in small groups, called focus groups (Moses & Knutsen, 2012).

Interviews can take a wide range of forms; it is most common to interview an individual face to face and collect data through verbal interaction (Easterby-Smith et al., 2015). Interviews can be also conducted via telephone calls or other communication tools. Advantages that come with interviews, compared to the other qualitative methods for data collection, include that, for example compared to observation, they can be argued to provide a short cut when seeking answers, since people don't need to be observed, but can be asked directly about the issue at hand (Robson & McCartan, 2016). The role of the interviewer is to be sensitive enough to capture and understand the viewpoints of the interviewee, but also assisting them to clearly formulate their own opinions and beliefs (Easterby-Smith et al., 2015). Additionally, they offer the opportunity to follow up on interesting responses and create a more open environment that invites more truthful answers, also taking into account non-verbal cues (Robson & McCartan, 2016). Therefore, the researcher needs to balance two levels: finding

out more about the topics that are part of the line of inquiry, and at the same time also formulating friendly, nonthreatening and relevant questions (Yin, 2018).

The literature describes three main methods for interviews: structured interviews, semistructured interviews, unstructured interviews (Fontana & Frey, 2005). These interview methods will be described in the following.

Structured interviews have pre-determined questions, fixed wording and a specific procedure. Open response on questions is possible, but within a restricted frame. There is no space for unplanned questions or further discourses. Unstructured interviews are then conducted in a setting, where there is no interview schedule or guide, and participants may talk without interruption or intervention and be more open about confidential topics (Easterby-Smith et al., 2015). The semi-structured interview approach is positioned between these two approaches of, in other words, either a highly structured interview, that includes mostly close-ended questions and a fluid inquiry of focus groups with open-ended sessions (Adams, 2015).

Semi-structured interviews are more open, the interviewer has a guide for the procedure with default wording and questions about the topic, but the questions and wording are modified during the interview, according to the flow of the conversation. As such, the approach allows the interviewer enough flexibility to approach different respondents in a different, personalized way (Noor, 2008). There is space for unplanned questions and discourses, for example to follow up on something that the participant said. Unstructured interviews, as the name already says, are informal. The interviewer is interested in a specific topic and lets a conversation about it develop freely. There is no predetermined procedure and wording (Robson & McCartan, 2016). For this research project a semi-structured interview approach was found to be most suitable.

Disadvantages of the semi-structured approach include that interviews conducted in such a way are time-consuming, labour intensive, meaning that many hours of transcripts need to be analysed and that they require the interviewer to be smart, sensitive, as well as knowledgeable about the relevant topics (Adams, 2015). If the interviewer however possesses these traits and may apply them, these requirements might turn from a

123

disadvantage into an advantage. What takes time in general in the interview process is that they require careful preparation, including confirming arrangements, or also rescheduling appointments (Robson & McCartan, 2016). Also getting potential interviewees to cooperate may pose a challenge (Robson & McCartan, 2016). Furthermore, it can be argued that by the research design, the total sample size of interviewees is limited, since creating such a sample would require a disproportionately large commitment of time and resources. This could then potentially decrease the validity and generalizability of the research results (Adams, 2015).

The advantages of the semi-structured interviews are that their design leaves enough flexibility to follow up on answers to open-ended questions, as mentioned earlier. More specifically, they are suited to situations where respondents need to be asked probing questions, that they most likely wouldn't answer candidly when sitting with peers in a focus group or when answering a standardized anonymous questionnaire online or on a sheet of paper (Adams, 2015). Such a setting was expected for the interviews in the company, since projects that could be defined as either a success or a failure were to be analysed. Based on the researcher's assumption and experience, people would be expected to be more reluctant or fearful of being honest when describing the reasons for a failure. Furthermore, interviewees were to be questioned about company-internal and even department-internal dynamics, which again could contribute to reluctance or fear of being honest, leading to evasive or only partially honest answers to the researcher's questions, and therefore in the end, faulty data.

To implement such an approach, preparations needed to be undertaken. First of all an interview guide needed to be created, which stands in contrast to a questionnaire, that are used in structured interviews (Adams, 2015). In this interview guide a "shopping list of topics" (Robson & McCartan, 2016) should be included that the researcher wants to tackle. It should include various sections, such as introductory comments (in the form of a verbatim script), a list of topic headings and key questions to ask associated with them, prompts to give to the interviewees and finally, closing comments (Robson & McCartan, 2016). Also, not too many issues should be included in the interview guide, and the included issues should be prioritized according to their importance for the research topic. Furthermore, it should be made clear to

the recipients that confidentiality of their answers is ensured, and that there is no pressure to give socially acceptable answers (Adams, 2015).

This interview guide should always be considered a work in progress, since based on the input received in the field, adjustments might need to be made. Such adjustments could include reordering or adding/removing questions (Adams, 2015).

Especially in settings, where interviewees need to provide confidential information, it is particularly important for the interviewer to act skilfully in that he or she recognize what is relevant, being sensitive and perceptive to events (Easterby-Smith et al., 2015). Also, an interviewer needs to exclude their own feelings or opinions from the situation, but at the same time include enough probes to get to improved and refined interviewee responses (Easterby-Smith et al., 2015).

3.3.4 Participant selection

Before the data collection through interviews could start, it was necessary to develop a sampling strategy to select potential participants for data collection. The aim of the sampling strategy was to identify purposeful examples that could provide data about the research phenomenon.

At the same time, however, the probability to influence the outcome of the research through the way the participants are chosen should be decreased (Easterby-Smith et al., 2015). The literature offers many different sampling strategies, for example: snowball sampling, ad-hoc sampling, random sampling, maximum variation sampling, typical-case sampling, theoryguided sampling and negative sampling (Miles & Huberman, 1994).

Based on a brief comparison of two main categories of sampling, random and non-random sampling, it will be argued why methods of non-random sampling were chosen for this research project. In general, random sampling is used, when a sample is aimed to be representative of a general population of people who are relevant for answering the research question. For example, based on the observations of the "average" behaviour of a sample of people in situation X, inferences can be drawn to how the general population would act on

"average" in that exact same situation X. Each member of the general population has the same chance of being included in the sample through the use of a random selection procedure by the researcher (Etikan, 2016). Contrasting that, in non-random sampling, members of the general population don't have equal chances to be included in the sample. Also, for research designs based on non-random sampling, drawing inferences from the sample to the general population is only possible using more complicated statistical procedures, which may lead to the adverse side-effects of an increase in the uncertainty of the estimation, as well as a weakening of treatment effects, which was discussed for example by Copas and Li (1997). However, drawing inferences from the sample to the general population might not be considered as a purpose or goal of a particular research project (Etikan, 2016). This was also the case in this research project, since it was an exploratory study aimed at generating insights that could then potentially be assessed in further research, therefore a non-random sampling strategy was selected.

Furthermore, a distinction can be drawn between two categories within the area of nonrandom sampling, namely convenience and purposive sampling. Convenience sampling, according to Robinson (2014), denotes the concept that convenient (e.g., close-by to the researcher's location and willing to participate) cases of participants with the required criteria are included in the sample. First, all fitting, convenient, participants are located, and then the sample is filled on a first-come-first-served basis until the sample is complete (Robinson, 2014). Purposive sampling on the other hand rests on the researcher's underlying assumption, based on a theoretical literature review, that different categories of people might have a unique and important perspective on a phenomenon and therefore should be included in the sample (Mason, 2002). A further distinction that was highlighted by Etikan (2016) is that convenience sampling is mainly used in quantitative research, and purposive sampling in qualitative research. This is also supported by Miles and Huberman (1994) who state that qualitative samples tend to be purposive. Even though purposive sampling is not aimed at producing a sample that is statistically representative of the general population, it still is important to demonstrate that the sample was selected in a logical and systematic way (Mason, 2002).

In this specific case, methods that pertain to the category of purposive sampling were chosen. In general, in purposive sampling the researcher deliberately chooses participants to include in the sample for their characteristics, such as their knowledge, information, or experience (Etikan, 2016). In addition to their characteristics, the participants should also be willing and able to participate, meaning they can communicate their opinions and experiences in a reflective, articulate and expressive way (Etikan, 2016). The category of purposive sampling can be further detailed into maximum variation, homogeneous, typical-case, extreme-case, critical-case, total population or expert sampling (Etikan, 2016).

Following the proposed aim, topic and methodology of the research, a combination between typical-case sampling and snowball sampling was the best suited approach. In typical-case sampling, the selection focuses on typical instances of the research phenomenon, which for this study meant including participants that were affected in the "average intensity" compared to how participants were usually affected by digital transformations in their department. In other words, the typical-case sampling highlights what is normal or average (Miles & Huberman, 1994).

Snowball sampling was used in addition to typical-case sampling. In this research study, participants that had already been selected, since they fit the research criteria, were asked to recommend or recruit further participants, who also would meet the defined criteria, therefore applying selection according to the concept of snowball sampling (Easterby-Smith et al., 2015). Snowball sampling is also stated to benefit inductive, theory-building analysis, which fits very well with the purpose of this research project (Miles & Huberman, 1994). The use of snowball sampling also meant that the sample in this research project wasn't fully prespecified before fieldwork began, but rather evolved throughout the process, which would be a characteristic of qualitative samples (Miles & Huberman, 1994).

Snowball sampling in general is a good approach to obtain more access and to find participants that are under the radar, meaning, for example, individuals that have a lot of knowledge about the topic, but only a small amount of people within the organisation are aware of this (Biernacki & Waldorf, 1981). Snowball sampling, since it is by design relying on sampling in organic social networks, contains two relevant concepts of firstly social

knowledge, meaning that the sampling approach uses and activates existing social networks, and secondly power relations, from which important conclusions can be drawn and a unique type of knowledge generated (Noy, 2008).

According to Parker et al. (2019), snowball sampling could be criticized for bearing a selection bias. This is since it starts based on the researcher's contacts, which initially might be a small number of initial seeds, so that the sample could become distorted, for example if only people from the same ethnic background and gender of the researcher are included. Also, participants could be recruited based on their likelihood to be cooperative, rather than how well they fit the research criteria. Furthermore, the approach can be challenged for a "[..] lack of external validity, generalisability, and representativeness" (Parker et al., 2019), as is true for all forms of non-random and non-representative convenience sampling. However, since this study was mainly aimed to be explorative, creating a random and representative sample was not a sought-after goal. Additionally, sufficient backing by top-level management was ensured so that even though the topic was considered sensitive, which could present a barrier according to Parker et al. (2019), a sufficient number of participants that fit the research criteria were found and interviewed.

3.3.5 Defining an applied analytic strategy and techniques used

"Playing" around with the data was taken as a starting point for the specific analysis of data, in the sense that insightful patterns or concepts were aimed to be identified (Yin, 2018). The specific strategy that was used to analyse the data combines two of the approaches suggested by Yin (2018), namely that of "Relying on theoretical propositions and that of "Working your data from the ground up"" (p. 225). While these approaches were contrasting each other, with the first one being guided by theoretical propositions, and the second one following an inductive approach, for this study a combination of them offered insights that contributed to reaching the goals of this study. The first approach helped to link the occurrence of drivers, barriers and success factors for digital transformation in the organizational projects to the ones that were mentioned in literature. The second approach then helped to identify new, relevant insights and relationships between factors, all of which hadn't been recorded in literature yet. In the next section, the specific data analyses processes based on this broad strategy will be described in more detail.

3.3.6 Data analysis and presentation using thematic analysis

After data had been collected through interviews, it was necessary to prepare the data for analysis by a transcription of the records. During the analysis, the data was broken down into smaller units to get a structure and expose their characteristics. Descriptions set the foundations for analysis, but for a deep understanding it was necessary to go beyond descriptions (Gray, 2021). There are a lot of different approaches to analyse data, for example: grounded analysis, thematic analysis, discourse analysis, narrative analysis, visual analysis, argument analysis and more. For this research project, both thematic analysis and grounded analysis were considered in more detail.

Starting with grounded analysis, it is usually connected to a grounded theory research design and can be difficult to use with another design. Grounded theory design would usually be based on a research cycle that includes specifically defined phases of data collection and data analysis (Easterby-Smith et al., 2015). The aim of grounded analysis is to build theory from categories identified by systematically analysing the data, rather than imposing an external structure in advance (Charmaz, 2014). The focus lies on understanding "[...] the meaning of data fragments in the specific context in which they were created" (Easterby-Smith et al., 2015, p. 191). Due to its strong linkage to the grounded theory research design, this approach was disbanded for this particular research project, that followed a constructionist-based casestudy research design.

Thematic analysis is a systematic technique to describe written and spoken material that is widely used. However, there was no clear agreement in literature on what thematic analysis is, and how it should be conducted (Braun & Clarke, 2006). This method is suitable for analysing qualitative data, examining trends and conducting comparisons (Tharenou et al., 2007). The comparisons are undertaken across an entire data set, rather than focusing on an instance within a data item, like an individual interview (Braun & Clarke, 2006). Thematic analysis is based on themes that refer to a particular pattern of meaning that is present in the

data, either referring to something directly observable/explicit or to something implicit (Joffe, 2012, Namey et al., 2008). The final product of the thematic analysis is then a compilation of the most salient constellations of meanings that are apparent in the dataset, potentially including affective, cognitive and symbolic aspects (Joffe, 2012). This concept can be put in contrast to a content analysis, where the frequency of particular words plays a larger role (Namey et al., 2008).

The thematic analysis is versatile and flexible, in that it can both be used with the positivist and constructionist research paradigms (Vaismoradi et al., 2013). As such, there is no preexisting theoretical framework that the thematic analysis speaks to – when applied in a constructionist fashion, it "[...] examines the ways in which events, realities, meanings, experiences and so on are the effects of a range of discourses operating within society" (Braun & Clarke, 2006, p. 81). Joffe (2012) argued that it was well matched with weak constructionism, which was underlying this research. Also, the thematic analysis could be used in a fashion of combining a deductive and an inductive approach, therefore drawing both on theoretical ideas that were developed before engaging in the research, as well as themes that would arise from the raw data itself (Joffe, 2012). Such an approach indicates a high quality of the research, since it both links to existing, previous findings, as well as being open and responsive to new findings that may bring revolutionary, new insights to the topic area (Joffe, 2012). Also, such an approach fits the combination of the analytic strategies of "Relying" on theoretical propositions" also known as a theory-driven approach and that of "Working your data from the "ground up"" also known as a data-driven approach that were discussed in the previous chapter. Namey et al. (2008) stated that, in thematic analysis these approaches might be combined. To briefly mention also disadvantages, reliability is a concern in thematic analysis, since interpretations, that are required in this method, often vary across researchers (Namey et al., 2008). This disadvantage can be counteracted however by a theory-driven approach that is guided by ideas or hypotheses that a researcher may want to assess, in contrast to a data-driven approach that considered to be more valid due to it being more flexible and open to new themes that are "grounded" in data (Namey et al., 2008).

To briefly touch upon the historical origins of thematic analysis, it has its roots in the tradition of content analysis, and therefore shares many of the principles and procedures of it. Content analysis focuses on the frequency with which attributes, such as particular words, appear in a specific dataset. Thematic analysis was then developed by Gerald Horton to uncover more implicit themes and thematic structures that may also be present, and thereby add another layer of interpretation to the layer of pure analysis of frequency (Joffe, 2012).

Thematic analysis was used to code and interpret the data from the interviews in this research project. Usually, the interview data was generated with semi-structured interviews, that delineate topic areas and guiding questions, while still leaving enough leeway for people's meaning systems to emerge (Joffe, 2012), which was the case in this study.

Robson and McCartan (2016) outline the steps that are required to use this method, that will be described in the following, complemented with contributions of additional authors such as Namey et al. (2008). The process of thematic analysis starts by familiarising the data, which means the data is first transcribed and then read several times before first ideas are noted. The second step is to develop a framework or conceptual tool that allows the coding of extracts from the data in a systematic and structured fashion across the overall data set. These may be either themes and codes can be found in the literature and can be tested on the dataset, or they can arise from the data itself. Another option to apply structured coding is to link text extracts to questions posed to and answers given by participants, that relate to for example specific topics or in the case of this study, specific projects (Namey et al., 2008). Based on these identified extracts, further analysis may then be conducted.

Braun and Clarke (2006) provide a few helpful guidelines of what constitutes a theme: there should be a few instances, in other words a certain prevalence, of the theme in a data point, as well as across the entire dataset – but a theme occurring more often doesn't automatically point to a higher importance of this theme. Rather, a theme should be judged based on whether it captures something relevant regarding the overall research question. Prevalence can be for example represented as 'the majority of participants' having a certain perception of a topic for example (Braun & Clarke, 2006). More specifically, at first, themes that occur with a high frequency may be explored in depth as such, as well as group-based differences

in their occurrence (Joffe, 2012). The frequency of these themes or even a count of words used then may an idea of the general spread and breadth of thematic responses across interviewees and provide helpful input for the development of a thematic codebook (Namey et al., 2008).

Similar extracts or chunks of text get the same code or assigned to the same category to generate initial codes. A so-called coding frame, also known as coding manual or coding book or codebook can be devised and has proven to be helpful in guiding the thematic analysis (Joffe, 2012). Following from this, codes are classified into potential themes to identify the essential ones and the themes are then reviewed to examine whether they align with the extracts from the data. Based on this classification, it is possible to establish a report that shows how often the category occurs in interviews, and how often it occurs within an interview, potentially even showing connections to and co-occurrences together with other codes (Joffe, 2012). The reviewed themes are then used to develop a thematic network, a map of analysis, with which it is possible to compare different aspects. Finally, patterns are described, summarised and interpreted (Robson & McCartan, 2016). Themes and patterns may be identified either inductively or deductively, as was already mentioned briefly before.

Summing up, thematic analysis is a very flexible, systematic approach and it is accessible for several research designs. Therefore, it was well-suited for the analysis of the data that was collected in the case study. Consideration was given to use NVivo software to support the thematic analysis, to code the interview data and find patterns. Using computer assisted coding carries the benefits of keeping a better overview of a larger set of interviews, therefore enabling comparisons between them, and making retrieval of data far easier (Joffe, 2012). However, the results generated by software can only serve as a "primitive" starting point for the analysis and by no means represent the end of analysis (Yin, 2018).

In addition to the thematic analysis, the analytic technique of cross-case synthesis, as explained by Yin (2018) was employed. While this technique is used predominantly for multiple-case studies, in this study, it could also have been applied, due to the structure of the case study being an embedded single case, therefore containing subunits that may be compared among themselves. In this approach, any within-case patterns were identified at

132

first, drawing on thematic analysis, and then compared or synthesized across cases (Yin, 2018), or rather subunits in this study. Based on this process, any cross-case patterns could be lifted to a "higher conceptual plane" (Yin, 2018), however also taking into account potential differences between subunits.

To sum up, in the prior section, it was described how and why an embedded single-case study design was chosen. The focus was put on a single organization, however within this organization multiple projects introducing digital technologies were analysed, as another level. More specifically, five different projects on digital technologies within a specific company, in a specific department were assessed. Also, the choice for semi-structured interviews as a data collection method was justified. Additionally, the sampling strategies of typical case and snowball sampling that were used for selecting participants in this study were described and its use justified. Finally, the concepts thematic analysis and cross-case synthesis which were used to analyse the resulting data were introduced.

3.4 Influences on the research by the researcher's experience

With the constructionist view underlying this research, it was of great importance to make transparent where personal views or experiences might have shaped the development of this research and the interpretation of results. Therefore, potential influences on this study are outlined in the following.

The researcher in this case was able to obtain research access to the organization due to personal contacts. While the broad idea for this study was developed based on the researcher's individual interest, the specific setting was defined in collaboration with company and university representatives. This was required since that the topic would need to be deemed interesting or carrying new relevant insights for the organization to allow research access. While there was some interaction and coordination at the initiation stage of the research project for questions such as determining the scope and the exact question, at the stage of conducting the interviews, as well as analysing the results, there was no interference or influence from the part of the company. Therefore, to the best of the

researcher's knowledge no "contamination" occurred, following the definition of Easterby-Smith et al. (2015), since also no corporate funding was required to conduct the project.

Also, the researcher had developed so-called brokerage skills, having a wide range of contacts at all hierarchy levels of the organization, as defined by Easterby-Smith et al. (2015). Additionally, the researcher could draw on contacts within the organization to act as brokers for him, since they were well-connected with different organizational parts.

3.5 Ethical considerations

The importance of following ethical codes and principles in business and management research still holds true, even though, as compared to for example medical research, no lives are directly at stake (Easterby-Smith et al., 2015). However, there could be economic harm inflicted by plant closures or changes in work patterns or payment system, that is caused by research in this field (Easterby-Smith et al., 2015). As such, principles such as informed consent and the right of confidentiality are also relevant in our field, and there is growing pressure for all universities to adopt a common set of ethical codes and practices (Easterby-Smith et al., 2015). In the following, important ethical principles are lined out, and it is described how it was ensured that they were followed in this study.

Bell and Bryman (2007) analysed the ethical principles of nine professional associations in the social sciences and found ten principles that at least half of the associations used. The list of principles was initially formulated by Bell and Bryman (2007), the list displayed in the following however relies on the reproduction and summary by Easterby-Smith et al. (2015):

- 1. Ensuring that no harm comes to participants
- 2. Respecting the dignity of research participants
- 3. Ensuring a fully informed consent of research participants
- 4. Protecting the privacy of research participants

5. Ensuring the confidentiality of research data

6. Protecting the anonymity of individuals or organisations

7. Avoiding deception about the nature or aims of the research

8. Declaration of affiliations, funding sources, and conflicts of interest

9. Honesty and transparency in communicating about the research

10. Avoidance of any misleading or false reporting of research findings

In the following it will now be described what measures were taken specifically in this research project to ensure compliance with these standards, that also align with the "Handbook of Principles and Procedures" that was provided by the University of Gloucestershire (University of Gloucestershire, 2022).

Principle 1 and 2 (no harm and respecting dignity) were fulfilled, since based on the research design of conducting semi-structured interviews on factual topics the researcher hardly saw a danger of physical or psychological harm being inflicted on participants, or their dignity violated, even inadvertently. Principle 3 (informed consent) was fulfilled by, at the beginning of the interview, clearly stating the research objectives and how the data provided by the participants would be used for the research project. Furthermore, explicit consent of participants was asked for them to voluntarily participate and allow a recording of the interview. To ensure that this point was touched upon with each interviewe, it was included as a sub-point in the interview guide. Compliance with principle 4 (protecting privacy) was ensured by the researcher clearly stating at the beginning of the interview that participation would be voluntary, and that for these reasons questions may or may not be answered, for whichever reason, at the participant's liking. Principles 5 and 6 (ensuring confidentiality and anonymity) were applied by aggregating research data on different levels of hierarchies rather than the individual level. For example, it was stated in the discussion of results, that comprises

a summary of the conducted interviews, that statements or opinions were made by either "top management", "management" or "operational employees". Additionally, the name and specific details of the company with which this research project was performed, were not mentioned. Rather, the industry environment of the company was described, as well as the company, on an abstract level. To further ensure confidentiality and anonymity, the transcripts of the interviews were only available to the researcher and were not shared with any third party or made public. Principles 7, 8 and 9 (avoiding deception, declaration of affiliations/conflicts of interest and honesty/transparency in communication about research) were again fulfilled by the researcher introducing himself as well as the research project and its aims in the beginning of the interview and emphasizing the need for honesty in the participant's responses. To the best of the researcher's knowledge there were no conflicts of interest present with respect to this research project. Finally, compliance with principle 10 (no false reporting of research findings) was ensured by diligently analyzing the interview transcripts and cross-checking them with the notes taken by the researcher. Furthermore, the insights generated by the research as well as the final version of this study also underwent a mandatory check by the company in which it was conducted.

To sum up, this chapter lined out the research methodology that was underlying this study. A focus was put both on describing and presenting possible alternatives for this study, as well as justifying the choice of the methodology that was finally employed. Firstly, it was described which perspectives were selected in terms of the philosophy of science. Then the chapter discussed more practically applied choices, such as the data collection method, and the selection of participants, as well as the analytical approach applied to the data. Lastly, the last two sections focused on excluding and making transparent potential influences on the researcher and how it was ensured that ethical principles were followed.

Chapter Four: Data collection and findings

In this chapter it is discussed how the methodological choices outlined in the last chapter were applied in practice when analyzing the generated data. Firstly, the company is described, up to the extent that was possible while still maintaining confidentiality. Secondly, it is described how the methods of data collection, namely the sampling of interview partners was done, and how the semi-structured interviews were conducted. Thirdly, the methods of analyses that were used are lined out, and lastly, a comprehensive framework for analysis is included.

4.1 Introduction to company and context

In the following section, the organization and the context in which this study was conducted will be presented. Due to considerations of confidentiality from the focal organization, this introduction was made without naming the specific industry and the company. The subject of this case study was one of the market leading companies in its niche segment. Its main business is the production and processing of different variants of their product for a broad array of customers with differing needs. The company is active world-wide and employs over 2,500 employees at the location at which this study was conducted. The company is a system-dominated industrial company with high goods and investment requirements.

In this research project, the quality assurance department, more specifically a quality assurance laboratory was chosen as the focal area. This choice was driven by the fact that numerous digitalization projects had been conducted in this department over the past ten years, that could now be analysed. Furthermore, in the interviews it was stated by upper management levels that the department was perceived as open for projects that involve new technologies. The broad time frame of the project implementation furthermore gave the opportunity to observe projects along different levels of the changing overall digital maturity of the company.

Therefore, the operational levels in the department, as well as the connected higher management levels up to the top leadership level of the managing directors were included in this research project. The laboratories that were involved in the quality assurance process of the company provide a perfect environment for the research on the impacts of digital transformation since many separate projects relating to digital transformation had been undertaken in this laboratory. Additionally, a new laboratory had been opened in 2019, that however was not assessed as part of this study.

This department also presented itself as a great environment for research, since almost all hierarchical levels were represented in it or related to it, from the workman up to the toplevel manager. Therefore, interviews could be conducted on different hierarchical levels, potentially leading to varying perspectives based on the interviewee's position in the firm. With this approach, however, it was demanding to balance out contrasting views, since the question to whom to ascribe more credibility was not always easy to answer. Whenever such contrasting perspectives arose, this was made transparent.

Furthermore, due to its importance and criticality for the value chain and customer value generation, the quality assurance department had interfaces connecting it to many other areas of the company. This was since the company is positioned as a quality-leader, supplying their products to industries which are operating in sectors that have a low to zero tolerance for errors, which leads to a high importance of and focus on a close-meshed quality assurance system. For example, due to the criticality of the sectors, durations within which reproducibility needs to be ensured need to be longer than usual in the industry therefore leading to higher required storage times for quality control reports. Also, certifications that require a high amount of effort need to be obtained. This strategy can be contrasted with a strategy of the firm competing on costs. In addition, it opens up the opportunity to observe digital transformation projects that had been implemented across multiple departments and involving numerous stakeholders, which could yield additional interesting insights.

The earliest approaches to introduce digital technologies in the company had been made with the rise of the internet and software on a broader level. Since the core competencies of this company don't lie in the software development and technology area, knowledge had to be acquired externally and by relying on the initiative of motivated internal employees. In the early 2000s, the first approaches were undertaken to digitize the quality assurance process, by moving from pen and paper-based system to a digital software solution. Following the
definition of Verhoef et al. (2019), digitalization went in-hand with these early approaches, since processes needed to be standardized to be digitized. Many processes within the company had been already digitalised and automated, some were in planning, and some were still working with old technologies.

To sum up, the company that was analyzed in this study, has over 2,500 employees in the location of interest. The quality assurance department was chosen for this study since several digital transformation projects had been conducted in this department, and it is well-connected to other areas of the company.

4.2 Methods of data collection used in practice

In this section, the sampling of interview partners and projects are described, as well as a broad description of their characteristics given. Additionally, it is discussed how general interview concerns were addressed and how the interviews were conducted.

4.2.1 Sampling of interview partners and projects

As mentioned in the theoretical part, a combination of a typical case and snowball sampling system was employed to recruit interview partners. The first point of contact for this project was instrumental in determining the participants that then became part of the typical case sampling. A high-level manager served as this first point of contact. Due to the overview and knowledge associated with their position they were able to act as a broker, as defined by Easterby-Smith et al. (2015). They recommended a suitable department to conduct the study in and established contact with the responsible and involved parties from this department. Other interview partners were found based on the recommendations of the first selected interview partners, and from further interview partners. When choosing interview partners, it was ensured that they reflect a broad array of characteristics, such as different ages, gender and different hierarchical positions.

The projects that were included in this study for analysis were on the one hand selected based on the frequency of mention in the collected data obtained from interview partners. On the other hand, they were selected based on the "substance", meaning the quality and quantity of more detailed information that was obtained during the interviews. As such the projects with the most "substance" for analysis were selected. Following this strategy, it was decided to focus on five projects within the organization.

4.2.2 Hierarchy and broad job level/description and characteristics of interviewees

In this section, the interviewees are briefly presented, giving a broad characterization of them, without endangering their anonymity. This was part of the research agreement with the company, and a condition for being able to conduct the research. The aim for the selection of interviewees was to represent as broad of a sample of people as possible, that are familiar with the digital transformation projects conducted in the focal department, being either a member of this department or closely connected to it. The data presented in the following will try to support this claim.

In total, 17 people from the focal company were interviewed. Ten interview partners were selected based on typical-case sampling by the author in collaboration with company representatives. The remaining seven interview partners were selected based on snowball-sampling, therefore based upon the recommendation of other, prior interview partners.

The positions of the interview partners were located on five different hierarchy levels, according to the company organizational chart, and these 17 people carried out 11 different job titles. Thirteen interviewees were male, and four were female. The youngest person interviewed was less than 25 years old, while the oldest person was more than 50 years old. The tenure of employees ranged from just 4 years to more than 30 years in the company.

4.2.3 How general interview concerns were addressed

Moving on to the actual process of interviewing the selected people, Easterby-Smith et al. (2015) highlighted six practical issues that needed to be taken into consideration when conducting interviews. These issues will be described in the following, also with regards to how they were addressed in this research study.

Obtaining trust: Trust is very important to develop a relationship between interviewer and interviewees, where the interviewees feel comfortable to share truthful information. A suggestion from Easterby-Smith et al. (2015) is to be well-informed about the company and to present the research in a professional way, highlighting the possible benefits for the company. This suggestion was followed in this research, since through the connections of the researcher to the company, it was possible to obtain an impression of the sentiment and internally relevant topics even before the interviews were conducted. This information was then used to tailor the interview guide and devise prompts that were useful at obtaining the data that was needed.

Social interaction: Another point to keep in mind is that interviewees might adapt their answers to the expectations and goals of the interviewer, so they can satisfy those, leave the interview situation quickly and avoid confusion on the side of the interviewer (Easterby-Smith et al., 2015). While this dynamic surely cannot be avoided completely in any social interaction let alone interview situation, and the goal of the research was stated clearly by the interviewer, the interviewer aimed at staying critical and observant to any such strategy being deployed by the interviewees.

Appropriate attitude and language: Both the used language and attitude should reflect the context and topic in which the researcher is operating, also helping to establish clarity and to obtain helpful interview results (Easterby-Smith et al., 2015). The researcher had prior experience in interacting with a diverse set of stakeholders in a professional environment. These built-up skills could then be applied in the interview situation, where the interviewees possessed different backgrounds, hierarchical positions, and age, therefore requiring an adaptive approach.

Getting access: Getting access was, as already mentioned, achieved through personal connections of the researcher to company representatives. These connections were then followed-up by e-mails summing up the most important points, and a thesis contract was signed prior to the interviews being conducted. Together with the company representatives, the scope of research was clearly defined, so as the company obtains the side-benefit of getting the generalized take-aways from the research. In this particular case it was an

141

overview of digital technology projects, that included a detailed description, an evaluation of the outcome and potential factors that contributed to said outcome.

The location of the interview: The interviews were conducted on the company's premises in meeting rooms since those were easiest to access for both parties and contained little distraction. While the office itself might not have been perceived as a neutral spot by the interviewees, the one-on-one setting and emphasis on confidentiality could be argued to have contributed to creating a more neutral ground.

Recording interviews: Permission to record the interview was asked and obtained from each interviewee. Additionally, notes were taken by the interviewer to highlight the most important and remarkable points that were made.

4.2.4 Conduct of interviews & interview guide

For the interviews, as already discussed in the theoretical methodology part, a semistructured approach was chosen. To ensure standardization and consistency in collecting information on the same topics from all participants, while allowing flexibility in responses, an interview guide was created as recommended by Adams (2015). This interview guide is included later in this section.

For this research project, the interview guide was structured along two parts. Firstly, the "Structure" part started by the researcher introducing himself and thanking the interviewee for their participation. Then the researcher introduced the research project, and it was clarified explicitly that all statements made in the interviews would be anonymized. Additionally, permission was asked for recording the conversation, and then the recording device was switched on. While using a recording device when conducting research on a topic that is perceived to be sensitive might lead to more inhibited answers by interviewees, the benefit of being able to analyse detailed transcripts with highly specific information on projects and technologies in this case outweighs the potential downsides. It was emphasized that the generated data would be treated confidentially and that the transcripts of the interviews would not be published, either in the company or in the research project.

Additionally, the importance of answering as detailed as possible and honestly was mentioned.

Then, the content-specific part of the interview was started by relying on Part 1, that asked firstly for general data, such as how long a person had been working in the department, what their role would be and in which projects they were involved, or that they witnessed. Based on this information, an open-ended question was asked on their experience or opinion regarding the projects they were linked to. This design was chosen, as the main aim of interviews was to get the story behind a participant's experience and build up trust (McNamara, 1999). Depending on the answer given by the interviewee, further follow-up questions were asked, that were summarized under Part 2. These questions were designed so as to allow for freely formulated and detailed answers by the interviewees but to also keep them within the pre-specified topic and research area, which taken together serves as a characteristic of the semi-structured interview technique (Robson & McCartan, 2016). In particular, following the research design of this study, answers were sought that were touching upon the drivers, barriers and success factors for digital transformation, so that a link and contribution to existing literature could be ensured. In Part 3, follow-up questions that centre around the lasting impact of the changes brought by the projects were asked. This question was aimed at getting more information to evaluate whether the particular project could be considered a success or a failure. Also, information was collected on measures undertaken in the context of the projects that facilitated overcoming barriers to digital transformation.

Finally, in the closing section of the interview, more general questions were included, such as the interviewees' general opinion on the main blockages of digital transformation, irrespective of any specific project, and how they felt that the COVID-19 crisis impacted the digital transformation projects. The interviews ended with the researcher offering the opportunity for feedback and suggestions on the interviews. Additionally, according to the snowball sampling strategy, participants were asked for further potentially interesting interview partners that they recommended as knowledgeable on the topic and that fit the research criteria. Secondly a "Random" part was included in the interview guide. In this part, questions were formulated that were projected to serve as additional follow-up questions to the interviewees' answers. To ensure a smooth flow of the interview, the random questions were sorted according to their relation to keywords such as time or resources or strategy. These questions were targeted at eliciting more details on barriers, success factors and drivers, and strategies to overcome barriers.

In the following the interview guide as used during the actual research was included. For the purpose of highlighting the link to the stated research questions, comments have been added to the interview guide. Before moving on to the specific questions of the interview guide, it can be stated that the questions that were included, asking for the interviewees' perceived experience were then linked to the research questions of e.g., "How does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?".

Explanation Phase:

Research project on digitization, recording, anonymous Handling of data, no publication of transcripts Important to tell as detailed as possible and honest opinion

Part 1

How long have they been in the lab and in what field? What digitization projects have they been involved in? Or witnessed on the sidelines? How was their experience in project 1, 2, 3?

Part 2

In your opinion, what worked particularly well? What challenges arose - And how were they dealt with? Did any change develop in the lab as a result? (Structural, individual, knowhow, strategic, communication, group dynamics, interfaces, performance). The questions included in Part 2 were aimed at identifying drivers, barriers and success factors of a digital transformation. For example, insights could be generated relating to the research questions of "What are barriers and success factors that are relevant for the successful completion of a digitalization project in a company, and digital transformation overall?" and "How are barriers and success factors interlinked with each other?". Also, the questions in Part 3 in the following were geared towards generating insights for the mentioned research questions. Additionally, open-ended questions were included to leave room for mentioning other factors, which could also have an impact, but were not captured in literature and other questions before.

Part 3

Did these changes have any further impact?

Were measures tal	ken in advar	ice for bette	er implemer	ntation (work	shops, furthei	[.] training,
education)?						

In your opinion, could anything have been done better?

Feedback from other employees?

Did Corona impact the project in any way?

What do you think are the main blockages to digitization?

More randoms if there is time left

Snowball and closing: feedback, suggestions, requests?

In the next, random questions section, further questions were included that aimed to contribute to an even more detailed understanding of drivers, barriers and success factors of digital transformation, and therefore helped to answer the research questions in even more detail.

Random questions

In general:

How were decisions made and were decision-making competencies changed? What drives digital transformation? Where does the desire or instruction come from? Have changes been made in the personnel structure?

Milestone related:

How were issues resolved? How were decisions made during implementation? Was there a leader or several people as the driving force? Did the performance of the area change, or improve after implementation? Were there implementations that failed or produced negative results?

Time-related:

Did the way of working change over the period? Has culture changed and mindset of employees? Did delays in implementation occur?

Resource related:

How was the budget determined? Was the budget met or exceeded? If so, how much? Did problems occur due to lack of resources (money, personnel, knowledge)? Was further training or specialist recruiting carried out in advance?

Structure related:

Was the structure or hierarchy changed? Were there any interface problems?

Strategy:

Is there a digital strategy? Were the milestones part of the strategy regarding digitization? Are there digitization goals and are the employees aware of them?

Employee-related:

What is the opinion on the individual implementations? (Milestones)Do employees have concerns about digitization?Is further training in relation to digitalization offered or carried out sporadically?Does the collaboration between humans and robots (lab) work?Are employees for or against digitization?

All interviews were conducted in a face-to-face setting on the company premises in German, which was the mother tongue of all the interview partners. The interviews lasted from 35 to 106 minutes. Interviewees did not receive any form of compensation, such as payment, to participate in the interviews. However, the interviews took place during the working hours of employees.

4.3 Methods of analysis used in practice

In the following section, an overview is given of how the data collected in the interviews was analyzed using a software package.

4.3.1 Description of analysis approach

The interviews, conducted in German were recorded, and the recordings of the interviews were then transcribed, again in German. In addition to the transcriptions, notes were taken during the interviews that highlighted interesting and important insights. As a first step, these transcriptions and notes were browsed through and organized, by filing the transcripts and notes systematically, labelling them in a consistent way and storing them securely, as suggested by Easterby-Smith et al. (2015). For the analysis of the transcripts in accordance with the chosen methodology, the software NVivo was used. Bazeley and Jackson (2013) describe the coding procedure in depth, that was also followed in this research.

4.3.2 Description of software used (NVivo)

Using a software package to support the analysis of qualitative data has become attractive during the past years, since it shows a few benefits: Firstly, they help to manage a project and data, secondly they include a search function, thirdly, they facilitate the analysis of data by providing coding functions, and lastly, provide tools to generate output formats to visualize data (Easterby-Smith et al., 2015).

The use of the qualitative data analysis software NVivo was recommended by the university, by which also the license was provided. The software has been designed by its developers as a means to assist the structured analysis of qualitative data (Bazeley & Jackson, 2013), in this case interview transcripts. As a code-based framework, it helps to identify concepts and themes, and is suitable for denaturalized data, which is available in this study, since involuntary vocalizations were not recorded (Easterby-Smith et al., 2015). Compared to earlier methods of analysis, the software aims to increase effectiveness and efficiency when learning from data, therefore freeing up more time for examining and interpreting the meaning of the data (Bazeley & Jackson, 2013). Also, several coding approaches are possible to be conducted with it. This software also enables to operationalize the approach of reducing qualitative data in its complexity and facilitate the incremental development of theories pertaining to the phenomenon under study (Easterby-Smith et al., 2015).

NVivo offers several possibilities to conduct text-based analysis. With NVivo it is possible to identify and count the number of times each element of a list of predefined expressions has been used. Based on the frequency of elements, so-called nodes can then been identified and defined (Bazeley & Jackson, 2013).

4.3.3 Description of particular approach to coding in NVivo – Thematic analysis

In the following, it will be described how the method of a thematic analysis was applied specifically when coding the obtained data in NVivo. The approach to coding bridged two potential units of analysis, namely individual interviews or interview partners – and also individual projects, in the course of which digital technologies were introduced. Giving a rough outline, before explaining the approach to coding in depth, the units of analysis were

combined insofar as each interview was coded as a separate case in NVivo. Within each case, statements pertaining to each of the selected five focal projects were identified. These project-specific statements were then analyzed for mention of drivers, barriers, success factors as well as other emerging themes. Additionally, statements on digital transformation in general or related areas were identified and analysed. In the following, the approach to coding will be lined out in more detail.

In a first step, each interview was included as a data record/source and coded as a separate case in NVivo following the methodology of Bazeley and Jackson (2013). Since only one interview has been conducted per interviewee, each interviewee was automatically defined as a separate case, following the terminology of the software. This case was different to the cases that designate specific digital technology projects that served as the main level of analysis. For each case or interviewee, attributes, in this case demographic and quantitative data, were recorded, namely their position title in the firm, hierarchical level, age group and gender. These attributes were however anonymized in the presentation of results due to confidentiality concerns.

Then, each interview was read thoroughly several times, to identify patterns and themes that were mentioned by interview partners repeatedly. Based on the notes taken during the interviews and this initial rough read-through a first list of potential nodes was created. Generally, in this research project, as is often the case in qualitative research, a vaguely defined question stood in the beginning, namely what factors contribute positively or negatively to the perceived success of a digital transformation. To further refine this question, the interview transcripts were explored in detail. Following the unit of analysis of projects, for each interview, statements on the focal projects that were made by the interviewees were coded in NVivo as a node. Additionally, topics that were touched upon in the interviews and were related to the overall topic of digital transformation, such as the impact of Covid-19, were coded as additional nodes.

Therefore, initial codes that were developed, on the one hand relied on the lists of drivers, barriers and success factors that were identified in literature research, and on the other hand relied on emerging themes, and therefore a data-driven approach (Namey et al., 2008). This

was the operationalization of the priorly defined analytical strategy that aimed to combine two of the approaches suggested by Yin (2018), namely that of "Relying on theoretical propositions" and that of "Working your data from the "ground up"". In other words, an inductive and a theoretical approach to thematic analysis was combined, with the inductive approach relying on themes that may have little connection to the specific questions asked of the participants or the researcher's topic interests, therefore without relying on a pre-existing coding frame (Braun & Clarke, 2006). The theoretical thematic analysis then would rely on the researcher's topic interests and a research question (Braun & Clarke, 2006).

In a next step, by combining codes, themes were created that were aimed to be accurately representing the underlying data in a useful way. For this purpose, each theme was then named, and a thematic map of the analysis was created, following recommendations and strategy suggested by Braun and Clarke (2006).

4.3.4 Approach to cross-case analysis

For the cross-case analysis, the following approach was followed. An overview table was set up that contained different projects as rows, and individual drivers, barriers and success factors as columns. For each of the projects, individual drivers, barriers and success factors were identified. Then, based on the table, drivers, barriers and success factors were identified, that (1) occurred across a large quantity of projects and (2) that occurred predominantly when either a project was a success or failure. Based on this analysis, it was possible to identify factors that are relevant for a broad variety of projects, and that could be highly relevant for either the success or failure of a digital transformation. Due to a qualitative methodology being employed, contextual and perceptive factors were considered in this analysis, rather than a purely quantitative approach being followed.

4.3.5 Final comprehensive framework for analysis

Based on the aforementioned approach to coding and cross-case analysis, the overall analysis of projects and cases is summarized in the following. The general analytic approach was based on "Relation 1" in the diagram that was initially introduced in the first chapter and is

reproduced here again. As a proxy for digital transformation, projects that were geared at the introduction of novel digital technologies were analyzed.



Figure 1. Overview of the study.

The analysis was conducted in two parts: in the first part, the collected data was analyzed and presented based on individual projects with which new digital technologies were being introduced. In the second part, the collected data was analyzed and presented based on drivers, barriers and success factors to digital transformation, so that more generalizable insights into these factors were gained across individual projects.

In the first part, the analysis was conducted in a way that firstly, it was evaluated whether a particular project was a partial success or failure. Since the chosen methodology was based on social constructivism, the perception of a broad variety of stakeholders was reported and considered in the evaluation. As stated in the introductory chapter, the dimensions of success or failure of a project or technology implementation that were evaluated, are the implementation of the technology as such, the evaluation of the leadership or management team of the technology implementation, objective measurable criteria and lastly, the acceptance and adoption of a technology by employees. For example, a project might be considered a success by management due to an increase in productivity, but not by employees who only grudgingly adopt the technology in their day-to-day work.

Secondly, drivers that contributed to the initiation of a project were identified and analyzed. In the semi-structured interviews, interview partners were questioned on the aims of the project. In the opinion of the author, the aims of a project might be the expression of drivers. These aims were then mapped onto drivers.

Thirdly, barriers and success factors were identified and analyzed that were based on those already identified in prior literature, as well as those that were newly identified. Additional themes that were emerging were identified and analyzed as well.

The second part was then structured along general drivers, barriers, and success factors for digital transformation. This helped to gain insights on the relevant factors that were assumed to have an impact on the outcome of a digital transformation and were independent from individual projects. The specific approach was already outlined in detail in the prior section, more generally speaking a cross-case analysis would be conducted with the individual projects constituting the cases.

In this section it was discussed how the chosen methods of analysis were applied in practice, using the software NVivo. Firstly, it was described how the recordings were transcribed, using NVivo. Then, the details of the software and how it was applied for thematic analysis and cross-case synthesis was described in more detail. Lastly, a final comprehensive framework for analysis was presented and described.

To sum up, in this chapter it was discussed how the chosen theoretical methodology was applied in this particular study. Firstly, respecting concerns of anonymity, the company and the participants were described. Their diversity in terms of demographic characteristics as well as hierarchical positions was highlighted. The interview guide used in the semi-structured interviews was included to illustrate how the interviews were conducted. Finally, it was described how the software package NVivo was used to analyse the data based on the thematic and the cross-case analysis approaches. Lastly, a final comprehensive framework for data analysis was included.

Chapter Five: Discussion of results

In the following chapter, the results that have been generated from the collected data are discussed. The discussion of results is structured such that firstly the projects with which digital technologies have been introduced or digitization or even digitalization has taken place, are described. The problems that are set to be tackled by introducing the technologies, as well as the aims of the projects, are discussed. These aims are then linked to drivers for digital transformation found in literature. Furthermore, the projects are described in sufficient detail as to gain an understanding of their implications and impact on the organization. Secondly, the barriers and success factors that were perceived by the interview partners during the implementation of these projects and in the aftermath, once the technologies became operational, are being summarized in a structured way. The barriers and success factors are linked to those that have been mentioned in the literature. As such, while the main purpose of this chapter is to line out and display the results, in some sections a brief discussion on literature is included, so as to provide the reader with a concise overview on additional topics that occurred during the analysis of the results. The main discussion on the contribution of this study to literature is however included at a later point. Other themes that emerged over the course of the data analysis are also mentioned and analysed. For new themes that emerged or observations that are contrary or different to the ones found in literature, insights are formulated. These insights may then serve as a concise starting point for future researchers.

Quotes that were given by interview partners are included to support the analysis. However no identifying details on the interview partners can be given, due to a strict agreement with the company and the interview partners to protect their anonymity.

In the table below, the projects for which results were collected are listed and very briefly described.

Table 5. Overview of Analyzed Projects

Year started	Broad topic	Brief description
2000	SAP-like system	Sample processing tool including detailed informational aspects
2011	Logistics and transport tracking system of samples	Sample tracking tool focusing on throughput time and logistics
2017	Automated microscope	Automatization of microscopy procedures
2019	ANDON boards	Performance transparency tool
2020	Al project	Automatic analysis of samples based on Artificial Intelligence

5.1 Project 1 – ANDON Boards

5.1.1 Project description

In the following the project is described, so as to gain an overview of the technology and the project setting. The project "ANDON boards" went live in 2019, following an implementation phase of approximately 3 months. To give a brief re-cap of the context, the case study in this study is centred on the quality assurance department of the company. In this department samples of products are assessed for their quality in terms of their characteristics, based on which it is decided whether the quality standards and norms are met or not. Therefore, the tasks of the employees are tied to the samples, since each sample needs to go through a quality assurance process in the laboratory.

The need for implementing the project "ANDON boards" arose for several reasons. One reason is that product samples were lost over the course of the quality assurance process. An interview partner described it as follows:

"So we had massive problems years ago that samples just disappeared."

Furthermore, the analysis of samples was not completed within the duration that had been initially allocated by management, leading to above-plan processing times for samples. Lastly, the prioritization of samples was sometimes not clear to employees, which led to additional time being used on clarifying and collecting information on how the samples and linked tasks should be prioritized. Based on this problem description, a solution was developed and implemented. So-called Andon-boards, which are a well-known tool from lean management, were introduced. On these boards, status and disruptions in production, or in this specific case, the processing status of samples is visualized in an easily comprehensible way in real-time (Mayr et al., 2018). For example, the entire queue of samples and the capacity utilization for the entire laboratory team is displayed, as well as the remaining allocated processing time for each sample. Additionally, colour coding is used, for example red when a sample is overdue or green when there is still sufficient time left for processing it. In that way, the current performance is visible at one glance. Thus with this technology, employees "[...] are always informed about the performance of the whole production line [...]" (Kandler et al., 2022, p. 2), or in this specific case, about the performance of the whole laboratory.

With this project, goals on several levels were aimed to be achieved: Firstly, the Andon boards were seen as a tool to make information, specifically regarding performance and status, on the quality assurance process more transparent to not only management, but to all stakeholders involved. Both management as well as employees are then able to react based on the information provided. Management can undertake short-term process adjustments, while employees have an overview of the workload they are tasked to complete within their shift and can pick samples to process them based on their prioritization. Secondly, a secondary goal was to increase performance, in terms of a decreased processing time for samples. It was however mentioned by lower management, that this was not the main aim of the project, with transparency for stakeholders being the more important goal. Middle and higher management however clearly saw it as an important aim. This contradiction will be further discussed in the analysis of interviews. Thirdly, the goal was for traceability to be improved. By tracking the processing of each sample, it is recorded which employee undertook what processing step with which sample at what time. As such, an archive is compiled, that can be drawn on, should for example a complaint by a customer be conveyed to the company at a later point in time.

Another possibility of use for this technology might be to tie a part of compensation of the individuals or the entire group shift to the data on productivity obtained through these boards. However, so far this hasn't been implemented, and there are no plans of doing so.

5.1.2 Interview results5.1.2.1 Evaluation of success

In the following, the project will be evaluated with regards to it being a success or a failure. This project can be argued to be a successful project, in that the implemented technology has been accepted and is being used by the employees, now being integrated in their day-to-day workflow. Additionally, in terms of the perception of management of this project, it has also been evaluated as a success, since productivity increased, and therefore processing times for samples decreased. As described by an interview partner:

"[...] the thing I simply noticed is that the throughput time in the [...] department has greatly improved"

As such, there are no differences between hierarchy levels in the perception of the success of the project.

5.1.2.2 Drivers

In the following section, the aims for the project that were perceived by the interviewees when it was initiated will be linked to drivers of digital transformation that were found in literature. Drivers may therefore be perceived differently by different stakeholders. In case a driver is not reflected in prior literature yet, it will also be considered as a driver that is emergent from data. For this project, the aims that were perceived when deciding to implement the technology can be linked to drivers for digital transformation found in prior research. Digitalization in the context of this project can be categorized as organizational development driven, since specifically, business-related goals of process improvement are aimed to be achieved by it, as identified in literature by Tomičić Furjan et al. (2020). This is reflected by the main goal of the quality assurance process to become faster and more transparent to the stakeholders, while the quality is still being maintained.

Also, based on the analysis of interviews there is a lot of employee support for the project, which can, according to Liere-Netheler et al. (2018), be categorized as an individual driver for digital transformation, in addition to organizational or external drivers.

Furthermore, to some extent, there is a digital mindset in the department, as stated by an employee, who mentioned they are curious towards digitalization: "[...] we are open indeed, we are saying, yes, we collect data, we look into it, we are curious what the results are". This statement is also supported by the notes taken by the researcher, that reflect the perceptions, that most interview partners seemed open. Especially the team leaders were very curious about digital solutions in general, and a few good ideas and solutions have been implemented already.

This mindset can then act as a driver for further digital transformation projects and new technologies getting implemented in this department in particular, and in the company as a whole (Morakanyane et al., 2020). This mindset may also serve as a driver for the additional further projects discussed in this research. In summary, no differences in perception were found regarding the drivers of this project between different hierarchy levels.

If differences in perception were in fact found, another interesting follow-up question could be whether a project turns out to be more successful, depending on who holds what perception of a driver being present. Also, the prevalence of a certain perception could have an impact on project success. For example, if most of the team holds a similar perception, or there is a match in perception between employees and team leadership, it could be assumed that a driver is strongly connected to project success or initiation, by fuelling motivation and effort for the project to get initiated and completed.

5.1.2.3 Barriers to digital transformation

In the following, barriers to digital transformation that came up in relation to this project will be identified and analysed. Barriers that have been mentioned by several interviewees are the individual barriers, as also identified by Vogelsang et al. (2019) in their research. More specifically, interviewees, particularly those at the operational level, have mentioned that they feel a higher pressure to perform following the introduction of the new technology, for example: "[...] the negative side I say is that simply, in my opinion, that creates pressure somehow, a pressure to perform". This can be interpreted as the interviewees experiencing a pressure to perform. This pressure may be experienced due to the higher transparency both of individual and collective output, due to the introduction of a new technology. Another potential mechanism is that when new technologies are introduced, employees need to learn

how these technologies work and how to apply them correctly - often within a short period of time. This adds additional perceived pressure for them to perform well.

This assumption is supported by the contributions of the employees who have mentioned that, at first, they were fearful about the new technology and the consequences coming with it, especially because personal data (on their performance) now becomes transparent. This corresponds to what Vogelsang et al. (2019) have found in their study, namely that people fear the loss of control about data that relates to them. They also fear the transparency regarding their output, and the consequences of that, namely the possibility that it might lead to a lower acceptance by co-workers and their supervisors, in case their performance doesn't live up to the expected standards. In this study, it has however been reported, that after employees have become accustomed with the technology and with reassuring communication by leadership, the fear subsided:

"[...] so you notice that there is fear at first, but then afterwards, when you see that it works, that the people then go along with it". This might have been helped by the fact that compensation of employees is not tied to the data obtained through the Andon boards.

An additional interesting observation that, to the best of my knowledge, hasn't been observed in prior literature on barriers of digital transformation before, has been made with regards to interpersonal relationships and organizational culture. Over the period of the introduction of the technology and this study, the employees in the quality assurance laboratory had been split into two separate shifts, due to the COVID-19 pandemic. The composition of members of the two shifts remained fixed, and they were working at different times, one after the other, e.g., Shift 1 would be working from 6am to 2pm, and Shift 2 from 2pm to 10pm. Therefore, when the technology had been introduced, the performance of the shifts became transparent, and comparable.

Several mechanisms were triggered by that: On the one hand, employees reported that they were motivated by wanting to complete all their allocated tasks before the next shift arrived. The interpretation can be that they were motivated by the fact that they wanted to be seen as dutiful and performing well by their peers in the other shift. In addition, also they might have wanted to signal their motivation and good performance to their supervisor. On the other hand, employees also reported that they felt a little bit frustrated since they had the

impression that the other shift has not performed up to the expectation, and rather had left their tasks for the next shift to do:

"[...] when we see that something [referring to deterioration in KPIs] is rising again, then we are generally a bit angry with the others, because we know that they haven't made much progress"

Sometimes it might be the case, that there is actually a true performance difference between shifts. Sometimes however also the reasons for the performance discrepancy might lie in a faulty machine or other unexpected events occurring. The way in which the Andon boards are designed however means that it is not always clear what the reasons for an unsatisfactory or lower performance are. Creating transparency with regards to different reasons for performance discrepancies might in this case help reduce frictions in the department.

Oftentimes however, the perception that the other shift didn't perform due to reasons in their own sphere of influence prevailed, which, employees reported, led to a deterioration in organizational culture and interpersonal relationships in the department. While employees from different shifts had reported to be friendly with each other before the introduction of the new technology, there were reports that interactions and communication between shifts visibly decreased, and the relationships became frostier, as illustrated by the following statement:

"So I do not know how to say it, but we were really closed off from them and their work ethic was not like ours [...]"

While mechanisms regarding competitive behaviour and feeling of fairness due to increased transparency have been analysed in psychology (Toma & Butera, 2009), economics (Kersten et al., 2016) and management (Wang, 2022) before, it can be fruitful to study them particularly in the context of digital transformation. It would be particularly interesting to analyse whether it causes other barriers to digital transformation to occur or leads to a higher resistance to change in employees, when introducing further technologies in the future. Based on this observation, it can also be assessed, in theory, how linking compensation to performance might alter the observed mechanisms.

Therefore, the proposition can be formulated that when a new technology is implemented that leads to an increased transparency of performance, this seems to lead to a deterioration of the perceived quality of interpersonal relationships and a decrease in communication among employees, as set out in Proposition 1.

Summing up, in the project "ANDON boards", mainly individual barriers, related to fears associated with the introduction of the new technology, have been observed. Differences in perception were reported insofar, as operational employees gave individual barriers – such as fear of loss of control of own data - before or immediately after the introduction of a digital technology, more weight than higher level employees. When it comes to later stages of technology adoption, individual barriers decreased in their importance to operational employees.

5.1.2.4 Success factors

In the following section, the success factors that are counteracting barriers to digital transformation in this project will be presented. Despite barriers to digital transformation being present, the project was perceived as a success by both the employees and management. To see why this is the case, the success factors which are present in this project will now be identified.

Firstly, in general it was observed in the interviews, that the generally perceived attitude towards new technologies and digitalization is positive, as the following statement, that was given by an interviewee, highlights:

"Partly [there is] a little bit of sceptic, but predominantly I would say curiosity, [people] are just excited, I think, to see how this develops and are curious for what the outcome will be."

This is also mentioned as a success factor in the work by Cichosz et al. (2020) who state that an organization's leader needs to develop and communicate a digital vision in order for employees to be inspired and to adopt a digital mindset. In this project, the digital vision seems to have been adopted, not immediately but over time, however, as can be seen with the following projects, this might not have been generally true. Secondly, drawing on the categorization of critical success factors by Holotiuk and Beimborn (2017), two of these factors are present in this project. The information and data used in the Andon boards comes from a central source, a fact that has been mentioned as a success factor by Holotiuk and Beimborn (2017). By collecting that data, real-time and large-scale data processing is possible, and performance on KPIs becomes transparent on the levels of the employees as well as management. Transparency in this context means that on the Andon boards and screens of the laboratory the current performance of a shift in terms of number of samples processed is shown to employees, and that additionally, management has also availability of these measures, together with supplementary information. The perspective of the employees is reflected in the following statement:

"I think just because people know what's the workload, what's coming up in my shift, and then because people get a little bit of an idea or a sense of what's a lot of work, what's less work, what else can I expect over the course of my shift [...]"

Additional actionable insights can be accessed and derived from the data, and it was mentioned by management that short-term adjustments of the department operations and workflow may be performed based on that:

"[...] if they have a strong order intake [...] they can mentally prepare [...] that the group leader will probably check in with the employees on Thursday and ask who will come in for maybe a few hours on Saturday."

Furthermore, the project measurably increases efficiency in the interaction between employees and technologies, in that the increased transparency over the daily workload and prioritization of tasks that was enabled through the technology, has led to a lower processing time of samples through employees. This link between human and digital channels has also been found to be a success factor in the work of Holotiuk and Beimborn (2017) which they categorize under "Operations" and "blending human and digital resources" (p. 1000).

Thirdly, when it comes to organizational structure, the laboratory department is structured hierarchically with three operational levels, and five levels in the department in general, and the internal governance structures being fairly top-down. Therefore, neither cross-functional teams nor mutual decision-making, nor a particular failure culture, nor power equality, that are characterizing flat organizational structures, have been introduced. This means that success factors relating to organizational structure, that have been mentioned in literature by various authors (e.g., Duerr et al., 2018; Robertson, 2015)) can't be observed in this department.

Summing up, the major success factors that have been found in this project, are the support by the organization's leaders for the project, as well as the technology as such which enabled a link between human and digital resources, that led to more efficiency in processes. This improvement was clearly visible to both employees as well as management. This is specifically reflected in the fact that the perception of success factors is similar for employees as for management. For example, in the category of "Operations", where the boards lead to increased plannability and transparency over workload for employees as well as for management. A difference lies in the fact that, naturally, each group ties these success factors to the goals that are associated with their position.

To sum up, in this section a first project aimed at implementing new digital technologies was presented. The implemented technology were so-called ANDON boards, on which group performance metrics are made transparent. Firstly, the project was described, then it was found that all interview partners consider this project as a success. Finally, the link was made from the drivers, barriers and success factors found in the project to the drivers, barriers and success factors found that the project was primarily organizational development driven, but that also employee support was present, which is an individual driver for digital transformation. In terms of barriers, individual barriers were found that were associated with the introduction of the new technology. However, this perception was mainly shared by operational employees rather than the management. Lastly, the success factors of support by top management and a link between the analogue and digital components of the task, which led to more efficiency, were present.

162

5.2 Project 2 – Automated Microscope

5.2.1 Project description

In the quality assurance laboratory, microscopes are used to determine whether samples meet the applicable quality standards and norms or not. In 2017, a digitalization project in the department was implemented that was concerned with introducing an automated microscope.

The main aim of this project was to, on the one hand, optimize the process to be more efficient, and on the other hand, to ensure replicability of results. To further specify the aim behind the first reason, in the words of an employee, it did not necessarily mean that the process of checking a sample, seen in an isolated fashion, is faster. But rather efficiency is generated differently:

"[...] the microscope can of course work on weekends, it can work at night, it can run continuously, from the examination time, if you now say, you are now, you are examining something manually, it is in any case always faster or in the time in which the microscope works, we actually have, the only thing that brings an advantage from the time, is that it can run through. Otherwise, the speed is simply lower."

The aim of replicability is formulated as follows by an interview partner: "Yes, the reason is, that if the checking of samples is partially automated, [...] afterwards the results are 100% replicable." The technical reason for this is described as follows: "Now, if you automatically scan a microscope frame by frame, I'm sure the grid will always be correct. If you do it manually, there can be shifts afterwards and, for example, something can be overlooked on the test surface or something can be evaluated twice." This statement details exactly how test results are replicable due to the use of the new technology of the automated microscope. This can be considered as an improvement of the quality control process.

Prior to introducing this project, the main process was for employees to take a sample to a microscope, clamp it and adjust the microscope to the area that is to be assessed. Then an employee analyses this sample by looking at it through the microscope objective and is

determining the quality assessment as well as providing a justification for the assessment. This process needs to be performed for one sample at a time.

The new automated microscope consists of a microscope table, on which several dozens of samples can be placed at the same time. The microscope then automatically adjusts to the respective assessment area of each sample, scans all samples and takes a picture. This process can take several hours, and after it has finished, the quality of samples is assessed by an employee all at once, based on the pictures taken. Therefore, while the microscope is scanning, the employees are free to do other tasks, and time for clamping and adjusting each sample separately is saved.

5.2.2 Interview results5.2.2.1 Evaluation of success

This project again can be argued to be a successful project, in that the implemented technology has been accepted and is being integrated in the employee's day-to-day workflow and perceived to improve productivity. Interestingly, management has a double-edged view on this project. While having generally a positive opinion about the project, it has been mentioned in an earlier quote that the analysis of each sample is taking longer, based on the whole processing time from sample arrival until the classification for quality has been done. Still, there is an increase in productivity in the process, because while the microscope is automatically processing, and taking pictures of samples, employees are freed up to do other tasks, as they report: "So [it is] definitely a time saver and in the time the machine is running I can also do [other] normal work." Additionally, the microscope can run during non-operational hours, such as the night or weekends, so that employees can analyse the pictures directly upon their arrival at the office.

The difference in perception of success between different hierarchy levels in this case relates to different goals for a task. The goal of management is to reduce throughput times, that are then potentially measured as a KPI, while the goal of employees is to use their working time as efficiently as possible, without too much consideration for overall throughput times.

5.2.2.2 Drivers

The main aim of this project is a business-related goal of process improvement, in terms of increased efficiency, therefore it can be classified as organizational development-driven as defined by Tomičić Furjan et al. (2020). When considering the classification by Liere-Netheler et al. (2018), the aims of the project can be linked with process and workplace improvement, and potentially cost reduction, again pointing towards organizational drivers being at play. There are no differences in perception reported.

5.2.2.3 Barriers

A barrier that has been identified in connection to this project is the digital mindset of employees, that can be seen in line with the well-observed phenomenon of people's resistance to change (e.g., Cichosz et al., 2020). Specifically, it was reported that when the project was introduced, scepticism was voiced on whether the targeted process really can be improved based on the new technology. However, it was mentioned that over time the benefits of the system, such as saved time and freeing up employees to do other tasks, became more apparent:

"[...] [The opinion was] what we have, that's good anyway, and the other one [new technology] sucks, we do not need that, but as it became operational people saw that there's already a lot of progress [in terms of their own productivity] too, then it got slowly better."

What can be classified as another barrier in the context of this project is that there is a lack of digital skills in the department, when it comes to keeping the new technology operational, in other words, the maintenance of it: "It is generally the case that very few [employees] are really well versed in our programs [...]."

The microscope has been installed by an external company, which also needs to be contacted in case technical issues occur, since employees in the department do not possess the required expertise and skills. On the one hand, it can be argued that such skills are not necessarily required for performing the core tasks in the department. Rather employees should focus on executing and improving their knowledge and expertise on the core tasks. On the contrary, more involvement, knowledge and skills regarding the new technology could lead to a higher acceptance and adoption by employees. In other words, employees might feel a higher level of "ownership" of the project and technology. This could also serve as a basis for innovation, based on the occurrence of new ideas of employees that are directly working with the microscope on a daily basis.

Again, the perception differed in that employees were initially focused on individual barriers, in particular resistance to change, that however became less prominent the longer employees were using the new technology and benefits became apparent. The barrier of missing digital skills was perceived both by management and employees.

5.2.2.4 Success factors

This project was again very much backed by the management team of the department. The success factor of support by management as mentioned by Verhoef et al. (2019) is therefore present.

What has been an interesting observation in this project, is that younger employees seemed to be more open and adaptive to the introduction of the new technology in this project. No differences in perception between hierarchy levels regarding success factors were reported.

The finding that younger employees seemed to be more open and adaptive to the introduction of new technology stands in contrast to the findings of Kunze et al. (2013) who find a negative relationship between age and resistance to change in real-life work environments, i.e., older employees state a slightly higher openness to change than younger colleagues. However, it underlines the findings of Finkelstein et al. (1995), who find in simulated work environments that older employees are associated with a higher level of resistance to change, due to their lower potential for development, such as taking a longer time to learning new skills, and their higher need for stability. Vaportzis et al. (2017) find on the contrary, that older employees are eager to learn, however require instructions and support regarding the functioning of the novel technology, as well as clarity in those. Further in-depth research would however be required to analyse the roots of this disparity in the case of this project and to ensure generalizability.

To sum up, in the prior section, a project implementing the technology of an automated microscope was analyzed - this microscope is able to scan samples autonomously and helped to optimize the quality assurance process. Furthermore, it was discussed whether it was considered a success by different stakeholders. It was stated that while the process as such takes longer, overall, an increase in efficiency was observed in the project, which can be considered a success. Then, drivers, barriers and success factors were discussed and connected to existing literature. The main driver for this project was organizational development, the main barriers identified were individual barriers, specifically resistance to change, and missing digital skills. In terms of success factors, it was found that support by management was present. Additionally, other observations were made on differences in technology adoption and support between younger and older employees were highlighted.

5.3 Project 3 – Artificial Intelligence Project

5.3.1 Project description

In 2020 a project was initiated that was aimed at the introduction of proprietary Artificial Intelligence (AI) software into a process in the laboratory. The use of the AI software builds on the automated microscope that is being discussed as Project 2 in this study. As mentioned in the project description of Project 2, the automated microscope takes pictures of several dozens of samples automatically, that can then be analysed and assessed for their quality by employees. The AI project was aimed at taking the automation a step further, in that the analysis and assessment steps are automated as well. It was planned for the AI software to analyse each picture the automated microscope had taken of the samples and assess and rate the quality of each sample. Since such a technology or software that is tailored to the needs of the quality assurance department apparently did not exist or is not freely available, it needed to be developed proprietarily.

In general, proprietary technology can be a potential strategic asset (Amit & Schoemaker, 1993). This is since that on the one hand efficiency in processes can be increased, and on the other hand the competitive advantage may be sustained over a longer period of time, since it may be more difficult for competitors to imitate the technology. An additional beneficial side-effect might be the increased competences and knowledge of the technology that is built

up if the department is closely involved in the development and implementation process (Hayes & Wheelwright, 1985).

5.3.2 Interview results5.3.2.1 Evaluation of success

This project can be characterized as a failure, since the underlying technology wasn't implemented in the department, and the project was terminated:

"The whole thing failed."

Even though the technology in general has been perceived as beneficial by management as well as employees, several factors contributed to the failure of technology implementation, that will be discussed in the following. This project specifically illustrates on the one hand barriers that go in hand with implementing a proprietary, cutting-edge technology, and on the other hand with implementing a technology top-down and in cooperation with an external company. No differences in perception between hierarchy levels were evaluated regarding the evaluation of success of this project.

5.3.2.2 Drivers

The project was initiated top-down upon the initiative of an important stakeholder in the parent company of the assessed company. Therefore, there was no "department-internal" driver, urgent need or motivation that led to the initiation of this project. The AI software was then developed mainly by an external scientific research institution, with only limited involvement of employees and management of the company department. Rather it was reported that the initiative came from the company's headquarter, which then commissioned the external institution.

One driver for this project is therefore process improvement and an increase in efficiency, since the aim was for the processing time for each sample to be reduced, and for time capacities of employees to be freed up for other tasks through the automation by software.

This project can therefore be categorized as organizational development-driven, following the classification of Tomičić Furjan et al. (2020).

A second driver that can be identified in the context of this project is the external driver of an innovation push, that has been triggered by a new technology, in this case artificial intelligence. This concept of a technology-driven digital transformation, that is linked to new opportunities caused by digital technologies, is mentioned, among others, by Liere-Netheler et al. (2018) and Hrustek et al. (2019).

But conclusions can not only be drawn from what drivers were present in this project, but also from what drivers were not present. In the interviews on this project, it was not mentioned that there was a pressing need for the process to be made more efficient or the new technology to be implemented. While not being specific to digital transformation, the lack of establishing a great enough sense of urgency was identified as a common error that hinders change management efforts in general (Kotter, 1995). This notion was reflected in the statement of an interviewee, who also mentioned the notion of the lack of involvement of employees on lower levels: "I believe that for many projects, it's simply a matter of when the time is right, and that time is usually when the pressure of suffering is high enough, for example, and or improvements and or the benefits of a new technology are recognized by those responsible at a lower level." To interpret this statement, the interviewee expressed that in their opinion, the success of a project depends strongly on the timing of it. And the timing of the project should be aligned with the "degree of suffering" that is subjectively experienced by lower level responsible. This could be influenced by how long a process takes or how many intermediate steps are required. When this degree of suffering is considered to be too high for the lower level responsibles, then the timing would be right for the project.

In conclusion, it can be stated that two drivers of digital transformation are present in the project, namely an organizational as well as an external driver. However, based on the interview it can be assumed that these drivers didn't develop their full strength, since they seem to have been counteracted by a lacking sense of urgency related to this project. The proposition may be formulated that a lacking sense of urgency seems to slow or even stop

169

the initiation and progress of a digitalization project, despite organizational and external drivers being present, as seen in Proposition 2.

No differences in perception between hierarchy levels were reported regarding drivers.

5.3.2.3 Barriers

One barrier can be connected to the fact that the technology itself is relatively recent and the exact configuration had to be developed proprietarily for the company. Due to the additional coordination and planning effort required and the exploratory nature, such a project might be more challenging to successfully implement than a project that just applies well-developed and well-proven off-the-shelf technology in a pre-defined way. This notion has been confirmed by a study of Tatikonda and Rosenthal (2000). The impact of the project type, as defined by technology novelty and project complexity on the project execution success was assessed in their study. They particularly found, based on a questionnaire-based study, that the more novel a technology that concerns a process, relative to the status quo in the company, the higher is the risk of an unfavourable outcome of such a project, defined in their case by a prolongation of time-to-market and higher costs (Tatikonda & Rosenthal, 2000). The insights from this project therefore support their findings.

Another aspect that came with applying new technology was that it was not entirely clear whether the technological solution can even be applied in the automation of the process, since no example of a successful earlier application in a similar company was known of. This led to uncertainty on whether the project as such would even be technologically feasible. Possibly based on this lack of a strong belief in the technology and its feasibility in the specific context, the project was abandoned after a first series of trials hadn't brought the envisioned results. Thus the existence of technical barrier, following Vogelsang et al. (2019), or technological barrier, following Peillon and Dubruc (2019) was perceived by the interviewees.

Contrasting that view, it was mentioned in the interviews that for the technology to become fully operational, further, more extensive trials might have been needed. Also, without indepth knowledge of the underlying technology it is not clear whether there truly was a technological barrier, or rather a lack of belief in the technology and other individual barriers at play, that then led to the impression that a technological barrier existed. Based on these perceptions, it can be stated that in the perception of stakeholders, for relatively new and barely tested technologies, a technological barrier is more likely to arise than for off-the-shelf and well-proven technologies, independent of the factual existence of such a barrier, proposed in Proposition 3. Also, another proposition can be made that the relation between the type of technology (novel/established) and the occurrence of a perceived barrier is moderated by the degree of trust in the feasibility of a technology implementation, as set out in Proposition 4.

Another barrier is related to the way the project was initiated and governed. As already described, it was started and executed as a top-down initiative by an important stakeholder of the company's parent organization and in cooperation with an external research institution. Management and employees of the department had therefore the perception that the project was imposed on them and felt they had limited opportunities to contribute and voice their own thoughts, ideas as well as concerns, which might have led to a potentially lower motivation or proactive approach when participating in the project. This mechanism corresponds to the work of Vogelsang et al. (2019) who also identified lack of employee involvement as a barrier.

Furthermore, it was mentioned by employees who were directly involved in the project that they had the impression that responsibilities, roles and tasks were not clearly defined, which might have led to the progress of the project being slowed down as well as a decrease of motivation: "Well, I think it was a bit due to the task, so to speak. Because there was simply too little information behind it [...]"

Töytäri et al. (2017) had made a similar observation in their study, namely the insight that a misfit between requirements of the project and a company's "home-grown" governance structure leads to the emergence of a barrier. Based on the prior three mentioned barriers, the proposition can be made that the barrier of a lack of employee involvement, as well as lack of clear roles seem to be reinforcing technological barriers, in that the higher the level of employee involvement and the clearer the task, the more easily a possible technological barrier seems to be able to be overcome, as seen in Proposition 5.

This is because often the technological feasibility may not be clear, and with the involvement of employees, they might be enabled to carry the project through difficulties and create the resilience and basic motivation that is required for a successful implementation. On the contrary, if employee involvement is not given and the task not clear, a technological barrier may arise or be reinforced.

Additionally, since this technology is relatively new, the necessary digital skills for developing an AI software weren't available in the company in-house. Therefore, there initially was a lack of skills and skilled resources, which can be categorized as a barrier (e.g., Vogelsang et al., 2019). This barrier was however overcome by the acquisition of skills from an external research institution, which likely reduced its overall influence on the project success.

While in theory, the necessary digital skills were acquired from external sources, in practice there were challenges in applying them in the context of the project. It was mentioned that the communication between the IT side, represented by the external company, and the operational side, represented by the quality assurance department, was challenging. This was attributed to the limited understanding of the IT side for the technical needs and context: "And that's where it failed on its own, I do not think at all in terms of communication, but in terms of understanding between the technical area and the IT area."

Thus, on the side of the external company there seems to also have been a barrier of missing skills, but this time relating to technical knowledge of the underlying process (Vogelsang et al., 2019). Summing up, a lack of different skills in the different stakeholders might have existed in the project.

But assuming that the required skills were, considering the entire project team, available, other barriers could have hindered the success of the cross-functional collaboration between the external firm, i.e., the IT side, and the quality assurance department. De Clercq et al. (2011) explored moderator variables in the relationship between cross-functional collaboration and product innovativeness. They concluded that the underlying relationship is stronger, the higher the decision autonomy and shared responsibility, as well as the higher the social interaction, trust and goal congruence between the teams. However, it is not clear whether these moderators are also significant in the relationship between cross-functional

collaboration and project success, even though, judging from personal observations, an analogous application seems feasible and promising. Yet, there was no explicit mentioning of these factors in the interviews, therefore exploring whether and how they played a role in this project is a question to be tackled in a further study. Additional points on the crossfunctional collaboration will be mentioned in the following section on success factors. Based on these insights it may be formulated that the probability of project success in a digitalization project seems to be higher, with cross functional collaboration being present, more so the higher the social interaction, trust and goal congruence between teams, proposed in Proposition 6.

Another barrier that came up was a lack of technical resources as substantiated for example by Jakob and Krcmar (2018). For the AI project to become fully functional, it would have required substantial server capacity as well as storage space, which was reported not to have been available to the required extent.

As for the barriers in this project, it was observed that in this case upper management did not observe the barrier of a lack of employee involvement, while lower management and operational employees that were involved in the project on a day-to-day basis, perceived it as a prominent barrier. A similar observation was made with regards to the barrier of a lack of clear roles.

5.3.2.4 Success factors

A success factors that was clearly present in this project was the strong support by top management as mentioned by Verhoef et al. (2019), since it was initiated by an important stakeholder in the parent company. But two questions present themselves when considering these circumstances: firstly, it can be questioned whether the active, driving involvement, and initiation of projects by top management really leads to a higher success rate in digital transformation. In the interviews it has become apparent that if the project leadership is being perceived as "far away" from the department and employees, as well as the project being initiated top-down, there might be a lower motivation and engagement of department management as well as employees. Therefore, it seems even though strong support by top

management is especially important to get the necessary resources, in terms of ensuring project success a stronger focus on establishing a leadership team that is perceived as more "local", as well as active involvement of employees might be required. In terms of formulating a proposition, this means that for involvement of top management to take its effect as a success factor, also the presence of the success factor of employee involvement seems to be required, as set out in Proposition 7. This corresponds partly to a success factor that Vogelsang et al. (2019) identified, namely the integration of employees in the change process.

Another success factor that was identified, is the knowledge of employees of the existence of a digital vision, as defined by the top management of the company, implying that such a vision had been developed and communicated. This was mentioned by Cichosz et al. (2020) as a success factor, with a digital vision inspiring employees to promote a digital mindset and culture. However, a lack of commitment to this vision, and inspiration by it, was mentioned in the interviews. As such, it seems that a focus for management in the company could lie on ensuring commitment to this vision and strengthening communication in this regard.

Another success factor that was present was the presence of a cross-functional team, consisting of employees from the external IT company, from the internal IT department, as well as the quality assurance department. Such teams in general are considered best-practice in digital transformations and should reduce conflicts and possible confusion between the functions (Duerr et al., 2018). However, it seems that there had been no facilitators involved in the process. Due to the fact that concerns on the mutual understanding between functions in the project team had been voiced by employees, coaching, mentoring or workshop sessions might have helped to create a better and more fruitful collaboration environment. The importance of this success factor was mentioned also in work by Westerman et al. (2011). This can hint to the conclusion that for the success factor of cross-functional teams to fully materialize, there seems to be a need for the additional success factor of an accompanying facilitation and mentoring process, to be present, as seen in Proposition 8. Therefore, these success factors may be positively reinforcing each other. To what extent in what form, and under what conditions this is the case is a question that can be tackled by further research.
Also, it may be insightful to consider which success factors weren't present. Again, no adaptations of the organizational structure were made in the department (Hrustek et al., 2019), that may have made a rapid reorganization and reallocation of resources impossible (Holotiuk & Beimborn, 2017).

No differences in perception between hierarchy levels were reported regarding success factors.

To sum up, in this section an artificial intelligence project was introduced. The aim of this project was to automate a process by using tools powered by artificial intelligence. It was found that organizational as well as an external driver, of a newly developed technology, was present. But it was also found that there was a lacking sense of urgency that counteracted these drivers. This led to the project to not be considered as a success. Additionally, a focus was also put on discussing the impact of how novel a technology is on the progress and success of a project. It was found that a very new technology might be more difficult to implement than an already established one, and could be a barrier, closely connected to being a technological barrier. Further barriers were a lack of employee involvement, a lack of clear roles, a lack of technical resources and a lack of skills and skilled resources. As for the success factors, strong support by top management was present, as well as the knowledge of employees about the digital vision of the company. Lastly, also the presence of a cross-functional team was found. But it seems that these success factors were not strong enough to counteract the barriers, leading to the preceived failure of the project.

5.4 Project 4 – Logistics and transport tracking system of samples

5.4.1 Project description

The project was introduced in 2011 and introduced a logistics and transport tracking system of samples. This project has a similar function as the ANDON boards in terms of the targeted aim and underlying problems and solution developed. As the ANDON boards, the project also serves as a tool to track the processing status of samples. While with the ANDON boards the processing status of samples are tracked within the laboratory, the logistics and transport tacking system tracks the entire quality assurance process chain of a sample in the entire company. It has also been described as a logistics and transport tracking system of samples. To understand the distinction, it will be roughly described in the following how the quality assurance process is structured. At first, at the point of production, a sample gets taken that is representative for the batch that was produced and possibly also further processed. Then, to analyse this sample as a sample in the laboratory, further steps need to be undertaken to turn the sample into a sample ready for analysis. These further steps are carried out across different workshops in the entire company, that are now tracked with the logistics and transport tracking system. Therefore, with the introduction of this tool, more transparency is introduced into this process. The tool produces a detailed overview over the processing steps at which a sample currently is located, of where the sample is projected to go and over the time that passed since the quality assurance process was started.

Based on the interviews, it has not become clear however, how exactly monitoring is conducted, and how decisions are taken based on the data that is generated using the technology. As data is collected from the entire company, the process is not being steered by the laboratory, but rather a department that supervises all workshops. Contrary to the ANDON boards discussed in a prior project, information on the sample status is not made available to the operative employees in the laboratory on screens. Rather, it seems to serve as a reporting tool for management and work planning on the company-level. Since this part of the organization is outside the scope of this research project, further investigations would need to be undertaken, to get a more complete view of the details of this tool.

Concurring with the company-level use of the technology, it was initiated upon an initiative of the board of directors of the company, rather than by the laboratory staff or management itself. One aim underlying the project was a reduction of throughput times, another one the tracking of samples, to avoid them getting lost. An external company has been commissioned to implement the system and technology.

5.4.2 Interview results5.4.2.1 Evaluation of success

This project in its ideal state should have been aimed at digitizing and tracking and performance and process metrics entire quality assurance process, from the collection of the

sample at the shop floor to the issuance of a quality rating at the laboratory. However, it was mentioned in the interviews, that not the entire process was digitized, just parts of it. As such it was rather seen as a "rudimentary digitalisation" than a complete one. But the parts that are digitized are in use and the system is operational. As such it can be categorized as a success.

No differences in the perception of success were recorded between different hierarchy levels.

5.4.2.2 Drivers

This project was introduced, like the ANDON boards, as a means to increase the performance and efficiency in the quality assurance process. This is reflected in the goal of making the quality assurance process across the whole company more efficient and streamlined, but without impacting the quality of analysis. As such, the project is again driven by considerations of organizational development and process/workplace improvement (Tomičić Furjan et al., 2020).

An individual driver, as defined by Liere-Netheler et al. (2018) for the project can also be identified, in that employees were reported to be accepting of this technology. But while employees were supportive, the initiative for the project clearly came from top management of the company.

No differences in the perception of drivers were recorded between different hierarchy levels.

5.4.2.3 Barriers

In this project a few barriers occurred already in the solution design phase before the actual implementation of the technology. It was reported in the interviews that this system was designed and implemented as a separate, new system. This was since that no common solution or rather agreement between different workshops and departments could be found on how to integrate it into an already existent process workflow system:

"The [anonymized] project, that also goes back to 2006, it was not possible to find an agreement on how to integrate it better [...]"

In the interviews this was partly attributed to a resistance to change as mentioned for example by Cichosz et al. (2020), which made it difficult to find a comprehensive solution. It was also mentioned that even though the departments were generally open to the project and found it beneficial, it was difficult to convince the project partners to give their unwavering commitment and full involvement, also in terms of resources: "[...] so that's a matter of convincing project partners, etc., or whether you can convince them, so from the project manager to the project partners and to the decision makers and that's a matter of how you approach processes, or whether and how you dare to approach them [...]" To interpret this statement, the interviewee expressed the difficulty of getting all stakeholders on board of a project across departments. They highlighted the importance of strategically approaching convincing the stakeholders and using a targeted approach and considering how to involve them.

Therefore, to an extent the barrier of a lack of resources (Jakob & Krcmar, 2018) was present in this project. Similar to the artificial intelligence project described earlier, the root cause for this dynamic might also, in this project, lie in the mode of initiation and governance. Topmanagement involvement presents a dilemma, since on the one hand, often top-level support and hierarchical power is required to create alignment between stakeholders with different goals. But on the other hand, it can dampen the motivation and commitment of the stakeholders that are operationally involved, in that they draw back to a more passive, reactive position. A balance needs to be found, through which lower-level involvement is encouraged, but at the same time top management provides sufficient guidance to facilitate an agreement. This is also reflected by the interplay of the success factors of strong top management support and guidance (Verhoef et al., 2019), and the barrier of a lack of employee involvement (Vogelsang et al., 2019).

This interplay was especially difficult in this project, since the tool was aimed at enhancing transparency on measurable parameters. In this case, it was the throughput time of samples that was made transparent for each processing step. An implication of this fact was that, especially in the introductory phase of the project, the processing time at each step was not reflected correctly for each department. For example, the transportation times from one workshop or department to the next one, were attributed to departments instead of being

booked as a department-independent category. This resulted partly in distorted and misrepresented throughput times, appearing to point to a lower performance for some workshops, even though that was in fact not the case. Naturally this was perceived as unfair by the involved stakeholders and possibly led to a resistance to change. However, it seems this problem has been solved over time with the implementation of this project. Nevertheless, it shows the importance of creating a solid stream of high-quality, clean baseline data, based on which further projects can be implemented. This notion is also underlined by Hazen et al. (2014) who suggest that to produce high-quality data for further analyses, methods for monitoring and controlling data quality need to be introduced to the data collection process. The observations made for this project therefore highlight again the possible implications that an increase of transparency can lead to in an organization. It shows that a seemingly objective criterion of measurement based on factual data, may on the one hand be considered unfair due to the way of recording the data, leading possibly to a higher discontent. On the other hand, it could also lead to "political" implications, with managers not appreciating the increased transparency due to the possibility of it being used in "political" power play in the organization (Flyverbom et al., 2015).

5.4.2.4 Success factors

In this project, as mentioned briefly earlier, the success factor of support by top management (Verhoef et al., 2019) was present, since the project was both initiated as well as governed by the board of directors.

Additionally, cross-functional teams had been established that consisted of members from different departments and workshops, upper management and employees of the external company which supported the implementation. This again was mentioned as a success factor by Duerr et al. (2018). No differences in perception regarding success factors were mentioned.

To sum up, in the last section a project aimed at the introduction of a logistics and transport tracking system of samples was presented. It is similar to the ANDON boards, but collected data is only provided to management rather than operational employees, and the focus lies more on the transportation and logistics processes of samples. The project can be considered a success. The drivers of organizational development and employee support were found to be present in this project. As for barriers, the barrier of a lack of resources was present, and that of a resistance to change. In terms of success factors, support by top management was given, and cross-functional teams had been established.

5.5 Project 5 – Laboratory-specific SAP-like system5.5.1 Project description

This project is concerned with the development of a proprietary, laboratory-specific system like the commonly used enterprise resource planning (ERP) software SAP. In the following it will be abbreviated as "lab-SAP". While in earlier software solutions, data concerning processes and workflows was saved by each department separately, SAP centralized data storage. This led to the benefit of having a central source of data, that in turn facilitated the interaction between departments, with everyone having access to the same data (SAP, 2022). Furthermore, costs for data storage decreased and errors were reduced that might have occurred due to duplicate data (SAP, 2022). While in SAP different processes in the entire company are included, for example order management or pay processes, in the lab-SAP, the quality assurance process is reflected. Before the introduction of this digitalized system, a paper file was attached to each sample that served as a tracking sheet and "went along" with the sample for all processing steps. Each step or analysis that the sample went through needed then to be noted down by hand on the tracking sheet.

To understand this project, the quality assurance process needs to be described further. The process starts when a sample is being taken during the production process and ends when a quality and feature assessment of the sample has been made. The samples are not only taken from finished products, but rather throughout the entire production process. This is due to the criticality of the areas in which the products are often used, that require a close-meshed quality assurance system. As such, for one finished product, usually multiple samples are taken and processed.

This project differs from the others in that the earliest phase of the project was already implemented in 2000. Following that, the system was then continuously developed further,

over time increasing the number of departments and workshops that are granted access and whose processing steps are reflected in the system. Since each department has different requirements and processes, the software needed to be adapted to them specifically. Therefore, projects were conducted to create proprietary access for departments.

This project differs from the logistics and transport tracking system of samples in that all information that is required for the quality assurance process is stored in the system. To give an example, certain norms apply to different types of products. These norms are very detailed and would be difficult to remember or require a large storage capacity if stored on paper, especially since a large variety of products is manufactured. Being able to save them in a centrally accessible, standardized system, poses therefore a great advantage. The logistics and transport tracking system on the other hand is focused on performance data, meaning the main aim for it is to create transparency over throughput times, the processing status and location of samples. Such data is not included in the lab-SAP.

In short, all information that employees need to know for correctly processing and analyzing product samples is included in this system. This can, in addition to the already mentioned specifications of norms, include parameters for testing, such as which testing methods are to be used and which testing steps need to be fulfilled to meet a pre-defined norm and what aspects should be particularly paid attention to. It also includes pre-defined thresholds for each norm, that give indicators on whether a certain product meets the required quality criteria or not. Furthermore, after each testing step is performed, the test results are saved in the lab-SAP. Saving the data in a central system enables the company to create a comprehensive and detailed archive. Based on this it is possible to quickly retrieve data and react to customer complaints on quality, that may in some cases, only occur years later.

Also, the project has contributed to a standardization of processes. Before the introduction of the lab-SAP similar processes had been done differently, or similar test results saved differently. When the system was introduced, standards necessarily had to be introduced, to create comparability and alignment between departments. So, in addition to the digitization of the process, an additional improvement was created by standardization. This can then in turn result in greater efficiency in internal transactions, business-to-business transactions, and increased convenience for customers (Andal-Ancion et al., 2003). Also it was suggested that standardization can paradoxically lead to increased agility, in that even though standard core processes are aligned, companies can build local variations on top of the standard platform (Westerman & Bonnet, 2015). This is exactly what the aim was for this project as well. The alternative to such an approach would be to customize core ERP processes for each unit separately, which has the disadvantage of creating long-term costs and risks, and potentially messy data (Westerman & Bonnet, 2015).

The system does not only serve as an internal data-storage and process tracking tool, but access can also be given to external customers, who require information on the test results for their own quality assurance processes.

5.5.2 Interview results5.5.2.1 Evaluation of success

This project, in general, can be categorized as a success, since the lab-SAP has been implemented, and is being used as the standard tool for the quality-assurance process. Both employees as well as management are generally considering it a good tool that is, by now, well accepted by employees. It was reported that by introducing the lab-SAP, efficiency in the quality assurance process was improved: "[..] [The employees realized] that they only have to enter 10% of the data instead of a third of the working time, and they can simply check the rest, and they really... that was a tremendous relief and was accepted immediately, because they realized that it really makes their work easier and they get a lot more samples through, so that was an extreme relief."

No differences in the perception of success were recorded between stakeholders from different hierarchy levels.

To analyze this project, it can be categorized along the distinction following Verhoef et al. (2019). This project clearly digitizes processes, in that analogue information is put into a digital format. Earlier, all information was stored on paper and written down by hand, now the information is stored centrally in a digital database. Digitalization occurs as well, since

business processes are altered, in that customers were granted access to the digitized quality assurance data. Furthermore, simply by standardization the processes as such have been altered. However, the stage of a digital transformation, as defined by Verhoef et al. (2019) hasn't been reached, since, to the best of the author's knowledge, no new company-wide business-models were developed based on this technology.

Another categorization of the project is useful for the further analysis along barriers and success factors. The lab-SAP project can be split into three separate levels for the purpose of this analysis. The first one is the initial introduction of the technology and the software system, which was initially implemented in the 2000s. This level is not the main focus of this discussion but will be touched upon in passing. The second one is the constantly ongoing general development of the lab-SAP, with the system being extended by additional applications and interfaces. This level will be analyzed in more depth. The third one is focusing specifically on an application interface that is developed in the laboratory which is analyzed in this study. Also, this level will be analyzed in detail, since some of the interviewed employees had been directly involved in it and could therefore provide insightful comments.

5.5.2.2 Drivers

Initially the main driver for this project was the spread of the – at the time - fairly new technology of high-performing computers and software, as well as the internet, that had been gaining more and more reach and maturity. As such, this project initially was technology driven, following the categorization by Hrustek et al. (2019). Following the classification by Liere-Netheler et al. (2018) the project can also be categorized as being driven by an innovation push, therefore by an external driver.

An additional driver is tied to the fact that customers are granted partial access to the testing data. It can be argued that the quality assurance process is made more transparent and data becomes more easily accessible for the customers, therefore more customer value is created. Thus, the project can be categorized as customer driven, following the definition by Tomičić Furjan et al. (2020). Furthermore, it can be argued that with the spread of the new technology, customers started to expect getting access to data from the entire quality assurance process

183

to improve traceability. Therefore, the project is also driven by customer demands, which are categorized as another external driver by Liere-Netheler et al. (2018).

Clearly there are also organizational drivers at play, when considering the fact that processes are improved, in that they are made more efficient in terms of a reduced processing time, caused by less time required for information gathering and transmission. Furthermore, transparency is improved, which also can support management in taking better decisions. Therefore, this project can be defined as organizational development driven, following Liere-Netheler et al. (2018). Lastly, individual drivers as defined by Liere-Netheler et al. (2018) are also present, since employee support for the project was reported.

Summing up, this project disposes of drivers in nearly all categories that were defined in the reviewed literature, ranging from organizational development, technology, customer, external to individual drivers. No differences along hierarchy levels were reported for the perception of drivers.

5.5.2.3 Barriers

Starting with discussing the barriers that are associated with the first level of the initial technology introduction, it was reported that in this project, initially people were resistant to change, which was defined as a barrier by Cichosz et al. (2020). Like other projects it was mentioned that on the level of the workforce, initially, older employees were less open to the change and less accepting of the project: "So all the staff was actually, just saw additional workload."

This however changed over time, as the benefits of the new system became increasingly clear. It was mentioned that in the beginning, older employees struggled more, possibly leading to an increased resistance to change, but it got better since these employees have now retired: "[...] these were mainly older employees, [...] who probably also found it even more difficult, who also resisted it and yes, and as I said, that's no longer the case today, back then it was a big problem." Since the mentioned employees are no longer working in the focal company, their perspective on the barriers can't be considered directly. However, possibly their perception would have been the existence of individual barriers, mainly resistance to change in the initial phases of the project, while management might have been more open to the project as a whole.

When looking at the second level of the further system development and addition of applications, resistance to change has also been encountered in this project. Not always are changes welcomed by all the stakeholders, for different reasons that are elaborated in the following.

Firstly, the lab-SAP has over the years grown into a highly complex system. This is partly since that many departments that are participating in the quality assurance process started to develop software solutions and user interfaces for their own purposes. While being tailored to the individual departments' needs, it was reported that oftentimes issues arise in the interaction between systems, in that they can't communicate correctly with each other, as an interview partner stated: "[...] the cooperation between the different systems that you have now mentioned, I think it is not quite clean-cut." To interpret this statement, the interviewee expressed that in their perception, two different computer systems that they need to use in their daily work are not well connected.

Stated differently, there are problems regarding the interfaces between systems. However, the isolated solutions are appreciated by the individual departments since, from their perspective, they fit their specific needs. Therefore, the propensity to switch to a system that is more aligned and efficient from a company-wide perspective but caters less to their individual needs, seems to be low. To make an assumption, the origin of the resistance to change might lie in the trade-off between individual department-specific and general company-wide preferences, as such the likelihood of the occurrence of the barrier resistance to change seems to be higher, the more different department-specific and general company-wide preferences are from each other, proposed in Proposition 9.

An example that illustrates this dynamic is the logistics and transport tracking system project that was shown in the prior section, which is also described in detail in this study. This project

was dealing with the introduction of a system that is based on the quality assurance process and is aimed at monitoring performance and efficiency-related data. Initially it was planned to include this monitoring feature in the lab-SAP, however no agreement on how to achieve this could be found across departments. Contributing to this was exactly the reliance on proprietarily developed software for each department. For each of these software systems, an interface to the logistics and transport tracking system would have needed to be created. This is why in the end a separate, parallel system was created that now tracks logistics and performance-related data from the quality assurance process.

Furthermore, employees and management in the laboratory reported that they see the need for a streamlining of interfaces of the lab-SAP and attached department-specific developments. In some interviews it was mentioned that a completely new development of the lab-SAP and relaunch could be, at this point, easier to implement and more effective than simply streamlining existing systems and interfaces, as highlighted by this quote: "Then it would be smarter to throw the whole thing out and redo it. That is what we are doing right now. Because it has now become so complex, it's no longer manageable at all, [...]" To interpret this statement, the interviewee expressed that it would be, in their view, beneficial to develop a completely new lab-SAP system. The current system that is used has become too complex to manage due to different "work-around" solutions.

This change would however require significant resources as well as commitment since a major strategy change as well as a restructuring of the IT are necessary. As such there are high implementation and running costs present, which represent a barrier according to Agrawal et al. (2019). Therefore, with the barrier of the current infrastructure being present, that might not be worth upgrading, a technical barrier, as defined by Vogelsang et al. (2019) is also present. This relation can be formulated in a proposition in that the occurrence of the barrier of existing current infrastructure, a technical barrier, seems to be highly correlated with the barrier of high implementation costs of new technology, as set out in Proposition 10.

Even when the decision would be taken to commit to introducing a completely new system, a further complication stems from the fact that no off-the-shelf software is readily available, that caters exactly to the requirements of the quality assurance process. Therefore, the software would need to be a proprietary development, fitted to the specific needs of the company and the process. Such a development generally could be done either in-house or in collaboration with an external company. Since the development of software is not defined as a core capability of the company, not enough highly qualified talent with these skills is available in the company in-house: "You cannot usually buy the interfaces as standard software, except for very large systems, [...], you have to do it all manually and now we're not a software company, we're a company that manufactures [anonymized] and that's why we're not specialists in the field and these interfaces work accordingly modestly."

Therefore, the barrier of missing skills as defined by Vogelsang et al. (2019) seems to be present in this project. These missing skills can be acquired externally, but similar to the Artificial Intelligence Project the question remains on whether alignment can be created between the skills provided by an external company and the technical needs of the departments. In addition to the missing hard skills, attention should also be paid to potential cultural barriers arising by the fact that the project is driven from the outside.

A completely new system could also lead to a higher data quality. It was reported that in the current system baseline data is sometimes incomplete, and no match can be made between different sorts of data, which can then lead to miscommunication, potentially leading to the occurrence of barriers: "[...] this miscommunication is partly based on bad baseline data, so this baseline data needs to be fundamentally cleaned up." For context, the new technology that is implemented led to improvements in the data quality, but to achieve solid and reliable baseline data, a more radical approach would be necessary, according to the interview partners. It would need to be reconsidered what data should be tracked, and in what detail, and how the analysis process of this data should be structured. Only then, a solid data foundation that produces reliable baseline data can be built.

Management mentioned that the issue of bad baseline data was partly solved when a department involved in the quality assurance process bluntly refused to work with incomplete data: "[...] he said he does not handle erroneous information [...]" Then the "gun" was at the management's head to improve data quality, since if this issue hadn't been tackled, the department wouldn't have done the required tasks, and this would

187

have led to delays in the entire quality assurance process. This then led to a noticeable improvement of data quality. As such, a seemingly bold action like this may be considered as a success factor in certain circumstances, since it helps to establish "urgency" that may then lead to successful change.

To understand what difficulties and barriers arise in such a project, a look can be taken at the third level of analysis defined earlier, namely the development of an application interface specifically for the laboratory. The background of this project is that to enter data into the lab-SAP system, a department-specific application interface had to be created. The initial solution was a home-made application that was programmed by an employee in the department. When issues or questions regarding the program arise, contacting the creator for help is sometimes the fastest solution. To alleviate this reliance on a single employee, an external company was commissioned to develop a new user interface where data can be entered that is then fed into the lab-SAP system. However, it was reported by employees and management that the quality of the software at the time of doing this research was still not up to their standards, with many errors occurring:

"[...] and then we noticed pretty quickly that there was almost nothing working and that surprised us a little bit."

Additionally, it was mentioned that the speed of programming and software development seems to be fairly slow. It can be argued that even when taking into account the entire market, including external firms, for IT solution development, there is a lack of skilled resources (Jakob & Krcmar, 2018).

In terms of barriers on the second and third level of the overall project, no differences in perception were reported between employees and management.

5.5.2.4 Success factors

A clear success factor present in this project, particularly at the third level of departmentspecific interface development, is that employees are integrated in the change process (Vogelsang et al., 2019). More specifically, employees are testing new developments and applications that are to be included in the lab-SAP. They are then asked to provide detailed feedback, that is fed back into the development process:

"[...] we got the order, yes we are supposed to test the program [...]". To interpret this statement, the interviewee expressed that they were instructed by their supervisor to participate in testing the newly developed applications to support the development process.

The overall question related to employee involvement is however, to what extent they need to be involved in order for a project to be successful. Testing data and applications is a fairly intense and close involvement, while simply being introduced to a new technology in a workshop may represent a weaker form. Also in this project, employees are involved at an early stage of technology implementation, namely before or while the technology is introduced, while in other projects, they may only be involved during or after the implementation. It seems that the closer the involvement of employees in a digitalization project, the higher the probability of a successful technology introduction and adoption, as seen in Proposition 11. More specifically it seems that the more closely employees are involved in the early stages of a digitalization project, the higher the probability of a successful technology introduction and adoption, as

Another success factor that applies to this project, or rather all levels of analysis of this project, is that teams consisting of experts from different departments were created for the different project phases, such as conceptualization and implementation. These cross-functional teams were also required to reflect the full complexity of the underlying processes in the system. Cross-functional teams are a success factor according to Kane et al. (2018).

Drawing on Holotiuk and Beimborn (2017), the success factors of digitalization of customer interaction is also present on all project levels of analysis, since customers are granted access to the quality assurance data they need for their own internal quality assurance processes: "[...] because there we can then store our data as the customer requires us to do, that we can reproduce a test that we did five years ago, that we can prove again how we did it and that we can reproduce the result again [...]". This statement by an interviewee highlights that through the new technology, the quality assurance process is perceived to be improved. This

improvement creates additional customer value, since the documentation of the steps in the quality assurance process is more precise and can be accessed faster.

The presence of this success factor may represent a strong incentive for the implementation of the technology due to the external relevance and feeling of having to "keep face" to their customers.

Additionally, the aim in this project is to use information and data from a central source, and a digitally automated and data-driven process was implemented, which are again defined as success factors by Holotiuk and Beimborn (2017). Also, by the introduction of customer access, customer interaction was digitalized, another success factor, according to Holotiuk and Beimborn (2017).

The success factor of employee involvement was prominently reported by employees, while from management, more focus was put when mentioning the external-facing success factors relating to customer interaction. As such there was a difference in perceptions observed.

To sum up, the last project analyzed in this study was implementing the digital technology of a laboratory-specific SAP-like system. In this lab-SAP, the quality assurance process is reflected in a digital form, replacing the earlier paper file that was attached to each sample. This project was considered a success by all interview partners. The drivers that were identified are as follows: initially the project was technology driven by an innovation push, additionally, it was also customer driven, and lastly it was also organizational development driven. The barriers present were initially employee resistance to change, missing skills and lack of skilled resources. Identified success factors were employee involvement, the presence of cross-functional teams, the digitalization of customer interaction, data from a central source, and the implementation of a digitally automated and data-driven process.

5.6 General results

In the following, all drivers, barriers and success factors that have been considered as relevant by interviewees and the researcher so far in the projects are listed and discussed, and a concise summary that speaks to their importance across all projects, and links them to prior literature, formulated. The methodology of a cross-case synthesis is employed (Yin, 2018). This gives the opportunity to draw more general insights on the occurrence and workings of drivers, barriers and success factors, that are more independent from the specific digital technologies and projects.

Firstly, an overview is given on drivers, and their relevance for the implementation and the fuelling of projects in the context of a digital transformation. The barriers are described, in terms of insights across projects, and a link to literature is made. Then, further, additional insights that are not reflected in the literature yet are presented, and it is assessed whether and to what extent there are interactions between different barriers occurring. Lastly, success factors that speak to the discussed barrier and are mentioned during the interviews are presented along with an assessment of the actual relevance of these success factors. A critical evaluation is made so that the link between barriers and fitting success factors can be established.

5.6.1 Drivers

In the following section, drivers are presented along the two dimensions in which they are considered to operate: the initiation of a digitalization project, as well as the implementation of such a project.

All of the assessed projects are organizational development driven. As stated in a defined model, drivers are understood to have two possible ways of influencing the success or failure of projects of digital transformation. Firstly, the drivers contribute to the initiation of projects, and secondly, they fuel the technology implementation and acceptance.

Focusing on the project initiation it was perceived that organizational development drivers contribute most strongly to a project being launched. With the projects, process-related

goals are aimed to be achieved, such as increasing efficiency, measured for example as decreased throughput times. Following the definitions for digitization, digitalization, and digital transformation, as lined out in an earlier section, the assessed projects can be categorized in the areas of digitization and digitalization, in the broader context of digital transformation.

Both projects that are aimed at making analogue processes digital, as well as projects that are aimed at improving the customer experience and generating additional customer value are discussed in the overall context of digital transformation. The majority of projects is the former type, thus being in the category of digitization. Projects 1 (ANDON-boards), 2 (Automated Microscope), 3 (AI), 4 (Logistics and transport tracking system) and 5 (Lab-specific SAP) all are primarily geared at the digitization of analogue processes, as well as improving process-efficiency. Only project 5 also contains elements of digitalization in that customer experience should be improved, by granting customers access to information generated and provided by a new digital system. All of these projects can be seen in the context of a digital transformation that is being conducted in the company. This project is also the only included one that is also customer-driven (Liere-Netheler et al., 2018). A generalization from this fact to a general lack of importance of this driver can't however be made. This is since the focus of the assessed department is mainly internal and not client-facing, which decreases the potential influence of customer-related drivers.

It can be argued that relatively new technologies were involved in all the projects. However, to what extent they contributed strongly to the initiation of digital transformation projects remains unclear. An argument can be made based on the relative novelty of these technologies. For project 1 (Andon boards) ready-made solutions that are employed off-the-shelf in other companies already existed. For projects 2 (Automated Microscope), 4 (Logistics and transport tracking system) and 5 (Lab-specific SAP) the technology as such existed, but in order to implement it in the company, further custom adjustments needed and still need to be made. For project 3 (AI) the technology in general existed. However had only recently been developed, so it was not clear whether and how this technology is capable of fulfilling the requirements of the project and how it needs to be adapted to the company specifically. In project 3, the technology seems to have carried a stronger impact as a driver than in the other

projects. This conclusion can be drawn from the interviews that stated that the project was initiated mainly due to upper management being passionate about the new technology. But without the potential improvement of organizational efficiency that was projected to come with it, the project likely would not have been implemented. This leads to the perception that the driver of new technology needs another driver, such as one on the organizational level, in order to contribute to the initiation or fuel an ongoing project. This can be captured in that the drivers of new technology, as well as customer-based drivers, only seem to become effective regarding the introduction of a project, when another driver, such as an organizational driver, is present as well (Proposition 13).

Regarding the technology implementation and acceptance part, it was found that across all projects that were categorized as successful, therefore all projects except project 3 (AI), employee support for the projects developed over time, rather than being present initially, before or at the initiation of these projects. This is the reason why, for the assessed projects, employee support wasn't reported to be present as a driver at the project initiation stage, but rather at the implementation stage. The mechanism behind this is the following: for the initiation of a successful project, it is argued in literature that bottom-up and top-down elements need to be present (Bughin et al., 2015). These findings are also supported by this study. Yet, the hierarchical level from which the bottom-up support is most important to come from is that of lower and middle management which needs to actively drive the project, rather than "normal" low-level employees, in the perception of the majority of the interviewees. The importance of employee acceptance however rises, as the technology is then implemented and integrated into the day-to-day usage, since then they are the actors who need to drive and use the technology. While management may be able to give guidance and incentives, employees will need to take the initiative, since constant monitoring and controlling of whether the technology is even used, by management, will not be possible or economically efficient. The topic relating to bottom-up and top-down elements will however be discussed and argued in more detail in one of the further sections.

To sum up, the driver that was perceived to carry most importance across all projects in the initiation phase was the driver of organizational development, aimed at achieving process-related goals. The driver of employee support that can be categorized as an internal driver

was not present during the initial phase of the technology introduction but rose in importance during the technology implementation phase. External drivers, in the form of new technology or customer-based drivers were also observed, however, they seemed to have gained their strength and had a decisive impact only in association with other drivers, in particular on the organizational level.

5.6.2 Missing skills barrier

A frequently mentioned barrier in the interviews was that of missing skills. Slightly more than half of all interviewees mentioned that barrier, according to the analysis of interview transcripts by the researcher. Mainly, on the side of the assessed company and department, technology and IT skills were reported to be missing. While in some projects these skills were acquired from external companies and the missing technical skills mitigated, in other projects, the skills were difficult to find even in the broader external market.

Additionally, even if the skills were acquired externally, sometimes it was difficult to apply them successfully to a project. This was since that there was limited understanding on either side for the requirements of the other side. The external companies possessed the necessary IT skills but lacked the required procedural and technical understanding, while for the department it was the other way round.

Aspects related to the inclusion of external companies in the introduction of the technologies are analyzed in more detail in the following. While for four out of the five introduced projects there is information that an external company was involved, this involvement per se doesn't seem to constitute a barrier or a success factor. On the positive side, it was perceived that these external companies provide technical and IT skills that are not readily available in the company, therefore counteracting the barrier of missing skills. This might have contributed to the success of the projects, since the success factor of training programs and recruiting to build up digital capabilities (Cichosz et al., 2020) was not present, related to the projects. On the negative side, it was observed that the knowledge about the underlying technical processes and requirements in the company is oftentimes missing in external companies. Therefore, the process knowledge still mainly lies with the focal company. In the "AI" project

194

(Project 3) it was reported that this link was not given, and also in the "Laboratory-specific SAP-like system" project this aspect poses difficulties. As such, it seems that a coordination between these two different types of knowledge, process as well as technical knowledge, needs to be established for a project to succeed.

How such a coordination may be structured, and what elements are of particular importance will be discussed in the following paragraph. The success factors that were found for a successful collaboration of cross-functional teams, on which there exists a vast literature, may also apply in the context of digital transformation and the relation between external and internal stakeholders and between process and technical skills analogously. For example Majchrzak et al. (2012) conducted an exploratory study on approaches that were reported to help cross-functional teams, collecting ideas such as "voicing fragments" where teams were prompted to create a common landscape that includes individual statements but without already discussing knowledge differences. Surely, when this literature is considered in future research in more detail, more success factors that also apply analogously may likely be found that then help to bridge the gaps between external and internal stakeholders.

Additional success factors that may have helped guide a successful project could have been common workshops and guidance by a qualified facilitator. A specific solution or success factor to address this gap may be to adjust the training curriculum of employees, so as to include a basic training in relevant IT topics. This may then provide them with the necessary foundational knowledge and understanding to coordinate effectively with the external company in projects. Or going a step further, the employees are enabled to provide their own ideas and qualified input, also regarding topics that require more specialized IT skills.

Based on the above input, a proposition may be formulated on this topic, that it seems that a strong degree of coordination and understanding between the technical and the IT side leads to a higher probability of success of a project, as seen in Proposition 20.

5.6.3 Technical barriers

The technical barriers that were observed are not so much rooted in the "security" aspect following the categorization by Vogelsang et al. (2019). Rather they appear to occur when

other technologies or existing infrastructure is needed for the introduction of a new technology. For example, in the statements by interviewees on projects 3 (AI), 4 (Logistics and transport tracking system) & 5 (Lab-SAP) it was mentioned that existing current infrastructure can be defined insofar as a barrier, as introducing a new technology becomes more cumbersome. This is since the new technology needs to be connected or interact with existing technologies through programming interfaces. Often, no standardized solution exists to establish such a connection, leading to the need for a custom-tailored solution to be designed and implemented, that is more costly and involves a longer time to be developed. And since relatively high costs coupled with a high risk are involved, the business representatives may be more reluctant to introduce a novel technology and continue to rely on maintaining an existing older solution (Pratt, 2021). Additionally, it may also be the case that existing systems are well tested, working stable and are therefore reliable, being supported by the familiarity of users with it (Pratt, 2021).

When the decision is made to update existing so-called legacy systems rather than completely replace them with a new technology, a potential success factor that is targeting this barrier, is the development of a process or strategy that details the replacement or updating of legacy technologies. Bianchi et al. (2003) suggest an approach, that they call the iterative reengineering of legacy systems. They propose a gradual, but quick update of legacy systems, so as to maintain the familiarity of users with the system, and reach a result that is reported to be satisfying for all involved stakeholders in their individual perception (Bianchi et al., 2003). This approach may therefore also be useful for projects in the focal company, that are including the updating of existing technologies.

5.6.4 Individual barriers

As for the individual barriers based on the categorization of Vogelsang et al. (2019), it was observed that it is not so much the sub-category of fear of job loss that constitutes the barrier when considering the perceptions across projects. Rather the sub-categories catering to transparency of performance, as well as acceptance and the fear of loss of control of data seem to be more pronounced. The mechanism behind this fact may be that the consequence of a job loss might not be as tangible or easy to grasp for employees, as compared to for example their performance being published on a board which is visible also to all their peers. This coincides with the perception recorded in the researcher's notes that almost half of the participants feel that there is a high pressure to perform present. Thus, increased transparency may even lead, paradoxically, to a reduction in their performance, since they engage in behaviour that aims to give them more privacy, but is costly in terms of efficiency, as suggested by a study conducted by Bernstein (2012).

This barrier seems to however not be directly related to the success or failure of a project, since it was reported in Projects 1 (Andon boards) and 4 (Logistics and transport tracking system), which were categorized as a success. This points to a more pronounced view, namely that the importance of this barrier depends particularly on the presence of success factors that are counteracting it. For one of the mentioned projects, Project 1, in particular the success factors of employee support may have been an important factor counteracting it. One can hypothesize that the mechanism that leads to employee support, is that tangible benefits, such as better plannability as well as increased efficiency for employees were present. This notion is already supported by literature on Technology Acceptance Models (TAMs), such as by Brown et al. (2002). What strikes as interesting is that in the case of the assessed projects, even if employees were not directly involved in the project, which might constitute a barrier according to Vogelsang et al. (2019), their support was obtained, leading to the impression that a barrier of a lack of a direct employee involvement in a project may be counteracted by clearly highlighting the perceived usefulness of a technology, proposed in Proposition 21.

While a digital vision has been formulated in the company, it was mentioned in interviews that it only carries limited relevance in the departments and the day-to-day business. Therefore, this success factor wasn't assumed to be present. Another success factor may be the underlying culture that may then turn into a success factor counteracting individual barriers. In particular, it was reported that the department was perceived as open for digital projects by management, possibly also due to their prior experience with implementing such projects. This open culture may then help to alleviate the concerns of employees. In summary, it seems that there is a close relation between individual barriers and the success factor of an open and innovative organizational culture, as set out in Proposition 22.

197

5.6.5 Organizational/cultural barriers

In this section, barriers that were subsumed under the category of organizational and cultural barriers will be discussed. To remind the reader of the structure again, besides the aspects that were captured by Vogelsang et al. (2019), such as keeping traditional roles/principles, no clear vision/strategy, resistance to cultural change/mistake culture, risk aversion, lack of financial resources and time, the following barriers are also part of this category: organizational structure, such as a strong top-down hierarchy (Verhoef et al., 2021), governance infrastructure and identity (Töytäri et al., 2017) and lack of support of top management (Agrawal et al., 2019).

In the following, the organizational and cultural barriers will be highlighted not based on each individual topic or sub-barrier, but rather based on an overarching topic, namely that of the interplay between a top-down and bottom-up initiation, governance and implementation of a project. This topic is tied to two barriers which are closely connected: namely the barriers of a lack of employee involvement, as defined by Vogelsang et al. (2019) and the barrier of an organizational structure that is dominated by a strong top-down hierarchy (Verhoef et al., 2019). The matching success factor that bears the potential to counteract these barriers is in particular the inclusion of top-down and bottom-up elements in digital transformation, as stated by Bughin et al. (2015) and Agrawal et al. (2019). In the following, the topic will be analyzed on a level that is independent from particular projects, aiming for generalizable insights that involve the interaction between barriers, as well as the interaction between barriers and success factors. Drivers will be considered as well. The interplay of top-down and bottom-up governance therefore somewhat transcends the limits of being purely a driver, barrier, and success factor; rather it is relevant for all three categories. The aim is to provide a more fine-grained and pronounced view on this topic to generate detailed actionable insights, so as to extend perceptions on the presence or absence of a barrier, which was discussed in a previous section.

In the interviews it was in particular touched upon whether a bottom-up or top-down driven digital transformation is potentially more successful, which can then be connected to barriers of digital transformation that relate to employee involvement. Bottom-up driven can be defined two-fold as illustrated by Heyden et al. (2017), either meaning that change initiation,

i.e., the ideas or starting points for a project stem from employees or lower management. Or it can mean that change execution, i.e., the implementation of a technology or project is steered or guided by them. Top-down would then, on the contrary, mean that upper management initiates projects or guides their implementation.

The author is aware that this topic was already touched upon when looking at specific projects at an earlier point in this study and when analyzing drivers, barriers and success factors to digital transformation. However, this overview aims to paint a more condensed and generalizable picture, that is abstracted from project-specific details.

Lower-level employees and lower management reported that they in general felt that a bottom-up-driven digital transformation leads to better results. The main causes were reported as operative employees having a better feeling or understanding for what the most pressing issues are, therefore being able to prioritize them accordingly. Furthermore, due to the higher know-how and accumulated expertise, they perceive to have a better basis for decisions on whether projects are feasible or not. Therefore, in the perception of employees and lower management, projects related to digital transformation seem to be more likely to succeed when they are driven bottom-up, closely involving employees in the process, as seen in Proposition 14.

Middle and higher management argued that a mixture between a top-down and bottom-up approach is required to conduct successful digital transformations. This notion was pointedly formulated by a manager as: "[...] if I wait until the dwarfs carry me, it won't work. But if I wait until the good Lord gives me a system that works in an all-encompassing way, it will never come either."

Also, a "digitalization blend" was argued to be advantageous based on the underlying motivations of on the one hand ensuring top-down compliance and streamlining with the overall company strategy and on the other hand fostering the competence and creative input of employees by their bottom-up involvement:

"We are building on the fact that all employees, regardless of whether they are standing at a machine in the [anonymized], in sample preparation, in sales, in accounting, in logistics,

wherever, have the opportunity to develop digitization further, to take up topics, to question things, to deal with them, but at the same time the company, the management can also, so to speak, contribute ideas top down to combine digitization approaches with the corporate strategy, synergies with the digitization initiatives, I like what a sister company of mine is doing right now, I'll take it up, I'll bring it top down to my company and say, come on, let's get to grips with it, that could also work well for us and I believe that this mixture can result in a wonderful digitization melange, if you will, that can seamlessly combine both top down and bottom up."

In the perception of middle and upper management, projects related to digital transformation seem to be more likely to succeed when they combine top-down guidance by top management as well as ideas evolving from employees, bottom-up, proposed in Proposition 15.

The take-away at this point is that there is a consensus between employees and management that a bottom-up involvement of employees in digital transformation is perceived to contribute to the success of it. This perception is also reflected in literature, e.g. by Heyden et al. (2017), who argue that in the more general context of change management, that change initiated by middle-management leads to above-average levels of employee support, and even more so if top-management leads the execution. Employee support had been defined as a driver for digital transformation by Liere-Netheler et al. (2018). Vogelsang et al. (2019) also defined integrating employees in the change process as a success factor, and the lack of employee involvement as a barrier.

The extent to which a bottom-up approach is required, and how it should be interlinked with a top-down approach was however seen differently by the interview partners. While operative employees and lower management were in favor of a strong bottom-up approach, middle and higher management saw the necessity of including a top-down approach in the mix. Several guiding principles of how this mix between top-down and bottom-up could be structured were mentioned by different representatives in the interviews, that will be presented in the following. Firstly, it was stated that the general direction, in terms of basic rules and frameworks should be defined top-down. That could be for example general decisions on infrastructure and software. A control mechanism should be implemented to ensure that these general directions are in fact followed:

"I'm convinced that the idea, approach has to come from the bottom, [...] but the rules of the game are clearly top down."

This is also important for ensuring compliance with relevant company regulations and the overall company strategy. However, smaller decisions and the implementation of projects should be guided bottom-up. This mixture is already reflected in Proposition 15, which states that in the perception of middle and upper management, projects related to digital transformation seem to be more likely to succeed when they combine top-down guidance by top management as well as ideas evolving from employees, bottom-up. While Proposition 15 states that combinations of the top-down and bottom-up approaches are beneficial, the quote from the interviewee further details how this combination can be structured.

Secondly, it was found that a distinction should be made between smaller, departmentinternal projects, and larger projects that may involve multiple departments. On the one hand, smaller projects were perceived to work better with a bottom-up approach:

"We have already tested both variants, so it depends on the type of project. So, I'll break it down into small and large projects. Small ones are, as you said, a small, isolated solution. I've noticed that a small, isolated solution works much better for us if it comes from the bottom up."

Bottom-up in this context was said to mean that it is team leaders who deliver ideas, rather than low-level operative employees "on the ground": "[...] [ideas coming] directly bottom up from the employees, unfortunately, we have it rather rarely, but group leaders, plant managers, department heads, find something, put something there, they run very well." To interpret this statement, it refers to how operational employees are, in the perception of this interviewee, less likely to proactively offer ideas for projects to implement new technologies. The impression was that rather lower or mid-level employees who additionally have managerial responsibility are more likely to provide ideas. For such smaller projects, it was mentioned that they do not work well top-down, coming from a distant department or headquarters, since the further away – organizationally or geographically – the initiating unit, the smaller the knowledge on a particular problem or potential solution: "There it depends also very often on, the further one is away, does not know exactly what the requirements are on site, what they have already looked at, that it is so to speak, if one comes with the solution to a problem, does not know exactly the problem and also does not know exactly for what the solution is suitable and then one just shoots a shot there." In this statement an additional insight into why bottom-up guided projects lead in some cases to better results than top-down guided projects is given. Specifically, the perception is that sometimes an issue can be better understood, the closer the responsible stakeholder is to it. This might be often the case for complex topics that are focused on one department that require a detailed understanding of the issue. It might not be the case, when multiple departments are involved - then a more top-down perspective may be required. When the issue is better understood, then also the solutions can be better fitted to it.

On the other hand, larger projects are said to work better top-down, especially when projects encompass various organizational units. The top-down approach ensures that departmentspecific, isolated solutions are avoided:

"In large projects, what I have seen so far is that large bottom-up projects usually fail, these are projects that, for example, go over two or three organizational units, which are then difficult to roll out when you are in a process that is a support process, such as in the laboratory. The developments that have started there are often only isolated solutions and have made less progress or simply not progressed at all. I have the impression that it is better for management to at least take an active look at some things and initiate something there. That's better." This statement can be understood as detailing when a top-down approach in initiating and implementing a project is better suited for a project to be a success, than a bottom-up approach. In particular it seems to be the case, in the perception of the interviewee, when projects are involving multiple organizational units and require coordination across these units. If the coordination across units wouldn't occur, there would be a risk for isolated department-specific solutions to be developed. What can be taken from these quotes is that it seems that smaller projects, involving single organizational units, seem to be more likely to succeed when they are initiated and driven bottom-up (defined as lower/middle management), while large projects, involving multiple organizational units seem to be more likely to succeed when they are initiated and driven top-down, as set out in Proposition 16.

Thirdly, another guiding principle might be the extent to which a project requires technical expertise, to decide whether it should be conducted top-down or bottom-up. It was mentioned that "the devil often lies in the details", and therefore a more technically complex project should better be conducted bottom-up with close involvement of operative employees who have an in-depth knowledge of the specific technicalities. Also, it was highlighted that in general, managers should aim to understand the most important technicalities to obtain a better assessment of the effort and costs that are associated with the implementation of a project, and the effects and impact of it:

"It depends, so it always seems to me, it is also important that the person who gives an instruction or says something, for example, that he also understands your work more or less, that he does not say now, okay he is doing something in his, from his point of view it is a great idea, but implementation-wise and work-wise something has become worse for you now, for example [...]"

Therefore, projects requiring a high level of technical expertise seem to be more likely to succeed when driven bottom-up and closely involving operational employees, as seen in Proposition 17.

Lastly, yet another perspective was introduced, when it was mentioned that an overall strategic goal should be defined top-down, that is aligned with a digital and overall company strategy. The entire digital transformation process however should be conducted in an iterative way, combining a bottom-up and top-down approach. It was mentioned that a modern network-like structure would be in fact recommendable, that is aligned with a clear operational vision:

"[...] it has to [be] in the sense of our company philosophy, do we want to be a high-tech company, do we want to be a low-tech company, to support these goals with. And [...] then

you'll come up with, yeah well, you need from the top and from the bottom and from everybody, so this modern network-like structure to do that."

This statement reflects the idea of an interviewee, that the combination of a top-down and bottom-up approach should be made in a dynamic rather than a static way. The two approaches should be closely connected in the sense of a network that is flexible to the demands of a project. Also the statement suggests that the company philosophy should include a reference and commitment to striving for being a high technology company, rather than a low technology company. Based on this philosophy, the goals for a digital transformation, and in the context of it, the goals for the implementation of digital technologies can be clearly understood and can be aligned more easily.

This vision could include for example guidelines on which modules should be developed, what the know-how is that is required, and based on these pillars, a concept should be further refined into a target concept. Based on this target concept, then a detailed implementation strategy should be developed, to see whether the concept is in fact feasible from a technical perspective, therefore creating a feedback loop. This notion of an iterative process that combines top-down and bottom-up approaches was also formulated in prior literature by Pflaum (2018). They argue that first of all a Business Strategy should be developed, which is then to be broken down into specific business initiatives and populated with information gained bottom-up. This idea again highlights the importance of a top-down and bottom-up approach for digital transformation to be successful.

Summing up, the insight can be established that a combined bottom-up and top-down approach is a driver, or even a success factor of a digital transformation. The question on how exactly the interplay between bottom-up and top-down factors should be structured, remains a point open for further assessment by future research. The overview given before can serve as a starting point for such an endeavour.

Separate from the question of how a digital transformation including both a top-down and bottom-up approach should be structured, the importance of a targeted incentive structure to support employee involvement and a bottom-up approach was also highlighted by interviewees. Employees and lower management are reported to be more motivated to challenge existing processes and bring up new ideas when they are given decision-making power and know that they will be rewarded with an appropriate incentive. Such a system already exists to an extent in the examined company:

"For example, we have in [anonymized: company name] a very elaborate system of [anonymized: program name], of energy efficiency, where we rely on our employees to bring many hundreds and thousands of ideas, which we do reward, [anonymized: program name] and improve the company." This statement highlights how employees are involved in an idea generation process in the area of energy efficiency. In the perception of the interviewee, an incentive scheme supports this process. If more bottom-up involvement of operational employees is wanted in a digital transformation, a similar process and incentive scheme may also be applied to this area.

Therefore, it seems that a fitting incentive structure targeted at rewarding ideas and creativity of employees might strengthen the positive impact of employee involvement in a digital transformation, therefore serving as a moderating variable, proposed in Proposition 18.

5.6.6 Customer-related barriers

Customer-related barriers, as defined by Peillon and Dubruc (2019) didn't seem to have played a prominent role in the assessed projects. This may not be tied to their overall relevance, but may be since, that the quality-assurance department is not primarily a clientfacing department. In a department that is more facing more towards the outside of the company, these barriers might be more likely to occur.

5.6.7 General success factors

In this section, briefly, insights into general success factors, that were defined and that may not be attributable to specific barriers are discussed and analyzed. Holotiuk and Beimborn (2017) formulated success factors that contribute to the quality of a digital business strategy. Based on the interviews, it was found that the targeted "use of information and data from a central source" was an important aim that drives projects, especially being relevant for projects 1 (Andon boards), 4 (Logistics and transport tracking system) and 5 (Lab-specific SAP system). It may however be categorized rather as a driver, than a success factor in the context of this study, based on the data obtained. The "seamlessly integrated on- and offline channels" are then reflected in all of the projects, since the work is based on physical samples that need to be processed, as such there is always an offline component involved. As an example, consider project 2 (Automated microscope), where the integration of these channels matters insofar, as the preparation of samples and manual setup would need to be coordinated with the working times and availabilities of the automated microscope, to establish a maximum efficient process. The "digitalization of customer action" may have contributed especially to the success of project 5, where the implemented system also included making certain information available for external customers. Summing up, the general success factors of "seamlessly integrated on- and offline channels" as well as "digitalization of customer action" seem to contribute to the success of digitalization projects, as set out in Proposition 23.

Drawing then on the success factors for digital transformation that Morakanyane et al. (2020) defined, these are focused mainly on the "meso" level, as well as the point in time when a digital transformation is planned on a higher, conceptual level, rather than implemented or executed. As such, no information was obtained in the interviews on whether and how for example the success factors of "Define expected customer-facing impacts" was actually fulfilled in the digital transformation that is analyzed in this study. Similarly, this holds true for the other success factors that were defined by Morakanyane et al. (2020).

To sum up, in this section it was mentioned which so-called general success factors were present, taking into account all projects. These success factors are defined as not being closely tied to specific barriers. It was found that the success factors of "seamlessly integrated on-and offline channels" were present, but no statement could be made on "meso" level success factors.

5.6.8 Common themes

In this section, common themes that are underlying or spanning across multiple barriers are lined out. What connects them is that they, while being abstracted from individual drivers, barriers and success factors, still carry relevance for and impact them. For example, a common theme may specify the characteristics and occurrence of particular barriers and success factors. Also, more abstract theoretical concepts might be denominated as common themes, that can be linked to existing literature.

5.6.8.1 On which hierarchical level do the factors need to be present?

Across all projects and all barriers and success factors, it was perceived that oftentimes it is not clear on what hierarchical level a barrier or success factor needs to be set and materialize to decisively impact the success or failure of a digital transformation.

One example to illustrate this notion refers to the general change management mistake of a missing sense of urgency, with Kotter (1995) generically mentioning that it refers to "stakeholders" in a company. However, to specifically target this barrier, further assessments need to be undertaken to find out on what hierarchical level establishing a sense of urgency is most important. From the collected evidence, it seems that since the middle and lower management is the main driving force behind the implementation of a project, establishing a sense of urgency is most important there. While it is beneficial for employees to consider the technology to be generally useful, to start using it as projected, it doesn't seem to be crucial for the success of a project that operational employees do see an initial need or urgency for it. In the interviews, it was rather reported that employees only grew accustomed to and saw the need for a technology over time, when getting acquainted with the technology. Formulated as a proposition, this means that establishing a sense of urgency seems to be positively related to the probability of success of a digital transformation project, even more so when it is present on the levels of middle and lower management, as seen in Proposition 19.

Another barrier to which this common theme might apply is the barrier of resistance to change. It was also reported to be relevant by close to half of all interviewees. Also, regarding this barrier, the question that may be posed, and carries relevance for practice, is whether taking the middle-management on board and ensuring that the barrier is counteracted on this level, is more important or crucial for the overall project success than focusing on lower-level employees.

5.6.8.2 Goal conflict between individual (department-specific) and company-wide objectives

Another observation that can be made based on the interviews is that oftentimes there is a strong goal conflict underlying the introduction of new technologies which is then leading to the emergence of a barrier. In particular, this goal conflict plays out due to different levels of the organization having different goals. In the case of the projects mentioned, for some of them, there were different individual, department-specific and company-wide goals present in them. These differences became especially salient in projects 4 (Logistics and transport tracking system) and 5 (Lab-specific SAP-like system), that involved multiple departments. There, the goals of the departments were for example to have a version of the program that is customized for their particular needs, while the overall goal of the company was to create a standardized and streamlined program across departments that facilitates interaction between departments.

Due to this internal dynamic and goal conflicts, further barriers can arise, such as missing resources. While providing department-internal resources, such as employee capacities or financial means, for a project across departments may be in the interest of the entire company, it may not cater exactly to the preferences of the specific department. Therefore, individual departments may then be reluctant to draw on their own individual budgets to contribute to the company-wide project. Rather they may be inclined on using the budget for projects that are catering to their own needs. As such, the barrier of missing resources seems to be more likely to arise, when there is a goal conflict present, rooted in different preferences of specific departments and the overall company, proposed in Proposition 21.

Top-management involvement may serve as a crucial success factor for a corporate project in such a situation since the desired bottom-up solution would be to create a department specific solution. This solution may however not be conducive to the overall success of a digital transformation initiative on the company level. By using the power and oversight that comes with a position in higher management to govern such a project, this barrier can potentially be counteracted. This observation is already reflected in a proposition formulated earlier (Proposition 16), namely that projects, involving single organizational units, seem to be more likely to succeed when they are initiated and driven bottom-up (defined as lower/middle management), while large projects, involving multiple organizational units seem to be more likely to succeed when they are initiated and driven top-down.

5.6.8.3 Novelty of technology as a moderating variable

Across the analyzed projects it was further observed that technology that can be considered novel, as mentioned by Tatikonda and Rosenthal (2000) can lead to barriers arising that may be more difficult to counteract. In particular, this means that a measure of the novelty of a technology, or also whether an off-the-shelf solution already exists may serve as a moderating variable, moderating the relation between the introduction of a technology and the occurrence of a barrier. This is already reflected in the formulated proposition that in the perception of stakeholders, for relatively new and barely tested technologies, a technological barrier is more likely to arise than for off-the-shelf and well-proven technologies, independent of the factual existence of such a barrier, as set out in Proposition 3.

A mechanism that involves the novelty of a technology could look as follows: In general, stakeholders in a company, in particular if they are at a lower level of hierarchy can be considered as risk-averse and having a low tolerance for mistakes. Any mistake that is made may have negative repercussions on the reputation or professional standing of the individual responsible for the project. An established technology that can already show some use-cases in similar companies may therefore help to alleviate the concerns and provide stakeholders with confidence that the technology is applicable and functional. As such, they may be more willing to undertake such a project, and take a risk, since it facilitates their task of needing to convince other stakeholders of the viability of the technology. In this context, implementing on the one hand the success factor of a so-called ambidextrous organization with two parts developing with two speeds (Duerr et al., 2018), may be beneficial. On the other hand, the success factor of establishing a culture of experimentation that is accepting of mistakes and supportive for digital transformation (Kane et al., 2018, Cichosz et al., 2020) could also counteract this tendency, even more so when a novel technology is involved.

5.6.8.4 Pressure to perform

A topic that was also reported by employees in the context of the introduction of Project 1 (Andon boards) was that they perceived the pressure to perform to increase. This pressure to perform can also result in perceived stress by employee, which then may decrease work engagement. This relation was found in a study by Shinta Winasis et al. (2020) who however focus on the general influencing factor of "the emergence of various uncertainties due to technological change". Specifying this relationship, one may focus on the precise impact of an increase of transparency in performance on the perceived pressure to perform or even stress levels. Even a mediator variable may be considered here, namely that of competitive behavior that may increase, when there is more transparency on performance present.

For a more detailed discussion on this topic, one can also consider work by Fletcher et al. (2008) who find that "the effect of competitive climate depended on trait competitiveness and the level at which climate was assessed for four of the outcomes assessed: job satisfaction, organizational commitment, job dedication, and supervisor-rated task performance" (p. 899). All in all, they urge managers to be cautious when taking measures that could induce a competitive climate. This can be related to the focal company insofar, as it may not be recommendable to tie any form of compensation to the recorded data, since this would further create a competitive climate. However, in any case the benefits and disadvantages of creating incentives for competitive behavior would need to be carefully balanced, so as to maintain a productive and satisfying organizational climate.

To sum up, in the prior section a few common themes that came up in the interviews were presented and discussed. These common themes can be seen as underlying themes that might however still influence or detail drivers, barriers and success factors in a digital transformation project. The common themes identified were firstly, that it was unclear on which hierarchical level a driver, barrier or success factor would need to be present for it to have an impact. The impression was that middle and lower management play a significant role. Secondly, it was discussed how a goal conflict between individual, department-specific and company-wide objectives leads to difficulties in a project and can be counteracted. It was found that top-management involvement can help in such projects to successfully implement

210
them. Thirdly, it was mentioned that a very novel technology might be more challenging to implement, due to risk aversion being present in a company. Implementing an ambidextrous organization and a culture of experimentation could however help the introduction also of these kinds of technologies. Lastly, it was discussed how a higher pressure to perform, that might be a by-product of new technologies, can lead to a change in organizational climate. All in all, these are factors and consequences that should also be considered during a digital transformation by a manager.

5.7 Differences in perception

In this section the differences in perception between different hierarchical levels, of the evaluation of a successful project, drivers, barriers, and success factors are highlighted, that were found in the interview data. The topic of differences in perception can be analysed from different angles. One option would be to compare what stakeholders mention which drivers, barriers and success factors to be present and mainly relevant in a project. Another option would be to go into even more detail and consider how different stakeholders are talking about one common barrier, taking potentially into account factors such as the words used and sentence structure, to gain insights into the way of thinking of the stakeholders. The second option requires the additional recording of detailed data and might be considered in a future study. This is why the first option was selected for the study.

In terms of judging whether a project or technology introduction was successful, employees from different hierarchy levels seem to largely agree on whether it was a success or not. This seems to be the case even though employees and managers are judging the success of a project based on different KPIs or perspectives. While for management, KPIs related to overall efficiency and productivity are for example relevant, for employees potentially the ease of use and influence on their workdays hold more relevance. This difference in perception of goals was reported in Project 2 (automated microscope), where management was considering the reduction of throughput times as a success, while employees reported the project as a success due to an improvement leading to a more efficient use of their working time.

Another factor that may be used to judge whether a project was a success or not is related to the sentiments related to the adoption of the technology. This area could be fruitful for further research, and also contribute to the existing literature on Technology Adoption Models in a mandated context, such as to studies conducted by Yuqiong (2008).

As for drivers, no significant difference in perception between employees on different hierarchy levels was reported. This might however also be since, that the aims of projects were mainly defined by management in the department, and as a consequence also visible mainly to management. Therefore, employees also had a limited opportunity to perceive drivers.

For barriers and success factors, a difference was observed insofar as employees more often mentioned barriers that are closer to their own sphere of influence. For example, in Project 1 (Andon boards), operational employees rather reported individual barriers to be present, while higher level employees didn't report them. In Project 3 (AI) similarly, a lack of employee involvement was reported to be present as a barrier, which in this case was shared by higher level employees, since they were more closely involved in this project. For success factors the perception seems to be similar for employees and for management, no discrepancies were reported, other than the perceptions being tied more to goals associated to their position. I.e., employees more often reported strong employee involvement as a success factor, as compared to management which was reporting a more balanced perspective on employee involvement to be beneficial.

Lastly, also differences in the perception of leadership and communication regarding digital transformation were assessed. Leadership and communication are very broad topic areas, which is why only specific observations relating to them are presented here. Regarding the communication of digital transformation, it was observed that while a digital vision was reported to exist by management, it was also reported by employees that the communication or implementation of it is lacking, or they were not even aware of such a strategy. So, it may be the case that management overestimates the extent to which this digital vision disseminates through the organization without a significant effort, or a roll-out strategy. For the perception of leadership, and in particular leadership style, it may be referred to the

section on top-down and bottom-up governance. Based on this discussion, it seems that for different types of projects, different methods of governance are required. With these different methods of governance, also different perceptions of leadership styles may be associated. Leadership styles could potentially be perceived as less involving or democratic by employees in projects that were initiated and driven in a top-down fashion than in projects that contain a larger bottom-up component. Also, perceptions in other areas related to communication or leadership are possible to assess in the context of a digital transformation or digitalization projects. This however may be done in a future study, that more closely collects data on such aspects, including targeted questions.

To sum up, in this section it was discussed how the perception of success, drivers, barriers and success factors differs between interviewees on different hierarchy levels of the organization. In terms of the perception of success and the drivers of a project, there doesn't seem to be a difference between stakeholders. For barriers and success factors, a difference was observed, in that stakeholders rather mentioned factors that were closer to their own sphere of influence. And lastly, also a difference exists in the perception of communication and leadership of a digital transformation. This highlights that there are differences in perception regarding digital transformation that depend on a stakeholder's position in a company, that should be taken into account when interpreting past and potentially future results.

5.8 Additional insights relating to the COVID-19 pandemic

In the following section, an additional topic that carries relevance for digital transformation but is not attributable to specific barriers is covered. Namely that of the impact of the COVID-19 pandemic on digital transformation. It can be seen as based on additional findings that came up when analysing the data, following a data-driven approach. Compared to the common themes section, this topic is even further withdrawn from individual drivers, barriers and success factors, rather representing a topic that is loosely connected to the area of study.

Insights regarding external shocks, especially COVID-19 that were collected in this study, are presented, and analyzed in the following. The insights can contribute to existing literature

insofar, as they add insightful perspectives of a diverse set of employees and managers and highlight potential mechanisms of how this external shock influenced digital transformation. In particular, the role of drivers, barriers and success factors shall be analyzed.

The interviewees in the focal company are, in quantitative terms, split equally between saying there had been an impact and there had been no impact of the COVID-19 pandemic on digital transformation. What is remarkable in this context, is that this split in opinions corresponds to hierarchy levels, with mid- to upper-level employees saying that they perceived an impact, and lower-level employees saying they did not perceive an impact.

When asked to specify how measures related to the COVID-19 pandemic specifically affected digital transformation, the following perceptions were reported. It was mentioned that in general, communication in the department became more efficient when meetings were conducted via online platforms: "[...] in terms of communication, I'd say things have become a bit easier thanks to digitization, discussions, Webex meetings and everything else [...]"

The observed mechanism was that small talk was reduced in online meetings, with the core subjects of meetings tackled more directly:

"Previously in a conversation where you have all the people meeting in the same room, often, there's a bit of a chaos, a cacophony in the duty call, everyone's talking there and there's no structure. With Webex or with Zoom or with the other tools that exist, there's no such thing and it's very minor. And if anybody wants to say something, usually they can say it and then it's up to the listener to hear that or not, but I find that pleasant, so the time slots are also mostly kept, so it's not... you want to get to the point a lot more." This statement highlights that in the perception of the interviewee, online meetings have been more efficient than inperson meetings. It states that one is able to get to the point faster, since chaos is avoided, because a better meeting structure can be implemented during an online meeting.

The trend to shift meetings online had been perceived to remain sustainable in this company. Lastly, it was perceived by management that the COVID-19 pandemic "forced" digital transformation and served as a booster. This led to an increase in digital know-how of employees, which could potentially contribute as a success factor to further digital transformation projects. By simply not having an analogue alternative, digital technologies that were priorly unthinkable to be implemented and met with scepticism, had to be embraced, and therefore grew more attractive and adoption rose. An interview partner put it in the following way: "What's changed is that we've found a broader participant base that's using this, that's using this, so the participant base, the larger participant base that's using this and more people participating with it, but qualitatively, that people are now more proficient with these tools as well, that's somewhat improved, I can already say, yes, because it's just required."

Tying it back to existing literature, therefore, evidence was also found in this study that digital transformation was perceived to be accelerated by the COVID-19 pandemic. To sum up, an external shock, such as the COVID-19 pandemic can directly serve as a driver or success factor for digital transformation since it can enable a faster technology adoption. Indirectly it leads to a more efficient communication, that might also be conducive to digital transformation. Another interesting observation was that the impact of the external shock regarding digital transformation is felt differently, based on the hierarchical level of an employee. There seems to be a more immediate and stronger perception of the external shock on the higher levels than the lower levels of hierarchy, therefore having potentially a stronger impact as a driver and success factor again on these higher levels.

The specific aspects however remain to be studied in more detail by future research. Yet, it can also be a barrier in that the resource base that is available is reduced, or priorities shift from extending a firm's resources and capabilities to maintaining a status quo to survive in such a turbulent environment.

As an extending question to the existing literature, a potentially interesting avenue for further research is whether the impact of the COVID-19 pandemic that "forced" the adoption of new technologies, also can improve, and accelerate the voluntary adoption of other new digital technologies in the future. The novel contribution to existing literature is the differentiation based on the source of the "forced" adoption. The adoption is not forced through a company-internal source, such as a guidance given by management, but rather through a company-

external source, in this case, the pandemic, and subsequently, legal regulations, that are out of control of company-stakeholders.

It can be further assessed whether, consequently, a sustained positive effect on digital transformation can be observed. To answer this research question, an extended study period after the peak of the COVID-19 pandemic would be required, which for this current study, was not feasible.

In this section, additional insights relating the COVID-19 pandemic to digital transformation were discussed. It was found that the interviewees were split equally between saying they perceived an impact of the pandemic on digital transformation and not perceiving any impact. Those who saw an impact, which were those on higher hierarchical levels, stated that through the use of online meetings, communication became more efficient. Also, it was stated that the pandemic could be a booster in the uptake of digital transformation, since it forced the use of some digital technologies. This might make the future introduction of new technologies easier.

Overall, to sum up, this chapter discussed and analyzed the insights that were gained from the data collected in interviews. Firstly, five projects were selected for detailed analysis that introduced new technologies, and from which interesting insights could be gained. Then, for each of those projects, it was analyzed whether the project was considered a success, and which drivers, barriers and success factors were found to be present in it. This analysis was done by comparing the factors present in the projects, as stated by the interview partners, to the factors identified in prior literature, using thematic analysis. Secondly, a general results section was included, in which, based on a cross-case synthesis, factors that were found to be relevant across cases, and their patterns were discussed and identified. In addition to drivers, barriers and success factors also so-called common themes were identified, which then might influence the factors. Thirdly, differences in perception between different stakeholders were discussed, this was to support the constructivist approach of this study. Lastly, insights relating digital transformation to the COVID-19 pandemic were presented.

Chapter Six: Conclusion 6.1 Contributions to knowledge

In this chapter, a general summary of the study is given, starting out with a summary of the main methodological choices. Then, the insights that were generated and contributions that could be made both to theoretical literature as well as to managerial practice, are lined out and connected to prior literature. A new holistic framework that was established based on the results discussed in the prior chapter is introduced and described. This framework summarizes and connects the insights that were collected, in a map that helps to understand the factors influencing a project in digital transformation in more detail. As such, it is one of the main contributions of this study. Following that section, limitations of research, directions for future research, and implications for practice are mentioned. Lastly, the study journey, from the perspective of the researcher, is critically reflected in the final section.

6.1.1 Summary of methodology

The research methodology in this study followed a qualitative approach, based on a relativist ontology and a constructionist epistemology (Easterby-Smith et al., 2015). More specifically, an embedded single case study, as defined by Yin (2018), was created, with the single case referring to the focal company, and the embedded cases referring to digitalization projects that were analysed. Data was collected in the form of 17 semi-structured interviews that were conducted with employees on different levels of hierarchy and in different functional positions in the company of interest. The generated data was then analysed using the techniques of both thematic analysis, as set out by Braun and Clarke (2006), that relied on the single case and cross-case synthesis, that relied on the embedded cases, as defined by Yin (2018).

While the overall research topic relates to digital transformation, the projects that were analysed more specifically related to digitalization as well as digitization, following the given definitions. However, it was assumed that factors relevant at the project level may also have an impact on the more abstract level of a digital transformation. This is why these words are used interchangeably in this study.

217

6.1.2 Summary of results6.1.2.1 Observations and Propositions

In this section, the observations in the results section are collected as well as briefly summarized – both factors with a direct, as well as those with an indirect influence are included. The propositions formulated in the results section are containing both of those possible types of influences, representing often important relations between variables, as well as the baseline outcomes.

Due to the variety and facets of topics touched upon in the interviews, these propositions are in a first step deliberately not fitted into a common framework but are rather grouped according to a loose structure developed by the author. This grouping is a necessary basis for the further analysis of propositions and the compilation of them in an overall framework. The different aspects of the structure will be explained in the following and in a first step tied back to the initial model or framework that was defined for structuring this study, that is reproduced in the following.

In a second step, a graphical illustration was devised. This illustration is based on the propositions formulated based on the results of this study, as well as supplementary associations found in literature. This step carries the purpose of clearly highlighting both the individual factors that this study found to be relevant for explaining digital transformation outcomes, as well as showing possible relations between those factors in a comprehensive way.



Figure 1. Overview of the study.

The first proposition, states that when a new technology is implemented that leads to an increased transparency of performance, this then seems to lead to a deterioration of the perceived quality of interpersonal relationships and a decrease in communication among employees. Therefore, it focuses on the consequences of a digital transformation, relating to the Relation 2 in the initial analysis framework, in particular on "Changes in parts of the organization" that are caused by digital transformation.

The second cluster of propositions is focused on the interactions and relationships between factors that are driving or potentially slowing digital transformation projects, therefore relating to Relation 1. The propositions highlight the importance of the drivers of a sense of urgency and organizational development being present, also in addition to other drivers being present.

More specifically, it seems that a lacking sense of urgency slows or even stops the initiation and progress of a digitalization project, despite organizational and external drivers being present. Furthermore, the results of the study point towards the fact that the drivers of new technology, as well as customer-based drivers, only become effective regarding the introduction of a project, when another driver, such as an organizational driver, is present as well. In the third cluster of propositions, the perception of different stakeholders is the main subject of interest. These insights have their origin in the constructivist approach that was pursued in this study. They underline differences in perceptions between employees/lower management and middle/upper management regarding the importance of bottom-up vs. top-down governance in driving the project, as well as the role of new technologies. It was found that in the perception of stakeholders, for relatively new and barely tested technologies, a technological barrier is more likely to arise than for off-the-shelf and well-proven technologies, independent of the factual existence of such a barrier. Focusing on the perception of employees and lower management, projects related to digital transformation are more likely to succeed when they are driven bottom-up, closely involving employees in the projects related to digital transformation are more likely to succeed when they combine top-down guidance by top management as well as ideas evolving from employees, bottom-up.

The next cluster is shedding light on how barriers arise, again speaking to Relation 1 in the overall model. The insights highlight how the presence of different, possibly contradictory goals on different levels of the organization lead to a higher risk of occurrence of the barriers of resistance to change and missing resources. The likelihood of the occurrence of the barrier resistance to change seems to be higher, the more different department-specific and general company-wide preferences are from each other. The barrier of missing resources seems to be more likely to arise, when there is a goal conflict present, rooted in different preferences of specific departments and the overall company.

The following cluster is then focused on the interactions and relationships between barriers to digital transformation, also highlighting the role of trust in the feasibility of a project. The relation between the type of technology (novel/established) and the occurrence of a perceived barrier seems to be moderated by the degree of trust in the feasibility of a technology implementation. And the occurrence of the barrier of existing current infrastructure, a technical barrier, seems to be highly correlated with the barrier of high implementation costs of new technology.

The next propositions focus on single success factors, and again may be tied to Relation 1 in the overall model. The propositions particularly highlight the perceived importance of employee involvement at all stages of the project. This often represents the perception of employees, while management was expressing a more restricted view of when employee engagement would actually be crucial for the success of a project. Generally, the barrier of a lack of employee involvement, as well as lack of clear roles are considered to be reinforcing technological barriers, in that the higher the level of employee involvement and the clearer the task, the more easily a possible technological barrier can be overcome. Furthermore, the closer the involvement of employees in a digitalization project and the more closely employees are involved in particular in the early stages of a digitalization project, the higher the probability of a successful technology introduction and adoption seems to be.

In this particular cluster of propositions, further success factors are pointed out. Also, linking success factors to barriers on different levels, it is highlighted how success factors on an organizational level may counteract barriers on an individual level. A strong degree of coordination and understanding between the technical and the IT side seems to lead to a higher probability of success of a project. In terms of counteracting relations between different levels, individual barriers may be counteracted by the success factors of an open and innovative organizational culture. And lastly, also the general success factors of "seamlessly integrated on- and offline channels" as well as "digitalization of customer action" seem to contribute the success of digitalization projects.

The next cluster of propositions includes potential moderating variables in the relationship between the existence of success factors and project success. Trust and goal congruence between cross-functional teams, as well as a targeted incentive structure is further found to strengthen this relationship. Also establishing a sense of urgency, which is a driver, is linked to the probability of success. The probability of project success in a digitalization project seems to be higher, with cross functional collaboration being present, more so the higher the social interaction, trust and goal congruence between teams. Also, employee involvement seems to lead to a higher probability of success of a project in a digital transformation, more so when a fitting incentive structure rewarding ideas and creativity is present. Lastly, establishing a sense of urgency seems to be positively related to the probability of success of a digital transformation project, even more so when it is present on the levels of middle and lower management.

The next cluster then focuses on the interaction and co-occurrence between predefined success factors. It highlights the crucial importance of employee involvement and facilitation in cross-functional teams for success factors to materialize. For an involvement of top management to take its effect as a success factor, also the presence of the success factor of employee involvement seems to be required. And for presence of cross-functional teams to take its effect as a success factor, the presence of the success factor of facilitation and mentoring seems to be required.

Lastly, insights may be formulated that speak to the topic of how project characteristics determine how drivers, barriers and success factors are established in more detail. These insights may not be tied directly to the predefined model, rather they can be seen as a specification/concretization of aspects of it. Smaller projects, involving single organizational units, seem to be more likely to succeed when they are initiated and driven bottom-up (defined as lower/middle management), while large projects, involving multiple organizational units are more likely to succeed when they are initiated and driven top-down. Projects requiring a high level of technical expertise seem to be more likely to succeed when they are initiated and driven top-down.

6.1.2.2 Comprehensive summary – graphical illustration

A part of the results of this study can be summed up in a graphical illustration that is displayed in the following, which is set up based on the framework that was initially defined for this study, general insights gained, as well as the propositions formulated. Following the timeline of a digital transformation project, the framework is firstly focused on factors, or "drivers" and the relations between them, that help explaining under what conditions a digital transformation project is initiated.

Given the qualitative nature of this study, the relations can be considered as broad connections between variables, rather than "hard" statistical relationships. They illustrate what indicative relations were observed during the course of this study, as well as in the literature review. Also, moderating or influential factors are included – again these factors shouldn't be understood as statistical moderation effects. They should be considered as factors that contribute to making it more likely that a particular driver, barrier or success factor occurs, or that strengthen or weaken the impact of those factors on eventual project success or project failure. The researcher is aware that these two mechanisms are not necessarily identical, yet in the project scope it wasn't possible to distinguish between them, which is why the mentioned relations can be seen as a composite of the two mechanisms. Also, they are used interchangeably to describe the relation.



Figure 5. Summary of Study Results

6.1.2.2.1 Project initiation – Drivers

The drivers whose presence was found to be most important for the initiation of a digital transformation project, based on the results of this study, are when a new technology is implemented, or when there are reasons of organizational development that require a digital transformation project. To support this qualitative assessment of the relative importance of drivers with numerical results from the analysis in NVivo, interviewees mentioned organizational development regarding all of the analysed five projects as an important driver. Another factor that the interviewees mentioned as well for all projects, was the presence of a digital mindset, again pointing towards its importance. Additionally, the presence of a sense of urgency seems to contribute to the initiation of a project – and the absence of it slows or even stops the initiation and progress of a digitalization project, despite organizational and external drivers being present which is related to Proposition 2. Additionally, lack of urgency is also a frequently mentioned barrier, underlining the importance of the presence of the driver of establishing a sense of urgency seem to strengthen furthermore the impact of the new technology driver on the initiation of a project, as proposed to Proposition 13.

Thus, in terms of relative importance of drivers for the initiation of a project, the driver of organizational development is found to be most important. Additionally, establishing a sense of urgency and the presence of a digital mindset were also found to be highly relevant as drivers in the project initiation phase. At this point, a limitation needs to be mentioned on this evaluation and the evaluations of the relative importance of factors that are included in the following chapters: The actual impact of the factors on project initiation, failure or success may be influenced by linkages between the factors, as well as additional moderating factors being present. The evaluations of relative importance included here and in the following focus on the main connections between the factors and outcomes of interest.

Based on the propositions formulated in this study based, one could go even further and argue that it seems a project that is aimed at introducing a new technology or driven by a customer need has a higher chance to be initiated once there are also goals related to organizational development or a sense of urgency present as set out in Proposition 13.

225

While the presence of a sense of urgency by itself seems to contribute to the initiation of a project, its influence seems to be even stronger when this sense of urgency is present at the levels of lower and middle management in a company, rather than at top management or the level of operative employees.

Another relation that was observed, was that when a project is driven by the introduction of a new technology, that leads to increased transparency of performance, this seems to lead to a decrease in the perceived quality of relationships and communication among employees or groups of employees, as presented in Proposition 1. As such the communication and quality of relations among employees can be seen as yet another organizational outcome of a digital transformation project.

6.1.2.2.2 Drivers during implementation

Focusing on the phase after a project had been initiated, it was also assessed what factors drive the project even further, and what factors contributed to either the failure or success of a project in the broad area of digital transformation. Firstly, drivers that seem to be relevant for the post-initiation phase of leading a project to success are mentioned. Then, on the one hand barriers were identified, as well as success factors that seem to have a direct influence on project success or failure, and on the other hand, the relationships between them in their own categories, across categories as well as between them and other identified factors.

Drivers that seem to carry relevance for a project being guided to a successful conclusion and therefore a technology to be implemented and adopted, are both the driver of a sense of urgency, as well as that of employee involvement, since the latter is needed for the technology to be used in the day-to-day processing. The latter driver will also be mentioned as a success factor later. The relative importance of a sense of urgency and employee involvement as a driver during the implementation of a project is also supported by numerical results from NVivo, with interviewees mentioning a sense of urgency and employee involvement as a relevant driver in most of the analyzed projects.

6.1.2.2.3 Barriers

As for the barriers it was found that the following barriers seem to directly contribute to the failure of a project: The barrier of missing skills, in particular missing skills in the fields of technology and IT seems to contribute to the failure of a project, this can either be since that no skills are available within the company, but also that not enough resources are readily available in the broader market. Underlining this barrier's high relative importance, based on numerical information from NVivo across cases and interviewees, and the author's handnotes, missing skills was mentioned most frequently as a barrier. The next barriers mentioned and included are technical barriers – especially current infrastructure, also called legacy systems. Individual barriers are yet another category of barriers that seem to contribute to project failure. Rather, it seems that its impact is dependent on the presence of success factors mitigating it. Two barriers which again seem to have an impact are that of a lack of employee involvement, as well as that of an organizational structure dominated by a strong top-down hierarchy. Further mentioned barriers are missing resources, high implementation costs, lack of clarity in terms of tasks definitions.

Now moving on to linkages involving barriers, and as such indirect influences on the failure or success of projects. Regarding technical barriers, meaning that a project might fail since it is not technically feasible, it was observed that this barrier seems to occur more often when the project is concerned with the implementation of a novel technology, as presented in Proposition 3. It was also already stated in this study that one would need to distinguish between a barrier either factually being present or rather being present in the perception of the relevant stakeholders. This distinction seems to be especially relevant when a novel technology is introduced, since if there are no prior successful examples present or easily accessible, this can shed doubts on the actual feasibility of a project, and lead to the moderated by the trust that stakeholders have in the feasibility of the technology implementation, in that a failure may be avoided if measures are taken or the project is managed in a way to establish trust in its actual feasibility, proposed in Proposition 4. Another interesting relation regarding technical barriers was observed, in that it seems that the presence of the barriers of a lack of employee involvement and lack of clarity in terms of the

227

definition of a task further fuel the establishment of a technical barrier, as well as potentially strengthening its impact on leading to project failure. This means however also that the absence of these barriers, in terms of employee involvement and a clear task definition being present, seem to be able to mitigate the impact of a technical barrier on the project outcome, which is aligned to Proposition 5.

Lastly, also a relation between the barrier of high implementation costs and technical barriers, in terms of existing current infrastructure was observed as seen in Proposition 10, meaning that when current infrastructure is present, this seems to lead to a higher resource requirement in terms of implementation costs, since customized solutions as opposed to off-the-shelf ones may be required.

Focusing on the barrier of high implementation costs, they seem to be fuelled by goal conflicts between departments and the overall company, which is linked to Proposition 21. This shows the strength of this moderating factor of goal conflicts, in that, as mentioned in the following, they also seem to fuel the occurrence of individual barriers.

As for individual barriers, in particular regarding the specific barrier of resistance to change, the observation was made, that it seems more likely to occur, the more different the preferences of a department are with respect to the preferences of the company as a whole, as seen in Proposition 9. Generally, analyzing resistance to change and its linkages carries high relevance, since the barrier was mentioned by a high proportion of interviewees as being present in a majority of the projects. These fundamental differences might lead to actors on each of the two levels pursuing different goals and being guided by different incentives. As for mitigating the effect of individual barriers, it was found in the study, that clearly highlighting the benefits of a new technology seems to have such an effect, as set out in Proposition 22. It was found that also an open and innovative culture seems to serve as such a mitigating factor, proposed in Proposition 22. Closely connected to the barrier resistance to change is also the barrier of a lack of employee involvement, this barrier seems to be counteracted by the strategy of highlighting the perceived usefulness of a technology as proposed in Proposition 21. Also, it was found that employee resistance to change seems to be mitigated when middle and lower management is taken on board.

Regarding the barrier of a lack of employee involvement, it seems that it oftentimes occurs together with the barrier of an organizational structure that is dominated by a strong top-down hierarchy.

If the barriers were to be ranked on their relative importance, missing skills can be considered the most important one, since it occurs frequently and has a high impact on project failure or success. Even though resistance to change was mentioned frequently as a barrier and thus seems to be a likely candidate for the second rank, it doesn't seem to carry as high of a relevance for the success or failure of a project. Possibly, since multiple - relatively easily available - remedies exist to counteract this barrier. Finally, the presence of a lack of urgency can also be considered a highly relevant barrier based on how often it occurs and its impact, underlined by the fact that it was brought up in relation to drivers and success factors.

6.1.2.2.4 Success Factors

In the prior paragraphs, it was discussed what factors can potentially contribute to a digital transformation project failing – in the following paragraphs it will be discussed what factors potentially contribute to a digital transformation project succeeding, and what the linkages and relationships between them are.

It was found that the following success factors potentially directly contribute to the success of a project: First of all, it seems that employee involvement can lead to project success, as set out in Proposition 11. This was not only a success factor stated in literature, but also one that was perceived as important by employees and lower management in the studied firm, as seen in Proposition 14. Furthermore, a strong degree of coordination and understanding between the technical and the IT side seem to lead to a higher probability of success of a project, proposed in Proposition 20. Even though the impact of this success factor seems high, the success factor was only reported to be present in less than half of all projects. Also, a fitting incentive structure targeted at rewarding ideas and creativity of employees might strengthen the positive impact of employee involvement in a digital transformation, therefore serving as a moderating variable, as set out in Proposition 18. Another success factor that was reported to be present and seemed to have a positive effect on project success, was that of an open culture, that was reported to be present in the focal department. Also, the general success factors of "seamlessly integrated on- and offline channels" as well as "digitalization of customer action" seem to contribute to the success of digitalization projects, as seen in Proposition 23. Lastly, also the success factors of crossfunctional teams, top-management support or similarly top-down governance, as well as clear highlighting of the usefulness of the implemented technology seem to have an influence on project success. Especially top-management support was mentioned as a success factor present in most of the projects.

But not only factors that can be uniquely attributed to success factors play a role in project success, but also factors that serve as drivers in earlier stages. In particular, the driver of establishing a sense of urgency seems to not only have an impact on project initiation but also in the later stages, influencing project success, proposed in Proposition 19.

Focusing on the relative importance of success factors, a combination of two frequently mentioned success factors, namely of the right mix between top-down support, also phrased as top-management support, and bottom-up support, alternatively formulated as employee involvement, seems of the highest importance for project success. Additionally, the presence of a cross-functional team seems to carry a high importance for project success, even though in this study, it didn't come up frequently.

6.1.2.2.5 Linkages among Success Factors

As for linkages and relationships it seems that the impact of the set-up of cross-function teams on project success is further strengthened by the presence of trust, goal congruence and a high degree of social interaction within and between teams, as set out in Proposition 6. Another linkage related to the success factor of cross-functional teams that observed in literature, is that its impact on success seems to be even stronger when an accompanying facilitation and mentoring process is present, as seen in Proposition 8. Regarding the success factor of the involvement of top management, it seems in the current study that it has a stronger impact on project success if there is also the success factor of employee involvement present, proposed in Proposition 7.

As for the success factor of employee involvement it seems that it carries even higher relevance and is strengthened, if the involvement of employees occurs at the early stages of a digitalization project, rather than only after technology implementation, as set out in Proposition 12. There are further interactions that are linked to employee involvement that are however concerned with the bottom-up and top-down governance of projects. In the perception of middle and upper management however, a project that is steered by a mix of top-down and bottom-up governance is more likely to succeed, which is the reason for the interaction included in the illustration, as seen in Proposition 15. Furthermore, to further specify this observed relation, it was found in the study, that smaller projects, involving single organizational units, seem to be more likely to succeed when they are initiated and driven bottom-up (defined as lower/middle management), while large projects, involving multiple organizational units seem to be more likely to succeed when they are initiated and driven topdown, proposed in Proposition 16. To add yet another flavor to the success factor of employee involvement, it seems that projects requiring a high level of technical expertise are more likely to succeed when driven bottom-up and closely involving operational employees, as set out in Proposition 17.

6.1.2.2.6 Links between barriers and success factors

Also included in the illustration are linkages between barriers and success factors. These linkages indicate what success factors might help mitigate barriers. For the barrier of missing skills, especially in the field of technology and IT, it seems that it can be mitigated by the success factors of coordination and understanding between the technical and organizational side. Another connected success factor seems to be that of cross-functional teams. Regarding technical barriers, it was found in literature, that the success factor of an iterative reengineering of legacy systems, as proposed by (Bianchi et al., 2003) seems to mitigate and help dampen this barrier – this success factor was however not observed in the current study. Also, an open culture or a culture of experimentation can contribute to mitigating technical barriers, in that a technology might be tried out in one are of the organization, and then rolled

out to other areas. Individual barriers may be counteracted by various success factors, namely that of employee support, and that of clearly highlighting the perceived usefulness of a technology (Proposition 21), and also that of an open and innovative organizational culture, as seen in Proposition 22. The barriers of lack of employee involvement, and that of an organizational structure that is dominated by a strong top-down hierarchy, seem to be counteracted by the success factors of employee involvement and inclusion of elements of bottom-up governance in a project.

6.1.3 Summary of research questions

In this section, the research questions that were defined in the beginning of this study are presented again. Based on the results and formulated insights in this study it will be attempted to provide answers to them.

The following specific research questions were formulated based on the identified research gaps, to guide this work:

- How does the perception of drivers of digital transformation vary, based on the hierarchical level of employees in an organization?
- How does the perception of success factors and barriers of digital transformation vary, based on the hierarchical level of employees in an organization?

Regarding the perception of drivers, barriers, and success factors of digital transformation, it can be stated that it differed between hierarchical levels insofar, as interviewees rather reported factors closer to their own goals and sphere of influence to be present. For example, operational employees more than managers reported individual barriers or a lack of employee involvement to be present. While this study laid a first basic foundation regarding differences in perception, a further study, that is purely focused on the perceptive component would be required to lead to more detailed conclusions and a more elaborate answer to these research questions. • How does the perception of leadership and communication regarding digital transformation vary, based on the hierarchical level of employees in an organization?

The perception of leadership and communication is a fairly broad topic that was touched upon only peripherally in this study. Regarding the perception of leadership, depending on the type of initiation and governance of the project (bottom-up vs. top-down), different styles of leadership may be perceived as being present. A more bottom-up driven project might lead to the perception of a leadership style being present that is more unifying and democratic. Regarding the perception of communication, for example a difference between hierarchy levels was present insofar, as a digital vision was reported to be present by management, that however wasn't known or considered to be implemented on lower hierarchical levels.

• How do changes in the organizational structure moderate the impact of barriers on digital transformation?

In this study, the organizational structure of the department wasn't changed. Furthermore, no comparisons between differently structured departments were undertaken due to the study being focused on one department. This means that no variation in types of organizational was possible to be explored, rather only the impact of a single, hierarchical structure, that existed in the focal department. Exploring the impact of a different organizational structure on the impact of barriers to digital transformation might serve as the basis for future research. It may be argued that especially the barriers of a lack of employee involvement or resistance to change could successfully be counteracted by the introduction of flatter organizational structures.

Based on the general purpose and the model underlying this research, a few more general and broader research questions are also addressed, namely:

• What are drivers that are relevant for the successful initiation and progress of a digitalization project in a company, and digital transformation overall?

Relating to the relevant drivers, it was found that especially the drivers of organizational development as well as that of creating a sense of urgency carried high relevance for the success of a digital transformation and the implementation of new technologies. On the one hand, it is the driver of organizational development that was closely linked to the aims of most projects, namely process and efficiency improvement. On the other hand, it was found that external drivers, such as that of a new technology, require the drivers of organizational development and creating a sense of urgency to be present to fully materialize. Additionally, also individual drivers, such as employee support were present, however were rather considered to be relevant for the implementation phase rather than the initiation phase of a project.

• What are barriers and success factors that are relevant for the successful completion of a digitalization project in a company, and digital transformation overall?

As for barriers, in many of the projects, missing skills in the focal department and company were identified as a relevant barrier. This barrier was counteracted by the acquisition of knowledge and skills through the services of external companies.

Also, individual barriers such as resistance to change were reported frequently as barriers that were present. They were oftentimes reported to be counteracted by the simple factor of time, that made stakeholders more accepting of novel technologies and change in general.

• How are barriers and success factors interlinked with each other?

In general, linkages between specific barriers and success factors were observed both for factors on the same as well as on different levels. A linkage on the same level is for example the barriers of missing skills or individual barriers being targeted by the introduction of training programs for employees. A linkage on different levels relates for example to organizational-level success factors counteracting individual-level barriers by an organizational climate open for innovation and technology being created.

• What are other influential themes or ideas that are underlying barriers and success factors?

In the interviews, and data analysis, themes or ideas are reported that are connected to barriers and success factors of digital transformation. They are related to broad topical areas such as that of project governance, performance transparency and competition, goal-conflicts as well as collaboration. It becomes clear that each of these areas is linked to a vast array of related literature and presents a very different direction for research. A structured effort would be required to link these themes to existing literature, tying it to the context of a digital transformation, highlighting the possible particularities of a digital transformation in the process.

6.1.4 Theoretical contributions

In this section, the theoretical contributions that can be made to existing fields of literature, based on the results of this study are outlined. They can be made along the two relations that were used to structure this study: On the one hand on factors that are influencing the success or failure of a digital transformation, on the other hand, the varied impact that a digital transformation has on different parts of the organization. In particular, what is missing in existing literature, yet seems to be very relevant based on the findings of this study, is an evaluation and assessment of importance and of linkages of factors. While the importance refers to the importance of certain drivers, barriers or success factors, relative to other factors in their categories, linkages refer both to linkages within categories e.g., between drivers, as well as linkages across categories, e.g., between barriers and success factors, or between barriers and other identified factors that are relevant. Additionally, outside this analytical structure, contributions may be made regarding the general approach to the studied topic, to topics related to common themes identified in the data and also the more general digital transformation and management and strategy literature. Furthermore, the results of the study were summed up in a graphical illustration that represents the process from initiating a project to the end result of said project. So far, in existing literature, the focus was put mainly on assessing each of the stages and factors separately, yet the graphical illustration provides a connected overview of stages and factors, that allows researchers to better understand linkages and the time-dependent impacts of relevant factors. Lastly, also contributions may be made towards formulating clearer definitions for the relevant terms of digitization, digitalization, and digital transformation.

Contributions to the first relation of factors influencing the success/failure of a digital transformation can be made on multiple levels: Firstly, on the very granular level of drivers, barriers, and success factors to digital transformation. Secondly, contributions can be made towards the more general level of digital business and digital transformation strategy formulation. Thirdly, this study adds insights on identified common themes. Fourthly, contributions may also be made on the level of theoretical streams in management literature that are aimed at explaining the differences in profitability and survival of firms.

Starting with the most granular level, contributions can be made to the literature that discusses drivers of digital transformation, as lined out by Liere-Netheler et al. (2018). Focusing on what drivers were present, drivers in all three defined categories, namely external, organizational development, and individual drivers, were observed. In the category of external drivers, purely customer-driven projects as defined by Hrustek et al. (2019) were not observed, which might be since that the department is rather internal-facing than clientfacing. Technology, as defined by Liere-Netheler et al. (2018) was however observed as a driver. In the category of individual drivers, both employee support (Liere-Netheler et al., 2018) as well as skillset and mindset of employees (Morakanyane et al., 2020) were observed. And lastly, in the category of organizational development, process and workplace improvement, management support and cost reduction were present as drivers of digital transformation. The drivers of introduction of new products and services, as well as reaction to disruptive competition weren't present. This again might be since that the focal department is not a client-facing one. All in all the categorization by Liere-Netheler et al. (2018) seems to capture all of the drivers that were observed in the projects, pointing towards the framework being collectively exhaustive and providing support for its suitability for future analysis.

Regarding the importance of drivers, it was stated in the literature review, that it is not clear based on the existing literature which category of driver is most important for the initiation and drive of a digital transformation. In the context of this study, it was however shown that drivers that are organizational development drivers need to be present for a digital transformation to succeed, despite drivers from other categories being present. The contribution to literature is such that there is evidence for a differentiation in the importance of drivers, that also considered linkages between them. And in particular, organizational development related drivers seem to play a larger role in that regard, since their presence seems to be a necessary condition for other drivers to actually lead to the initiation of a digital transformation project. External and individual drivers seem to carry a lower relevance, based on this argumentation. Also, a sense of urgency, as defined by Kotter (1995) can be seen in a similar way to organizational development, as its presence was found to be required for other drivers to materialize in their impact, as well as its absence was found to hinder them.

Secondly, also contributions can be made to literature focusing on barriers to digital transformation, for example relating to the overview by Vogelsang et al. (2019). It may be analysed firstly whether barriers that were mentioned in existing literature were also reflected in data that was collected here. While not the occurrence of all barriers that were mentioned in literature could be reported in this study, this doesn't necessarily point towards a decreased general importance of those that weren't mentioned. It simply shows that, depending on the context in which a study on digital transformation is performed, different aspects become salient. The barrier of missing skills following Vogelsang et al. (2019) is present in many projects, and also technical barriers, in particular relating to current infrastructure were observed. Individual barriers were also reported to be present, as well as organizational and cultural barriers. Customer-related barriers, as defined by Peillon and Dubruc (2019) were not observed. Again, also here the reason might be that the department is rather internal than external facing. Resistance to change, as per Cichosz et al. (2020) was also reported to be present as a barrier to digital transformation. Based on this overview, it seems that the defined categories of barriers that were found in literature cover most of the barriers that were observed in the digital transformation projects. In addition to the barriers specific to digital transformation, also general barriers to change as defined by Kotter (1995) were assessed. From these barriers, lack of urgency was observed in the projects.

237

Relating to the fact of which barriers were perceived to be the most relevant, something that for example Vogelsang et al. (2019) and Kotter (1995) only discussed incompletely, no final conclusion can be taken, however a perceived lack of urgency seems to have played a major role in the failure of at least one of the projects, and existing current infrastructure at least slowed down some other projects. Regarding linkages, individual barriers, such as resistance to change only seem to have a strong impact, when other barriers or factors, such as goal conflicts, a novel technology, technical barriers, or a lack of clarity are present – as such individual barriers seem to be weaker barriers. Another important addition in the area of barriers is the assessment of the impact of other factors that characterize the setting of a project, such as potential goal conflicts, or the novelty of a technology being present. So far, these factors, to the best of the researcher's knowledge, haven't been considered in existing literature to specify and characterize the impact of barriers on project outcomes.

As the last aspect on a granular level, contributions may be made to the literature on success factors. Success factors that were present include the establishment of cross-functional teams as defined for example by Robertson (2015), the development of a digital vision as defined by Cichosz et al. (2020), support from management, as well as the inclusion of top-down and bottom-up elements in the project structure and governance (Bughin et al., 2015). Therefore, a majority of the success factors that were found in prior literature weren't observed in the projects. Nevertheless, most projects turned out to be successful. A few reasons might be leading to that: First of all, the focus of this study was on barriers, and operational employees. Most of the success factors are actually located on the "meso" or company-wide level, which wasn't represented or analysed as detailed as the micro-level. Therefore, these success factors might not have been observed due to missing data. Another reason might be that the barriers were not strong enough to require a strong dedicated action to overcome them, but rather the aspect of passing time could have led to barriers being overcome "on the go". For future research it might be interesting to see how it can be determined whether barriers actually require dedicated success factors to be overcome, and for a project to lead to a success.

Regarding the importance of success factors, two very prominent success factors were the bottom-up and top-down governance – the conclusion of this study is that both seem to be

required to lead a project to success. Also, a success factor that showed a strong impact was that of managing the project in a way, that the usefulness of a new technology is clearly highlighted. This is a factor that is very granular, on a project-management level, yet seems to carry great relevance for the project success. Similar to barriers, also for success factors, additional factors were identified that may help to detail the relation, such as when the success factor was present, or how large the project was, or the characteristics of the project. This extent of detail in terms of factors of influence was so far not reflected in existing literature, to the best of the author's knowledge.

Concerning the linkages between barriers and success factors, they seem to largely correspond to existing literature as lined out in the literature review, yet this study contributed by further detailing the relations – for example to the barrier of missing skills only the success factor of a targeted strategy and training programs were attributed, yet this study has shown that also creating an understanding between the technical and organizational side helps to counteract it. Additionally, the graphical illustration that was presented in an earlier section enables future researchers to consider new relations that may serve as a basis for a further study.

Moving on to the second relation, that of analysing the impact that digital transformation has on different parts of the organization. The literature that was mentioned mainly focused on the impact of digital transformation on innovation and organizational performance. The observations made in this study regarding this topic were however more granular, in that it was observed that a digitalization project led to changes in the communication structure and interpersonal relationships between teams of employees. This insight might then present an interesting direction for future research, as a possibly so-far overlooked aspect of the consequences of digital transformation.

A contribution to the overall management literature that this study provides, is that it further highlights the importance of understanding micro-structural processes and results, following the suggestion for research from Puranam (2018). This understanding then helps to draw implications on the actual determinants of organizational profitability and survival. In the case of this study, the mechanisms that are governing the success or failure of individual digitalization projects may help to understand the success or failure of a digital transformation. And further, the success or failure of a digital transformation might help to understand performance differences or differences in survival between companies. Also understanding what drives the success or failure of a digital transformation may be used as an input factor for formulating a digital business and transformation strategy.

A more general contribution to existing literature in the area of digital transformation was made based on the holistic approach that was pursued. The holistic approach was defined in this study in a way, that interviews were conducted, and information was obtained from employees on the lowest up to the highest hierarchy levels. This represents an addition to existing literature, which mainly focused on top management or higher levels of management, such as in a study by Holotiuk and Beimborn (2017). The addition of lower levels to the study, that is also including operational employees, adds yet another important perspective, that could be crucial in understanding why a digital transformation might fail or succeed.

In summary, the main contributions of this study are filling multiple gaps identified in literature: firstly, the holistic approach in this study, adds the perception of a broad array of stakeholders priorly missing in existing literature. Secondly, by developing a graphical overview of potential factors, this allows a holistic perspective in a different understanding, namely that of including and analysing potential linkages and interrelations between and among factors. Thirdly, it adds to showing the importance of understanding microstructural mechanisms for understanding company outcomes.

6.2 Generalizability of results and Limitations of research

A few limiting factors are brought up in the following, that should be considered when considering the results of this study and that can possibly be addressed in future research.

One limiting factor is that the study was conducted at a relatively narrowly defined timewindow and point in time. A contrasting approach might have been to extend the observational period to create a longitudinal data set, to potentially see how recollections and perceptions change over time. However, given that digital transformation or digitalisation projects usually require months or even years to be fully implemented, such an approach was, due to time and resource constraints, not deemed feasible for this study. If these resources become available, additional data points could build on this study and yield interesting further insights on the change in these factors and their importance over time. Also, some of the projects were still ongoing at the time of this research study, so the categorization as a success or a failure may be premature.

An additional limitation of this research is that it is only based on the case of one company in one country. Therefore, it may be argued that the insights are not replicable to other companies, industries, countries or cultures on a statistical basis. This argument is also supported by the use of the constructivist methodology, and the main aim of this exploratory study - namely to achieve an in-depth understanding of a selected case to gain new insights on the process of digital transformation. This selected approach is in contrast to generating results by using a positivist methodology, where the results are often assumed to be generalizable over many contexts. However, the challenges that companies encounter in terms of digital transformation may be very similar, in that while the specific technology and configuration may differ, the general process of introducing new digital technologies may bear some similarities. This statement can be supported by drawing on the work of authors that was used as the basis for establishing the initial list of factors influencing project success and failure. The authors conducted their work in industries other than the one used in this study, including for example different sectors of the manufacturing industry, such as automotive, engineering, and chemical (Liere-Netheler et al., 2018), the logistics industry (Cichosz et al., 2020) or the fashion and the banking industry (Broekhuizen et al., 2018). The factors identified in these studies were used as a basis to establish basic initial lists of drivers, barriers and success factors for this study. Over the course of this study, support was found for the presence and importance of the factors regarding project success. Thus, it can be argued that insights generated in this study relating to the broad area of digital transformation are to an extent independent from the specific industry context they are placed in, and thus transferable to other contexts.

Another point supporting the transferability of the results to other contexts is based on the fact that a digital transformation is often a project-based effort. Thus, parallels can be drawn to "general" change management and project management. For example, factors related to the presence or absence of a sense of urgency were oftentimes, in this study, seen as important for determining digital transformation project success or failure by interviewees. These factors had been mentioned in prior research in the field of change management, e.g., by Kotter (1995), who considered the presence of a sense of urgency as integral for successful change to occur. Also factors relating to the configuration of a project in terms of the mix of bottom-up and top-down governance, can be found in the general project management literature (Daradkah et al., 2018).

Even though there are arguments in favour of generalizability, the ability to generalize insights ultimately hinges on the extent to which the context in which a digital transformation takes place significantly influences the process associated with digital transformation. The context plays an important role, since each industry and each company can be argued to be unique in many ways. Different industries might, for example, have different legacy technologies, and different processes, and firms might have a different corporate culture and a different composition of workforces, skill, and resources. All of those factors can be argued to lead to variation in the outcomes of similar projects in different companies, even though the overall change management mechanisms might be the same. Therefore, for the generalizability of the findings of this study, this means that while the same drivers, barriers and success factors can be argued to be present in different industries, their specific linkages and relations to outcomes might be different based on the industry or company. To give an example, it seems reasonable to argue that there is a difference in corporate culture or compositions of workforce between companies in the industries of software development and traditional manufacturing. These differences might then moderate project outcomes, even though the initial technology and project set-up might be the same. To determine to what extent this in fact holds true, further research is required. Future research may approach the topic with quantitative methods to further strengthen the generalizability of the insights and enable generalizations to an even wider range of firms and industries.

It may be argued that due to the set-up of the interviews, taking place on the company premises, the atmosphere might not have been open enough for employees and managers to transparently communicate their thoughts, attitudes, and ideas. This was however counteracted by on the one hand, the researcher paying close attention to highlighting the confidentiality and anonymity of everything that was said during the interviews and creating a trusting atmosphere. On the other hand, it can be argued, based on the statements and data collected in the interviews, that involved personal impressions and detailed information, that the researcher was successful in creating such an atmosphere.

A further limitation that can be brought up is that the sample of participants was generated based on purposive sampling, in particular drawing on typical case and snowball-sampling, rather than being randomly selected. Therefore, it may be argued that the sample is not diverse and biased, and again, that no generalizable conclusions may be drawn due to that fact. An attempt to counteract this was taken by purposively sampling interviewees with diverse characteristics, in terms of their hierarchical and functional position, as well as their age and gender, therefore trying to influence the "input". Also, judging from the "output", the diverse set of opinions, that were partly contrasting each other, which was recorded points towards a well-balanced sample.

Lastly, it may be argued that the constructivist methodology, which mandates an active involvement of the researcher, leads to results that are biased by the researcher's views and attitudes. Two main steps were taken to counteract this argument: Firstly, the researcher attempted to stay reflective and open when conducting the interviews, which may be even facilitated by the use of a semi-structured interview. Secondly, in this study, explicit critical reflections of the researcher's background and journey were included, that strengthened the reflective mindset, as well as serving as a reference point for the critical reader, who may be enabled to judge any potential remaining bias based on this information.

6.3 Directions for future research

In this section, implications and possible avenues for future research will be lined out. A few possible avenues for future research may already be drawn from the insights that were formulated throughout the text. All of these insights may serve as a starting point for further research. Future research studies may also employ different methodologies such as a quantitative or an experimental approach, or even a mixed methods design seems to be feasible, that takes into account the insights and results of this qualitative study. In the following, further, more general directions will be given.

A topic that may be worthy further exploration is to link defined barriers of digital transformation more strongly to already existing concepts in management or psychology research. So far, for the author the impression formed that many of the barriers contain already existent, more abstract concepts. For example, individual barriers often seem to be related to the loss of control of own data, as well as a fear of an increased transparency of performance. The topic of performance transparency and implications of it was for example touched upon in a study by Bernstein (2012), in the field of management research. Similarly, this topic was probably already touched upon in psychology research as well. What may be an avenue for future research in this context, is to establish a fit between the digital transformation literature and existing concepts and highlight what the truly novel aspects are when considering digital transformation. More casually stated, this may shed light on where authors in the field of digital transformation are "reinventing the wheel" versus where they truly are creating novel insights.

Besides this general direction for future research, a more fine-grained analysis of drivers, barriers and success factors may yield further interesting insights. The impression arose, that insights that are truly relevant for day-to-day managerial practice may be rather gained on a more detailed than on a more general level. Research on these aspects could for example include a focus on the mechanism of how barriers are arising, or how they materialize, based on different characteristics of a project.

Yet another direction would be to delve even deeper into the individual perceptions that stakeholders have of drivers, barriers and success factors, and their relevance for the overall success of a digital transformation. This topic was touched upon in this study, however, an even stronger focus on subjective impressions, and feelings, already when conducting interviews may lead to even more detailed and interesting insights.

Lastly, future research may focus on placing a study in different contexts, to see whether the results from this study context are still relevant in them. Potential changes in the context could include that this study is based in a department that is rather internal-facing than client-facing. Also, the company is located in Europe, which could also be compared to companies that are headquartered in other parts of the world. Furthermore, a different type of company, that is mainly focused on services, and located in a different industry might be chosen to compare the results with the ones of this study.

6.4 Implications for practice and managerial recommendations

In the following, a summary of the insights of this study will be given, aimed at relaying the insights to practitioners. This summary is formulated so that it may be easily applicable in practice by stakeholders who work in the area of digital transformation. It will be structured along the phases of a digital transformation or project.

At the stage of initiating a digital transformation or particular project that is introducing a novel technology, special consideration should be given by managers to creating a sense of urgency. This helps to initiate and drive forward projects, by convincing and motivating stakeholders of the urgent need for a particular technology to be implemented. When implementing new technologies, it should be ensured that there are organizational drivers present, meaning that a project should be aimed for example at an improvement of processes as well as an increase in efficiency. As such, it can be used for supporting project management in the context of a digital transformation with novel insights and specific suggestions.

When a project is large and involving multiple departments, then a stronger involvement by top management governing it top-down may be required. When only one department is involved and the project is at a smaller or experimental scale that may require high technical expertise, then the top management should scale down its involvement and the project should be rather governed by local leadership, closely involving the relevant employees. When external companies are involved in the process, a special focus should be put on creating a common understanding and knowledge sharing between the members of the project team. A short-term solution is to use a facilitator to moderate between the external IT and internal technical process knowledge, as well as create a safe environment for knowledge exchange. A more medium-term solution is to focus on training employees in basic IT skills that are relevant for their work and projects.

At the stage of executing and implementing a novel technology within the context of a digital transformation, it seems that novel, cutting-edge, customized technologies are more difficult to implement than off-the-shelf, well-proven technologies. When implementing truly novel technologies, the process could be designed in a way that the technology is implemented on a small scale, a safe environment is created, that allows for initial failure, with time-constraints not being as strict as for other projects.

Considering the impacts of the introduction of a novel technology, managers should pay attention to potential negative effects on the organizational climate. This is especially relevant in the context of technologies that lead to performance transparency between employees.

6.5 Critical reflections on the study journey

Before deciding to pursue a PhD and conducting this study, I was the co-founder of a start-up which was strongly technology driven. The focus of this start-up was on augmented reality and artificial intelligence. In this role, I was able to establish business contacts with employees and managers in some large companies. During conversations with the stakeholders about the latest technology trends, I noticed that, broadly speaking, there was a big question mark around the topic of digital transformation.
Most of the companies were only in the first trials of implementing the new technologies, and only recently started to follow the concept of Industry 4.0, which is used to describe the intelligent connection of machines and processes in the industry, using information and communication technology (PlattformIndustrie4.0, 2023). Potentially due to the relative novelty of the topic, I had the perception that there was a lack of clarity on various aspects of it. For example, the managers often were unsure of how to approach the broad topic, due to various reasons. One such reason was a lack of clarity on how the technologies will likely be developing further in the future, another was that of what changes in interactions between stakeholders are generated by these new opportunities and technologies.

Or to cite one example, a manager told me at the time that they now had these new technologies available in the company and were starting to completely digitalize processes. But he said that there was uncertainty on how to "deal with them", specifically for example in terms of communication, hierarchical relations, and organizational structures, etc. In terms of academia, because this topic was still very new in the initial phase of this study, the literature and existing publications were correspondingly shallow and only covering a part of the broad spectrum that novel technologies offer.

Drawing on these observations and my own background my interest in the topic was sparked and led me to dedicate myself to this research area in my study. Now about five years after I was first confronted with the topic, in 2023 new technologies have even developed further and have been implemented at a broader scale. Also, in academia, a noticeable increase in publications was observed.

Even though by now the amount of literature has increased, in the beginning of my PhD journey, it was challenging to prepare this topic with existing literature and to find a suitable framework to start out from, which was meeting the requirements. Because there was so little existing literature and data, a quantitative research approach was ruled out; rather a methodology was chosen, which made it possible to gain new insights in a fairly unexplored field. In particular, it was decided to undertake a qualitative approach focused on exploring the topic and generating insights that may then serve as a starting point for further research. Even though an explorative approach was chosen, a few early, pioneer, survey papers, e.g. by Vogelsang et al. (2019), served as a great starting point for me to roughly grasp the topic.

247

In the midst of the study, the COVID-19 pandemic led to drastic changes in the world, which also influenced this study. This led to me having to adapt my methodology due to numerous restrictions implemented by the focal company. Access to my research environment became much more difficult due to contact restrictions. However, while posing a challenge, this also opened up a new opportunity and the COVID-19 topic was included in this study and examined as an additional focus or lens in connection to digital transformation. Including questions on this topic led to interesting insights being collected and analysed. The challenges posed by the COVID-19 pandemic also led to slight delays in the course of the work.

Because in this study a lot of work was done in close connection to and collaboration with people, it was also a challenge to get access to them and to build up the necessary trust. This was especially the case, since in an organization there are different "political" factors, as well as group dynamics and social norms present as factors that may then influence how individuals behave. Also, very personal and individual fears and emotions may also play a further role in influencing individuals' behaviour. This aspect was very important to prepare for and address so that the data collection could provide meaningful results and also so that the collected data is extensive and profound enough to generate further insights in the focused topic area.

The biggest personal insight from this research study is that it is more important than ever to take into account all the factors that exist in connection with digital transformation. Some factors may seem inconspicuous at first but nevertheless have a decisive and surprising impact on a digital transformation process. This is why further studies should be conducted and learnings implemented in practice, to ensure that the best possible holistic approach is being followed, negative surprises are minimized, and a successful digital transformation is achieved.

Bibliography

- ADAMIK, A. & NOWICKI, M. 2018. Preparedness of companies for digital transformation and creating a competitive advantage in the age of Industry 4.0. *Proceedings of the International Conference on Business Excellence*, 12, 10-24.
- ADAMS, W. C. 2015. Conducting semi-structured interviews. *Handbook of practical program evaluation.*
- AGRAWAL, P., NARAIN, R. & ULLAH, I. 2019. Analysis of barriers in implementation of digital transformation of supply chain using interpretive structural modelling approach. *Journal of Modelling in Management*.
- ALCOVER, C.-M., BARGSTED, M. & YEVES, J. 2022. Individual agency and structure perceptions in intentions to withdrawal from work early/late in the mid-and late-career. *Personnel Review*.
- AMIT, R. & SCHOEMAKER, P. J. H. 1993. Strategic Assets and Organizational Rent. *Strategic Management Journal*, 14.
- ANDAL-ANCION, A., CARTWRIGHT, P. A. & YIP, G. S. 2003. The Digital Transformation of Traditional Businesses. *MIT Sloan Management Review*, 44.
- ANDERSON, C. 2010. Presenting and Evaluating Qualitative Research. *American Journal of Pharmaceutical Education*, 74.
- APPELBAUM, S. H., HABASHY, S., MALO, J. L. & SHAFIQ, H. 2012. Back to the future: revisiting Kotter's 1996 change model. *Journal of Management Development*, 31, 764-782.
- APPIO, F. P., FRATTINI, F., PETRUZZELLI, A. M. & NEIROTTI, P. 2021. Digital Transformation and Innovation Management: A Synthesis of Existing Research and an Agenda for Future Studies. *Journal of Product Innovation Management*, 38, 4-20.
- ASLANOVA, I. V. & KULICHKINA, A. I. 2020. Digital Maturity: Definition and Model. Advances in Economics, Business and Management Research, 138.
- ASPERS, P. & CORTE, U. 2019. What is Qualitative in Qualitative Research. *Qual Sociol*, 42, 139-160.
- BAIN, J. S. 1956. Barriers to New Competition, Harvard University Press.
- BALSMEIER, B. & WOERTER, M. 2019. Is this time different? How digitalization influences job creation and destruction. *Research Policy*, 48.
- BARNEY, J. 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17.
- BARTLETT, C. A. & GHOSHAL, S. 1988. Organizing for worldwide effectiveness: The transnational solution. *California management review*, 31, 54-74.
- BAZELEY, P. & JACKSON, K. 2013. *Qualitative Data Analysis with NVivo*.
- BELL, E. & BRYMAN, A. 2007. The Ethics of Management Research: An Exploratory Content Analysis. *British Journal of Management*, **18**, 63-77.
- BERGHAUS, S. & BACK, A. Stages in Digital Business Transformation: Results of an Empirical Maturity Study. MCIS, 2016. 22.
- BERNSTEIN, E. 2012. The Transparency Paradox: A Role for Privacy in
- Organizational Learning and Operational Control. *Administrative Science Quarterly*, 57, 181-216.
- BHARADWAJ, A., EL SAWY, O. A., PAVLOU, P. A. & VENKATRAMAN, N. 2013. Digital business strategy: toward a next generation of insights. *MIS quarterly*, 471-482.

BIANCHI, A., CAIVANO, D., MARENGO, V. & VISAGGIO, G. 2003. Iterative Reengineering of Legacy Systems. *IEEE Transactions on Software Engineering*, 29.

- BIERNACKI, P. & WALDORF, D. 1981. Snowball sampling: Problems and techniques of chain referral sampling. *Sociological methods & research*.
- BOCKSHECKER, A., HACKSTEIN, S. & BAUMÖL, U. 2018. Systematization of the term digital transformation and its phenomena from a socio-technical perspective–A literature review.
- BOWMAN, E. H. & HELFAT, C. E. 2001. Does Corporate Strategy Matter? *Strategic Management Journal*, 22.
- BOYNTON, A. C. & ZMUD, R. W. 1984. An Assessment of Critical Success Factors. *Sloan Management Review*, 25.
- BRAUN, V. & CLARKE, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, **3**, 77-101.
- BRENNER, W., KARAGIANNIS, D., KOLBE, L., KRÜGER, J., LEIFER, L., LAMBERTI, H.-J.,
 LEIMEISTER, J. M., ÖSTERLE, H., PETRIE, C., PLATTNER, H., SCHWABE, G.,
 UEBERNICKEL, F., WINTER, R. & ZARNEKOW, R. 2014. User, Use & Utility Research.
 Business & Information Systems Engineering, 6, 55-61.
- BROEKHUIZEN, T. L., BAKKER, T. & POSTMA, T. J. 2018. Implementing new business models: What challenges lie ahead? *Business Horizons*, 61, 555-566.
- BROWN, S. A., MASSEY, A. P., MONTOYA-WEISS, M. M. & BURKMAN, J. R. 2002. Do I really have to? User acceptance of mandated technology. *European Journal of Information Systems*, 11, 283-295.
- BROWN, S. L. & EISENHARDT, K. M. 1997. The Art of Continuous Change: Linking Complexity Theory and Time-Paced Evolution
- in Relentlessly Shifting Organizations. Administrative Science Quarterly, 42.
- BRYMAN, A. & BELL, E. 2007. Business Research Methods.
- BUCCIARELLI, L. 2015. A Review of Innovation and Change Management: Stage Model and Power Influences. *Universal Journal of Management*, **3**, 36-42.
- Bucy, M., Schaninger, B., VanAkin, K., & Weddle, B. 2021. Losing from day one: Why even successful transformations fall short. Charlotte, US: McKinsey & Company.
- BUGHIN, J., HOLLEY, A., MELLBYE, A., GOTTLIEB, J. & RUTTEN, E. 2015. Cracking the digital code: McKinsey global survey results. *online], www. mckinsey. com/business-functions/business-technology/our-insights/cracking-the-digital-code*.
- CALITZ, A. P., POISAT, P. & CULLEN, M. 2017. The future African workplace: The use of collaborative robots in manufacturing. *SA Journal of Human Resource Management*, 15, 11.
- CHANIAS, S. & HESS, T. 2016. Understanding Digital Transformation Strategy formation: Insights from Europe's Automotive Industry. *PACIS*, 296.
- CHANIAS, S., MYERS, M. D. & HESS, T. 2019. Digital transformation strategy making in predigital organizations: The case of a financial services provider. *The Journal of Strategic Information Systems*, 28, 17-33.
- CHARMAZ, K. 2014. Constructing Grounded Theory, SAGE.
- CHEN, Y.-Y. K., JAW, Y.-L. & WU, B.-L. 2016. Effect of digital transformation on organisational performance of SMEs. *Internet Research*.
- CHENAIL, R. J. 2011. Interviewing the Investigator: Strategies for Addressing Instrumentation and Researcher Bias Concerns in Qualitative Research. *The Qualitative Report*, 16, 255-262.

CHI, T. 1994. Trading in Strategic Resources: Necessary Conditions, Transaction Cost Problems, and Choice of Exchange Structure. *Strategic Management Journal*, 15.

- CHOW, C. W. & VAN DER STEDE, W. A. 2006. The Use and Usefulness of Nonfinancial Performance Measures. *Management Accounting Quarterly*.
- CICHOSZ, M., WALLENBURG, C. M. & KNEMEYER, A. M. 2020. Digital transformation at logistics service providers: barriers, success factors and leading practices. *The International Journal of Logistics Management*.
- COPAS, J. B. & LI, H. G. 1997. Inference for Non-random Samples. *Journal of the Royal Statistical Society*.
- CORBO, L., CORRADO, R. & FERRIANI, S. 2015. A New Order of Things: Network Change and Field Transformation Following an Exogenous Shock. *Academy of Management Proceedings*, 2015.
- CRESWELL, J. W. 2013. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*.
- CROTTY, M. J. 1998. *The Foundations of Social Research : Meaning and Perspective in the Research Process,* London, SAGE Publications Ltd.
- CSASZAR, F. A., & EGGERS, J. P. 2013. Organizational decision making: An information aggregation view. Management Science, 59(10), 2257-2277.
- DARADKAH, M., AL JOUNID, E., & QUSEF, A. 2018. Top-Down vs. Bottom-Up in project management: A practical model. In Proceedings of the Fourth International Conference on Engineering & MIS 2018 (pp. 1-5).
- DAVENPORT, T. H., & WESTERMAN, G. 2018. Why so many high-profile digital transformations fail. Harvard Business Review, 9(4), 15.
- DAVIS, F. D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13.
- DAVYDENKO, I., KOLOMYTSEVA, O., KOLESNIKOVA, E., GRIGORIEVA, V. & REZNIKOVA, E. Innovative potential: The main drivers of digital transformation. "New Silk Road: Business Cooperation and Prospective of Economic Development" (NSRBCPED 2019), 2020. Atlantis Press, 594-597.
- DE CLERCQ, D., THONGPAPANL, N. T. & DIMOV, D. 2011. A Closer Look at Cross-Functional Collaboration and Product Innovativeness: Contingency Effects of Structural and Relational Context. *Journal of Product Innovation Management*, no-no.
- DEMIRKAN, H., SPOHRER, J. C. & WELSER, J. J. 2016. Digital innovation and strategic transformation. *IT Professional*, 18, 14-18.
- DENZIN, N. K. & LINCOLN, Y. S. 2017. The SAGE Handbook of Qualitative Research.
- DÖRNER, O. & RUNDEL, S. 2021. Organizational Learning and Digital Transformation: A Theoretical Framework.
- DUERR, S., HOLOTIUK, F., WAGNER, H.-T., BEIMBORN, D. & WEITZEL, T. What is digital organizational culture? Insights from exploratory case studies. Proceedings of the 51st Hawaii International Conference on System Sciences, 2018.
- EASTERBY-SMITH, M., THORPE, R. & JACKSON, P. R. 2015. *Management and Business Research*.
- EISENHARDT, K. M. & MARTIN, J. A. 2000. Dynamic Capabilities: What Are They? *Strategic Management Journal*, 21.
- EL SAWY, O. A., KRÆMMERGAARD, P., AMSINCK, H. & VINTHER, A. L. 2016. How LEGO built the foundations and enterprise capabilities for digital leadership. *MIS Quarterly Executive*, 15.

ETIKAN, I. 2016. Comparison of Convenience Sampling and Purposive Sampling. *American* Journal of Theoretical and Applied Statistics, 5.

FELDMAN, M. S. 2000. Organizational Routines as a Source of Continuous Change. *Organization Science*, 11, 611-629.

FINKELSTEIN, L. M., BURKE, M. J. & RAJU, M. S. 1995. Age discrimination in simulated employment contexts: An integrative analysis. *Journal of Applied Psychology*, 80, 652-663.

FITZGERALD, M., KRUSCHWITZ, N., BONNET, D. & WELCH, M. 2013. Embracing Digital

Technology. MIT Sloan Management Review.

FLETCHER, D. 2007. Social Constructionist Thinking: Some Implications for Entrepreneurship Research and Education. *In:* FAYOLLE, A. (ed.) *Handbook of Research in Entrepreneurship Education, Volume 1.* Edward Elgar Publishing.

FLETCHER, T. D., MAJOR, D. A. & DAVIS, D. D. 2008. The interactive relationship of competitive climate and trait competitiveness with workplace attitudes, stress, and performance. *Journal of Organizational Behavior*, 29, 899-922.

FLICK, U. 2002. Qualitative research - state of the art. Social Science Information, 41.

- FLIGSTEIN, N. & MCADAM, D. 2011. Toward a General Theory of Strategic Action Fields. *Sociological theory*, 29, 1-26.
- FLYVERBOM, M., CHRISTENSEN, L. T. & HANSEN, H. K. 2015. The Transparency–Power Nexus. *Management Communication Quarterly*, 29, 385-410.

FONTANA, A. & FREY, J. 2005. The Interview. *The Sage Handbook of Qualitative Research.*

FREITAS JUNIOR, J. C., MAÇADA, A. C., BRINKHUES, R. & MONTESDIOCA, G. 2016. Digital capabilities as driver to digital business performance.

FREY, C. B. & OSBORNE, M. A. 2017. The future of employment: How susceptible are jobs to computerisation? *Technological forecasting and social change*, 114, 254-280.

FUCHS, C., BARTHEL, P., HERBERG, I., BERGER, M. & HESS, T. 2019. Characterizing approaches to digital transformation: Development of a taxonomy of digital units.

FURR, N., SHIPILOV, A., ROUILLARD, D. & HEMON-LAURENS, A. 2022. The 4 Pillars of Successful Digital Transformations. *Harvard Business Review*.

FURRER, O., THOMAS, H., & GOUSSEVKAIA, A. 2008. The structure and evolution of the strategic management field: A content analysis of 26 years of strategic management research. International journal of management reviews, 10(1), 1-23.

GHEMAWAT, P. 2002. Competition and Business Strategy in Historical Perspective. *Business History Review*, 76.

GHOBAKHLOO, M. 2020. Industry 4.0, digitization, and opportunities for sustainability. *Journal of Cleaner Production*, 252, 119869.

GHOSH, S., HUGHES, M., HODGKINSON, I. & HUGHES, P. 2022. Digital transformation of industrial businesses: A dynamic capability approach. *Technovation*, 113.

GLOUCESTERSHIRE, U. O. 2022. Research Ethics: A Handbook of Principles and Procedures. Available: <u>https://www.glos.ac.uk/information/knowledge-base/research-ethics-a-handbook-of-principles-and-procedures/</u>.

GONZÁLEZ-VARONA, J. M., LÓPEZ-PAREDES, A., POZA, D. & ACEBES, F. 2021. Building and Development of an Organizational Competence for Digital Transformation in SMEs. *Journal of Industrial Engineering and Management*, 14.

GRAY, D. E. 2021. *Doing research in the real world*, Washington, D.C. :, SAGE Publications Ltd.

- GREVE, H. R. 2020. The Resource-Based View and Learning Theory: Overlaps, Differences, and a Shared Future. *Journal of Management*, 47, 1720-1733.
- GUBA, E. & LINCOLN, Y. S. 1994. Competing paradigms in qualitative research. *Handbook of qualitative research.*
- GUERRAS-MARTÍN, L. Á., MADHOK, A. & MONTORO-SÁNCHEZ, Á. 2014. The evolution of strategic management research: Recent trends and current directions. *BRQ Business Research Quarterly*, **17**, 69-76.
- HAFFKE, I., KALGOVAS, B. & BENLIAN, A. 2016. The Role of the CIO and the CDO in an Organization's Digital Transformation.
- HANELT, A., BOHNSACK, R., MARZ, D. & ANTUNES MARANTE, C. 2021. A Systematic Review of the Literature on Digital Transformation: Insights and Implications for Strategy and Organizational Change. *Journal of Management Studies*, 58, 1159-1197.
- HART, S. & BANBURY, C. 1994. How Strategy-Making Processes Can Make a Difference. *Strategic Management Journal*, 15.
- HAYES, R. H. & WHEELWRIGHT, S. C. 1985. Competing Through Manufacturing. *Harvard Business Review*.
- HAZEN, B. T., BOONE, C. A., EZELL, J. D. & JONES-FARMER, L. A. 2014. Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. *International Journal of Production Economics*, 154, 72-80.
- HELFAT, C. E. 2007. *Dynamic capabilities : understanding strategic change in organizations,* Oxford [u.a.], Blackwell.
- HESS, T., MATT, C., BENLIAN, A. & WIESBÖCK, F. 2016. Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, 15.
- HESSE, A. Digitalization and Leadership How Experienced Leaders Interpret Daily Realities in a Digital World. Hawaii International Conference on System Sciences, 2018.
- HEYDEN, M., FOURNÉ, S., KOENE, B., ANSARI, S. & WERKMAN, R. 2017. Rethinking 'topdown'and 'bottom-up'roles of top and middle managers in organizational change: Implications for employee support. *Journal of Management Studies*, 54.
- HJALMARSSON, A., JOHANNESSON, P., JÜLL-SKIELSE, G. & RUDMARK, D. 2014. Beyond innovation contests: A framework of barriers to open innovation of digital services.
- HOLOTIUK, F. & BEIMBORN, D. 2017. Critical success factors of digital business strategy.
- HORNBY, A. S., ASHBY, M. & WEHMAIER, S. 2000. Oxford Advanced Learner's Dictionary of Current English. *In:* CROWTHER, J. (ed.). Oxford University Press.
- HRUSTEK, L., FURJAN, M. T. & PIHIR, I. Influence of Digital Transformation Drivers on Business Model creation. 2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2019. IEEE, 1304-1308.
- JACKSON, P. J. 2015. Networks in a Digital World A Cybernetics Perspective. ECIS 2015.
- JAKOB, M. & KRCMAR, H. Which barriers hinder a successful digital transformation in small and medium-sized municipalities in a federal system? Central and Eastern European eDem and eGov Days, 2018. 141-150.
- JAMES, E. H., WOOTEN, L. P. & DUSHEK, K. 2011. Crisis Management: Informing a New Leadership Research Agenda. *The Academy of Management Annals*, 5, 455-493.
- JOFFE, H. 2012. Thematic Analysis. *In:* HARPER, D. & THOMPSON, A. (eds.) *Qualitative Research Methods in Mental Health and Psychotherapy: A Guide for Students and Practitioners.* Wiley-Blackwell.

- KANDLER, M., STRÖHLEIN, K., GORNY, P. M., RIEDINGER, S., LANZA, G. & NIEKEN, P. 2022.
 Human-Oriented Design of Andon-Boards 4.0 Promoting Decentralized Decisions on the Shopfloor and Acceptance by Employees. *12th Conference on Learning Factories.*
- KANE, G. C., PALMER, D., PHILLIPS, A.-N., KIRON, D. & BUCKLEY, N. 2018. Coming of age digitally. *MIT Sloan Management Review and Deloitte Insights*, 5.
- KARAGIANNAKI, A., VERGADOS, G. & FOUSKAS, K. The impact of digital transformation in the financial services industry: Insights from an open innovation initiative in fintech in Greece. Mediterranean Conference on Information Systems (MCIS), 2017. Association For Information Systems.
- KERSTEN, G. E., WACHOWICZ, T. & KERSTEN, M. 2016. Competition, Transparency, and Reciprocity: A Comparative Study of Auctions and Negotiations. *Group Decision and Negotiation*, 25, 693-722.

KIMBLE, C. & BOURDON, I. 2013. The Link Among Information Technology, Business Models, and Strategic Breakthroughs: Examples from Amazon, Dell, and eBay. *Global Business and Organizational Excellence*, 33, 58-68.

- KLEIN, M. M., BIEHL, S. S. & FRIEDLI, T. 2018. Barriers to smart services for manufacturing companies an exploratory study in the capital goods industry. *Journal of Business & Industrial Marketing*, 33, 846-856.
- KLÖTZER, C. & PFLAUM, A. 2017. Toward the development of a maturity model for digitalization within the manufacturing industry's supply chain.
- KOR, Y. & MAHONEY, J. 2003. Edith Penrose's 1959 Contributions to the Resource-based View of Strategic Management. *Journal of Management Studies*, 41.
- KORACHI, Z. & BOUNABAT, B. 2020. General Approach for Formulating a Digital Transformation Strategy. *Journal of Computer Science*, 16, 493-507.
- KOTTER, J. P. 1995. Leading Change: Why Transformation Efforts Fail. *Harvard Business Review.*
- KOTTER, J. P. 1996. Leading Change.
- KUKLA, A. 2013. Social Constructivism and the Philosophy of Science, Taylor and Francis.
- KUNZE, F., BOEHM, S. & BRUCH, H. 2013. Age, resistance to change, and job performance. Journal of Managerial Psychology, 28.
- KUTNJAK, A. & PIHIR, I. Challenges, Issues, Barriers and Problems in Digital Transformation–
 Systematic Literature Review. 11 th International Doctoral Seminar (IDS 2019), 2019.
 7.
- LAMBERG, J.-A., LUBINAITE, S., OJALA, J. & TIKKANEN, H. 2019. The curse of agility: The Nokia Corporation and the loss of market dominance in mobile phones, 2003–2013. *Business History*, 63, 574-605.
- LAWRENCE, T. B., DYCK, B., MAITLIS, S. & MAUWS, M. K. 2006. The Underlying Structure of Continuous Change. *MIT Sloan Management Review*.
- LEE, M.-X., LEE, Y.-C. & CHOU, C. 2017. Essential implications of the digital transformation in industry 4.0.
- LEE, M. Y. & EDMONDSON, A. C. 2017. Self-managing organizations: Exploring the limits of less-hierarchical organizing. *Research in organizational behavior*, 37, 35-58.
- LEE, O.-K., SAMBAMURTHY, V., LIM, K. H. & WEI, K. K. 2015. How Does IT Ambidexterity Impact Organizational Agility? *Information Systems Research*, 26, 398-417.
- LEONHARDT, D., HAFFKE, I., KRANZ, J. & BENLIAN, A. 2017. Reinventing the IT function: the role of IT agility and IT ambidexterity in supporting digital business transformation.

LESTAGE, G. 2015. How Have Kotter's Eight Steps for Change Changed? Forbes.

LICHTENTHALER, U. 2017. Shared value innovation: Linking competitiveness and societal goals in the context of digital transformation. *International Journal of Innovation and Technology Management*, 14, 1750018.

LIERE-NETHELER, K., VOGELSANG, K. & PACKMOHR, S. Drivers of digital transformation in manufacturing. 51st Hawaii International Conference on System Sciences (HICSS), Waikoloa, Hawaii (2018), 2018. Shidler College of Business, 3926-3935.

LORINO, P. 2018. Pragmatism and organization studies, Oxford, Oxford University Press.

- LUCAS, H. C. & GOH, J. M. 2009. Disruptive technology: How Kodak missed the digital photography revolution. *The Journal of Strategic Information Systems*, **18**, 46-55.
- LYYTINEN, K., YOO, Y. & BOLAND JR, R. J. 2016. Digital product innovation within four classes of innovation networks. *Information Systems Journal*, 26, 47-75.
- MAHONEY, J. T., & MCGAHAN, A. M. 2007. The field of strategic management within the evolving science of strategic organization. Strategic organization, 5(1), 79-99.
- MAHRAZ, M.-I., BENABBOU, L. & BERRADO, A. A Systematic literature review of Digital Transformation. International Conference on Industrial Engineering and Operations Management. Anais... Toronto: IEOM Society International, 2019. 917-931.

MAJCHRZAK, A., MORE, P. H. B. & FARAJ, S. 2012. Transcending Knowledge Differences in Cross-Functional Teams. *Organization Science*, 23, 951-970.

MARKIDES, C. 2006. Disruptive Innovation: In Need of Better Theory. *The Journal of Product Innovation Management*, 23.

- MASON, J. 2002. Qualitative Researching.
- MATT, C., HESS, T. & BENLIAN, A. 2015. Digital Transformation Strategies. *Business & Information Systems Engineering*, 57, 339-343.
- MAXWELL, J. 1992. Understanding and validity in qualitative research. *Harvard educational review*, 62, 279-301.
- MAYNARD, M. & PURVIS, J. 1994. Feminist Perspectives on the Past and Present.
- MAYR, A., WEIGELT, M., KÜHL, A., GRIMM, S., ERLL, A., POTZEL, M. & FRANKE, J. 2018. Lean 4.0 A conceptual conjunction of lean management and Industry 4.0. *51st CIRP Conference on Manufacturing Systems.*
- MCNAMARA, C. 1999. General Guidelines for Conducting Interviews.
- MEHRA, B. 2002. Bias in Qualitative Research: Voices from an Online Classroom. *The Qualitative Report*.
- MILES, M. B. & HUBERMAN, M. 1994. Qualitative Data Analysis -

MIN, S., SO, K. K. F. & JEONG, M. 2018. Consumer adoption of the Uber mobile application: Insights from diffusion of innovation theory and technology acceptance model. *Journal of Travel & Tourism Marketing*, 36, 770-783.

MITHAS, S., KRISHNAN, M. S. & FORNELL, C. 2005. Why Do Customer Relationship Management Applications Affect Customer Satisfaction? *Journal of Marketing*, 69.

- MOCKER, M., WEILL, P. & WOERNER, S. L. 2014. Revisiting complexity in the digital age. *MIT Sloan Management Review*.
- MONGER, M. 2015. *The winners and losers of the digital revolution* [Online]. World Economic Forum Website. Available:

https://www.weforum.org/agenda/2015/03/the-winners-and-losers-of-the-digitalrevolution/ [Accessed 28.02.2021 2021]. MORAKANYANE, R., GRACE, A. A. & O'REILLY, P. 2017. Conceptualizing Digital Transformation in Business Organizations: A Systematic Review of Literature. *Bled eConference*, 21.

MORAKANYANE, R., O'REILLY, P., MCAVOY, J. & GRACE, A. Determining digital transformation success factors. Proceedings of the 53rd Hawaii International Conference on System Sciences, 2020.

MORGAN, J. 2014. *The future of work: Attract new talent, build better leaders, and create a competitive organization,* John Wiley & Sons.

MOSES, J. & KNUTSEN, T. 2012. *Ways of Knowing: Competing Methodologies in Social and Political Research*, Macmillan Education UK.

MURPHY, G. B., TRAILER, J. W. & HILL, R. C. 1996. Measuring Performance in Entrepreneurship Research. *Journal of Business Research*, 36.

NAGEL, L. 2020. The influence of the COVID-19 pandemic on the digital transformation of work. *International Journal of Sociology and Social Policy*, 40, 861-875.

NAMEY, E., GUEST, G., THAIRU, L. & JOHNSON, L. 2008. Data reduction techniques for large qualitative data sets. *Handbook for team-based qualitative research*.

NEALE, J., MILLER, P. & WEST, R. 2014. Reporting quantitative information in qualitative research: guidance for authors and reviewers. *Addiction*, 109, 175-6.

- NOOR, K. B. M. 2008. Case Study: A Strategic Research Methodology. *American Journal of Applied Sciences*, 5.
- NOWOTNY, H. 2016. The Increase of Complexity and its Reduction. *Theory, Culture & Society*, 22, 15-31.
- NOY, C. 2008. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. International Journal of Social Research Methodology, 11, 327-344.
- NWANKPA, J. & ROUMANI, Y. IT Capability and Digital Transformation: A Firm Performance Perspective. Thirty Seventh International Conference on Information Systems, 2016.
- OSMUNDSEN, K., IDEN, J. & BYGSTAD, B. Digital Transformation: Drivers, Success Factors, and Implications. MCIS, 2018. 37.

PARKER, C., SCOTT, S. & GEDDES, A. 2019. Snowball Sampling. SAGE Research Methods Foundations.

PEARCE, R. J. 1997. Toward Understanding Joint Venture Performance and Survival: A Bargaining and

Influence Approach to Transaction Cost Theory. Academy of MAnagement Review, 22.

PEILLON, S. & DUBRUC, N. 2019. Barriers to digital servitization in French manufacturing SMEs. *Procedia CIRP*, 83, 146-150.

PENROSE, E. 1959. *The Theory of the Growth of the Firm,* Oxford, OUP Oxford.

PESLAK, A. R., SUBRAMANIAN, G. H. & CLAYTON, G. E. 2007-2008. The Phases of ERP Software Implementation and Maintenance: A Model for Predicting Preferred ERP Use. Journal of Computer Information Systems.

PFADENHAUER, M. & KNOBLAUCH, H. 2019. Social Constructivism as Paradigm? The Legacy of the Social Construction of Reality.

PFLAUM, A. G., PHILIPP 2018. The IoT and Digital Transformation: Toward the Data-Driven Enterprise. *IEEE Pervasive Computing*.

PLATTFORMINDUSTRIE4.0. 2023. *Was ist Industrie 4.0?* [Online]. Available: <u>https://www.plattform-i40.de/IP/Navigation/DE/Industrie40/WasIndustrie40/was-ist-industrie-40.html</u> [Accessed]. PORRAS, J. I. & SILVERS, R. C. 1991. Organizational Development and Transformation. Annual Review of Psychology, 42.

PORTER, M. E. 1980a. Competitive Strategy.

- PORTER, M. E. 1980b. *Competitive strategy: techniques for analyzing industries and competitors*, Free Press.
- PRATT, M. K. 2021. *Replacing vs. maintaining legacy systems* [Online]. Available: <u>https://www.techtarget.com/searchcio/feature/Replacing-vs-maintaining-legacy-</u> systems [Accessed].
- PRIYONO, A., MOIN, A. & PUTRI, V. N. A. O. 2020. Identifying Digital Transformation Paths in the Business Model of SMEs during the COVID-19 Pandemic. *Journal of Open Innovation: Technology, Market, and Complexity,* 6.
- PURANAM, P. 2018. The Microstructure of Organizations, Oxford University Press.
- PURANAM, P., ALEXY, O. & REITZIG, M. 2014. What's "New" About New Forms of Organizing? *Academy of Management Review*, 39, 162-180.
- RACHINGER, M., RAUTER, R., MÜLLER, C., VORRABER, W. & SCHIRGI, E. 2019. Digitalization and its influence on business model innovation. *Journal of Manufacturing Technology Management*.
- REIS, J., AMORIM, M., MELÃO, N. & MATOS, P. Digital transformation: a literature review and guidelines for future research. World conference on information systems and technologies, 2018. Springer, 411-421.
- ROBERTSON, B. J. 2007. Organization at the leading edge: Introducing Holacracy[™]. Integral Leadership Review, 7, 1-13.
- ROBERTSON, B. J. 2015. *Holacracy: The new management system for a rapidly changing world*, Henry Holt and Company.
- ROBINSON, O. 2014. Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative Research in Psychology*.
- ROBSON, C. & MCCARTAN, K. 2016. Real World Research
- RODRÍGUEZ, N. G., PÉREZ, M. J. S. & GUTIÉRREZ, J. A. T. 2008. Can a good organizational climate compensate for a lack of top management commitment to new product development? *Journal of Business Research*, 61, 118-131.
- SAP. 2022. Was ist SAP? [Online]. Available: <u>https://www.sap.com/austria/about/company/what-is-sap.html</u> [Accessed 11 May 2022].
- SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2016. *Research methods for business students,* Harlow, England London New York, Pearson.
- SCHMIDT, J., DREWS, P. & SCHIRMER, I. 2017. Digitalization of the banking industry: A multiple stakeholder analysis on strategic alignment.
- SCHUMACHER, C., KECK, S. & TANG, W. 2020. Biased interpretation of performance feedback: The role of CEO overconfidence. *Strategic Management Journal*, 41, 1139-1165.
- SEBASTIAN, I., ROSS, J., BEATH, C., MOCKER, M., MOLONEY, K. & FONSTAD, N. 2017. How big old companies navigate digital transformation.
- SHINTA WINASIS, ULI WILDAN & SUTAWIDJAYA, A. H. Impact of Digital Transformation on Employee Engagement Influenced by Work Stress on Indonesian Private Banking Sector. 5th
 - NA International Conference on Industrial Engineering and Operations Management, 2020.

- SIA, S. K., SOH, C. & WEILL, P. 2016. How DBS Bank Pursued a Digital Business Strategy. *MIS Quarterly Executive*, 15.
- SIMON, H. A. 1951. A Formal Theory of the Employment Relationship. *Econometrica*, 19.
- SIMON, H. A. 2002. Science seeks parsimony, not simplicity: searching for pattern in phenomena. *Simplicity, Inference and Modelling.*
- SINGH, A. & HESS, T. 2017. How Chief Digital Officers promote the digital transformation of their companies. *MIS Quarterly Executive*, 16.
- SKLYAR, A., KOWALKOWSKI, C., TRONVOLL, B. & SÖRHAMMAR, D. 2019. Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research*, 104, 450-460.
- SMITH, K. A., VASUDEVAN, S. P. & TANNIRU, M. R. 1996. Organizational learning and resource-based theory: an integrative model. *Journal of Organizational Change Management*, 9, 41-63.
- SOLBERG, E., TRAAVIK, L. E. & WONG, S. I. 2020. Digital mindsets: recognizing and leveraging individual beliefs for digital transformation. *California Management Review*, 62, 105-124.
- SOLTANI, E., PEI-CHUN, L. & GHARNEH, N. S. 2005. Breaking Through Barriers to TQM Effectiveness: Lack of Commitment of Upper-Level Management. *Total Quality Management*, 16.
- SOLUK, J. 2022. Organisations' Resources and External Shocks: Exploring Digital Innovation in Family Firms. *Industry and Innovation*, 29, 792-824.
- STAKE, R. E. 1995. The Art of Case-Study Research.
- STAKE, R. E. 2005. Qualitative Case Studies. *The Sage handbook of qualitative research, 3rd ed.* Thousand Oaks, CA: Sage Publications Ltd.
- TABRIZI, B., LAM, E., GIRARD, K. & IRVIN, V. 2019. Digital Transformation Is Not About Technology. *Harvard Business Review*.
- TATIKONDA, M. V. & ROSENTHAL, S. R. 2000. Technology Novelty, Project Complexity, and Product Development Project Execution Success: A Deeper Look at Task Uncertainty in Product Innovatio. *IEEE Transactions on Engineering Management*, 47.
- TEECE, D. J. 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319-1350.
- TEKIC, Z. & KOROTEEV, D. 2019. From disruptively digital to proudly analog: A holistic typology of digital transformation strategies. *Business Horizons*, 62, 683-693.
- THARENOU, P., DONOHUE, R. & COOPER, B. 2007. *Management Research Methods,* Cambridge, Cambridge University Press.
- THOMSON, S. B. 2011. Qualitative Research: Validity. JOAAG, 6.
- TILSON, D., LYYTINEN, K. & SØRENSEN, C. 2010. Digital infrastructures: The missing IS research agenda. Research commentary. *Information Systems Research*, 21, 748-759.
- TOMA, C. & BUTERA, F. 2009. Hidden profiles and concealed information: strategic information sharing and use in group decision making. *Pers Soc Psychol Bull*, 35, 793-806.
- TOMIČIĆ FURJAN, M., TOMIČIĆ-PUPEK, K. & PIHIR, I. 2020. Understanding Digital Transformation Initiatives: Case Studies Analysis. *Business Systems Research: International journal of the Society for Advancing Innovation and Research in Economy*, 11, 125-141.

TÖYTÄRI, P., TURUNEN, T., KLEIN, M., ELORANTA, V., BIEHL, S., RAJALA, R. & HAKANEN, E. 2017. Overcoming institutional and capability barriers to smart services.

TRENERRY, B., CHNG, S., WANG, Y., SUHAILA, Z. S., LIM, S. S., LU, H. Y. & OH, P. H. 2021. Preparing Workplaces for Digital Transformation: An Integrative Review and Framework of Multi-Level Factors. *Front Psychol*, **12**, 620766.

TULINAYO, F. P., SSENTUME, P. & NAJJUMA, R. 2018. Digital technologies in resource constrained higher institutions of learning: a study on students' acceptance and usability. *International Journal of Educational Technology in Higher Education*, 15.

UBIPARIPOVIĆ, B., MATKOVIĆ, P., MARIĆ, M. & TUMBAS, P. 2020. Critical factors of digital transformation success: A literature review. *Ekonomika preduzeća*, 68, 400-415.

VAISMORADI, M., TURUNEN, H. & BONDAS, T. 2013. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nurs Health Sci*, 15, 398-405.

VAN DE KAMP, P. 2014. Holacracy–A radical approach to organizational design. *Elements of the Software Development Process-Influences on Project Success and Failure. University of Amsterdam*, 13-26.

VAPORTZIS, E., CLAUSEN, M. G. & GOW, A. J. 2017. Older Adults Perceptions of Technology and Barriers to Interacting with Tablet Computers: A Focus Group Study. *Front Psychol*, 8, 1687.

VENKATESH, V., MORRIS, M. G., DAVIS, G. B. & DAVIS, F. D. 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27.

VERHOEF, P. C., BROEKHUIZEN, T., BART, Y., BHATTACHARYA, A., DONG, J. Q., FABIAN, N. & HAENLEIN, M. 2019. Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901.

VERHOEF, P. C., BROEKHUIZEN, T., BART, Y., BHATTACHARYA, A., QI DONG, J., FABIAN, N. & HAENLEIN, M. 2021. Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901.

VIAL, G. 2019. Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28, 118-144.

VOGELSANG, K., LIERE-NETHELER, K., PACKMOHR, S. & HOPPE, U. Barriers to digital transformation in manufacturing: development of a research agenda. Proceedings of the 52nd Hawaii International Conference on System Sciences, 2019.

WANG, C. L. & AHMED, P. K. 2007. Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, 9, 31-51.

WANG, Y. 2022. Analyzing the mechanism of strategic orientation towards digitization and organizational performance settings enduring employee resistance to innovation and performance capabilities. *Front Psychol*, 13, 1006310.

WARNER, K. S. & WÄGER, M. 2019. Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, 52, 326-349.

WEICK, K. E. & QUINN, R. E. 1999. Organizational Change and Development. *Annual Review* of Psychology, 50.

WELCH, C., PIEKKARI, R., PLAKOYIANNAKI, E. & PAAVILAINEN-MÄNTYMÄKI, E. 2011. Theorising from case studies: Towards a pluralist future for international business research. *Journal of International Business Studies*, 42, 740-762.

WERNERFELT, B. 1984. A Resource Based View of the Firm. *Strategic Management Journal*, 5.

WESTERMAN, G. & BONNET, D. 2015. Revamping Your Business Through Digital Transformation. *MIT Sloan Management Review*.

- WESTERMAN, G., BONNET, D. & MCAFEE, A. 2014. *Leading digital: Turning technology into business transformation*, Harvard Business Press.
- WESTERMAN, G., CALMÉJANE, C., BONNET, D., FERRARIS, P. & MCAFEE, A. 2011. Digital Transformation: A roadmap for billion-dollar organizations. *MIT Center for digital business and capgemini consulting*, 1, 1-68.

WIKIEDUCATOR Digital artefact.

- WÓJCIK, P. 2015. Exploring Links Between Dynamic Capabilities Perspective and Resource-Based View: A Literature Overview. *International Journal of Management and Economics*, 45.
- WORLD-ECONOMIC-FORUM 2018. Digital Transformation Initiative: Executive Summary. World Economic Forum.
- XUE, L., ZHANG, C., LING, H. & ZHAO, X. 2013. Risk-Mitigation in Supply Chain Digitization: A Study of System Modularity and IT Governance. *Journal of Management Information Systems*, 30.
- YEOW, A., SOH, C. & HANSEN, R. 2018. Aligning with new digital strategy: A dynamic capabilities approach. *The Journal of Strategic Information Systems*, 27, 43-58.
- YIN, R. K. 2018. *Case study research and applications Design and Methods*, SAGE Publications.
- YOO, Y., BOLAND JR, R. J., LYYTINEN, K. & MAJCHRZAK, A. 2012. Organizing for innovation in the digitized world. *Organization science*, 23, 1398-1408.
- YOO, Y., LYYTINEN, K. J., BOLAND, R. J. & BERENTE, N. 2010. The next wave of digital innovation: Opportunities and challenges: A report on the research workshop'Digital Challenges in Innovation Research'.
- YUQIONG, Z. 2008. Voluntary adopters versus forced adopters: integrating the diffusion of innovation theory and the technology acceptance model to study intra-organizational adoption. *New Media & Society*, 10, 475-496.
- ZELENY, M. 2012. High technology and barriers to innovation: From globalization to relocalization. *International Journal of Information Technology & Decision Making*, 11, 441-456.
- ZOLLO, M. & WINTER, S. G. 2002. Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13, 339-351.

Appendix

Two example handwritten notes from the interviews

(Some parts are invisible to protect the interviewees.)

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