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Digital servitization and leadership: A holistic view on required leadership traits and skills

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Abstract

PURPOSE: *Digitalization and servitization are two major developments significantly disrupting companies' competitive landscape. The research area that combines both aspects, digital servitization, poses substantial opportunities and challenges for companies to navigate. It requires guidance from leadership to succeed and innovate, but current scientific research lacks a holistic view on leadership for digital servitization so far.* ***METHODOLOGY:*** *We conducted 30 semi-structured interviews with leaders active in digital servitization initiatives, holding positions ranging from first-level managers to vice presidents and executives. Eighteen have more than ten years of leadership experience. Through inductive coding, we derived 43 codes within a qualitative analysis. We applied thematic analysis to structure our findings, resulting in a thematic map of leadership skills for digital servitization based on the research participants' insights.* ***FINDINGS:*** *Our findings present a holistic view of leadership skills for digital servitization. Leaders need to consider the perspectives of strategic business and people leadership. Digital servitization requires leaders to engage in a wide range of activities. From a strategic business leadership perspective, this ranges from evolving goal setting, a comprehensive business understanding, the ability to find the right team composition, and understanding customer and market needs. The people leadership perspective requires leaders to create and communicate a vision for digital servitization and manage change and employees' fears while enabling and empowering employees. Furthermore, we identified that digital servitization requires a balanced level of cognitive, interpersonal, business, and strategic leadership requirements.* ***IMPLICATIONS:*** *We contribute to scientific research by providing a comprehensive definition of digital servitization and summarizing existing research focusing on leadership aspects of digital servitization. Our findings offer actionable insights for practitioners by approaching with a holistic view on digital servitization and considering strategic business and people leadership aspects. Applying our outlined themes will support leaders in improving the conditions and possibilities to successfully trigger and implement digital servitization activities within their companies.* ***ORIGINALITY AND VALUE:*** *Our research combines isolated leadership aspects for digital servitization and underlines the complexity of digital servitization, emphasizing the need for a holistic view. Outlining the element of balancing business and people skills provides novel insights on advancing digital servitization into the research domain, which is dominated by technical-oriented research.*

Keywords: *digital servitization, leadership, servitization, digitalization, change management, innovation, digital transformation, business, strategy*

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INTRODUCTION

Globalization and complex business environments are altering the business landscape for manufacturing companies (Kim & Toya, 2018). Within the last decade, transformational challenges such as globalization, demographic changes, or digitalization (Pęciak, 2016) have changed existing business models, customer relationships, and how products are developed, manufactured, and delivered (Frank et al., 2019). Manufacturing companies pursue differentiation by adding customer-oriented services to their existing offerings (Chen et al., 2021). Vandermerwe and Rada (1988) first described the phenomenon of adding value to the core offerings through services. They coined servitization as offering bundles of customer-focused combinations of goods, services, support self-service, and knowledge. Servitization can be seen as a strategic alternative to product innovation (Carlborg et al., 2014) and enhances customer relationships through customized and integrated offerings (Coreynen et al., 2017; Paschou et al., 2020). In addition to increasing service offerings, companies in almost all industries have conducted several initiatives to explore new digital technologies and exploit their benefits (Matt et al., 2015). Digitalization is described as using digital technologies (Fitzgerald et al., 2014) such as the Internet of Things (IoT), cloud and mobile services, artificial intelligence, big data, and social media (Mihardjo et al., 2019) to change existing processes, business models, and revenue streams. (Bloomberg, 2022; Clerck, 2017).

Despite originating from different research fields, scholars see a supporting link between servitization and digital technologies (Paschou et al., 2020; Vendrell-Herrero et al., 2017). The convergence of servitization and digitalization is called digital servitization and refers to developing new services or improving existing ones through digital technologies to enable new (digital) business models. (Gebauer et al., 2021; Paschou et al., 2019, 2020; Vendrell-Herrero et al., 2017). Large manufacturing companies such as General Electric or Rolls-Royce have introduced service business models enabled by digital technologies (Paschou et al., 2020). For example, whereas the aviation engine producer Rolls Royce implemented IoT technologies that allow monitoring engine data in real-time for compelling maintenance offerings, General Electric has developed analytic tools to enable remote monitoring services based on data analysis of the installed base (Evans & Annunziata, 2012; Lightfoot et al., 2013).

Nevertheless, scholars describe that most companies lag behind their expectations around digital servitization (Pham & Vu, 2022), mainly caused by complexity and interplay of involved stakeholders, making digital servitization challenging to manage (Kohtamäki et al., 2021). Utilizing digital technologies in servitization is associated with innovation (Coreynen et al., 2017). Especially when it comes to radical innovations and their realization, leadership is required and described as one of the most influential factors for innovation (Faix, 2020; Rosing et al., 2011). Reconfiguring business models, such as implementing digital services, requires organizational change (Bustinza et al., 2018), which Kotter (2000) defined as a leadership responsibility. Leadership requires a diverse set of skills ranging from cognitive, interpersonal, business, and strategic skills (Mumford et al., 2007), which extant literature emphasizes as important for building a true service culture (Dmitrijeva et al., 2020).

Digital servitization is a relatively new research stream (Paschou et al., 2020), mainly focusing on qualitative and case study-based research on how companies can supplement their service offerings through digital technologies (Gebauer et al., 2021). Some researchers point out certain aspects attributable to leadership concerning digital servitization. For example, Cimini et al. (2021) elaborated on employee competence development within digital servitization through case-study research. Another research contribution by Kohtamäki et al. (2021) provided insights into business skills for digital servitization through a single case study. Sklyar et al. (2019) investigated the scientific research on organizing activities for digital servitization, thus focusing on more strategic leadership aspects.

Despite its widely recognized importance for innovation and growth and rising research interest in digital servitization (Favoretto et al., 2022), current scientific research lacks a holistic view of leadership aspects and managerial decision-making models (Paschou et al., 2020). In the context of this study, a holistic view of leadership is understood as considering the multi-faceted aspects of leadership, such as cognitive, interpersonal, business, or strategic skills requirements (Mumford et al., 2007) and the different scopes of applicability ranging from leading individuals and teams (Day et al., 2004), building business models (Doz & Kosonen, 2010), financial and technology understanding to visioning and communication skills (Men et al., 2020).

The present, qualitative study aims to contribute through an exploratory research design, providing insights into relevant leadership skills for digital servitization through the following research questions: What are the relevant leadership skills for digital servitization? What is the scope of the leadership role, and what are the affected leadership skill requirements for digital servitization?

Using the data from thirty semi-structured interviews with leaders active in digital servitization activities, we examined which focus areas within companies and interpersonal relationships form a holistic view to support managing the inherent complexity of digital servitization.

LITERATURE REVIEW

The convergence of digitalization and increased service focus by building digitally enabled service business models are coined digital servitization (Paschou et al., 2019; Vendrell-Herrero et al., 2017). We first deconstruct the theoretical backgrounds of servitization and digitalization to introduce the current scientific discussion on digital servitization and highlight the connection to innovation. The following sections introduce the topic of leadership with a specific emphasis on the digital age before summarizing the current research contributions linking digital servitization and leadership.

Servitization, digitalization, and digital servitization

The term *servitization* was first introduced by Vandermerwe and Rada (1988) to increase value by adding services to a company's offering. Manufacturing companies transform from product-centric to service-oriented business models (Frank et al., 2019; Kowalkowski et al., 2017; Raddats et al., 2019). The change in business model expects a fuller market offering through the customer-oriented combination of goods, services, support, self-service, and knowledge (Vandermerwe & Rada, 1988). Baines et al. (2020) categorized services into base, intermediate, and advanced services (see also Figure 1). Whereas base services are related to warranties and spare parts, intermediate services can be understood as maintenance and repairs. Advanced services are more complex value propositions where companies provide performance outcomes such as pay-per-use contracts (Baines et al., 2020; Martinez et al., 2017).

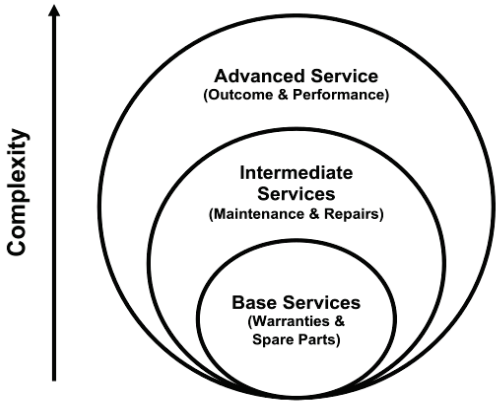

Figure 1. Service levels
Source: Own illustration based on Baines et al. (2020).

Servitization strategies can bring advantages compared to single product offerings. From a commercial perspective, adding service offerings leads to more steady revenue streams and higher profit margins (Baines et al., 2007; Bustinza et al., 2013; Gebauer et al., 2005; Wise & Baumgartner, 1999). Companies are more resistant to economic cycles than product-only businesses, especially in heavy investment industries (Oliva & Kallenberg, 2003). Servitization additionally creates the opportunity to achieve competitive advantages by addressing unmet customer needs (Oliva & Kallenberg, 2003). Manufacturing companies can offer customized and tailored service offerings to their customers, which are more difficult to imitate (Baines et al., 2007, 2009; Gebauer et al., 2005; Oliva & Kallenberg, 2003). Thus, manufacturing companies can avoid price-based competition (Baines et al., 2007). The servitization process describes a business model change from transactional to relationship-oriented interaction with customers (Oliva & Kallenberg, 2003) and increases customer loyalty by locking in customers, locking out the competition, and creating dependency for sustained business relationships (Bustinza et al., 2013; Vandermerwe & Rada, 1988).

Digitalization and the emergence of digital technologies offer new potential to facilitate service innovation of manufacturing companies (Ardolino et al., 2018; Coreynen et al., 2017). Technology development enables the incorporating

of digital technologies into previously purely physical products (Hirsch-Kreinsen, 2016; Yoo et al., 2012). Digital technologies such as the Internet of Things, cloud and mobile services, artificial intelligence, big data, analytics, social media, and embedded devices are the foundation for companies' digitalization (Fitzgerald et al., 2014; Mihardjo et al., 2019; Vial, 2019).

A research stream that recently emerged is digital servitization. Several authors have published a definition of digital servitization. Vendrell-Herrero et al. (2017) described digital servitization as providing IT- or digitally enabled services that rely on digital components embedded in physical products. Another definition provided by Tronvoll et al. (2020) emphasized deploying digital technologies to support the transformation from a product-centric to a service-centric business model. Kohtamäki et al. (2019, p.4) presented a more technical-oriented definition as a "transition toward smart product-service-software systems that enable value creation and capture through monitoring, control, optimization, and autonomous function." Paschou et al. (2019) offered a very encompassing definition. They referred to digital servitization as developing new services or improving existing ones using digital technologies by enabling new digital business models, finding ways of co-creating value, generating knowledge from data, improving a firm's operational performance, and gaining competitive advantage. Despite defining the same term, we conclude that existing research has a different emphasis and focus areas when describing digital servitization. Whereas Vendrell-Herrero et al. (2017) relied on the connection to the physical product, Paschou et al. (2019) did not mention products in their definition when describing digital servitization. All definitions quoted above share that they see digital technologies as a core element of moving towards digital servitization. In addition, the aspects of value creation and business model changes are mentioned in all definitions except the one from Vendrell-Herrero et al. (2017).

Besides existing definitions of other researchers, we outline specific attributes of digital servitization to describe our understanding of the paper's central term (see Figure 2). Digital technologies enable several services and business models, such as remotely tracking and reporting real-time information, monitoring customers' usage behavior, responsive and proactive maintenance, remote control of operations, and availability services (Paiola & Gebauer, 2020). These digital services depend on data availability and analytics (Tronvoll et al., 2020; Ulaga & Reinartz, 2011). Manufacturing companies and product firms possess an existing customer base called an installed base. Access to this installed base based on previous product deliveries and the ability to harness and leverage customers' data is the basis for successful digital servitization (Paiola & Gebauer, 2020). Compared to a product-centric business relationship, where the product is the basis for the business relationship, the product only becomes one element of the interaction in a more service-centric business model (Paiola & Gebauer, 2020). Companies' customer relationship shifts from a transactional to a relational view (Ehret & Wirtz, 2017). Thus, digital servitization is underpinned by changing the business model and value creation processes (Chen et al., 2021). Companies help customers reach their goals by providing digitally enabled services (Coreynen et al., 2017). Based on the aspects mentioned above, we define digital servitization as generating additional value for the installed base of existing customers by providing product and service bundles enabled by digital technologies through newly created or revised business models. Our definition highlights the interplay of products and services, as both components are required to create value for the companies' customers. These services can only be assigned to customers where the manufacturing company sells a product-service bundle at the time of the transaction or previously supplied a product, which now enables the provision of digital services. Thus, the installed base is a core element of our definition as it initially defines the accessible market for digital servitization activities. Digital technologies enable new or revised business models due to the ability to access and connect information and data, which manufacturing companies use to create revenue streams.

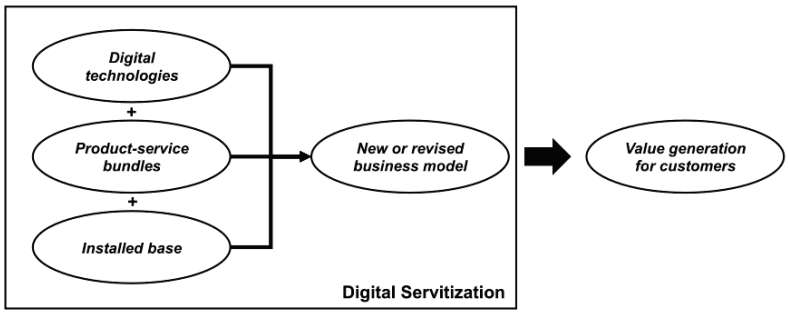

Figure 2. Definition of Digital Servitization

For manufacturing firms, servitization and digitalization are complex transformations requiring organizational changes. Thus, digital servitization requires new resources, capabilities, and collaborations to support value generation (Lerch & Gotsch, 2015; Peillon & Dubruc, 2019). Scholars proposed changes in the organizational structure to meet evolving customers within digital servitization (Baines et al., 2017; Bustinza et al., 2018). In the following section, we outline the impact of leadership on organizational changes and how to capture innovative business models within the context of digital servitization.

Leadership for digital servitization

Leadership is crucial for enabling innovations, shifting business models, and guiding organizational change (Faix, 2020; Mihardjo et al., 2019; Nadler & Tushman, 1990). Leadership has been widely researched (Kotterman, 2006), but focus areas and applications have developed over time due to changing boundary conditions and transformations in business and society (Larjovuori et al., 2018). Faix et al. (2020, p. 61) described leadership as "to lead oneself and human communities […] into an innovative and creative future in open and complex situations under unclearly defined and dynamic conditions while always considering the framework conditions and collective rationality." In his understanding of leadership, Kotter (2000) also highlighted producing change, setting direction, and aligning people toward a visionary goal.

Based on a concept developed by Mumford et al. (2007), leadership skill requirements can be categorized into cognitive, interpersonal, business, and strategic skills. Cognitive Mumford et al., (2007), skills are seen as foundational for leaders (Mumford et al., 2007), including communication skills (Yukl, 1989), learning (Jacobs & Jaques, 1987), adapting to deal with non-routine and dynamic job components (Kanungo & Misra, 1992), and critical thinking (Gillen & Carroll, 1985). Interpersonal leadership skills are associated with social skills such as interaction, influencing (Katz, 1974), or persuading others (Yukl, 1989), focusing on people orientation. The area of business skills can be associated with managerial leadership tasks such as management of resources (e.g., material, personnel, or financial) (Katz, 1974), also including functional expertise and technical know-how (Mumford et al., 2007). The final category, strategic skills, requires conceptual thinking in complex systems from leaders (Mumford et al., 2007; Zaccaro, 2001). The associated skillset includes topics such as visioning (Conger & Kanungo, 1987), problem-solving (Cox & Cooper, 1988), or decision-making (Mumford et al., 2007) abilities.

A research area that recently gained attention is "digital leadership." It describes the elements of strategic success of digitalization for enterprises and their business ecosystems (de Araujo et al., 2021; El Sawy et al., 2016). Authors highlighted specific leadership attributes positively influencing digitalization. For example, leaders in a digital world should have a clear vision of transforming their company and acting as active drivers for innovation (Kane et al., 2019; Westerman et al., 2014). Given the fast-paced VUCA (volatility, uncertainty, complexity, ambiguity) environment, existing research on digital leadership described the attributes of fast decision-making (Larjovuori et al., 2018; Neubauer et al., 2017), embracing change (Kane et al., 2019) and open-mindedness to new ideas (Guzmán et al., 2020; Imran et al., 2021) as required responses to digital changes. In line with the speed of the market environments, risk-taking (Kane et al., 2015) and creating environments for experimentation (de Araujo et al., 2021) were seen as supportive of creating digital innovations. Another significant aspect outlined by leadership research for digitalization is collaborating within ecosystems and engaging in partnerships. Companies benefit from networks with suppliers, customers, and other stakeholders such as universities or start-ups (de Araujo et al., 2021; Ivančić et al., 2019). Collaboration beyond organizational limits supports companies' ability to keep up with new developments and innovate in the digital age (Gurumurthy & Schatsky, 2019; Larjovuori et al., 2018). A holistic view covering the multi-faced leadership skill requirements in the digital context are for example, provided by Eberl & Drews (2021), Guzmán et al. (2020), Imran et al. (2020) or Tagscherer & Carbon (2023).

As indicated earlier, previous research on digital servitization emphasized certain aspects of leadership skills and activities. Struyf et al. (2021) summarized specific topics such as strategic development, organizational development, networking, and organizational decision-making in their research on a multilevel perspective on digital servitization. Kim and Toya (2018) researched the leadership style for servitization within Japanese manufacturing companies, not considering the digital context. Their empirical results indicated charismatic and transformational leadership styles supporting servitization efforts. On the other hand, autocratic and autonomous leadership styles impede successful servitization (Kim & Toya, 2018). Furthermore, we structured the extant contributions of digital servitization research and the associated leadership aspects in Table 1.

Table 1. The main outcome from the literature review on digital servitization and leadership

Reference	Research focus	Contribution
Kim & Toya (2018)	Leadership styles for servitization	Charismatic leadership style is supportive for organizational change required for servitization Required top-management efforts to inspire commitment from employees
Cimini et al. (2021)	Competence development for digital servitization	Agile and collaborative mindset is essential for digital servitization Training provisions for soft skills and digital literacy are important Competence development for sales and marketing employees involved in digital service offerings
Struyf et al. (2021)	Multilevel framework for digital servitization	Digital servitization is a complex and interrelated requiring proactive management to be overcome Effective management of digital servitization challenges is an iterative process and agile approach
Tronvoll et al. (2020)	Required change initiatives for digital servitization	Focusing on customer value Defining and maintaining a vision for digital servitization Cultivating agile ways of working Shorter timelines for target-setting
Sklyar et al. (2019)	Organizing for digital servitization	Setting out a comprehensive vision for digital servitization Close collaboration between service and product organizations

Source: Kim and Toya (2018); Cimini et al. (2021); Struyf et al. (2021); Tronvoll et al. (2020); Sklyar et al. (2019).

The identified studies elaborating on leadership aspects for digital servitization recognized the complexity of shifting towards digital servitization (Struyf et al., 2021). Common recommendations include the creation of a vision (Sklyar et al., 2019; Tronvoll et al., 2020) and applying agile ways of working (Cimini et al., 2021; Struyf et al., 2021; Tronvoll et al., 2020) asking for close internal and external collaboration for digital servitization (Cimini et al., 2021; Sklyar et al., 2019). Furthermore, extant literature highlights the requirement for top management involvement and commitment towards digital servitization (Kim & Toya, 2018; Struyf et al., 2021).

METHODOLOGY

Our research aims to gain exploratory insights into the research question of a holistic view on leadership skills for digital servitization due to its underexplored nature. The extant literature on digital servitization and leadership has been reviewed to build a theoretical background for formulating the distinct questions of the semi-structured interview guide. We selected the method of semi-structured interviews as a well-proven and fitting instrument for qualitative and exploratory research (Kallio et al., 2016). We generally used open-ended questions to support the exploratory nature of the research (Weller et al., 2018). Before inquiring about our main research question of required leadership skills for digital servitization, we ensured generating a common understanding for the two main subjects of the study: digital servitization and leadership. Furthermore, we added subsequent questions regarding change management, risk attitude, goal-setting process, role in ecosystems, and communication skills, which were identified as essential leadership aspects in our previous literature review on leadership, digital leadership, and the five articles referenced in our literature review on leadership for digital servitization. The interview guide with the respective questions is presented in Appendix 2. The applied research procedure is based on a combination of the works of Braun and Clarke (2006), Mayring (2014), and Thomas (2006) on qualitative research analysis and depicted in Figure 3 with a particular emphasis on the step of data analysis.

For the data collection, we used purposive sampling: We contacted potential research participants through the business network platform "LinkedIn" based on matching job titles to ensure their expertise in providing insights into our research question. This included the search terms "digital services," "servitization," "digitalization," and "digital transformation." Besides an initial check about the suitability of our research participants through conversation, we validated their contribution through their job titles, position in the company hierarchy, industry association of their company, and years of leadership experience. Our research participants held positions at different firm levels, ranging from first-level managers to Directors, Vice Presidents, and Executives. On the one hand, this spread allows insights from various perspectives based on hierarchy levels within the company but also allows strategic leadership relevance due to the significant number of senior-level leaders in our reference group.

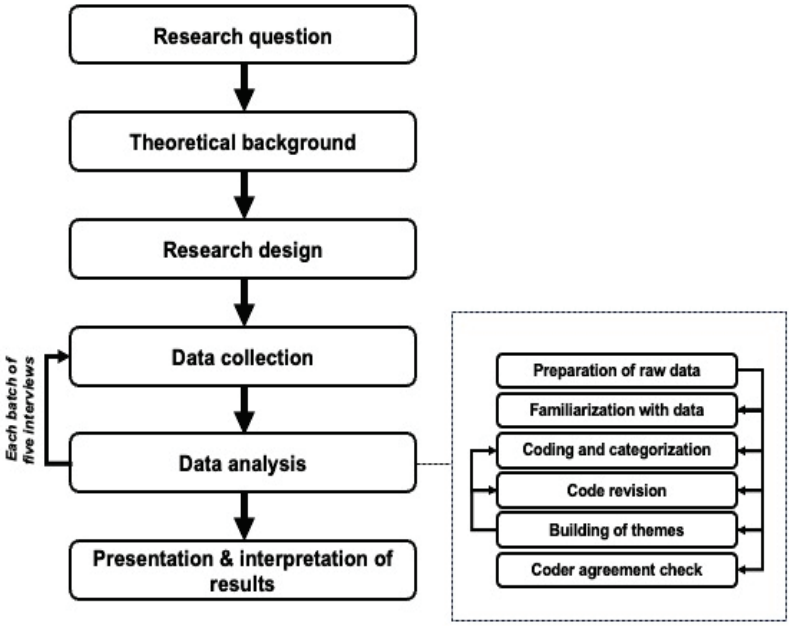

Figure 3. Research procedure

Source: Own illustration based on Braun and Clarke (2006,) Mayring (2014), and Thomas (2006).

Furthermore, we used the Global Industry Classification Standard (GICS) to present the industry in which the companies of our research participants were active (MSCI, 2022). Besides the leaders in the business or IT consulting, classified as professional services or IT services according to GICS, our research participants were also employed in companies active in the machinery or electrical equipment industry. As those industries are mainly concerned with manufacturing and servicing equipment, we can confirm their relevance for our study on digital servitization. Lastly, we present the years of leadership experience in defined categories. Similar to the spread at the company level, the range of leadership experience offers insights into different perspectives based on experience. Table 2 shows the distribution of leadership experience ranging from up to five years of leadership experience to very experienced leaders with more than twenty years in active leadership roles.

Table 2. Research participants

Identification of research participants by search terms	Amount	Share in %
Digital services	9	30%
Servitization	9	30%
Digitalization	5	17%
Digital Transformation	7	23%
Total	*30*	*100%*
Company level	Amount	Share in %
Executive	6	20%
Vice President	5	17%
Director	6	20%
Head of	7	23%
Manager	6	20%
Total	*30*	*100%*
Industry	Amount	Share in %
Professional Services	5	17%
Machinery	15	50%
Automobiles & Components	1	3%
Chemicals	2	7%
Electrical Equipment	3	10%
IT Services	4	13%
Total	*30*	*100%*

Leadership experience	Amount	Share in %
0-5 years	6	20%
6-10 years	6	20%
10-20 years	10	33%
>20 years	8	27%
Total	*30*	*100%*

One researcher conducted and recorded the interviews online via Microsoft Teams to ensure consistency from April 2023 to July 2023. We decided to include a loop between data collection and data analysis after each batch of five interviews to assess code saturation (Hennink et al., 2017), which was reached after thirty interviews. For the first step of the data analysis, we used the 2023 version of Microsoft Teams' system-immanent transcription function as an initial baseline and manually optimized the raw data through intelligent verbatim transcription while rehearing the interviews. This step ensured the correctness of the research participants' statements and improved readability, which formed the baseline for analyzing the interview transcripts (McMullin, 2023). After familiarizing with the data, we used the software MAXQDA (VERBI Software, 2021) for the code development. We followed Braun and Clarke's (2006) thematic analysis to identify codes and themes using an inductive approach following our exploratory research design. Nevertheless, we would like to acknowledge that parts of the codes are theory-driven (Braun & Clarke, 2006). They are based on the outcome of the previously conducted review about the theoretical background to formulate our interview questions. Thus, our study includes elements of deduction due to our research design (Mayring, 2014; Thomas, 2006), which are further refined by inductive elements based on the nuanced statements of the research participants (Fossey et al., 2002). Within a recursive process, we conducted our coding, which required refinements and optimization of the code structure (Braun & Clarke, 2006; Mayring, 2014). Additionally, we collated codes into perspectives, themes, and sub-themes to structure our findings based on their relations and connections. Within this step, initial codes were summarized, rephrased, or discarded to create a thematic map within a three-stage model to present the results (Braun & Clarke, 2006). The coding process is depicted in Appendix 1. One researcher performed the initial coding based on the outlined procedure. Researcher bias and the reliability quality criteria were addressed through an inter-coder check of the research partner, who served as a supervisor with access to all material, definitions, and codings (Mayring, 2014). The review did not result in disagreement with our coding results, thus supporting the conclusions on the basis of our findings and, thus, increasing cross-reliability.

We reviewed our transcripts inductively to set up the initial code set referring to our research question of leadership skills and traits for digital servitization. Afterward, we structured our initial code set of 43 items into sub-themes, themes, and perspectives through an iterative process. Twelve of our initial codes were not included in the thematic map while reviewing our themes. There was insufficient data to support them, or they were disqualified during the refinement process (Braun & Clarke, 2006). The exclusion criteria "insufficient supporting data", "mentioning specific communicational channels", and "no actional item for leaders" are assigned explicitly for each initial code in Appendix 1. In addition, we rephrased two of our initial codes after the initial coding procedure to better represent its content. Furthermore, we summarized the remaining 31 codes into 20 sub-themes, further clustered into five themes. During this process, we eliminated the initial "internal change management" code and labeled one "change management" theme to represent the associated content. Lastly, our presentation of the thematic map of leadership aspects for digital servitization was finalized by identifying two main perspectives (see also Table 3). The process of coding the interviews and reviewing the identified themes led us to structure our findings in a three-level setup. Furthermore, interview statements were included for further explanation and detailing based on research participants' quotations. The far-right column of the thematic map (Table 3) explains the themes' coding origin, whether they are inductive and emergent findings or entail a degree of deductive and theory-driven origin due to applied theoretical background to formulate the interview guide's research questions. Furthermore, we have included the sources for the theory-driven codes.

RESULTS

On the highest level of the thematic map, we present two perspectives – strategic business leadership and people leadership. Moreover, both perspectives entail further themes to specify the different aspects of required leadership skills for digital servitization. From the strategic business leadership perspective, this entails "strategic business decisions," "business building elements," and "market and customer." On the people leadership side, we summarized the sub-themes into the

themes of "change management" and "employee orientation" themes. Table 3 outlines all 19 sub-themes categorized into the five themes, including exemplary interlocutors statements and the explanation of the coding origin.

Table 3. Thematic map leadership for digital servitization

Perspectives	Themes	Sub-themes	Interview statements	Coding origin
Strategic business leadership	Strategic business decisions	Conscious top management decision for digital servitization	• "We would always say that servitization is a C-level conversation first and foremost" • "Do you really want to do that as a company?" • When an organization and the leadership decides to build a business case in the area of digital servitization"	Inductive and emergent finding
		Evolving target setting within digital servitization journey	• "Every time you have two or three other metrics that are really defining your success" • "Don't do only financial targets, do some other measurable targets" • " […] it really depends where you are in your journey in digitalization. So if you are at the beginning, […] I would put very different targets."	Inductive findings but the degree of deduction and theory-driven codes due to interview question on goal-setting process derived from, e.g.: Tronvoll et al. (2020)
		Positive financial contribution	• "I think in the end, every business in the medium and long term must earn money" • "The end goal is to make money or to have a business that is sustainable"	Inductive and emergent finding
		Risk-taking and risk management	• "You have to manage the risks" • "I'm more used to actually take bigger risks, but controlled ones" • "You need to be open for an open failure culture as well"	Inductive findings but degree of deduction and theory-driven codes due to interview question on attitude towards risk derived from e.g.: Kane et al. (2015)
	Business building elements	Comprehensive business understanding	• "Obviously they need to understand technology and the business and strategy perspective" • "that means as a leader you have to have a complete oversight of the business" • "It is the strategy, the business case, the monetization"	Inductive and emergent finding
		Agile methods	• "You need to be very agile" • "I think here agile methods are a good thing in this field".	Inductive and emergent finding
		Cross-functional collaboration	• "You need to unite the different people. So from finance to HR to operations to all of the different teams and personas which you need to bring together." • "You need to really think beyond your department or your group" • "From the leadership perspective it's much more about collaboration and interorganizational collaboration"	Inductive and emergent finding
		Team composition	• "You need to have the right people in your team which are eager to create something new" • "I hate to say it, there is a pretty decent change you are going to have some attrition"	Inductive and emergent finding
		External collaboration	• "Partnering is extremely important because you have to be really aware all the time what kind of possibilities you have […] and that technology is changing so rapidly" • "When it's about developing some new thing you need also to get some outside impulses" • "Because the market is changing so fast, you need to have different partners for different things"	Inductive findings but the degree of deduction and theory-driven codes due to interview question on ecosystems and partnerships derived from e.g: Gurumurthy & Schatsky (2019); Larjovuori et al. (2018)
	Market and customer	Understand customer and market needs	• "You have to put yourself into the customers' shoes and being customer-centric" • "We have to collaborate closer with the customer already in the beginning and don't be afraid of talking about something that is not yet finished" • Be aligned with market needs because many organizations that do a lot of product development at the end, they come to the conclusion that the market doesn't need that"	Inductive and emergent finding
		Focus on value creation for customers	• "The value proposition should be very clear to the customer that what value they will get" • "Focus on the value" • "Speak about the value for the customers"	Inductive and emergent finding

Perspectives	Themes	Sub-themes	Interview statements	Coding origin
People leadership	Change management	Vision creation for digital servitization	• "They have to provide a vision to the employees" • "Leadership certainly demands an ability to create a vision and convey the vision" • "Create a joint vision" • "I would go back to the vision. That's one of the main drivers for that change management" • "You need to give them a vision. You need to give them a direction without setting too hard borders"	Inductive and emergent finding
		Communication of the vision understandably and regularly	• ""It must be easy to communicate and easy to understand" • "Speaking the language of the people you want to convince" • "Communication on a very frequent level" • "I wouldn't go too much in the technical terms"	Inductive findings but degree of deduction and theory-driven codes due to interview question on communication derived from e.g.: Mumford et al. (2007); Yukl (1989)
		Creation of a sense of urgency and why the change is required	• Build a sense of urgency around it, but also understand if we're not able to adapt at some point we're going to be in trouble" • "I think they should clearly explain why business model change is needed and why it's on the immediate horizon"	Inductive findings but degree of deduction and theory-driven codes due to interview question on enabling change derived from e.g.: Bustinza et al. (2018); Kane et al. (2019)
		Awareness of employees' fears	• "Take away that fear to the employees" • "I would want to address that fear or that anxiety" • "The fear of people, especially people above fifty"	Inductive and emergent finding
		Speed & patience	• "Things can move very quickly, so you have to be in a position to react quickly to that" • Especially in a subject like digital servitization, which is very fast" • "Digital servitization is nothing that you can do in three months. So that's a very long journey"	Inductive and emergent finding
	Employee orientation	Employee participation and feedback	• "You need to be able to go down into the trenches with the people and […] and one of the traits is be really open to feedback' • "I think giving feedback is really important"	Inductive and emergent finding
		Enablement & empowerment	• "To empower each and everyone to take her or his role and driving it jointly" • "But not control them in their jobs, but rather enable them in their jobs" • "Because you shoudn't do everything on your own, but you have to enable the people"	Inductive and emergent finding
		Training and skill development	• "It should go down to the point of whereby the leader has educated or trained the sales and service people who are actually on the customer front" • "So it's not only communicating, it's also training the sales force, the marketing, etc."	Inductive and emergent finding

Strategic business leadership perspective

Strategic business decisions

The first leadership decision is required by the firm's top management whether to pursue digital servitization activities. Based on this, leaders in charge of the needed undertakings should be assigned. Those individuals require full backing from the executive level in terms of financial and personal resources. One research participant stated: "It is a C-level conversation because of the substantially huge degrees of change" (Interview #24). On the contrary, top management must clearly state if they do not see digital servitization as the current focus topic to avoid a waste of resources if projects are pursued without aligned consent from the executive level. The following statements of the research participants support this: "Do you really want to do that as a company? […] I think leadership means that the company and the leaders provide a clear direction (Interview #8)." Another participant added: "You have to have the openness and I would call it the real commitment that you want to do that (Interview #12)."

From a goal-setting perspective, the research participants emphasized the importance of targets, KPIs (key performance indicators), and performance measurements to succeed within digital servitization. As digital servitization is a new approach to the business for most incumbent companies, the success of the new business model should not solely be measured by financial attributes such as order intake, sales, or profit as one research participant highlighted: "Don't do only financial targets, do some other measurable targets (Interview #2)." Instead, more qualitative and customer-oriented targets, for

example, "I think other KPIs besides the pure money like customer satisfaction, customer loyalty, these are the important things (Interview #22)", should be focused on, especially in the beginning, on measuring building the business model.

Another comment recommended, "I think in the beginning it's much more relevant that you think about the customer backward in terms of customer experience, customer satisfaction, added value for customers. Because whenever you enter something new, I think these are the key elements, and they should be first (Interview #8)."

Based on the statements, we recommend an evolving approach, depending on the maturity level of the digital servitization topics. An executive's point of view underlines this: "At the beginning, you're managing are we learning? Then, are we innovating? Then, are we finding the our first business? Are we scaling? (Interview #16)" In addition, those KPIs and targets should be short-term and change along the development of the business model, emphasized by one research participant: "If you are at the beginning of the journey, I would put […] very short terms like quarterly targets (Interview #30)." The more digital servitization becomes a regular part of the traditional business, the more traditional goal setting can be applied to link business success to financial performance indicators.

Despite prioritizing non-financial measurements at the beginning of digital servitization activities, leaders shall emphasize the ultimate reasoning of business activities – profit contribution and positive cash flow. A research participant's statement underlines this as follows: "It must be a business model which flies, which means that you earn money (Interview #22)" and "to be really sure that you are able to make money with the business model (Interview #18)". Therefore, reaching a self-sustaining business model through digital servitization needs to be considered. Even though digital servitization is a new topic for the company, it shall not be excluded from basic economic principles, which is emphasized through the comments: "The end goal is to make money or to have a business that is sustainable (Interview #15)," or "I think in the end, every business in the medium and long term must earn money (Interview #22)."

Linked to the previous subject, pursuing digital servitization requires a certain amount of risk-taking, which we explicitly inquired about in our interview questions. One leader described a difference between investments in machinery and manufacturing lines and digital servitization: "The only thing that is different if we talk about digital is that the first step is cheaper. […] You can test much more in the early steps that you could do with other investments (Interview #15)." Nevertheless, we found consent when analyzing the interview sessions that active risk management is required for digital servitization, underlined with the following statements:

"You always have to manage the risk (Interview #9)." "You need to understand what is happening, and be able to manage [the risk] all the time (Interview #13)." "You have to make the risk manageable and make it transparent to do that (Interview #7)."

On the one hand, this means establishing mechanisms to identify and understand risks and their potential outcome. On the other hand, continuous control and mitigation of those risks are required to ensure the activities do not harm the overall business or customer relations. In addition, leaders must be aware that fast failure and a trial-and-error mentality are supportive in an uncertain digital environment, which our research participants stated as follows: "acceptance of failure (Interview #2)", "you need to be open for an open failure culture (Interview #7)", or "with digital you really have to accept that you will make errors simply because you cannot foresee everything (Interview #6)."

Business building elements

The second theme in the business perspective is "business building elements". Here, we summarize all relevant elements our research participants answered for building a successful digital servitization business model, including organizational setups or leadership focus areas.

Besides a basic understanding of the underlying technology, our research participants highlighted the need for a comprehensive business understanding. For example, "they need to understand technology, the business, and the strategy perspective (Interview #22)". One Director emphasized: "You have to understand the business that you're standing up (Interview #20)", which is supported by another statement: "As a leader, you have to have complete oversight of the business system (Interview #18)." This also includes the resulting impacts on accounting models, business processes, or sales approaches, which are crucial to understand and consider while steering digital servitization activities. Especially the aspect of monetization was mentioned during the interviews: "Sometimes also monetization models look very different than in a one-time payment world (Interview #22)." A Director added:

"How am I going to handle this asset, or are we going to own the asset? Are we going to sell this asset to a third party if I offer a service model? […]. So the leadership has to be holistic because you are literally standing up a new business (Interview #20)."

To develop and refine digital servitization business models, our research participants suggested applying agile methods such as SCRUM to ensure fast development and the ability to adapt quickly in case of changing settings in the surrounding areas. Especially in digital servitization, leaders can use those concepts to react to changing technology trends or shifting customer requirements. Agile aligns with the above-mentioned trial-and-error mentality due to the short-paced iterations within the sprints. The research participants' statements underlined this: "You need to be very agile (Interview #6)", "the agile way of defining leadership (Interview #9)," or "I think here agile methods are a good thing in this field (Interview #27)."

Another crucial leadership skill for digital servitization within the theme of business-building elements relates to cross-functional collaboration. This also links to the previously mentioned comprehensive business understanding, which emphasizes the holistic view of different aspects within the firm. This is typically structured within various departments with specialized domain know-how within companies. Focusing on including and fostering the collaboration and exchange between those different areas is beneficial during digital servitization activities. A Director highlighted: "There has to be a tremendous amount of collaboration between sales, marketing, finance, accounting, field operations, et cetera (Interview #20).". Therefore, "a collaborative culture where people actually desire to collaborate with all of these cross-functional teams (Interview #20)." Building a solid network within the company is imperative to gain access and ensure excellent cross-functional collaboration with the necessary individuals from the traditional departmental structures. Therefore, digital servitization leaders are often required to lead their teams without formal reporting lines and directional power.

"[Leaders] need to unite the different people, from finance to human resources to operations to all of the different teams and personas you need to bring together on this joint journey (Interview #22)."

Besides cross-functional collaboration, certain aspects of composing teams can be outlined. Especially at the early stages, our research participants recommended selecting team members interested in the topic as they declared it is self-motivating for these individuals. The research participants highlighted the importance of having the right people: "I think you need to have the right people in your team who are eager to create something new (Interview #26)." Nevertheless, leaders should consider balancing their teams with a good mix of experience, business knowledge, or educational background. This allows for diverse discussions to enable the potential best outcome of the exploratory phase of digital servitization. When the topic is scaling up within the company, it requires caution not to let unmotivated or unqualified managers or employees slow down or block this expansion due to wanting to stick to the historical or traditional way of doing their job.

"You are going to have x percent […], they just want to do things the way they've been doing it for the past 35 years. […] they could actually be contra to your desires (Interview #20)."

For those situations, leaders' bold action and moving those employees to other areas where they can contribute more or even terminate them not to harm the overall business development are proposed leadership activities as one research participant foresaw attrition as a required element in the team composition. This is underlined: "Who will not fit in some of these roles? I hate to say it, but there's a pretty chance you're going to have some attrition (Interview #20)."

Lastly, leaders responsible for digital servitization should consider developments outside the companies' boundaries and actively pursue external collaboration. Especially in the digital context of digital servitization, our research participants strongly suggested partnering with other actors such as start-ups or academia. One research participant stated: "If there are start-ups which have strong knowledge about a certain technology which you believe is relevant for you, you should certainly talk to them and set up partnerships (Interview #26)." Due to the rapid developments of technology, support is essential to gain access and speed in applying the know-how of external partners to advance companies' business models. This is emphasized by:

"Because the market is changing so fast, that you need to maybe have different partners for different things (Interview #30)" and "partnering is extremely important because […] the world and the technology is changing so rapidly. So if you try to do this alone without a good network, it is impossible (Interview #13)."

Several research participants concluded that pursuing their developments with internal resources would consume too many resources and drastically slow down the digital servitization journey, risking not keeping up with the market or competitors' pace. For example, this is underlined by "it is completely outdated to do everything on your own (Interview #25)" and "I think companies need to quit thinking only they can master a specific task (Interview #26)." By outlining internal and external collaboration, we underline the requirement for focusing on "when it's about developing some new things, you also need to get some outside impulses (Interview #11)."

Market and customer

Leaders associated with digital servitization business models should focus on the sales side in addition to the internal and organizational aspects. With the theme of market and customer, we conclude the strategic business leadership perspective by summarizing the responses covering these essential areas.

Our research participants emphasized the requirement to understand the needs of customers. Terms like "customer-centricity" or "put yourself in the customers' shoes" were highlighted to understand customers' needs. Understanding customers' problems and challenges is vital to tailoring the digital servitization offerings to address these. Therefore, close customer engagement and obtaining feedback on customer requirements were suggested. "We have to collaborate closer with the customer already in the beginning and don't be afraid of something that is not yet finished already or market ready (Interview #27)." On the contrary, developing a digital servitization business model that does not fulfill market needs can be avoided by this deep market understanding. One research participant brought up:

"Be aligned with market needs because many organizations that do a lot of product development, but in the end, they come to the conclusion that the market doesn't need that (Interview #11)."

Digital servitization offerings can often be new to customers from either the digital technology side or the aspect of offering new business models from the servitization point of view. Therefore, we summarize that leaders should keep the value creation for customers in mind when creating and marketing digital servitization offerings, which are underlined by a "focus on the value (Interview #27)." To enable customers to pay a recurring fee for the offerings, they need to be convinced of how these offerings generate value for them. Therefore, "[…] the value proposition should be very clear to the customer and what value they will get (Interview #4)." This aspect was mentioned in the context of customer interaction and communication "to speak about the value for customers (Interview #27)."

People leadership perspective

Besides the strategic business leadership perspective, our research participants highlighted the importance of people orientation of leaders for digital servitization. In the following, we outline the aspects assigned to the themes of change management and employee orientation.

Change management

As described in the previous strategic business leadership section, digital servitization changes and differentiates from the existing business models – "it's a huge change within your company (Interview #25)".

Additionally, it affects almost all employees, spanning practically all company departments. In addition to working with new digital technologies, the organization is also asked to change its way of working through the increased service orientation and the related business model alternations. Due to those circumstances, one research participant declared:

"[…] change management, in my opinion, is by far and above the single biggest barrier that digital leaders have, then it comes to trying to convince the rest of the organization (Interview #1)."

Therefore, in the following, we highlight the most frequently used recommendations leaders can apply to guide their organization and motivate the employees to follow the digital servitization journey. The first sub-theme relates to creating a compelling vision for digital servitization, which was described as "one of the main drivers for that change management because you need to be able to imagine […] but even more visualize the vision (Interview #3)." This vision builds the foundation on where the company wants to go with digital servitization and how it fits within its overall strategy and "[needs to be provided] to the employees and [the leaders] need to make clear that the vision is also shared by the employees, that they understand where they are going (Interview #25)." It is described as "some kind of understood picture of how this all could work in the future (Interview #15)." A strong vision was mentioned as a critical factor for leaders to guide and motivate their employees, which is recommended that "leadership demands an ability to create a vision and convey […] the vision (Interview #24)." One manager said "You need to give them a vision without setting too hard borders (Interview #3)." Additionally, our research participants recommended involving employees to create a "joint vision (Interview #22)" to increase the commitment to follow this vision in digital servitization change management.

Once created, the next crucial leadership task is to communicate the vision. Based on the expert opinions we obtained, we outline several success factors for this step. The vision should be translated and made understandable for all affected individuals within the company. This is underlined: "I think in the end, it must be easy to communicate and easy to

understand (Interview #22)." Or "speaking the language of the people you want to convince (Interview #15)." On the one hand, this means explaining the technological changes comprehensively and refraining from technological buzzwords but emphasizing digital servitization's business model impacts and benefits. One Head of emphasized: "I wouldn't go too much in technical terms (Interview #15)." On the other hand, translating what the activities accompanying digital servitization change in the daily work lives of individuals within the company.

"People have to understand it, and the next step is that people have to understand what their own role is in this idea and what they have to contribute (Interview #12)."

Therefore, the impacts should be explained continuously to ensure they reach and convince their employees. This active communication helps generate a positive message and support throughout the organization for the change required for digital servitization. Lastly, our research participants emphasized the need for continuous, regular, and consistent communication to highlight the importance of the necessary change. Therefore, "communication on a very frequent level (Interview #28)," "there should be continuous communication (Interview #4)," and "sometimes you have to repeat it (Interview #25)" describe statements from the interviews.

The topic of highlighting the "why" and creating a sense of urgency for the change related to digital servitization was underlined during the interviews. Especially when companies still experience positive results through their traditional business "because a lot of the traditional manufacturing companies don't feel the pressure yet (Interview #29)", it is required that leaders explain why digital servitization activities should be pursued. As part of the change communication, highlighting the sense of urgency supports convincing employees to follow the new business model opportunity. Therefore, "you need to […] create a sense of urgency. Why do you need to change? (Interview #26)". Without initiating the change process, the company will miss out on future business potential through digital servitization offerings because "you need to build a sense of urgency around it, but also understand if we're not able to adapt to that we're going to be in trouble (Interview #16)." Leaders "should clearly explain why business model change is both needed and why it's on the immediate horizon (Interview #1)."

The introduction of digital servitization business models can significantly alter existing workplaces. It could make some obsolete and create new job profiles based on different skill set requirements. These changes can develop fears for employees holding these affected roles of losing their jobs or being unable to fulfill the upcoming requirements. One research participant described this: "I'm even scared that this is taking my job away because I don't have the education for that area (Interview #30)." Our research participants also highlighted a difference in openness for digital servitization due to generational differences, "especially people above fifty (Interview #5)." Leaders must know these fears to understand potential resistance to support the required change process as one leader described: "There was a lot of resistance inside this organization because they always thought […] I might lose my job (Interview #29)." Therefore, providing options for affected employees by either finding a new role within the company or upskilling them for the new requirements is an associated leadership task by explaining "We need you in a different position (Interview #10)." If appropriately accompanied, removing the fear from employees arising from emerging technologies or new business models is a vital success factor for the change management to pursue digital servitization successfully.

The final relevant item of the change management theme relates to the time perspective. In line with the fast-paced changes in digital technology, "trial and error"-mentality, agile methods, and required external collaborations for speed, our research participants emphasized the need for quickness within digital servitization: "Things can move very quickly, so you have to be in a position to react quickly to that (Interview #1)." Additionally, "in a subject like digital servitization, which is, I think, very fast, changing with a lot of new technologies coming (Interview #2)." Nevertheless, the overall change process of implementing digital servitization requires patience and time. One Head of emphasized: "Digital servitization is nothing that you can do in three months. So that's a very long journey (Interview #12)." Notably, aligned with the sub-theme "positive financial contribution", one of our research participants recommended, "be somewhat patient with time but be very, very impatient with the results (Interview #1)."

Employee orientation

The final theme of employee orientation focuses on the leaders' required soft skills for digital servitization, whereby its sub-themes complement the previously mentioned items due to their overarching nature.

Enabling their employees to actively participate and ask for continuous feedback during the digital servitization journey is crucial for leaders. This mindset supports several of the leadership themes. For example, our research participants recommended allowing employees to participate in the vision creation process to increase commitment. Secondly, leaders

should consider gaining feedback from employees close to the customers regarding market developments and value creation needs for digital servitization solutions. A Head of pointed out: "Feedback is also very important because sometimes what we are offering, maybe they don't need those things (Interview #4)." Another point described the closeness: "You need to be able to go down into the trenches with the people (Interview #29)." Leaders can, for example, use this continuous feedback in agile development cycles for business model development. Also, employees' feedback should be actively heard and incorporated during the change process to avoid losing employee connection. A research participant's statement underlined this: "I couldn't agree more that the change management is the most crucial, but you need to involve the people (Interview #3)." Additionally, our digital servitization leaders emphasized the benefit of a mutual goal-setting process, which results in ambitious but realistic targets.

Within the set boundaries of the vision, strategy, and goals, freedom should be granted to employees. This includes enabling them to make decisions independently and structure projects within the set guard rails aligned with the leadership.

"Not to control them in their jobs, but rather enable them in their jobs (Interview #24)."

Due to the recommended application of agile methods and the trial and error mentality, enablement and empowerment benefit faster development times without constant alignment. Another aspect is the increased motivation by granting room for entrepreneurship and less micro-management. "[Leaders] shouldn't do everything on [their] own, but enable the people (Interview #27)" and "empower each and everyone to take her or his role and drive it jointly (Interview #22)."

As the final sub-theme, our research participants recommended focusing on training and skill development as supporting elements for success in digital servitization. It requires general training to apply digital technologies, whereas increased knowledge supports the change process by reducing employees' fears. "It's not only communication; it's also training the sales force, marketing, et cetera (Interview #14)." Critical is the education of the sales teams responsible for selling digital servitization offerings, which was described as follows: "It should go down to the point where the leader has educated or trained the sales and service people who are actually on the customer front line (Interview #1)." Besides understanding the underlying technology, customers should be convinced of the additional value creation through these new offerings. Additionally, sales education should incorporate the shift from asset to service selling, as "this will be something completely new in most cases (Interview #26)."

DISCUSSION

Our identified leadership skills address the complexity of digital servitization (Kohtamäki et al., 2021; Struyf et al., 2021) through the multitude and diversity of identified themes and sub-themes. The decision to pursue digital servitization activities has wide-ranging impacts on companies. Digital servitization influences existing organizations from several perspectives. Therefore, digital servitization requires a multi-faceted leadership approach. Although previous research focused on specific leadership elements, our research provides structured guidance and a holistic view of leadership skills for digital servitization. However, specific themes have also been also identified in extant literature. For example, Kim and Toya (2018) highlighted the need for top management involvement in successful servitization implementation in Japanese manufacturing firms. However, their research did not focus on the digital component, which we confirmed in our study. The topic of target setting has also been given attention in the research of Tronvoll et al. (2020), which recommended short cycles for target adjustments, similar to those proposed by our research participants. However, our findings contribute by adding qualitative content to the target-setting for digital servitization. Especially the insights of evolving targets and including customer-oriented measurements within the digital servitization journey add value to the scientific discussion. Whereas the theme of applying agile methods was already outlined in scientific research on digital servitization (Cimini et al., 2021; Struyf et al., 2021), the statements of our research participants about the need to focus on positive financial contribution and the leadership requirement of a comprehensive business understanding has not been explicitly mentioned. Notably, the need for a comprehensive business understanding ranging from technology, finance, or IT underlines the complexity of managing digital servitization activities described by Kohtamäki et al. (2021) and Struyf et al. (2021). The focus on customers and the value creation through digital servitization, which our research participants highlighted through statements such as "focus on the value" or "it's important to speak about the value (Interview #27)", is similarly presented by Tronvoll et al. (2020) as an essential success factor. Within the perspective of people leadership, we explicitly present change management and employee orientation as the central themes relevant to leading digital servitization. Although the connection between change and digital servitization is recognized in extant literature (Kohtamäki et al., 2021; Sklyar et al., 2019; Tóth et al., 2022; Tronvoll et al., 2020), the presentation of our

research results provides a deeper understanding of required leadership activities. Ranging from "creating a joint vision (Interview #22)", "you need to have a clear vision (Interview #3)," and "speaking about the vision in a way people can relate to (Interview #5)", to "build[ing] a sense of urgency around it (Interview #16)", our research participants pointed out the required need for awareness of employees' fears and to "address the fear or that anxiety (Interview #5)." Lastly, the theme of employee orientation relates to the call of Cimini et al. (2021) for soft skill development and competence training for sales employees in digital servitization. However, the aspects related to employee participation, enablement, and empowerment provide further support for other leadership skills due to their overarching nature.

Leadership skills can be associated with strategic, business skills, interpersonal, or cognitive skills, overall supported by universal cognitive skills. Consequently, we underline the importance of applying a holistic view of leadership to address hurdles in establishing digital servitization (Figure 4).

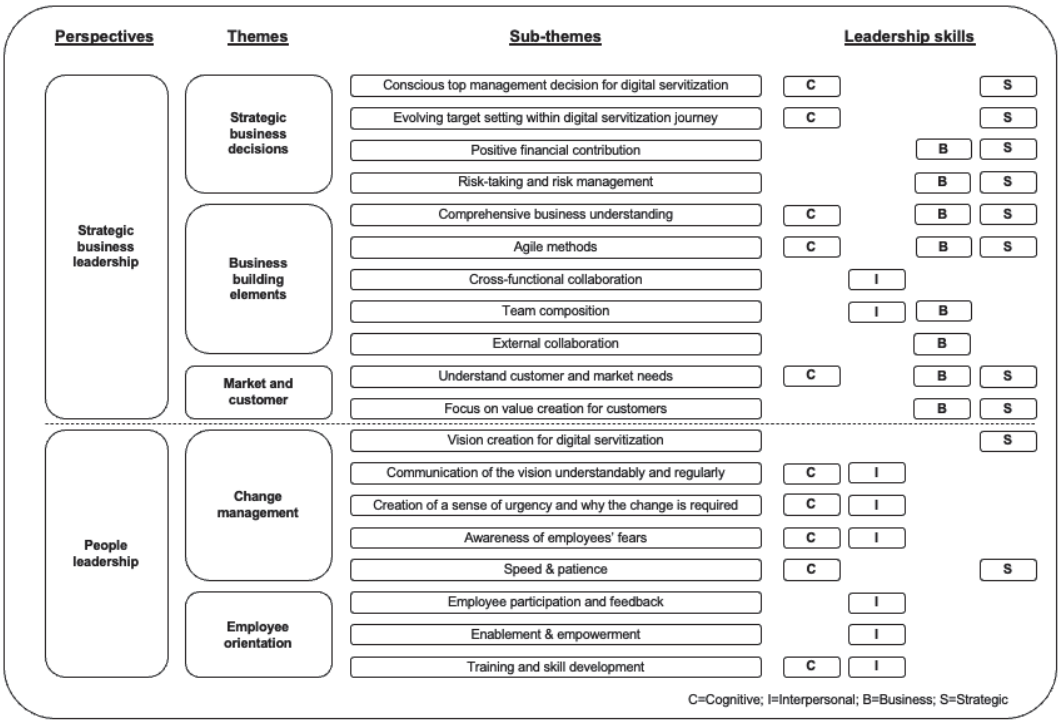

Figure 4. A holistic view on leadership for digital servitization

Source: Own illustration based on findings: association of leadership skills based on Mumford et al. (2007).

Based on mapping our thematic map to the four leadership skills described by Mumford et al. (2007), we see a balance between cognitive, interpersonal, business, and strategic skills among our 19 sub-themes. Cognitive skills as a foundational layer (Mumford et al., 2007) are identified as critical for leading digital servitization. This can be explained by their supportive nature, including understanding, comprehending, and communicating, which is required for strategic business and people leadership. On the other hand, we see tendencies of allocation of interpersonal, business, and strategic leadership skills to our identified leadership themes. Whereas the strategic business leadership perspective requires efforts in business and strategic skills, the people leadership perspective is reflected in cognitive and interpersonal leadership skills. The combination of the diverse skill requirements within digital servitization of applying strategic decision-making but also being close to employees is a significant ask to leadership. Furthermore, we point out that leadership for digital servitization involves several, sometimes opposite, touchpoints. For example, leaders active in digital servitization need to collaborate "typically [with] a lot of players (Interview #24)" inside and outside their company. Moreover, they interact with stakeholders such as customers, suppliers, and employees. As companies have the conception of falling behind their progress expectations on digital servitization (Pham & Vu, 2022), we offer support with our holistic view on the role and tasks of leaders to avoid missing out on understanding the diverse outlined leadership themes of strategic business leadership and people leadership or the lack of understanding of the lengthy duration as "it takes time (Interview #23)." Additionally, digital servitization interferes with several actors. On the one hand, digital servitization requires cross-

functional collaboration of several departments and "unit[ing] the different people (Interview #22)." On the other hand, companies are interacting with customers, suppliers, or other ecosystem stakeholders. Thus, our findings that digital servitization affects several departments require change management, and a long implementation period contributes to the research from Sklyar et al. (2019) on how to organize digital servitization with specific leadership aspects. In summary, our research questions are answered by displaying our thematic map of a holistic view on leadership for digital servitization by pointing out specific elements within the expressed sub-themes. The required scope of leadership is presented by diverse perspectives describing the need to focus on strategic business and people leadership, which are further detailed by the presented themes: strategic business decision, business building, market and customer, change management, and employee orientation. Lastly, mapping the required leadership skills to cognitive, interpersonal, business, and strategic skills describes the leadership skill requirements, which underline the holistic view on leadership for digital servitization.

CONCLUSION

Our findings outline essential decisions along the digital servitization journey, starting from the very first decision on whether those business models should be pursued at all. The identified leadership themes also give insights into the required considerations, skills, and traits for leaders to moderate the change process and motivate and educate their employees to implement digital servitization business opportunities successfully. Failure to build successful digital servitization business models can result in multiple adverse outcomes, such as lost financial funds or misallocated personal resources. Even more critical could be the loss of differentiation criteria against competitors or failure to fulfill potential customer needs. Furthermore, employees could feel misguided and lose faith in their leadership. Our research work supports reducing the risks above by raising awareness of the different aspects and multitude of activities, ultimately contributing to growth and profit expectations from digital servitization.

We contribute to scientific research and the practical digital servitization community. Firstly, we define digital servitization as "generating additional value for the installed base of existing customers by providing product and service bundles enabled by digital technologies through newly created or revised business models," which is customer-oriented and value-based. Furthermore, we conducted a qualitative study combining the aspects of digital servitization and leadership, acknowledging the diverse set of skills ranging from the strategic, business, or personal side, which has lacked scientific attention so far. Furthermore, mapping the identified leadership skills with cognitive, interpersonal, business, and strategic leadership requirements exemplifies the need for diverse competencies to manage complex digital servitization activities. The resulting leadership themes provide guidance to practitioners on what to consider leading for digital servitization and which leadership skills are required for which aspect of digital servitization. Our contribution of pointing out the holistic view on leadership can support digital servitization leaders as guidance within the daily practice to avoid missing out or neglecting vital leadership themes due to insufficient knowledge or resource allocation. Furthermore, executives can apply our research findings to staff their leadership teams assigned for digital servitization diversly to balance out different leadership personalities with the requested skillset. Without either of our outlined perspectives, strategic business leadership and people leadership can significantly harm companies' advancements in digital servitization. On the one hand, a strategic decision-making process neglecting customer or market needs or lacking a comprehensive business understanding could steer companies in the wrong direction. On the other hand, missing out on the people's perspective and neglecting the importance of change management harms employee motivation and, thus, companies' performance within digital servitization.

As we based our findings on a holistic view on leadership for digital servitization (Table 3) based on qualitative interviews and inductive analysis of the responses, we acknowledge the limitations of this research approach. Despite the significance of 30 research participants, it simultaneously corresponds to the limitation of the research material. Nevertheless, the variation of job titles, hierarchical levels, and industries of our research participants offers a broad range of viewpoints. Our identified themes representing a holistic view on leadership are set up based on a well-proven scientific method through gathering qualitative interview statements and our approach structuring them through inductive coding. Nevertheless, we recognize additional research potential to solidify our findings further.

Firstly, we recommend testing and confirming our leadership themes through quantitative research. On the one hand, this method can be used to statistically confirm the initially created theme structure through an increased number of responses. Furthermore, a quantitative research method with the presented leadership aspects as a baseline can create a ranking or weighing of the identified sub-themes to provide further insights into the identified items' prioritization,

importance, or impact. Another proposal for continuing research builds on a more long-term oriented case-study research design, where researchers accompany leaders applying the leadership skills for digital servitization in their practical business environment. While closely surveying the usefulness of our proposed themes and sub-themes, this research approach can give detailed insights into the applicability and effectiveness of our research results. Additionally, this could be compared to leaders and firms who follow our recommendations for a holistic view on leadership versus others who do not and pursue digital servitization activities without this guidance.

Our final further research recommendation links to the multitude and diversity of identified leadership themes for digital servitization. As leaders inherit different personality types or practice certain leadership styles, we propose further research to map digital servitization to the fit of specific personality types or leadership styles. This aspect can give more precise guidance for leadership on appointing to lead digital servitization within companies.

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Appendix

Appendix 1. Coding system and building of thematic map

1) Initial coding result		
Initial code	**Coding origin**	**Action**
Conscious top management decision for digital servitization	Inductive and emergent	
No quarter-to-quarter	Degree of deduction and theory-driven due to interview question on goal-setting process. Derived from, e.g.: Tronvoll et al. (2020)	Summarized to „Evolving target setting within digital servitization journey"
Customer-oriented KPIs	Degree of deduction and theory-driven due to interview question on goal-setting process. Derived from, e.g.: Tronvoll et al. (2020)	
From quality to financial targets	Degree of deduction and theory-driven due to interview question on goal-setting process. Derived from, e.g.: Tronvoll et al. (2020)	
Positive financial contribution	Inductive and emergent	
Trial & Error		Summarized to risk-taking and risk management
Digital is rather cheap at the beginning		
Risk Management & Risk Calculation	Degree of deduction and theory-driven due to interview question on attitude towards risk. Derived from, e.g.: Kane et al. (2015)	
Cross-functional collaboration	Inductive and emergent	
Comprehensive business understanding	Inductive and emergent	
Agile methods	Inductive and emergent	
Have the right people	Inductive and emergent	Rephrased to „Team composition"
So fast or new you need external help	Degree of deduction and theory-driven due to interview question on ecosystems and partnerships. Derived from, e.g.: Gurumurthy & Schatsky (2019); Larjovuori et al. (2018)	Rephrased to „External collaboration"
Understand customer and market needs	Inductive and emergent	
Focus on value creation for customers	Inductive and emergent	
Vision creation for digital servitization	Inductive and emergent	
Creation of a sense of urgency and why the change is needed	Degree of deduction and theory-driven due to interview question on enabling change. Derived from, e.g.: Bustinza et al. (2018); Kane et al. (2019)	
Internal Change Management	Degree of deduction and theory-driven due to interview question on enabling change. Derived from, e.g.: Bustinza et al. (2018); Kane et al. (2019)	
Continuous & regular communication	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	Summarized to „Communication of the vision understandably and regularly"
Communicate understandably	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	
Not too technical communication	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	
Generational differences	Inductive and emergent	Summarized to „Awareness of employees' fears"
Employees fears	Inductive and emergent	
Job changes	Inductive and emergent	
Fast & flexible	Inductive and emergent	Summarized to „Speed & patience"
Patience / it takes time	Inductive and emergent	
Feedback	Inductive and emergent	Summarized to „Employee participation and feedback"
Participation & Involvement	Inductive and emergent	
Leader not as expert	Inductive and emergent	Summarized to „Enablement & empowerment"
Enablement & empowerment	Inductive and emergent	
Training and skill development	Degree of deduction and theory-driven due to interview question on communication. Derived from e.g.: Mumford et al. (2007); Yukl (1989)	

Digital channels	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	no further consideration due to: - linsufficient supporting data (Data security, convince customers, change from engineering mindset, change of traditional after market mindset, convince traditional business leaders, balance existing and new business, bring in external people) - mentioning of specific communication channels (Digital channels, face to face, trade shows) - no actionable item for leaders (Topic itself is motivating, trust)
Face to face	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	
Trade shows	Inductive and emergent	
Data security	Inductive and emergent	
Convince customers	Inductive and emergent	
Change from engineering mindset	Inductive and emergent	
Change of traditional after market mindset	Inductive and emergent	
Convince traditional business leaders	Inductive and emergent	
Balance existing and new business	Inductive and emergent	
Bring in external people	Inductive and emergent	
Topic itself is motivating	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	
Trust	Degree of deduction and theory-driven due to interview question on communication. Derived from, e.g.: Mumford et al. (2007); Yukl (1989)	

2) Building of sub-themes

Sub-theme	**Initial code**	**Action**
Conscious top management decision for digital servitization	Conscious top management decision for digital servitization	Grouped into „Strategic business decisions"
Evolving target setting within digital servitization journey	No quarter-to-quarter	
	Customer-oriented KPIs	
	From quality to financial targets	
Positive financial contribution	Positive financial contribution	
Risk-taking and risk management	Trial & Error	
	Digital is rather cheap at the beginning	
	Risk Management & Risk Calculation	
Cross-functional collaboration	Cross-functional collaboration	Grouped into „Business building elements"
Comprehensive business understanding	Comprehensive business understanding	
Agile methods	Agile methods	
Team composition	Have the right people	
External collaboration	So fast or new you need external help	
Understand customer and market needs	Understand customer and market needs	Grouped into „Market and customer"
Focus on value creation for customers	Focus on value creation for customers	
Vision creation for digital servitization	Vision creation for digital servitization	Grouped into „Change management"
Creation of a sense of urgency and why the change is needed	Creation of a sense of urgency and why the change is needed	
Internal Change Management	Internal Change Management (Eliminated as summarized in theme „change management")	
Communication of the vision understandably and regularly	Continuous & regular communication	
	Communicate understandably	
	Not too technical communication	
Awareness of employees' fears	Generational differences	
	Employees' fears	
	Job changes	
Speed & patience	Fast & flexible	
	Patience / it takes time	
Employee participation and feedback	Feedback	Grouped into „Employee orientation"
	Participation & Involvement	
Enablement & empowerment	Leader not as expert	
	Enablement & empowerment	
Training and skill development	Training and skill development	

3) Summarizing to themes

Themes	**Sub-theme**	**Initial Code**	**Action**

Strategic business decisions	Conscious top management decision for digital servitization	Conscious top management decision for digital servitization	Clustered into „Strategic business leadership"
	Evolving target setting within digital servitization journey	No quarter to quarter	
		Customer-oriented KPIs	
		From quality to financial targets	
	Positive financial contribution	Positive financial contribution	
	Risk-taking and risk management	Trial & Error	
		Digital is rather cheap at the beginning	
		Risk Management & Risk Calculation	
Business building elements	Cross-functional collaboration	Cross-functional collaboration	
	Comprehensive business understanding	Comprehensive business understanding	
	Agile methods	Agile methods	
	Team composition	Have the right people	
	External collaboration	So fast or new you need external help	
Market and customer	Understand customer and market needs	Understand customer and market needs	
	Focus on value creation for customers	Focus on value creation for customers	
Change management	Vision creation for digital servitization	Vision creation for digital servitization	Clustered into „People leadership"
	Creation of a sense of urgency and why the change is needed	Creation of a sense of urgency and why the change is needed	
	Communication of the vision understandably and regularly	Continuous & regular communication	
		Communicate understandably	
		Not too technical communication	
	Awareness of employees' fears	Generational differences	
		Employees' fears	
		Job changes	
	Speed & patience	Fast & flexible	
		Patience / it takes time	
Employee orientation	Employee participation and feedback	Feedback	
		Participation & Involvement	
	Enablement & empowerment	Leader not as expert	
		Enablement & empowerment	
	Training and skill development	Training and skill development	

4) Building of perspectives → Thematic Map

Perspective	**Theme**	**Sub-theme**	**Initial code**
Strategic business leadership	Strategic business decisions	Conscious top management decision for digital servitization	Conscious top management decision for digital servitization
		Evolving target setting within digital servitization journey	No quarter-to-quarter
			Customer-oriented KPIs
			From quality to financial targets
		Positive financial contribution	Positive financial contribution
		Risk-taking and risk management	Trial & Error
			Digital is rather cheap at the beginning
			Risk Management & Risk Calculation
	Business building elements	Cross-functional collaboration	Cross-functional collaboration
		Comprehensive business understanding	Comprehensive business understanding
		Agile methods	Agile methods
		Team composition	Have the right people
		External collaboration	So fast or new you need external help
	Market and customer	Understand customer and market needs	Understand customer and market needs
		Focus on value creation for customers	Focus on value creation for customers

People leadership	Change management	Vision creation for digital servitization	Vision creation for digital servitization
		Creation of a sense of urgency and why the change is needed	Creation of a sense of urgency and why the change is needed
		Communication of the vision understandably and regularly	Continuous & regular communication
			Communicate understandably
			Not too technical communication
		Awareness of employees' fears	Generational differences
			Employees' fears
			Job changes
		Speed & patience	Fast & flexible
			Patience / it takes time
	Employee orientation	Employee participation and feedback	Feedback
			Participation & Involvement
		Enablement & empowerment	Leader not as expert
			Enablement & empowerment
		Training and skill development	Training and skill development

Appendix 2. Interview guide and interview questions

Research on Digital Servitization and Leadership

Interview on digital servitization and leadership

- Thank you very much for taking the time for this interview.
- Your expertise and experience are highly appreciated for gaining valuable research insights.
- Within the research, we are elaborating on the required leadership skills for digital servitization
- The research is conducted by me, xxx xxx, and supervised through xxx xxx (University of xxx)
- The interview is targeted for 45 to 60 minutes.
- Your contributions will be treated anonymously, and your responses will not be linked to your name or company/association in publications.
- To be able to concentrate during the interview as well as simplify the analysis, I would like to record this interview. Please confirm if this is ok for you.

- Before starting the recording – are there any questions from your side?

Interview section	Subsection	Questions / Probing / Detailing
Introduction		**Name** **Age** **Company size (# of employees)** **Industry** **Product portfolio** **Position**

Research on Digital Servitization and Leadership 1

Research on Digital Servitization and Leadership

Digital Servitization & Leadership	**Digital Servitization introduction**	*Digital servitization is a sub-stream of digitalization to provide digitally enabled services for manufacturing companies.* *Definition: Generating additional value for the installed base of existing customers by providing product and service bundles enabled by digital technologies through newly created or revised business models* *Examples could be maintenance offerings based on real-time engine monitoring (Rolls Royce) or remote monitoring offerings for the installed base (GE)* **What is your understanding of digital servitization? Do you have a similar/different view on digital servitization or anything to add?**
	Digital Servitization and Leadership	**How would you describe the term "leadership" in the context of digital servitization?** **Which attributes/traits/competencies are required for leaders in digital servitization?** o What are the relevant attributes for leaders to enable change towards digital servitization? o How would you characterize leaders' attitudes towards risk for digital servitization? *(Rather risk tolerant or risk averse?)* o How can the goal-setting process for digital servitization look like? *(Vision, strategy, operationalization, targets)* o What role does the work in ecosystems and partnerships play in digital servitization? (Customers, competitors, suppliers, start-ups, universities) o How should a leader communicate for digital servitization? (internally/externally)*
Closing	**Additional comments**	**Are there any further comments or personal experiences you would like to share with regards to digital servitization and leadership?**
	Thank you	*Thank you very much for your responses and valuable insights.* *Please read the consent form and send back a signed copy.* *Once the results are available, I will be more than happy to share them with you*

Research on Digital Servitization and Leadership *additional questions not analyzed / relevant for this study 2

Appendix 3. Interviews and research participants

Interview	Industry	Company level	Identification	Leadership experience
Interview #1	Professional Services	Executive	Digital Transformation	>20 years
Interview #2	Machinery	Vice President	Digitalization	0-5 years
Interview #3	Machinery	Manager	Digital Services	0-5 years
Interview #4	Machinery	Head of	Digital Services	10-20 years
Interview #5	Machinery	Manager	Servitization	>20 years
Interview #6	Machinery	Director	Digitalization	10-20 years
Interview #7	Machinery	Director	Digital Services	>20 years
Interview #8	Automobiiles & Components	Executive	Digitalization	10-20 years
Interview #9	Chemicals	Manager	Digitalization	6-10 years
Interview #10	Machinery	Director	Servitization	6-10 years
Interview #11	Machinery	Executive	Digitalization	10-20 years
Interview #12	Machinery	Head of	Digitalization	6-10 years
Interview #13	Machinery	Manager	Digitalization	10-20 years
Interview #14	Professional Services	Executive	Digital Services	>20 years
Interview #15	Chemicals	Head of	Digital Transformation	6-10 years
Interview #16	Professional Services	Executive	Digital Services	>20 years
Interview #17	Electrical Equipment	Head of	Digital Services	6-10 years
Interview #18	Professional Services	Executive	Digital Transformation	>20 years
Interview #19	Electrical Equipment	Director	Digitalization	0-5 years
Interview #20	IT Services	Director	Servitization	>20 years
Interview #21	Electrical Equipment	Vice President	Servitization	10-20 years
Interview #22	IT Services	Vice President	Digital Transformation	10-20 years
Interview #23	Machinery	Head of	Digital Services	10-20 years
Interview #24	Professional Services	Manager	Servitization	10-20 years
Interview #25	IT Services	Manager	Digital Services	0-5 years
Interview #26	Machinery	Director	Servitization	0-5 years
Interview #27	Machinery	Head of	Digitalization	0-5 years
Interview #28	Machinery	Vice President	Servitization	>20 years
Interview #29	IT Services	Head of	Digital Transformation	6-10 years
Interview #30	Machinery	Vice President	Digital Services	10-20 years

Biographical notes

Florian Tagscherer is a PhD Student at the University of Bamberg. He holds a Master's Degree in International Management (M.Sc.) from the School of International Business and Entrepreneurship (Steinbeis University). His research interests focus on the intersection of emerging digital technologies and their implication on leadership and organizations.

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Authorship contribution statement

Florian Tagscherer: Conceptualization, Sampling, Data Collection, Methodology, Formal Analysis, Project Administration, Visualization, Writing – Original Draft. **Claus-Christian Carbon**: Conceptualization, Sampling, Methodology, Formal Analysis, Project Administration, Visualization, Writing, Supervision, Review & Editing.

Conflicts of interest

The authors declare no conflict of interest.

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