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Understanding determinants of digital transformation and digitizing management functions in incumbent SMEs

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ABSTRACT

This study focused on the factors enabling digital transformation and the digitization of management functions in small- and medium-sized enterprises (SMEs). Empirical evidence was derived from case studies involving 22 incumbent SMEs. The findings indicate that while employee capabilities and digital know-how are essential enablers of digital transformation, they also present challenges, including skill gaps, resistance to change, and reliance on legacy systems. To facilitate effective digital transformation, we propose that SMEs enhance technological skills within their workforce, cultivate innovation-friendly cultures, and address the disconnect between public discourse and actual digital tool adoption. Companies should adopt a cautious approach when integrating new technologies, emphasizing sustainable and human-centric transition. Furthermore, developing leadership skills that promote data-driven decision-making, collaborative problem-solving, and adaptive management is crucial. This study provides valuable insights into the dual role of employee capabilities in both facilitating and obstructing digital transformation within SMEs, offering guidance on strategies to successfully overcome the challenges that this transformation brings.

1. Introduction

In the current business landscape, the integration of digital technologies has become synonymous with survival and success. Incumbent small-and-medium-sized enterprises (SMEs), recognized as the backbone of economy, have initiated a transformative journey toward digitalization.

Organizations are undergoing a transformation by the innovation driven by digitalization (Kraus et al., 2023). The change not only promotes the adoption of advanced technologies, but also requires a comprehensive reassessment of management functions, practices, and operational roles within incumbent SMEs. Companies have also begun focusing on data and their role and value differently owing to Digital Transformation (DT) (Brownlow et al., 2015). Gupta et al. (2020,b) state that DT requires a fundamental change in the organization's underlying mindset, systems, and tools to reposition parts of, or entire, organization. Nambisan et al. (2017, p. 224) also endorsed this view, saying “[i]t's the creation of, and consequent change in, market offerings, business processes, or models that result from the use of digital technology.”

In this era of Industry 4.0, it is imperative to understand the importance of the dynamics of DT in light of not only technological

transformation, but evolution of the entire industry.

The business environment in firms is undergoing rapid transformation driven by digitalization, making the current traditional business models outdated (Wirtz et al., 2022). Digital technologies are the central driving force enabling this change (Aström et al., 2022). The transformation is considered a disruption that requires a strategy to respond to the change in environment. To determine alternative ways to remain competitive, create value, and overcome challenges of DT, companies are required to make structural changes (Hess et al., 2016).

Public discussion has increasingly focused on the endless possibilities, challenges, and even threats that digitalization could bring to work life. Furthermore, it appears that incumbent SMEs' understanding and the manner in which they use new technologies such as artificial intelligence (AI) in the near future is somewhat overstated, even exaggerated. Research on the status of DT in incumbent SMEs is still nascent. Research on this topic began emerging in 2019, followed by a marginal growth in the number of published papers on the subject. Only limited studies have delved into this topic in 2021–2024. So, there is a notable gap in the research on digitalization in SMEs, especially regarding the specific drivers and challenges these businesses face. While digital transformation holds significant potential for improving SME

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performance, current research often focuses on large enterprises, leaving SMEs underexplored. Existing studies indicate that factors like leadership, employee skill levels, access to technology, and external collaborations (e.g., with universities or suppliers) significantly impact SMEs' digitalization efforts. However, more research is needed to fully understand these dynamics within the unique contexts of SMEs.

Firstly, one identified gap is the lack of holistic research that integrates the various dimensions affecting SME digitalization. These include technological capabilities, human capital, and organizational strategies. Many studies only address one aspect, such as technology adoption, without considering broader organizational or relational factors, such as collaboration with external partners or internal resistance to change. For example, larger SMEs may face complex digital challenges requiring professional management, whereas microenterprises tend to rely more on personal leadership and external collaborations due to limited internal resources (Romero & Mammadov, 2024; Thrassou et al., 2020).

Secondly, while some frameworks exist to study technology adoption, they primarily focus on IT systems rather than the overall business transformation required for digitalization. The specific economic and strategic challenges SMEs face, including cost barriers, leadership's digital mindset, and the need for continuous business model innovation, remain underexplored (Sagala & Öri, 2024).

Thirdly, the literature on enabling forces, obstacles, and strategic drivers in DT and the management of digitization in incumbent firms in recent years (2021–2024) is limited (Eisape, 2022). While there is a vast volume of theory on DT (Brownlow et al., 2015; Wessel et al., 2021), limited research has focused on the underlying secondary factors that influence the multi-dimensional entirety of propelling and implementing the change—transformation.

Hence, there is limited information on this phenomenon in the context of incumbent SMEs that focus on production and services in a business-to-business (B2B) environment. Existing research has provided only fragmented knowledge regarding the means that incumbent SMEs can utilize in their digitalization efforts (Svahn et al., 2017). SMEs that have established themselves in the market play a significant role in the economy, since they generally represent a major proportion of the total turnover for companies. However, the phenomenon has yet to receive extensive attention from researchers. Accordingly, it is crucial to understand and bring some objective reality to the discussion regarding the status of incumbent SMEs, the factors that propel change, their use of novel technologies, and short-term expectations of these companies from digitalization, in comparison to the prevalent understanding of the subject. Hence, it is important to highlight the economic impact of companies' ability to adapt to DT, since it could have wide-ranging implications in creating jobs, innovation, and competitiveness even on a global scale (Zhang et al., 2023).

This study contributes to the growing body of research on Digital Transformation (DT) in small and medium-sized enterprises (SMEs), with a particular focus on those operating in Business-to-Business (B2B) sectors, an area that has received comparatively limited attention in the literature. While much of the existing research has predominantly examined DT in large enterprises or concentrated on specific aspects such as technology adoption, this study offers a holistic perspective by integrating organizational, technological, and human factors. By addressing the unique challenges SMEs face in B2B contexts, this research fills a significant gap in the literature. The study builds on and extends key works in the fields of Digital Transformation, SME Strategy, and Business Model Innovation. It draws upon Marcysiak and Pleskacz (2021) who systematically review the state of digitalization in SMEs, and Omrani, Rejeb, Maalaoui, Dabić, & Kraus (2022), which identifies the key drivers and challenges of digital transformation in SMEs. Unlike previous studies that focus mostly on large firms or narrow aspects of transformation, such as technology adoption (Van Zeebroeck et al., 2021), this study emphasizes the multidimensional impacts of DT on business models, operations, and stakeholder relationships, offering a

broader view of how SMEs undergo transformation in response to digital disruptions.

The understanding of DT is crucial for SMEs, as digitalization can significantly enhance their competitiveness and long-term sustainability. By investigating the drivers, enablers, and challenges faced by SMEs, this study provides actionable insights for business leaders seeking to leverage digitalization for growth and improved performance. Furthermore, this research contributes to Dynamic Capabilities Theory (Teece et al., 1997) by demonstrating how SMEs develop and deploy capabilities to respond to digital disruption. It also uses the Resource-Based View (RBV) to examine how SMEs utilize existing resources and capabilities to foster digital innovation (Lubis, 2022). This study advances theoretical understanding by offering a comprehensive framework that integrates organizational, technological, and human factors in the digital transformation process, challenging traditional models that focus mostly on technology-driven approaches. Ta and Lin (2023) and N'Dri and Su (2024) further emphasize the importance of understanding the interplay between technology, organizational structures, and environmental factors for the successful adoption of digital transformation in SMEs.

This article emphasizes DT's multi-dimensional entirety in SMEs with a focus on three research questions (RQ1 & RQ2):

RQ1. What are the drivers and enabling factors of digital transformation in SMEs?

In light of the many opportunities presented by digitalization, it is essential to identify the factors that enable digital transformation (DT) in small- and medium-sized enterprises (SMEs). Understanding these enabling factors will clarify how organizational capabilities, employee skills, and cultural attitudes contribute to successful digital initiatives. Additionally, recognizing the drivers that influence digital transformation allows SMEs to align their strategies with changing market demands and technological advancements. This research aims to provide a clear overview of the dynamics involved in digital transformation, enabling SMEs to leverage their strengths effectively. For additional clarification; drivers create the need for change, while enablers help make that change happen.

RQ2. In what ways can SMEs overcome the challenges of implementing digital transformation?

As SMEs digitize management functions, they face new challenges and opportunities. This research aims to identify key challenges, such as resistance to change and resource limitations, while also highlighting opportunities for improved efficiency and better decision-making. By understanding these factors, SMEs can make informed decisions that help them overcome obstacles and take advantage of trends in digital management. The insights from this study are intended to provide SMEs with the knowledge needed to successfully manage their digital transformations and improve their competitiveness.

RQ3. What opportunities does digital transformation present SMEs?

Digital transformation (DT) presents significant opportunities for small- and medium-sized enterprises (SMEs) to enhance their operations and competitiveness. This research question aims to identify specific benefits that arise from adopting digital technologies, such as improved operational efficiency, and data-driven decision-making. Understanding these opportunities is crucial for SMEs to strategically align their resources and capabilities. By recognizing the potential for innovation and productivity gains, SMEs can better adapt to changing market demands and remain competitive. Ultimately, this research seeks to provide insights that empower SMEs to leverage digital transformation effectively for sustainable growth.

The paper consists of four sections. Section 2 introduces the relevant literature on the digital transformation in organizational control and incumbent firms. Section 3 is written to describe the used methodology and the findings are presented in Section 4. Section 5 discusses the

findings and presents practical and theoretical implications and section 6 concludes the study with research's limitations and future research directions.

2. Literature review

2.1. Digital transformation in organizational control

Vial (2021) defines DT as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies.” The transformation of business identity, processes, and organizational structure is linked to this definition (Wessel et al., 2021), which leads us to believe that DT is directly linked to creating new business models and innovative products and services—organizational innovation (Ceipek et al., 2021). In addition, the integration of digital technologies redefines value chains, allowing for improved efficiency and responsiveness through automation and collaboration. Therefore, DT pushes companies and organizations to re-assess their business model and the value that the data has in it (Adama & Okeke, 2024), since data is considered an integral part of all digital systems that are in the center of the fundamental change during the DT of an organization (Qiao et al., 2024). There are multiple definitions and frameworks for DT (Vial, 2021), which suggest that the core meaning relates to the change in the way organizations and companies create value through digitization.

The digital maturity of incumbent companies, particularly SMEs, is critical for understanding the impact of DT on the business landscape and economy. While digitalization offers significant opportunities for growth and innovation, many companies face challenges in achieving and sustaining digital maturity (Aslanova & Kulichkina, 2020; Thorsen et al., 2020). Factors influencing digital maturity include organizational readiness, building digital capabilities, integration of digital technologies into business processes, and the ability to adapt to evolving digital trends (Machado et al., 2020). A culture of agility and continuous learning is essential for successful DT, as highlighted by Venkataramani & Kothandaraman, 2020) who emphasize the importance of cultural alignment. Furthermore, DT enhances customer engagement by leveraging data analytics to deliver personalized experiences, enabling organizations to strengthen customer relationships (Verhoef et al., 2021). The digital maturity of SMEs and large companies differs significantly due to variations in resources, talent, and technology adoption strategies. SMEs often have limited financial resources, leading them to adopt cost-effective digital solutions like cloud computing and SaaS platforms, which are easier to implement with smaller budgets (Agostini & Nosella, 2020). In contrast, large companies have the resources to invest in cutting-edge technologies such as artificial intelligence, big data, and IoT. They can build in-house expertise, allowing for more sophisticated digital transformation (Moumtzidis et al., 2022). Despite the recognized importance of DT, research on the digital maturity of incumbent companies is nascent, with limited empirical studies addressing the specific challenges and opportunities faced by SMEs. Therefore, it is imperative to conduct comprehensive research to assess the current state of digital maturity, identify the barriers to adoption, and explore possibilities to accelerate DT within this context.

Digitizing management functions within SMEs presents both challenges and opportunities that reshape organizational operations and roles. As traditional management practices integrate digital technologies, challenges emerge in areas such as workforce adaptation, data privacy, cybersecurity, and organizational agility (Kahfi, 2022). Additionally, the complexity of managing digital platforms and analyzing increasing volumes of data requires upskilling of existing talent and strategic investment in digital infrastructure (Gupta, Leszkiewicz, et al., 2020; Gupta, Modgil, et al., 2020). The digitalization of management functions also provides opportunities for effective decision-making, improved customer engagement, streamlined processes, and innovation in business models (Kraus et al., 2022). By leveraging digital tools

for tasks such as data analytics, collaboration platforms, and automated processes, SMEs can increase efficiency, agility, and competitiveness in the digital era. The challenges that SMEs face in their digitalization effort can be reflected through the lens of three key theories. Real Business Cycle (RBC) theory explains that technological advancements act as “shocks” that impact SME productivity, often constrained by limited resources to fully capitalize on them (Delmar et al., 2011). This theory helps illustrate the difficulties SMEs face in implementing digital tools due to financial and operational limitations. Human Capital Theory highlights the digital skills gap within SMEs, where the lack of employee expertise and leadership capabilities hinders the adoption of new technologies (Ghobakhloo & Tang, 2015). Investment in digital skills and knowledge is crucial for overcoming this challenge. Lastly, the Capability, Digitalization, and Value (CDV) framework suggests that SMEs need to build sufficient internal capabilities to harness digital tools effectively, thereby creating value through increased efficiency and competitiveness (Slimane et al., 2022). These theories together emphasize that SMEs face challenges concerning resources, skills, and organizational readiness during digital transformation (Romero & Mammadov, 2024; Sagala & Öri, 2024; Thrassou et al., 2020).

DT in SMEs is influenced by multiple factors that either facilitate or impede the process. It is crucial to understand these factors to navigate the complexities of DT effectively. Enablers of DT often include factors such as leadership commitment, organizational culture that is innovation-friendly, availability of skilled workforce, access to funding, and supportive regulatory frameworks (Imran et al., 2021). Conversely, hindrances may arise from factors, including resistance to change, legacy systems, lack of digital literacy among employees, resource constraints, and cybersecurity concerns (Gupta, Leszkiewicz, et al., 2020; Gupta, Modgil, et al., 2020). Additionally, contextual factors such as industry dynamics and competitive landscape play a significant role in shaping the pace and extent of DT adoption within SMEs (Omran, Rejeb, Maalaoui, Dabić, & Kraus, 2022).

Fig. 1 presents the framework of digitalization in incumbent companies and the building blocks that define the shape and intensity of transformation. The meaning and expectations combined with challenges and perceived risks conclude the factors that affect the formation and intensity of DT. The framework also includes the outcomes of digitizing operational and management functions.

2.2. Digital transformation in incumbent firms

Current literature agrees almost jointly that incumbent firms in general face challenges in implementing novel digital tools in their operations and strategic practices (Wohlleber, Bock, Birkel, & Hartmann, 2022). However, the current understanding is that there is insufficient practical research on how DT can be made into reality and managed successfully, and the basic enablers and drivers for the change, as well as challenges and the current level of digitization in firms (Wohlleber, Bock, Birkel, & Hartmann, 2022).

Some of the barriers to DT failing to achieve expected success include lack of resources and complex business environments as well as low agility in operations. Companies launch extensive DT incentives across the organizations, but often end up making their business less manageable and daily operations complicated to be efficient and create value (Cichosz et al., 2020; Jöhnk et al., 2022). There has been limited research on the underlying factors that influence the successful implementation and utilization of new technologies, although some researchers have proposed that the main reasons are lack of leadership, adverse organizational culture, and absence of organizational adaptability and strategic agility (Cichosz et al., 2020; Warner & Wäger, 2019; Wohlleber, Bock, Birkel, & Hartmann, 2022).

Although the challenges have been identified, they have yet to receive the required attention. Some studies have focused on developing and engineering solutions to overcome this challenge that many incumbent organizations have. Meanwhile, some others have created

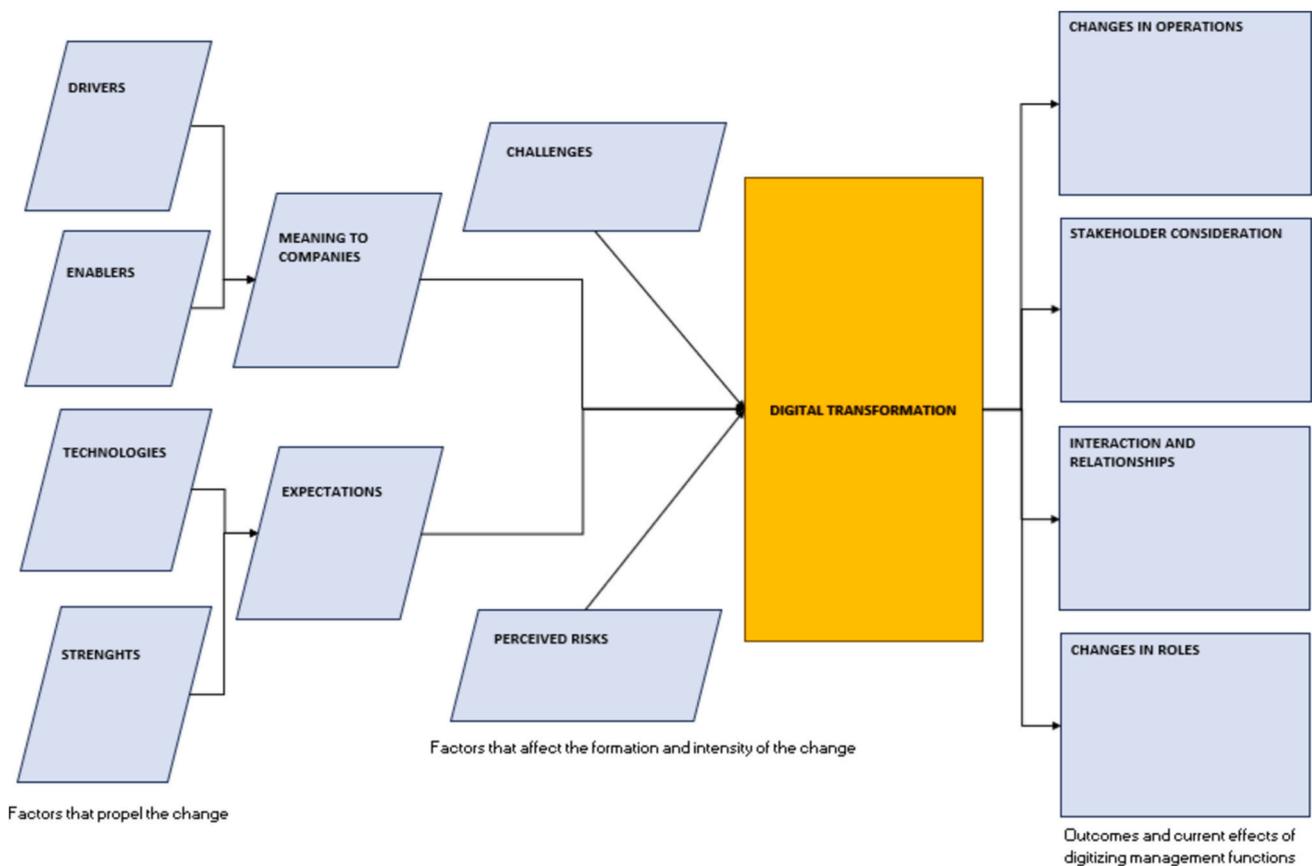


Fig. 1. The Pillars of Corporate Digital Transformation.

frameworks for strategizing the new digital competitive landscape where the interplay of organizational form, cognitive barriers that the management may have, and the need for reconfiguring digital routines are underlined (Volberda et al., 2021). Some argue that successful DT is driven by responsibilities, incentives, and ownership, where making a single person in a company responsible for the transformation is the solution (Klos et al., 2021). Although some studies failed to consider why these undertakings fail, they offered insights into how companies in general approach DT and what could be justified as the best strategic paths to follow in different conditions and settings (Margiono, 2021).

However, as far as our current knowledge extends, no study has investigated the actual needs and expectations that SMEs have from DT and digitizing their functions, as well as what are the internal and external drivers and challenges especially in incumbent SMEs. We also aim to elucidate the factors that cause the gap between public discussion where everything will—or even has to—soon be digitized and run by artificial intelligence (AI) and other digital technologies, and the reality and future expectations in the companies. Furthermore, we seek to determine what are the probable reasons and factors behind the current level of expectations, and perceived future possibilities from utilizing novel digital tools in management control systems and organizational control.

3. Method

3.1. Case selection

Considering the nature of this study, Purposive Sampling method was used, and Homogenous Sampling was utilized for precision. Purposive sampling means that the participants were selected intentionally based on their experience and position in the company they represent. Using homogenous sampling as a purposive sampling technique aimed

to achieve a sample with homogenous characteristics. This was seen useful to lessen the noise due variation. The possible downside in this method is narrower generalizability of the results. However, it was not seen as a relevant issue in this context. (Etikan et al., 2016). Interviewees were selected using researchers' personal networks and snowballing (Lecy et al., 2014). Snowballing and using personal networks was not seen as risk since the selection criteria was followed. Overall, 22 one-to-one semi-structured interviews were conducted from August 2023 to November 2023. The sample size was considered to represent the population of interest and the result can be generalized in incumbent SMEs.

All the interviewees were involved in the general management of their companies; therefore, they had a good understanding of their companies' current status after digitizing their functions and understood the topics covered in the interview. The criteria for selecting the interviewees were as follows:

- 1) They must have access to relevant information concerning digitization-related initiatives in their organization.
- 2) They must possess a basic understanding about the main concepts of this study. I.e. they work in a profession and position that requires basic understanding about common novel technologies.
- 3) Companies must be incumbent firms that produce products or services in a B2B business environment.

Interviewees' position in their organization, industry, and company's size are presented in Table 1. All the companies are based in Finland, but also have global operations. The credibility of this research is supported by careful interviewee selection, and the range of different represented organizations gives the sample a maximum variation while the focus is maintained on the research questions (Miles & Huberman, 1994). Interviewees Number A1 and A7 work in a big company—not SME—but the branch companies for which they work fit in the scope of the

Table 1
Interviewees and organizations.

No.	Interviewee's Role	Industry	Company size (Persons)
A1	Head of Regional and investment sourcing	Integrated Engineering Enterprises	6000
A7	Production Asset Manager	Integrated Engineering Enterprises	610
A5	Director, Innovations	Integrated Engineering Enterprises	201
A19	Enterprise architect	Information Technology and Consulting	190
A18	Business Controller	Integrated Engineering Enterprises	160
A10	Business Manager	Integrated Engineering Enterprises	92
A8	Production and Site Manager	Integrated Engineering Enterprises	75
A2	Controller	Integrated Engineering Enterprises	72
A22	Engineer	Information Technology and Consulting	60
A13	Sales Manager	Information Technology and Consulting	52
A6	Production Manager	Integrated Engineering Enterprises	51
A15	Director, Supply Chain and IT	Integrated Engineering Enterprises	34
A4	Business Director	Information Technology and Consulting	28
A12	Business Director	Transport and Logistics	19
A3	Senior consultant, Manufacturing	Information Technology and Consulting	16
A17	Sales Manager	Integrated Engineering Enterprises	12
A21	Development Manager	Integrated Engineering Enterprises	11
A16	Project Director	Integrated Engineering Enterprises	9
A20	Sales manager	Transport and Logistics	6
A9	Product specialist	Information Technology and Consulting	5
A11	Sales Director	Information Technology and Consulting	3
A14	Managing Director	Information Technology and Consulting	2

research based on the turnover and number of employees, them being less than 50 M€ and 250 persons. It was also observed that including these companies in the sample did not cause any noticeable anomalies in the results. Including these different companies in the sample works also as a control measure to the results. It points out how SME-sized branches of big companies can be compared to SMEs. Hence, they were considered to fit in the criteria of data collecting sample and to support quality of the research.

3.2. Data collection

Qualitative research, particularly analysis of interview data, demands a systematic approach to draw meaningful insights. This article details a robust and streamlined methodology employed in the analysis of 22 qualitative interviews, showcasing the integration of Microsoft Teams, Stream, Word, and Excel. The process involves transcription, verification, categorization, and prioritization of recurring themes. The analysis was data-driven. Theory creation followed an abductive approach, with both the data and theory guiding the theorization process.

The study commenced with interviews conducted on Microsoft Teams, generating approximately 50 h of recorded content. The interviewees were not aware of the interview questions before being interviewed. They were only presented with research questions and a

few key concepts that pertained to the scope of the interview. Not sharing interview questions with interviewees beforehand helped to minimize bias and ensured authentic responses, drawing on concepts from social desirability bias and expectancy theory. Social desirability bias suggests that individuals may tailor their answers to appear more favorable or align with what they believe the interviewer wants to hear (Grimm, 2010). This can lead to responses that reflect social expectations rather than genuine beliefs or knowledge (Fisher, 1993).

Similarly, expectancy theory suggests that people adjust their behavior based on anticipated outcomes (Vroom, 1964). If interviewees expect certain questions, they may craft responses to align with perceived desirable answers, rather than offering unfiltered perspectives (Oliver & Berger, 1979).

By withholding questions, researchers can get more spontaneous, honest responses, reducing the effects of social desirability and expectancy, and ultimately gathering higher-quality, unbiased data (Tourangeau & Yan, 2007), enhancing the scientific rigor of the study.

This approach ensured that there would be as little bias as possible in their answers, and there was no possibility to create new opinions and standpoints on the discussed issues before the interview. Leveraging Microsoft Stream for transcription, the resulting transcription text was transferred to Microsoft Word, forming the basis for subsequent analysis.

To ensure accuracy of data, a meticulous verification process was undertaken. Missing information identified during the analysis of Word documents was cross verified with original recordings to ensure data integrity.

3.3. Data analysis

Categorization and initial analysis were facilitated through Microsoft Excel, where relevant excerpts from the interviews were organized. This structured data was subsequently reintegrated into Word for a more cohesive and streamlined editing process.

Identification of recurring themes became a pivotal step, employing a color-coding system within Word documents. First, the transcriptions were read through carefully and recurring themes and words were identified. Each theme was given a designated color and the words and themes in the texts were highlighted with this color. This enabled the researcher to have a visual and intuitive understanding of recurrence and thematic patterns. Color coding the themes also made it easy to collect the sentences and chapters with distinct theme to MS Excel -file for further analysis.

Aggregation and quantitative analysis were executed in Microsoft Excel, where data from the color-coded Word documents were systematically organized. This facilitated a quantitative assessment of the occurrence of each theme, providing valuable insights into the prominence of specific topics within the dataset. The interview results analysis chart is presented in Appendix 2. The chart includes all interview questions and the themes that were recurring the in the answers. E.g. the first interview question was "Please explain what digitalization and digital transformation means to you and what it means to your company?" and from the chart you can see that the theme that was repeated in the answers most was "Making data processing more efficient".

This subsequent formation of overarching themes involved grouping recurring themes to identify larger entities and overarching patterns. To prioritize themes based on their significance, occurrences of each theme were quantified. This step elucidates the most-frequently recurring themes, providing a perspective on the most important and meaningful aspects highlighted by the interviewees. Data collection and analyzing process is presented in Fig. 2.

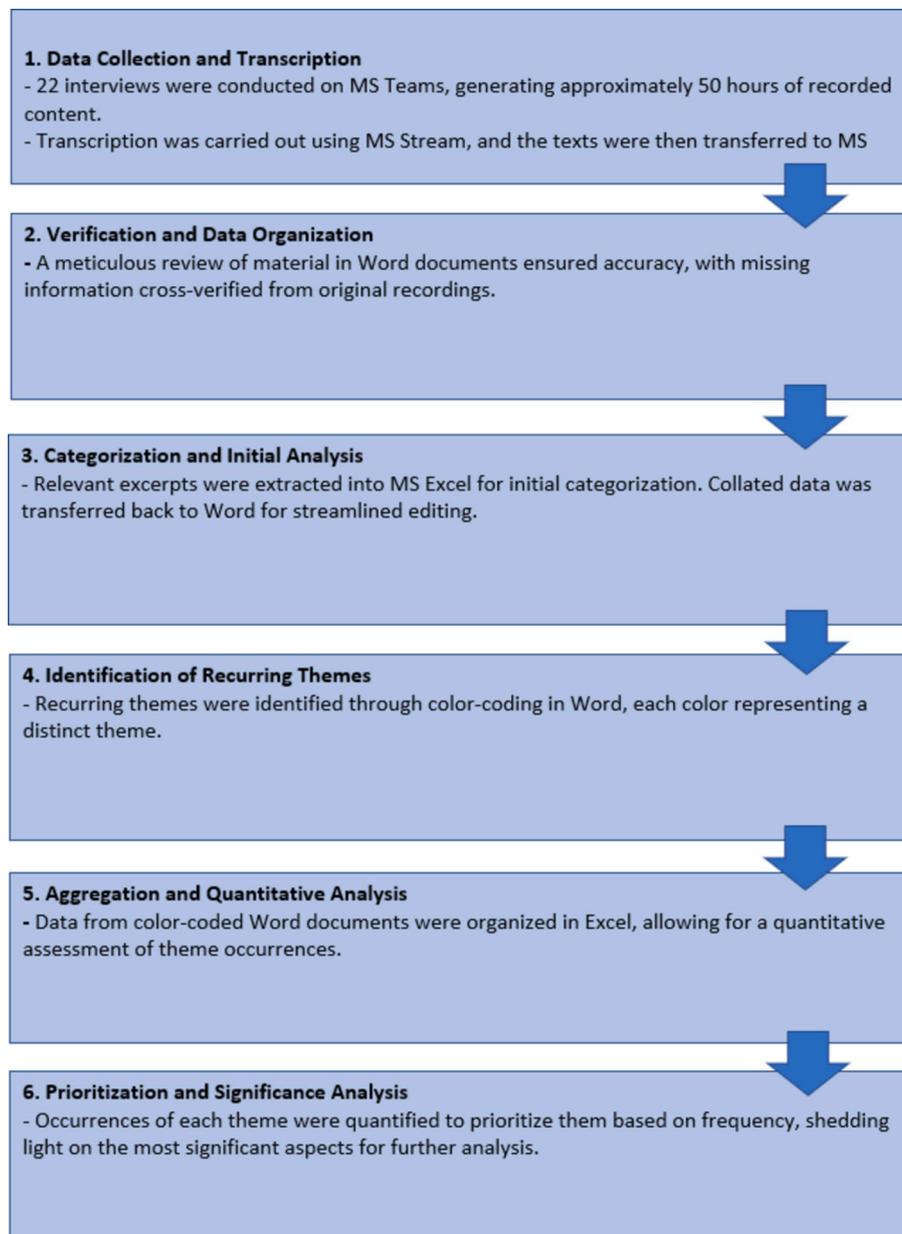


Fig. 2. Data collection and analysis.

4. Findings

4.1. Strategic dimensions of corporate digitalization

4.1.1. Enabling factors for digitalization

When exploring the enabling factors for transformation and successful implementation of digital tools, the identified recurring themes offer valuable information about the underlying mechanisms driving progress within the organization.

Within the category of Leadership and Organizational Commitment, leadership emerged as a cornerstone, providing direction and instilling a sense of purpose essential for transformation initiatives. Leaders' commitment to adapt to change sets the tone for the entire organization, fostering a culture of adaptability and innovation. Collaboration and stakeholder engagement are crucial enablers, ensuring alignment across various departments and shared vision on DT. Moreover, celebrating success and ensuring sufficient resources further empower teams to overcome challenges and drive the change.

“Operators were involved in the development project. This helped in

‘selling’ the idea for the operators, resulting in better and easier implementation.”

“Successful projects and good results increase the positive atmosphere for change. They also encourage managements to permit changes in the organization. Good experiences in user level and positive feedback offer more possibilities to make new changes.”

In the Technology and Innovation Ecosystem, the enabling factors revolve around empowering employees and cultivating a culture conducive to technological advancement. Employee development initiatives and a focus on tech literacy equip the workforce with the skills and knowledge needed to embrace digital tools effectively. Tech literacy can be seen as the most important enabler since it had the most recurrences in the interview material. Additionally, fostering an environment that promotes innovation and experimentation encourages the exploration of new technologies and approaches, driving continuous improvement and adaptation.

“Technology development and the fact that costs have come down has enabled this change for smaller companies as well. Generally, tech literacy and the desire for lifelong learning have been important changes. The

company's culture allows innovation, which promotes responsibility. Development and innovation are more democratic, like decision making too."

"Employees understand well the meaning of efficiency and the management has a will to put effort into these things. The level of IT know-how and good positive attitude toward change enables people to try new things."

"The main enabler is employees' personal will and ambition to develop their work and learn."

Therefore, having technologically capable employees and their knowledge regarding novel technologies helped enhance DT for these companies. The second largest impact as an enabler was technological development and innovation-friendly organization culture. The size, industry, or the role of the interviewee in the company had no effect on the theme occurrence in the answers to the question.

4.1.2. Drivers for digitalization

Three main categories of recurring themes were found from the answers to the question: "What have been the so-called drivers for DT in your company?" They were Operational Excellence, Data-Driven Strategy and Strategic Adaptation, and Globalization.

Therefore, the drivers for DT within the organization reflect an approach aimed at achieving operational excellence, data-driven decision-making, and strategic adaptation to global trends.

Operational Excellence is the first of the main categories that holds in themes of Operational Efficiency and Process Improvement. This includes optimizing internal processes and workflow to enhance productivity and reduce inefficiency. Technological Advancements and Automation further accelerates this by leveraging innovative tools and systems to automate repetitive tasks and streamline operations, thereby driving overall efficiency.

"Essentially, there is a need to reduce manual work to be able to allocate work input to more productive tasks to be competitive. We also need to generate efficient and reliable data for enhancing operative management."

"The first thing that comes to my mind is a certain type of laziness. We tend to perform activities that are easy, with less effort. We also want to become more productive in knowledge work and use resources as efficiently as possible, optimize."

Within the main category of Data-Driven Strategy, DT is propelled by a focus on Data-Driven Decision-Making. Organizations harness the power of data analytics to derive meaningful insights, enabling informed decision-making and strategic planning.

"The driver is not necessarily from inside the company. It can be the feeling of being left out from something. Sometimes we start to build new systems that we do not know to use."

Additionally, a Customer-Centric Approach guides transformation efforts that emphasize the importance of understanding and meeting customer needs. Strategic decisions are further supported by Strategic Decision-Making and System Upgrades, ensuring that the organization's technological infrastructure remains robust and adaptable to evolving needs.

The third category, Strategic Adaptation and Globalization, is underscored by Competitiveness and Market Dynamics and Organizational Development and Culture. Organizations must remain agile and responsive to changing market conditions and competitive pressures, necessitating continual adaptation and innovation. Cultivating an environment of Organizational Development and Culture is equally crucial, fostering a culture of innovation, learning, and adaptability that enables successful DT.

"Overall, the reason is that our competitors are doing the same. We must persevere to enhance our efficiency with these new tools. If you want to remain in the business, competitive and alive, you have to do it."

All the three themes had nearly the same number of occurrences in the interview answers, but a closer look at the results revealed that the two most important drivers for DT in the companies in this sample were "Operational Efficiency and Process Improvement" and "Competitiveness and Market Dynamics."

It can be concluded that companies believe that increasing the use of

digital tools in their practices helps them remain competitive and improve their operational efficiency, by designing a strategy that relies on technological advancements and improving the performance of their processes. Data-Driven Strategy was considered equally important; therefore, companies are also looking for ways to improve their strategic decision making by utilizing digital tools in their data-processing.

4.1.3. Company's strengths in digitizing its functions

In the pursuit of implementing novel digital tools within their operations, organizations see their strengths in three categories that reflect their strategic foresight and adaptability: Strategic Alignment and Planning, Organizational Culture and Change Management, and Technological Adaptability and Efficiency.

Strategic Alignment and Planning emerged as one of the three most recurring themes in the interview. It indicates companies' ability to engage in efficient strategic planning and goal alignment to ensure that digital initiatives are not just implemented but integrated seamlessly into overarching strategic objectives.

"We have had a good understanding of what we want to achieve by the change. We have managed to select the right partners to implement the change and both parties have known the goals well. People have worked together; we have good resourcing plans and communication and change management. Of course, the management's support has been very positive too."

Organizational Culture and Change Management serve as one of the main strengths in successful DT. The organizations' supportive culture, characterized by openness to change and a passion for innovation, creates an environment that is positive to experimentation and growth. This culture of support not only nurtures creativity but also accelerates the pace of digital initiatives, enabling the organization to remain competitive in a rapidly-evolving setting.

"Implementation is usually well managed and the new tools are put to real use from day one. One of the requirements is that the new system is used across the organization. We also make sure that the new tools serve the work, and are not implemented in an incomplete manner to avoid extra manual work."

Furthermore, the organizations see Technological Adaptability and Efficiency as one of their notable strengths in implementing novel digital tools in their operations. This main category includes two sub-themes: Technological Adaptability, and Data Utilization and Technical Understanding.

"Younger workers are capable of adopting to changes and take new things to practical levels. They are also very innovative when it comes to new ways to use technology. Our team leaders have good skills in moving things forward and our management has the ability to make good decisions about investments in new technology."

In conclusion, most of the strength that the companies believe they possess to implement novel digital tools in their operations fall into three categories: Strategic Alignment and Planning, Organizational Culture and Change Management, and Technological Adaptability and Efficiency. Among them, Organizational Culture and Change Management has been considered the most important.

Another factor that companies perceive as their strength in implementing new technologies is Technological Adaptability and Efficiency. However, this quality was considered a challenge in another instance; therefore, it is imperative to examine this thoroughly.

4.2. Digital Transformation's impacts

4.2.1. Meaning and significance of digitalization for a company

Several recurring themes emerged in the interviews, highlighting the evolving strategies and priorities within organizations. These themes can be broadly categorized into three areas: Increasing the Level of Automation, Developing IT Systems and Data processing, and Adopting Digital Management Tools.

The first category focuses on the drive toward automation, which is considered crucial for streamlining processes and reducing reliance on

manual labor. By automating repetitive tasks and workflows, organizations can improve efficiency and productivity, while minimizing errors. This theme underscores the ongoing shift toward leveraging technology to augment human capabilities and optimize resource utilization.

Within the realm of automation, a key sub-theme revolves around reducing manual work involved in operations. This involves identifying tasks that can be automated through the use of robotics, AI, and other advanced technologies. By doing so, organizations can free up human resources so that they can focus on more strategic endeavors requiring creativity and critical thinking.

“Digital transformation and change in our company means that we try to implement systems to collect well-managed master data. It must be stored in one place and accessible for further analyzing and refining. Based on that data, we try to make appropriate decisions expeditiously. We also aim to reduce manual work in processing data, which enables the scaling of operations with the same resources, translating to lesser manual work, fewer errors, more reliable data and information.”

The second category pertains to the development of IT systems and data processing capabilities. Here, the emphasis is on making data processing efficient and seamless, thereby enabling expeditious decision-making and insight generation. Integration of IT systems plays a vital role in this process, ensuring that disparate systems across different departments or functions can communicate and share information seamlessly.

Moreover, optimizing data processing involves implementing advanced analytics and machine learning algorithms to extract meaningful insights from vast datasets. By harnessing the power of data, organizations can gain valuable insights into customer behavior, market trends, and operational performance, thereby informing strategic decision-making and driving innovation.

“Currently, it means ICT tools that enable better compatibility, data processing and sharing as efficiently as possible, and also handling complex and extensive tasks expeditiously. We have digitalized our business long ago. Many aspects, signals, in the industry have been digitalized already. The paradigm now is more about maybe Industry 5.0 when we add more data, analysis and computing to existing robotics and automation. We also build different interfaces for utilizing the data and publishing information.”

The third category revolves around the adoption of digital management tools to enhance organizational performance and competitiveness. These include initiatives aimed at fostering a data-driven culture where decisions are guided by empirical evidence rather than intuition alone. The emphasis is on transparency of data and information, enabling stakeholders at all levels to access relevant insights and make informed choices.

Furthermore, digital management tools are perceived as a means of gaining a competitive advantage in a rapidly-evolving business landscape. By leveraging technology to optimize processes, improve customer experiences, and innovate products or services, organizations can differentiate themselves from competitors and thrive in an increasingly digital-centric environment.

“For us it is a major concept. It means tools that make us competitive, translating to employees having access to modern tools to perform their daily work. It also helps reduce manual work tasks that are tedious and sometimes dangerous. In my opinion, these are the basics. Digitalization can also mean small changes in operating, like using smart phones for some systems and reporting. Conversely, it is a bigger concept that is also about adjusting, adapting, and forming the business. It is not always fun, it hurts. We should try to be brave and also accept failures. Fail fast and try something new.”

In summary, the interviews highlight organizations' commitment to embracing automation, enhancing IT systems and data processing capabilities, and leveraging digital management tools to drive operational excellence and competitive advantage in a dynamic business environment.

4.2.2. Changes in corporate practices with the adoption of novel tools

In the wake of increasing prevalence of digital tools, companies are undergoing significant transformations in their operations. One of the key changes include the optimization of IT systems and the integration of various digital tools into existing infrastructure, to streamline processes, enhance productivity, and improve overall operational efficiency. Companies leverage digital solutions to automate tasks, reduce manual workloads, and develop sophisticated Enterprise Resource Planning (ERP) systems and operational planning/control mechanisms. These enhancements enable better decision-making and resource allocation, contributing to improved organizational performance.

Furthermore, the availability of digital tools has empowered companies to harness the power of data for management purposes. Data-based management and analytics practices are being adopted to gain insights into various aspects of operations, customer behavior, and market trends. Companies are switching to real-time monitoring and performance evaluation through digital reporting and Key Performance Indicator (KPI) tracking tools. Additionally, there is a growing emphasis on developing robust data collection mechanisms to ensure the availability of accurate and actionable data for informed decision-making.

“Reporting has changed from traditional static PowerPoints etc. to KPI Dashboards that has helped reduce the volume of manual work. We don't have to collect information manually for reports anymore since they come from the system in ready-made numbers and charts. This makes it possible for us to focus on actual management and controlling.”

“The main benefit is that data collection is automatized, and it is easy to recall previous data. We gather enormous volumes of data and make KPIs that no one really knows how to use, read, or know why they are being followed. Unfortunately, it takes too much efforts from productive management work. Automatic digital information offers analyses and charts, but does not actually offer information.”

Another significant change facilitated by digital tools is the transformation of work practices within organizations. Automation plays a central role in this transformation, as companies increasingly automate repetitive tasks to improve efficiency and divert resources for more strategic activities. Moreover, digital communication and collaboration tools enable flexibility and support hybrid working arrangements, allowing employees to work seamlessly, regardless of their location. Companies are increasingly investing in the development of communication platforms to facilitate smooth interaction and collaboration among employees, thereby enhancing productivity and fostering a cohesive work environment.

“Basically, smart phones have changed the way we operate now, and we are not dependent on the place where we operate. It may appear to be a good thing, but there are occasions when we have been forced to cancel some of the applications since our productivity was affected due to defective applications. We have also been forced to return to using local hard drives for saving data due to customers' demands.”

The manner in which companies have changed their operations and tasks by implementing novel digital tools resulted in efficient use and integration of digital systems, development of ERP systems and operational planning, data-based management and analytics, change in reporting and KPI tracking, data collection development, automatization and reduction in manual work, and flexibility and hybrid working. The three main themes include “IT system development and integration,” “data utilization in management,” and “facilitating changes in work.” Among them, data utilization in management was clearly the most popular theme in the interview material. Accordingly, digitalizing functions in companies has changed reporting and KPI tracking, data-based management and analytics, and development of data collecting.

The second category that novel digital tools has had an impact on was “facilitating changes in work.” This includes automatization and reducing manual work, developing communication and flexibility and hybrid working. The third theme was “IT system development and integration,” which consisted of efficient use of IT systems and integrating them and developing ERP and operational planning and control.

4.3. Organizational impact and perceived risks

4.3.1. Risks in digitizing management functions

Increasing the utilization of digital tools in management practices presents inherent risks, as highlighted through recurring themes from interviews. One of the risks relates to Data Quality, Accuracy, and Interpretation. As organizations rely heavily on digital tools for data analysis and decision-making, there is a heightened potential for errors in data quality or misinterpretation of results, leading to flawed decision-making processes. Moreover, the lack of human-centric leadership and intuition poses a notable risk. Over-reliance on digital tools may overshadow the importance of human judgment and intuition in decision-making, potentially resulting in suboptimal outcomes.

“The maturity level of the organization must be appropriate or sufficient before you can even think about adding sophisticated technology. Usually, the best tools are simple task lists, responsibility definitions, controlling etc. It is a pity that often the solutions offered are too sophisticated that no one knows how to use or has the time or the understanding to even learn. It is also a risk to think that leadership can be outsourced to a machine. It is after all only a tool, and people have their responsibilities. A successful ratio of tech and common sense is probably about 20/80.”

Additionally, Security Risks emerged as a primary concern with the increased adoption of digital tools. The digitization of management practices introduces vulnerabilities to cyber threats, data breaches, and unauthorized access to sensitive information. Therefore, organizations must prioritize robust cybersecurity measures to safeguard against these risks effectively.

Furthermore, risks in Organizational Readiness, Adaptation, and Competence are significant considerations. Organizations may encounter challenges in adapting to new digital tools, processes, and workflows, potentially leading to resistance or inefficiencies in operations. Moreover, lack of competence among employees in utilizing digital tools further increases these risks, hindering successful implementation and adoption.

“The process knowledge can get weaker when people don’t have to calculate and deduct things themselves. Now it is all about feeding information into the systems and you don’t have to be concerned about failures, which reduces the ability to make agile game moves when needed. Data and meters can be wrong, and this can cause wrong assumptions and conclusions of things. Also, the ability to see things that can’t be seen from the data can get weaker.”

“People working in managerial positions are overburdened, when they are required to deal with bigger entreties. That makes it possible to notice also the less important things that can cause some additional stress as well. Strategy may seem unclear when it is fast-paced and there is a constant flow of new tools and ideas all the time. The focus may be in wrong places at times.”

Overall, these identified risks can be classified into two main categories: Risks in Management and Risks in Organization. According to the interview material there were more mentions about risks that concern Risks in Management. Especially the Risks in Data Quality, Accuracy and Interpreting were perceived as the type of risks that have the most impact.

4.3.2. Roles’ transformation

The transition toward digitizing management functions and operations could result in profound changes in the roles of managers and superiors, as analyzed from the interview responses.

A significant shift is the increased reliance on accurate, fact-based information for decision-making. With digitization, managers and superiors leverage data-driven insights to inform their managerial decisions. This reliance on data fosters a more informed and strategic approach to management, increasing operational efficiency and effectiveness.

“It streamlines and makes the work easier when you can focus on important things. All information is available for everyone, which gives you more time to focus on developing, analyzing and leading people.”

Furthermore, the role of leaders is expected to transform into that of guides and supporters. Rather than merely directing operations, managers and superiors should focus on providing guidance, support, and mentorship to their teams. This shift toward a more supportive leadership style cultivates a collaborative and empowering work environment, fostering employee growth and development.

“Leadership should always have a humane approach. There are many fundamental issues to be addressed before we shift our focus to the latest and most efficient new technologies in use. Basic goal setting and control does not require complex technology. Digitalizing leadership through tasking and controlling tools reduces the commitment toward leaders. The primary task should be to make people commit in their concrete work. The maturity level of the organization should be right or sufficient before everything else.”

Digitization also enhances visibility and transparency across the organization. Managers and superiors have better access to real-time data and insights, allowing for effective monitoring of operations and alignment with organizational goals. This increased transparency fosters trust and accountability within the organization, driving collaboration and teamwork.

“The role of managers is transformed into that of coach and innovator. Decisions can be made at a lower level to some extent owing to transparency in information sharing. Managers are not required to only interpret the data and make decisions, but can make decisions based on actual operations and functions.”

However, the integration of digital tools drives an increasing demand for digital literacy and adaptability among managers and superiors. To effectively utilize these tools and navigate the evolving technological landscape, managers must have the necessary skills and knowledge.

“While routine tasks decrease, requirements of skills and knowledge increases dramatically. The time that is freed up from routine tasks can be utilized for new tasks that could eventually increase the workload. The need for being able to read meters and understand where they come from grows when already collected data is analyzed. The requirement for shop floor-level superiors’ role increases, and there are entirely new qualities that are needed in know-how and handling complex entreties. Most likely the essence of normal work will change at an operative level and the speed of systems development will be faster than people’s development.”

Moreover, as routine tasks become automated through digitization, the role of managers and superiors switch to a complex problem-solving. After being freed from basic tasks, managers have the capacity to focus on strategic initiatives and address complex challenges within the organization.

Additionally, digitization facilitates the decentralization of decision-making processes. Shared access to uniform information through digital platforms empowers stakeholders at different levels to participate in decision-making, enabling a more interactive organizational culture. This decentralization promotes agility and adaptability, enabling the organization to respond effectively to changing markets and possibly emerging opportunities.

In summary, the digitization of management functions and operations fundamentally transforms the roles of managers and superiors as they increasingly rely on data-driven insights, evolve into supportive mentors, foster transparency and collaboration, adapt to digital demands, engage in complex problem-solving, and promote decentralized decision-making.

4.3.3. Impact on relationships and interaction

According to the respondents, the integration of new digital technologies is expected to reshape interactions and relationships between managers, superiors, and employees.

An impact worth noting is the enhancement of communication through transparent data sharing. Digital tools enable real-time data dissemination, facilitating effective communication channels between employees and management. This transparency fosters trust, collaboration, and informed decision-making within the organization.

Moreover, the transition from subjective discussions to objective,

fact-based conversations is significant. With access to data-driven insights, digital technologies promote evidence-based decision-making, reducing reliance on subjective opinions. This shift toward objective discussions elevates the quality of interactions, empowering managers, superiors, and employees to make informed and strategic decisions.

“It is possible to enhance interaction when we see from the data what is the real situation with the workload and discuss about performance. This could prove to be agonizing for some employees because their true efforts and performance become visible and transparent. Communicating about the benefits that can be gained by digitizing functions is important in making sure that everyone is ready for the new tools.”

Additionally, digital technologies make communication flexible and efficient, while flattening organizational hierarchies. By leveraging digital communication platforms, employees can interact with managers and superiors seamlessly, transcending traditional hierarchical boundaries. This flattened hierarchy cultivates a culture of openness, accessibility, and innovation across the organization.

Ensuring organizational readiness for this transformation requires careful preparation and effective communication. Organizations must invest in comprehensive training programs and communication strategies to equip employees with the necessary skills and knowledge for technology adoption. Clear communication regarding the benefits and objectives of technology integration is essential to garner employee support and mitigate resistance to change.

“Training and familiarizing people with technology ensures that the organization is ready for change. When we have data and facts, the discussion remains effective, and we can focus on important aspects from the work’s point of view.”

Furthermore, involving employees in the development and decision-making process is crucial. By soliciting input and feedback from employees, organizations can leverage their insights and expertise to tailor digital solutions to meet the unique needs of the workforce. This participatory approach fosters a sense of ownership and commitment toward change, driving successful implementation and adoption of new digital technologies.

“There is some impact. Data has no feelings, no soft values, no green values, even though we still need those. After all, financial performance reflects a company’s success or failure. Well-being at work and motivation have a lot to do with that of course. Digital aids make interactions easier, but cannot replace face-to-face meetings and discussions. Well-being can seemingly improve, but generally people feel lonely due to the lack of social contacts. Weak signals of poor well-being cannot be seen in video meetings.”

In summary, the adoption of new digital technologies can potentially revolutionize interactions and relationships within organizations. However, the significance of face-to-face interaction and managing by other non-quantifiable factors has been emphasized.

4.3.4. Challenges in digitizing functions

In the process of implementing novel digital tools within its operations, organizations have encountered numerous challenges. The two main challenges that recurred in the interview material were Organizational, Cultural and Resource Factors, and Technical Implementation Factors.

In the first category, Cultural Resistance and Attitude toward change emerged as notable hurdles, where prevailing attitudes toward change and reliance on traditional methods have impeded adoption. Financial Constraints and Resource Scarcity present significant challenges, limiting investments in necessary technologies, training programs, and infrastructure upgrades. The resources imply the workforce that is assigned into development projects. It is not uncommon that companies use their internal workers in projects.

“The resistance. New ways of working seem to be tough to assimilate. It is also challenging to start learning about new systems while performing existing tasks simultaneously. In these cases, it is difficult to perceive the benefits of the new systems. When we discuss about AI, the main concerns are lack of understanding and considering the possibilities. Information security is also an

issue with the technologies that are entirely new.”

“People are generally happy with old systems that are already established even if certain jobs need to be performed manually. People don’t see any reason to start developing things that have higher abstraction levels. Really this is about the collaboration of two different worlds, IT and OT. Digitalization requires that ICT tools are being utilized in an industrial environment. The challenge is to combine IT and OT worlds even at the administrative level, since different functions have different needs, protocols etc.”

A lack of Technological Understanding and Digital Maturity among employees is one of the most noticeable barriers. Insufficient knowledge of new technologies and digital skills hinder the adoption and utilization of digital tools.

“The main issue is technological understanding, given that there are major differences within the company. Another issue is the data transfer between systems, and the processing capacity of systems. Third, the lack of understanding regarding the required technologies and the kind of solutions needed. Do we want to add more systems on top of the old, or is there a way to use the old systems effectively?”

Technical Implementation and System Integration prove to be complex challenges, demanding meticulous planning and coordination. Communication breakdowns and data ownership issues exacerbate implementation hurdles, hindering collaboration and decision-making. Furthermore, Data Quality and Fragmentation present significant hurdles, affecting the reliability and effectiveness of digital tools. Lastly, the complexity of existing processes and increased workload during the transition have been notable challenges.

“There is a lack of resources to innovate. People don’t dare to raise new ideas since they are usually not considered important; therefore, they will not obtain the required resources. The implementation of new working procedures are not communicated, and it is often one person’s responsibility. This results in a situation where new ideas will not be implemented widely, or they will die.”

In conclusion, the main challenges that companies face in implementing new technologies in their operations are related to two broader categories of factors: Organizational, Cultural and Resource and Technical Implementation. Among them, the latter was mentioned only a few times, and the factor that received increasing attention was Organizational Communication and Data Ownership Issues. The main challenges in digitizing functions are cultural resistance and attitude toward change, financial constraints and resource scarcity and technological understanding and digital maturity.

“I would like to turn this setting the other way around; there are no challenges or hindering factors, only a need for experimentation and considering opportunities. There is also a great deal of fear and lack of understanding regarding how digitalization can eliminate barriers and bottle necks. The benefits of digitalization are considered much more critically than for example conventional machine investments. The point is, go through positives, not negatives or constraints. More daring and national control is needed!”

4.3.5. Challenges in digitizing management functions

Digitizing management functions and operations entails several challenges that organizations anticipate or have encountered. These challenges can be broadly categorized into three main areas.

First, Technology and Data present significant hurdles. Companies find it challenging to ensure the quality and accuracy of data that is essential for informed decision-making. Integration issues arise when new digital tools and systems need to be integrated with existing technologies, potentially disrupting data flow and operational processes.

“The benefits of the transformation can go in vain when the communication about the needs and purpose of using data is not performed clearly downstream in the supply chain. In the worst case it can distort goals. A common problem is that people excessively rely on the new systems, and blindly trust all information that it feeds. Data is also a challenge when new systems are implemented. New systems shouldn’t use old history data since it is collected differently. However, people tend to believe that new systems can

fix problems from the past as well. There is also a lack of perseverance. Many companies change their metrics and data collection frequently, so there is no sensible background data available. This implies that the data is not comparable, and therefore it is impossible to set goals. Knowledge management only tells you about the problem, but doesn't consider solutions."

Culture and Competencies pose another set of challenges. Transitioning to digital ways of working requires a cultural shift within organizations, which can be met with resistance from employees. Additionally, acquiring the necessary skills and competencies to effectively use digital tools and analyze data is challenging. Employees may require extensive training to adapt to new technologies and workflows.

"Challenges and enablers can sometimes be the same. Digital understanding and maturity is a challenge; even though there is an intention to do something, there is not enough understanding of the possible solutions. The cost of technology is considered another constraint that prevents organizations from introducing digitalization."

Management faces various challenges related to cost, resources, and investment. Digitization initiatives often require significant financial investment for the acquisition and implementation of new technologies. Allocating resources effectively and prioritizing investments in digitization projects can prove to be challenging, especially for organizations with limited budgets. Additionally, sustaining digital initiatives in the long term necessitates ongoing investment in maintenance, upgrades, and staff training, adding to the financial burden.

"There are many complex areas in an organization. Some organizations do not have anyone to oversee certain work processes, so it is difficult to build new things in an uncertain environment. The scope and extent of the new system is difficult to define. It is challenging to build the architecture large enough to enable developing in the future, but on the other hand it shouldn't be extensive either."

4.4. Technological implementation, opportunities and expectations

4.4.1. Technological implementation

With regard to new technologies implemented to support operational functions and management, several recurring themes emerged from the interview.

Many companies prioritized data-driven decision-making by adopting various technologies. This includes implementing business intelligence and reporting tools to gain insights into key performance metrics and trends. Additionally, companies utilize data analytics platforms to extract actionable insights from large datasets, facilitating informed decision-making across different operational functions. AI was mentioned by only four interviewees, suggesting that it is not currently a common technology that is being utilized.

"Power BI and data analytics is being used across the organization. With better data analysis we can access real time information from our production. We also have a good forecast of production capacity in the coming weeks, which helps in selling the capacity and production planning. Financial reporting has also become faster and more accurate."

Another focus area is technology infrastructure and integration. Companies are investing in cloud technologies for scalable, flexible, and cost-effective data and application management. Communication and collaboration tools are also widely implemented to facilitate seamless interaction among teams, regardless of their location. Moreover, strategic planning and coordination technologies aid in aligning business objectives with operational activities, ensuring efficiency and coherence across the organization.

"The main task is to create a joint structure for business and IT. If we start to 'digitalize' only some areas, we need to have ready-built facilities for IT security, common cloud platforms etc. that are coordinated by the IT department. When these structures are ready, we can tap different opportunities and what is important for business. Only after putting in to practice, can the tools be implemented. So, we have only built this foundation now."

"We haven't really implemented any groundbreaking new technologies, mostly the existing common tools are being used. We managed to collect the

data in the right format and with fewer errors, which enhanced the quality of data. We can now also handle huge volumes of data more efficiently".

In terms of operational enhancement and production, companies are embracing new technologies to optimize manufacturing processes and boost productivity. This includes the adoption of automation systems, robotics, and advanced machinery to streamline production, reduce cycle times, and improve overall efficiency.

The four most recurring technologies or ways of using novel technologies were business intelligence and reporting, data utilization and analytics, cloud technologies, and strategic planning and coordination. It is worth noting that the functions that companies considered for introducing the new technology were mostly related to data processing and automating routine tasks, with limited mention of the most modern possibilities like utilizing AI.

4.4.2. Future expectations and opportunities

Companies anticipate significant benefits from digitizing management functions and operations. These include enhanced data quality and availability, and facilitating accurate and accessible information for decision-making. Improved real-time reporting, monitoring, and decision-making capabilities are also expected, empowering organizations to respond promptly to market dynamics.

"With precise and comprehensive data, it is possible to have effective real time situation information regarding all functions. Decision making can be done at lower levels of the organization, and it makes it possible for the management to focus on tasks that enhance the performance of the organization."

"Data quality and reporting will improve and expand to all functions. Decision making will be shifted at least partially to lower levels in the organization. Management will have better understanding of the current situation."

Additionally, there is a strong emphasis on leveraging AI for data analysis, forecasting, and decision support. AI-powered analytics tools enable companies to derive valuable insights from large datasets, guiding strategic initiatives and anticipating future trends effectively. Moreover, digitization is expected to foster a culture of data-driven leadership, where decision-makers rely on data and analytics to drive organizational performance and innovation.

"The changes in operations offers teams and units more autonomy in their work. New technologies enable them to decide when and where to work. Some believe that leading from a lower level will not be the most efficient way anymore. The use of AI in data and information processing is expected to increase when it can be used in the company's own data processing. Real time and good quality data enables better fact-based decision making."

"The use of AI is expected to increase significantly. It can help build risk analyses, market analyses, business cases and make predictions expeditiously and accurately. Every company uses AI in its operations. At some point, all employees are expected to have their own AI assistants to take care of routine tasks. Work will change so that the experts that now sit in meetings and support management can focus on their real work and use their expertise."

Furthermore, companies expect increasing automation of routine tasks and processes through digitization. Automation streamlines operations, freeing up human resources for more strategic tasks that demand human judgment, and enhancing overall productivity and work satisfaction.

In summary, digitizing management functions and operations is expected to revolve around leveraging data effectively, enhancing decision-making capabilities, embracing AI-driven insights, fostering data-driven leadership, and increasing automation.

4.4.3. Stakeholder considerations in corporate digitization

Several recurring themes emerged in the interviews with the 22 companies regarding their approach to considering stakeholders during change initiatives. A majority of companies emphasized stakeholder engagement and development throughout the change process. They highlighted the importance of effective communication and training to

ensure that stakeholders understood the reasons behind the changes and were equipped with the necessary skills to adapt. Some companies also emphasized the adoption of a customer-centric approach to ensure seamless system integration during change initiatives. They prioritized understanding and addressing customer needs and preferences, as well as integrating digital tools in supply chain and into existing systems for operational efficiency. Despite efforts to prioritize communication, certain challenges were identified, indicating the need for improvement in communication channels and providing feedback promptly.

“We have a portal for supply chain management that is of course in the use of stakeholders as well. We have given training for that. It is not mandatory, but extremely useful. Internally we have involved employees to commission new systems, but actual adoption takes time. In the upstream, to the supplier, we don’t have a portal, so we use traditional ways of communication.”

Overall, the insights underscored the importance of considering stakeholders’ perspectives and involving them through the change process to ensure successful implementation and alignment with desired outcomes. By prioritizing stakeholder engagement, effective communication, and training initiatives, companies aimed to minimize resistance to change and foster a sense of ownership and commitment among stakeholders. Moreover, the focus on a customer-centric approach and system integration reflected companies’ efforts to enhance overall customer experience and optimize operational processes.

“We have interacted with many stakeholders. We use cloud-based applications for information exchange, revision control, reducing the need for meetings etc. where all stakeholders can access the same systems, applications, documents etc.”

“We also have a supplier portal for tracking deliveries, where we occasionally receive negative feedback, especially when work processes change. Sharing information about production is generally considered as a positive move among the customers. Changes are rarely seen on the customer side.”

Interestingly, a customer-centric approach was not considered important as was information security, while integrating systems even though one of the most important drivers for digitizing functions is to remain competitive in the market.

“Generally, we have limited consideration for stakeholders potentially owing to modesty. The real drivers for change are undoubtedly the external needs, customers.”

5. Discussion

5.1. Theoretical contributions

The first research question (RQ1) in this study was “What are the drivers and enabling factors of digital transformation in SMEs?” The following paragraphs will summarize the results on enabling factors and drivers for digitalization, companies’ strengths in implementing novel tools, and how have operations changed when novel tools have been implemented.

The most crucial enabling factor for digitalization in incumbent SMEs that operate in B2B sector in developed area was having technologically capable employees with knowledge regarding novel technologies, which aligns with the principles of Human Capital Theory that emphasizes the value of knowledge and skills as organizational assets (Ghobakhloo & Tang, 2015). The second largest impact as an enabler was technology development and innovation-friendly organizational culture. The findings align with the Capability, Digitalization, and Value (CDV) framework, which posits that fostering innovation-friendly organizational cultures enhances the capability to derive value from digitalization efforts (Slimane et al., 2022). However, companies also perceived the same factors as their main challenges in DT. Precisely, the main challenges that companies perceive that they have in implementing new technologies in their operations are related to two broader categories of organizational, cultural and resource, and technical implementation factors. From the perspective of the CDV framework,

the challenges of aligning organizational culture and resource constraints reflects a gap in building the capabilities required to gain full potential of digitalization (Slimane et al., 2022). This aligns with existing literature, which highlights the significance of human capital and organizational culture in facilitating DT (Ghafoori et al., 2024). Additionally, investment in human capital and skills development is essential; Ghobakhloo (2020) stress that without adequate digital skills, transformation efforts may fail. User experience also plays a vital role, with Norman and Draper (1986) advocating for user-centered design to enhance technology adoption. This finding also underscores the Human Capital Theory, which emphasizes that a lack of investment in employee skills and knowledge can hinder the adoption and effectiveness of novel technologies (Ghobakhloo & Tang, 2015).

Established SMEs perceive the main reason—driver—for increasing the use of digital tools in their practices of manufacturing and providing services is to remain competitive and improve their operational efficiency by designing a strategy that relies on technological advancements and improving the performance of their processes. The identified drivers align with Real Business Cycle (RBC) Theory, which highlights how technological advancements serve as key determinants of productivity and financial performance (Delmar et al., 2011). Data-driven strategy was also seen as an important factor; therefore, SMEs are looking for ways to improve their strategic decision-making by utilizing digital tools in their data processing. Most of the strengths that the companies see they have in implementing novel digital tools in their operations fall into three categories: strategic alignment and planning, organizational culture and change management, and technological adaptability and efficiency. Among these, organizational culture and change management were considered the most important strengths by the observed SMEs. Implementing novel digital tools resulted in the effective use and integration of digital systems, development of ERP systems and operational planning, data-based management and analytics, change in reporting and KPI tracking, data collection development, automatization and reducing manual work, and flexibility and hybrid working. The findings resonate with previous research indicating that SMEs adopt digital tools primarily to enhance competitiveness and efficiency (Ghobakhloo et al., 2018).

The second research question (RQ2) of this study was “In what ways can SMEs overcome the challenges of implementing digital transformation?” The findings can be summarized as follows:

The main challenges in digitizing operations include cultural resistance and attitude toward change, financial constraints and resource scarcity, and technological understanding and digital maturity. By prioritizing stakeholder engagement, effective communication, and training initiatives, companies aimed to minimize resistance to change and foster a sense of ownership and commitment among stakeholders. This finding is consistent with Human Capital Theory, which emphasizes the role of skill development and knowledge transfer in fostering organizational adaptability and reducing resistance to technological change (Ghobakhloo & Tang, 2015). Moreover, the focus on a customer-centric approach and system integration reflected SMEs’ efforts to enhance overall customer experience and optimize operational processes. These results are consistent with the common barriers faced by SMEs in adopting digital technologies (Chouki et al., 2019). Effective change management and employee engagement are critical to overcoming resistance to change (Besson & Rowe, 2012). *This aligns with the CDV framework’s assertion that stakeholder involvement and co-creation enhance the capability to develop digital strategies that deliver value to the organization (Slimane et al., 2022).* The concept of co-creation emphasizes the involvement of stakeholders in developing digital strategies (Prahald & Ramaswamy, 2004), ensuring that transformations align with their needs.

The third research question (RQ3) of this study was “What opportunities does digital transformation present SMEs?” The findings can be summarized as follows:

The functions that incumbent SMEs in B2B setting consider for

introducing new technologies were mostly related to data processing and automating routine tasks, and there was limited indications of considering the most modern possibilities like utilizing AI. The focus on automating routine tasks and enhancing data processing capabilities reflects RBC Theory's emphasis on leveraging technology to drive productivity and economic growth (Delmar et al., 2011). This observation reflects that some organizations may face challenges in identifying skilled personnel to implement and manage novel technologies effectively or there is a perceived risk and uncertainty about integrating novel technologies in existing systems and lack of understanding regarding its potential benefits. This highlights a gap emphasized by Human Capital Theory: the need for adequate investments in developing skilled personnel to effectively implement and manage novel technologies (Ghobakhloo & Tang, 2015). There can also be considerations regarding data privacy and job displacement. This mirrors trends observed in the literature, where SMEs increasingly leverage technologies like business intelligence and analytics for decision-making (Wee & Scheepers, 2022; Han & Trimi, 2022).

The results indicate that incumbent SMEs that operate in B2B sector are increasingly pushing to digitize top-level strategic functions, while employees' performance, behavior, and actions receive limited attention and is also perceived to be more challenging. The strategic emphasis on digitizing top-level functions aligns with the CDV framework's proposition that organizational capabilities must adapt to generate value from digitalization (Slimane et al., 2022). This underscores the need for a human-centric management toward addressing the challenges. Organizations are utilizing novel technologies and digitizing management functions mostly at the strategic level focusing on achieving pre-set goals with built controls, with maximum emphasis on technology development. Meanwhile, the greatest challenges in digitizing management functions are perceived to relate to human interaction and direct employee performance and action control. There is a growing body of literature emphasizing human-centric approach to digital transformation, which focuses on the crucial role of people—employees, customers, and stakeholders—in the success of digital initiatives. Key themes include the importance of leadership and organizational culture in fostering a digital mindset, as highlighted by Kane et al. (2015), who argue that strong leadership drives successful transformations. The results are in line with the current literature on DT, confirming the challenges in implementing novel digital tools in incumbent firms' operations and strategic practices. This finding aligns with the CDV framework's emphasis on leadership and organizational culture as critical capabilities for building digital mindset and achieving transformation success (Slimane et al., 2022). The results also conform to propositions that the reasons for DT not growing significantly are associated with resource availability, organizational agility, and complexity of business environments (Metzler & Muntermann, 2020; Volberda et al., 2021).

5.2. Managerial implications

There is a certain dual role of employee capabilities and digital know-how. Current skills, capabilities, and know-how are on a level where companies are able to make minor changes and implement new technologies efficiently, but sufficient skills, capabilities, and know-how to implement novel technologies and innovate are lacking. While knowledge and capabilities are essential enablers for progress, they can also become hindrances owing to skill gaps, change resistance, reliance on legacy-systems and cultural barriers. This is a paradox that can be derived from companies' insufficient ability to invest in training, modernizing IT infrastructure, and leveraging organizational culture with internal resources.

Managements face various challenges related to cost, resources, and investment. Digitization initiatives often require significant financial investment, including acquisition and implementation of new technologies. Allocating resources effectively and prioritizing investments in digitization projects can be challenging, especially for organizations

with limited budgets. Additionally, the greatest challenges were perceived to be related to cultural, digital skills, and know-how.

The identified risks in this study can be classified into two categories: Risks in Management and Risks in Organization. According to this study, risks in management gained increasing attention. Especially, risks in data quality, accuracy, and interpretation were perceived to have the maximum impact in digitizing management functions.

Future expectations and perceived opportunities that companies have from digitizing management functions and operations revolve around leveraging data effectively, enhancing decision-making capabilities, embracing AI-driven insights, fostering data-driven leadership, and increasing automation, which can be considered as modest in comparison to generally-touted possibilities and expectations. The digitization of management functions and operations fundamentally transforms the roles of managers and superiors. They increasingly rely on data-driven insights, evolve into supportive mentors, foster transparency, and collaboration, adapt to digital demands, engage in complex problem-solving, and promote decentralized decision-making. The adoption of new digital technologies can potentially revolutionize interactions and relationships within organizations. However, face-to-face interaction and management through other non-quantifiable factors have been emphasized.

Therefore, capabilities and needs for digitizing functions is relatively rudimentary, and the challenges in digitizing management functions should be approached with less sophisticated technical tools in order to make the transition more sustainable and controlled. This study also aimed to elucidate the factors driving gaps between public discussion where digitalization and technologies take over normal tasks, leading to traditional workforce becoming obsolete, and the current ways of utilizing novel digital tools in incumbent companies as well as expectations and reality in 2024. Ethical considerations in digital transformation underscore the importance of creating inclusive and responsible technologies (Westerman et al., 2014).

The practical implication of this study is that public discussion is highly exaggerated, generating fears such as loss of jobs, complicating tasks in general, an increase in cognitive capabilities for normal work, polarization of work life and vulnerability in terms of information safety and physical safety. Conversely, it may give the impression that all possible problems and challenges can be solved by digitizing absolutely everything in work and business. It is crucial to change the connotation of digitalization and DT to more positive but realistic ones. Collectively, the previously introduced insights affirm that a human-centric approach is essential for sustainable and effective digital transformation. Eventually, if the transformation is managed right, it could enhance our quality of life, while the need for normal human abilities and intuition will be highly valuable in the future.

6. Conclusion

In this study, we have explored the diverse landscape of DT in incumbent SMEs, elucidating the enabling factors, challenges, opportunities, and drivers for this transformation. Through empirical research and analysis, several key findings emerged, offering valuable insights into existing literature on management and DT.

First, the study identified the dual role of employee capabilities and digital know-how in driving DT efforts within SMEs. While technologically-capable employees and innovation-friendly organizational cultures served as primary enablers, they also presented challenges such as skill gaps, resistance to change, and reliance on old systems. This paradox underscores the importance of investing in training, fostering a culture of innovation, and modernizing IT infrastructure to leverage employee capabilities effectively.

Second, the study highlights the dominant focus of incumbent SMEs on data processing, analysis and routine task automation rather than embracing novel technologies like AI, which can be considered modest in comparison to existing possibilities. Challenges in integrating novel

technologies include resource scarcity, cultural resistance, and lack of sufficient digital capabilities.

Third, the research emphasizes the evolving role of managers in a digitized setting. As organizations increasingly rely on data-driven insights and automation, managers must evolve into supportive mentors, adaptive leaders, and collaborative problem-solvers. However, the study also emphasizes the continued importance of human-centric management practices and face-to-face interactions in pursuing organizational success.

Fourth, the findings highlight the gap between public discourse on digitalization and the current utilization of digital tools in incumbent SMEs. While there is a prevailing narrative of technological disruption and job displacement, our study suggests a more realistic approach to DT. SMEs must navigate challenges such as cost constraints, resource allocation, and cultural barriers while prioritizing sustainable transitions and human-centric management practices.

Fifth, the study indicates that digitalization of enterprises focuses more on top-level strategic functions, but not employees' performance, behavior, and actions, since it is perceived to be more challenging. This suggests that there is a need for human-centric management in the future, and the manner in which challenges in implementing novel digital tools should be approached need careful consideration; digitalization has many more dimensions than just technology.

In conclusion, this study contributes to the growing body of literature on DT in SMEs by providing empirical insights into enabling factors, challenges, and drivers for transformation. By understanding the complexities of DT and embracing a realistic and positive narrative, organizations can effectively navigate the digital landscape, drive innovation, and enhance their competitive advantage.

6.1. Limitations and future research

There are some identified limitations in this study that can have an influence on the results. First, the number of companies in the sample is limited and therefore it can be said that the results present a moderately-narrow view. However, the companies, their size, business, and position in the supply chain is diverse, so it can be seen as beneficial. Future research could expand the sample size to ensure better representation of the business landscape. The interviews could be crafted shorter by making the interview more structured. This could also make the process of analyzing the results easier. Second, given that the world is changing at a fast pace, some aspects presented in this study may have become obsolete. However, we are not studying technology as such, but the phenomenon that affects management controls, management control systems, and organizational control, which are not significantly affected by technology. A strategy that could help in overcoming this limitation would be to make a longitudinal study to observe changes in the determinants over time. Thirdly, this study did not concern possible risk mitigation strategies when companies are implementing novel digital tools in their operations. This could leave out important factors that have an impact on how companies handle uncertainties and disruption, and should be considered in future research.

Future research directions derived from the findings and more broadly from the landscape of DT within incumbent SMEs could be conducting longitudinal studies to track the evolution of DT efforts within SMEs over time. This would provide deeper insights into the long-term impacts of digital initiatives. Another interesting direction would be to delve deeper into human-centric approaches to DT, including change management strategies, employee empowerment, and skill development. Also, a research direction that could be interesting is to delve deeper into the strategies that SMEs can use to address challenges such as cultural resistance, financial constraints, and skill gaps as well as risk mitigation strategies.

CRediT authorship contribution statement

Sami Seppänen: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation. **Juhani Ukko:** Supervision, Project administration. **Minna Saunila:** Supervision, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.digbus.2025.100106>.

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