

The digital transformation of Swiss small and medium-sized enterprises: insights from digital tool adoption

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Abstract

Purpose – The study explores the alignment of Swiss small and medium-sized enterprise (SME) managers' understanding of digital transformation, with evidence of digital tool adoption in managerial and operative work. This reveals opportunities for more fully realizing the potential of digital transformation for SMEs.

Design/methodology/approach – This multiple-case study, with four theoretically sampled cases, analyzes data from the qualitative answers of 1,593 respondents to a survey of Swiss SMEs about digital transformation. The study draws on a convenience sample of Swiss SME managers.

Findings – The analysis shows little understanding of digital transformation as related to managerial work. However, there are two clear digital tool adoption patterns for managerial work: (1) workflow and workforce management and (2) work-flow and team management. Understandings of digital transformation and operative work focus on the (1) organization of operational work or (2) a combination of organization and changing the way people work. The digital tool adoption in operational work additionally focuses on the digital skills of operational employees.

Research limitations/implications – The study is only able to identify patterns of understanding of digital transformation and digital tool adoption in managerial and operative work. More research is needed to understand why these patterns are observed.

Practical implications – SME managers need to think far more carefully about aligning their vision for digital transformation and the digital tools they adopt in both managerial and operational work, but especially in managerial work.

Originality/value – This is the first empirical study of the digital transformation of Swiss SMEs and their digital tool adoption. Significant potential for alignment is revealed, suggesting potential performance gains are possible.

Keywords Switzerland, Small and medium-sized enterprises, Case study, Digitization, Digital transformation
Paper type Research paper

Introduction

Digital transformation of societies and their economies has brought the ongoing co-evolution of business and technology into stark relief, as firms respond to the emerging opportunities and challenges presented by the strategic digitalization of their activities (Peter *et al.*, 2020). This process of digital transformation of businesses is fundamentally reshaping the role of digital

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technologies (combining information, computing, communication and connectivity technologies) (Bharadwaj *et al.*, 2013) in the work carried out by managers and employees in firms across diverse industries. Small and medium-sized enterprises (SMEs) are of particular interest in this respect, due to their important role in the economy of most countries, including Switzerland.

To digitally transform organizations and businesses is a managerial task (Andersson *et al.*, 2018; Andriole, 2017; Berman and Marshall, 2014; Day-Yang *et al.*, 2011; Gimpel *et al.*, 2018; Heavin and Power, 2018; Horlacher and Hess, 2016; Loonam *et al.*, 2018; Matt *et al.*, 2015; McKeown and Philip, 2003; Moreno *et al.*, 2015; Reddy and Reinartz, 2017) and goes beyond the mere understanding of digital technology. The role of managers and employees is thus widely recognized as central to the successful adoption of digital technologies by SMEs and increasingly the focus of research. Studies have shown the importance of (senior) managerial commitment and support (Ko *et al.*, 2021; Nguyen *et al.*, 2015), the role of boundary-spanning managers in shaping understandings of digitalization and digital transformation (Peter *et al.*, 2020) and need for managerial clarity about the vision for and adoption of information technologies (Nguyen *et al.*, 2015). Additionally, employee skills are a widely noted and discussed aspect of the successful digitalization/digital transformation of SMEs (Eller *et al.*, 2020; Ko *et al.*, 2021).

This paper argues that it is in the integration of digital technologies into the management activities and operational roles of SME employees that digital transformation becomes a manifest phenomenon. Managers and employees need to develop digital skills, which are argued to be supported by the use of digital tools, to collectively develop a digital capability for a specific SME (Proksch *et al.*, 2021; Scuotto *et al.*, 2021). If there is a lack of managerial commitment to and support for the development of digital skills and the adoption of digital tools, then SMEs run the risk of losing their competitiveness (Ko *et al.*, 2021). Furthermore, if there is no clear managerial understanding of the alignment of digital skills and tool usage with the vision for the SMEs' broader digitalization/digital transformation, the full potential of the adoption of such tools for the competitiveness of SMEs will not be realized (Nguyen *et al.*, 2015). With this managerial perspective in mind, the following research question emerged:

RQ. How do Swiss SMEs approach the process of digital transformation from a managerial perspective?

We answer this question by analyzing (1) managerial understandings of the digital transformation phenomenon, (2) the nature of the implementation of digital technologies in managerial and operational work, (3) the associated challenges and opportunities and (4) realized positive change associated with digital transformation of Swiss SMEs.

This study is focused on Swiss SMEs because of their central role in the economic activities in Switzerland, a country widely recognized as one of the most innovative and competitive in the world (IMD, 2021; WIPO, 2020). Switzerland provides a unique context to study SME digital transformation, as advanced forms of digitalization and transformation of SMEs are highly likely, given that Switzerland is ranked highly for the capacity and readiness of the economy to adopt digital technologies (IMD, 2020), is recognized as an innovation leader, has the status of the world's most resilient economy and is the country with the highest skilled workforce globally (WIPO, 2021). Understanding the digital transformation of SMEs from a managerial perspective is essential, as SMEs represent 99% of all businesses and employ two-thirds of all employees in Switzerland (Swiss Federal Statistical Office, 2021).

The potential for advanced understandings of digital transformation, given the very favorable Swiss context, makes our findings of four different patterns of engagement with digital transformation by Swiss SME managers all the more important, especially given that all four approaches see digital transformation through tool adoption as predominantly an operative and not managerial transformation of work.

The remainder of the paper proceeds as follows: first, we discuss the ongoing cycle of industrial revolutions, the impact on the nature of work and how this manifests in the Fourth Industrial Revolution more generally and specifically in the digital transformation of SMEs. Next, digital transformation, SME strategies, business models and the emergence of new ways of working are discussed, allowing our conceptual model of a managerial perspective of digital transformation to be developed. This is followed by an explanation of the research design, the findings and discussion of the changing nature of work and tool adoption in Swiss SMEs and, finally, a managerial work agenda for SME digital transformation is proposed. The paper concludes with implications for practice, research and a discussion of the study's limitations.

SME business management and digital transformation

Digital transformation is a diffuse concept that needs to be defined before we can progress to take a managerial perspective on its firm-level manifestation in the adoption of specific digital technologies and tools. This perspective is summarized in [Figure 1](#) and explained below.

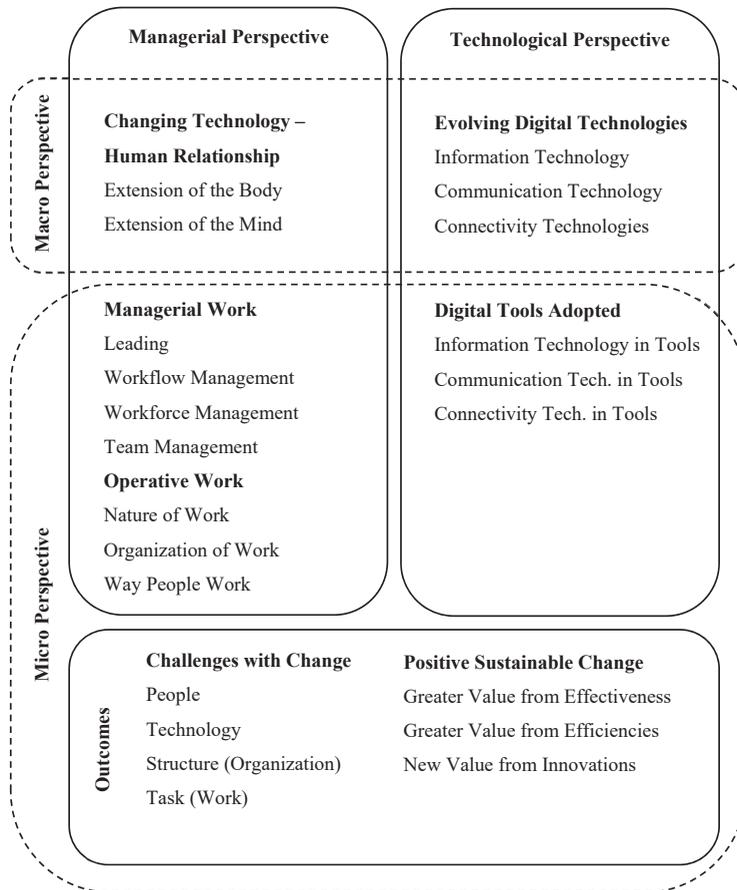


Figure 1.
Conceptual model of
SME digital
transformation

Source(s): The Authors

Defining digital transformation

Digital transformation is a multidimensional phenomenon that affects all domains of human activity, namely technology, the economy, politics and society. It is for this reason that digital transformation (DT) is often referred to as the Fourth Industrial Revolution or Industry 4.0 (Bharadwaj *et al.*, 2013; Lasi *et al.*, 2014). Each of the major transitions in industrial production, commonly referred to as industrial revolutions, is associated with the emergence of new technologies (Lasi *et al.*, 2014). We argue that, while the emergence of new dominant technologies is important, a deeper understanding of these transformation processes can be gained by focusing on the tools that these new technologies enable and the (changing nature of the) work these tools allow – by managerial and operational employees – to be completed.

Conceptualized as an ongoing transition process, each industrial revolution is a phase in the ongoing evolution of industrial production in response to the emergence of new dominant general-purpose technologies (Gölzer and Fritzsche, 2017); see Table 1. This cycle of new dominant general purpose technologies emerging has driven (1) a shift in the primary source of (new) value creation from the tangible to intangible capital of firms, (2) changes in the technology-human relationship and (3) the evolution of the nature of the tools on which managers and operational employees rely to complete their assigned work.

The Fourth Industrial Revolution is based on an ever-deeper integration of information, communication and emerging connectivity technologies (Bharadwaj *et al.*, 2013), see Table 1. This digital transformation – seen from an economic perspective – increases productivity within the value chain with the aid of technology (Stich and Hering, 2015). The integration of these digital technologies extends the importance of intangible capital, such as information, by further increasing the capacity of employees to gather and process information about the

Industrial revolution evolution	Time period	Dominant technology	Manifestation in the changing nature of industrial activity	Technology-human relationship	Tools
1st Phase	1750–1870	Steam engine	Tangible capital	Employees use technology to extend their physical capacity	Task-specific machine
2nd Phase	1870–1960	Electrification and automation	Tangible capital	Employees compensate for limitations of technology	Assembly line and mass manufacturing
3rd Phase	1960–1990	Computing; information and communication technologies	Tangible and intangible capital	Employees use technology to expand the capacity of the mind	Computers, software and communication devices
4th Phase	1990–ongoing	Advanced integration of information, communication and connectivity technologies	Intangible capital	Employees use technology to align the extension of the body and the mind	Connected hardware (Internet of things) and (software) applications

Source(s): Synthesized from Bharadwaj *et al.* (2013), Lasi *et al.* (2014), Gölzer and Fritzsche (2017) and Dröseln *et al.* (2017)

Table 1.
Digital transformation
in historical context

activities of the firm through ever-greater automation of business processes and the increasingly networked nature of relationships between employees, customers and machines. This information intensity is also associated with new tools that enable employees to leverage the networked nature of contemporary value creation and the large volumes of information being produced and captured by firms of all sizes, including SMEs (Bauernhansl, 2017). Digital tools are typically software applications and apps that exploit information abundance, computing power availability and connectivity to create new value.

Digital transformation differs from the first three industrial revolutions because it combines an intelligent, horizontal and vertical integration of people, machines and objects (Dröseln *et al.*, 2017). This can be observed in the most influential technological developments associated with digital transformation, such as mobile technologies, social media, analytics and big data, cloud computing and the Internet of Things (IoT) (Châlons and Dufft, 2018). These technologies enable higher efficiency, better connectivity, trust disintermediation and automation (Lanzolla *et al.*, 2020) and allow for “modular, distributed, cross-functional, and global business processes that enable work to be carried out across boundaries of time, distance, and function” in a way that was not previously possible (Bharadwaj *et al.*, 2013, p. 472).

Digital transformation and SMEs

The scholarly interest in SME-focused digitalization and digital transformation has also grown significantly in recent years. A Google Scholar advanced search (all keywords: digitization, digitalization, digital transformation) of highly regarded small business and entrepreneurship journals reveals a growing number of publications in the *Journal of Small Business Management* (2020: 1 article; 2021: 2 articles), *Small Business Economics* (2019: 1; 2020: 1 2021: 1), *Entrepreneurship Theory and Practice* (2020: 4) and *Journal of Business Venturing* (2020: 1). There were no articles identified in the other highly ranked small business and entrepreneurship journals listed in the *Chartered Association of Business Schools Journal Ranking 2021* (CABS, 2021).

These articles reflect the broader pattern of contemporary studies of SME digitalization/digital transformation, focusing on SMEs in specific national industries (Cannas, 2021; Somohano-Rodríguez *et al.*, 2020) and new ventures (Proksch *et al.*, 2021), entrepreneurship (Franco *et al.*, 2021) and entrepreneurial ecosystems (Autio *et al.*, 2018; Torres and Godinho, 2021). Further studies seek to understand how the digitalization/digital transformation of new ventures is impacting their responses to societal grand challenges, such as sustainable development (George *et al.*, 2020) and the recent COVID-19 global health crisis (Kuckertz *et al.*, 2020). Such studies of SME digitalization and digital transformation for the most part seek to explain sources of value creation by adopting firm-level explanations that draw on concepts such as dynamic capabilities (Cannas, 2021), digital capability (Scuotto *et al.*, 2021), digital strategies (Proksch *et al.*, 2021), innovation strategies/performance (Scuotto *et al.*, 2021; Somohano-Rodríguez *et al.*, 2020), product and services digitalization (Proksch *et al.*, 2021) and process digitalization (Proksch *et al.*, 2021).

Several review papers focusing on SME digitalization and digital transformation have also been published recently, complementing more general definitional reviews of digital transformation (Reis *et al.*, 2018; Vial, 2019), often focused on the antecedents (Meier, 2021; Taruté *et al.*, 2018), as well as the technological focus of previous studies (Meier, 2021). These reviews tend to be in the discipline of information systems research (Meier, 2021; Reis *et al.*, 2018; Taruté *et al.*, 2018; Ulas, 2019; Vial, 2019). At the same time, the antecedents and outcomes of SME digitalization and digital transformation have been empirically studied in well-regarded management journals (Eller *et al.*, 2020; Scuotto *et al.*, 2021). Increasingly, empirical studies of SME digital transformation are also confirming the performance effects experienced by SMEs (Eller *et al.*, 2020; Ko *et al.*, 2021).

Empirical research highlights opportunities for research that can show how digital transformation unfolds at the individual level of the SME manager or operational employee. Managers are argued to need to “rework ordinary routines within the work environment” (Cannas, 2021, p. 17), while employee interpretations and understandings of changes need to be understood and managed; managers and employees that feature an open-minded and collaborative mindset and an entrepreneurial attitude are seen as key for success. Proksch *et al.* (2021) argue that digital strategies are reliant on the digital capabilities of employees, emphasizing the ability to use digital tools such as digital platforms and digital communication channels. However, these skills are generally measured at a firm level. Scutto *et al.* (2021) similarly find that SME employees need to develop digital skills in the domains of information, communication and software, as well as problem-solving, in response to a perceived lack of research on employee skills within the context of the digital transformation of SMEs.

The digital skills, when used in the interest of SMEs, are the foundation of a firm-level digital capability (Scutto *et al.*, 2021). Digital skills are, however, enacted through the use of digital tools, and, to date, there has been no empirical study capturing the degree or nature of the use of digital tools in SMEs. The appropriate deployment of digital skills and the associated use of digital tools, however, remains an open question.

Digital transformation, SME strategies, business models and new ways of working

Traditional business strategies are being fundamentally reshaped by new digital technologies (Banker *et al.*, 2011; Ettlie and Pavlou, 2006; Kohli and Grover, 2008; Sambamurthy *et al.*, 2003; Straub and Watson, 2001), and these strategic changes contribute to the need for managers to find new ways of managing and developing employee digital skills (Proksch *et al.*, 2021; Scutto *et al.*, 2021).

More specifically, it means to strategically adopt and integrate digital tools “in business processes and working practices” (Peter *et al.*, 2020, p. 161), which ultimately leads to innovation, new business models and value creation (Akpan and Ibidunni, 2021; Bouwman *et al.*, 2019; Garzella *et al.*, 2021). Positive effects are increased operational efficiency, stronger agility, an enhanced firm image, as well as an expansion of the market from a regional to global scale (Akpan and Ibidunni, 2021; Morgan, 2019; OECD, 2021). Hence, digital transformation is of vital importance to SMEs as it ensures the ability to compete with larger businesses and to stay innovative (Akpan *et al.*, 2020; Lee and Runge, 2001), as SMEs in many cases have limited financial and human resources compared to large firms (Bouwman *et al.*, 2019). Moreover, early adoption of digital technology is essential (OECD, 2021).

Managers need to know that their decisions, about which tools to adopt and how to manage their employees’ adaptation to these new tools, changes not only the organization of work (a managerial task) but also the way people perform their work (operational work). Only when managers become aware of their decisions’ impact can SMEs exploit the full potential of digital tools and develop innovative business models and new, competitive products. The role of managers in digital transformation cannot be emphasized enough as there is a “shift from the boundaries of management to the management of boundaries” (Garzella *et al.*, 2021, p. 31) in the digital age.

Under conditions of digital transformation, the responsibility of SME managers thus more than ever spans the boundary of the firm (Garzella *et al.*, 2021; Peter *et al.*, 2020). The management of this boundary and the reliance on external resources to compensate for SMEs’ “liabilities of smallness” (Pullen *et al.*, 2012) necessitate that SME managers engage in the management of external stakeholders (Albats *et al.*, 2020). Jones *et al.* (2020) identified potential external stakeholders for SMEs, in relation to improving productivity, namely business associations, accountancy professionals, consultants, customers, natural

environment, family, local government, local community, regional government agencies, society (community), suppliers, technology providers and university researchers. Many of the same stakeholders will be relevant to SMEs' digital transformation, given the fundamental nature of the process to the SMEs' value creation efforts. These stakeholders represent not only complementary external resources to the SME undertaking digital transformation, but also potential sources of pressure and ideas for such a transformation process to be effectively achieved.

A proactive approach that SME managers can adopt to realizing the potential of external stakeholders for enabling digital transformation is that of open innovation (OI) (Albats *et al.*, 2020). OI is "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough and Bogers, 2014, p. 17). In an OI approach to digital transformation, the SME manager will need to manage stakeholders that include incubators, government, investors, large enterprises, other SMEs (that may be competitors), lead users, experts and researchers and universities (Albats *et al.*, 2020).

When done successfully, OI allows SMEs to access ideas, profit from existing knowledge and to use technologies from external stakeholder, and, thus it is an effective strategy for SMEs to reduce costs and compete in an increasingly global economy (Albats *et al.*, 2020). For SME managers that means developing strong relationships with the external stakeholders by implementing an adequate communication, building trust and managing mutual expectations; such boundary-spanning work related to digital transformation has been identified in Peter *et al.* (2020). Moreover, SME managers must ensure that the acquired resources can effectively and efficiently be integrated into the firm (Grama-Vigouroux *et al.*, 2020).

SMEs can only benefit from a sustainable process of digital transformation when managers understand the importance of this transformation and develop a set of skills to manage the newly available resources and logically (re-)organize their workforce. Managers need to start thinking of digital tools beyond mere supportive technologies (Priyono *et al.*, 2020). This paper thus seeks to better understand digital transformation from a managerial perspective, the micro perspective (see Figure 1), by studying how managers think about digital transformation and the tools adopted in their firms, as well as considering the perceived challenges and instances of sustained positive changes in the SME.

A managerial perspective of SME digital transformation

As the term *digital transformation* already suggests, the ongoing Fourth Industrial Revolution is a change process, and as such a business/managerial issue. There has been a fundamental shift in the nature of the work carried out in firms with each evolution in the industrial age, how that work is carried out and how the completed work is managed. Arguably, the technological progress has affected all three of these aspects. Clearly, the nature of the specialization of the work carried out by managers and other employees of the firm has changed along vertical and horizontal lines. The vertical and horizontal specialization of employees' work is clearly associated by a division of roles between those fulfilling what is contemporarily referred to as managerial work and employees with more operational roles (Simon, 1944). A managerial perspective of digital transformation of SMEs is thus two-sided, including the adoption of digital technologies in managerial work and the use of digital technologies that operational employees utilize in their work, associated with the changing nature of the work to be completed.

The nature of managerial work is a long-standing interest of managerial scholars: Laud *et al.* (2016) have proposed a revised conceptualization that seeks to achieve higher relevance for contemporary managers (Fayol, 2016). This work highlights that there is a general recognition that the roles and the nature of managerial work are time-sensitive and develop

“due to technological progress, expansion of knowledge work, social changes, and delaying that occurred as organizations became more horizontal, and workers became more autonomous” (DuBrin, 2012; Laud *et al.*, 2016). Digital transformation has been argued to impact the managerially relevant fields of human resources, business efficiency and business process redesign (Nadeem *et al.*, 2017) and requires managerial attention to organizational agility, organizational size and shape, organizational learning, digital innovations and business ecosystems (Kuusisto, 2017).

A contemporary understanding of managerial work needs to recognize these demands on managers and is accommodated by Laud *et al.*'s (2016) revised model of managerial work. Their model of managerial work identifies four role groupings of the seventeen managerial roles included, and five different engagement categories, from actively disengaged to highly engaged managers. Managers have a leadership role that includes activities like strategic planning, negotiating, motivating, allocating, spokesperson and entrepreneurship. Managers have a workflow management role that includes activities like operational planning, work/task delegation and acting as a figurehead. Managers also have workforce management activities (originally referred to as manpower management activities in Laud *et al.*, 2016) that address staffing and organizing work activities. Finally, the team management role of contemporary managers includes activities related to managing disturbances, solving technical problems, monitoring activities and serving as a team builder and team player. The authors found contemporary managers to be most consistently engaged in their workflow and workforce roles, followed by their team and leadership roles, respectively (Laud *et al.*, 2016, Figure 1). Finally, following a focus on interpersonal skills, mid- and upper-level managers ranked technical and diagnostic skills above conceptual and political skills, potentially reflecting the growing relevance of technology know-how for individuals, and not only for organizations.

From a digital transformation perspective, these findings are important as the workflow, as well as the workforce and team roles, is directly relevant to the adoption of digital tools in both managerial and operational work. Digital transformation is changing not only managerial work, but also the nature of the work that operational employees complete, the way this work is being organized and the way the work is being completed (Dean and Spoehr, 2018).

Advancing from technology decisions to digital tool adoption decisions in SMEs

SME technology adoption has received attention in relation to the emergence and evolution of computerization (Garris and Burch, 1983), information technologies (Malone, 1985), communication technologies (Barba-Sánchez *et al.*, 2007) and, most recently, digitalization (Beatty, 2017). However, technology and its adoption in SMEs is a well-recognized challenge for these businesses (Bucatinsky, 1996). This is especially true when it comes to digital transformation of SMEs: the adoption of digital tools presents SME managers with a new type of adoption decision which reflects the fact that digital tools are a further development in the use of technology to extend the human mind by increasing the connectivity and processing power available to managers. When adopting new digital tools, SME managers are effectively making choices about the degree of information to access and share, and how much computing power is needed in relation to the work they or operational employees need to complete.

SME management challenges and opportunities

The adoption of digital technologies provides, among others, multiple advantages for SMEs, including better access to skills and talents, better access to markets, better access to financing, advanced collaboration, communication as well as product development and reductions in “red tape” (OECD, 2017). New business models that arise from the digitalization or digitization of everything, for example, in the form of pay-per-use models, subscriptions or

peer-to-peer models, are also opportunities that digital transformation provides to businesses (Vasisht and Guitierrez, 2004). Moreover, efficiencies can be increased overall (Lepping and Palzkill, 2017), and international expansion becomes easier for companies due to communication options and ways to facilitate complex logistics (Hamidian and Kraijo, 2013). However, besides the identified advantages of the adoption of new digital technologies, SMEs also face challenges, including financial, human, organizational and capital obstacles when it comes to implementing ICT and other digital tools. Furthermore, SMEs seem to be skeptical when it comes to the point where they must trust the underlying technology and tools of the digital economy, for instance, topics associated with security and privacy (OECD, 2017).

Leavitt (1965) regards industrial organizations as complex systems that are composed of at least four dimensions – people, technology, structure and task – that are dependent, which means that change in one of the four dimensions will have consequences for the other three dimensions. People need qualifications to perform tasks like producing goods and services. By doing so, they find themselves in structures that regulate dimensions like communication, authority and workflow. Here, technology is understood as a set of tools that help to solve specific problems.

In summary, to digitally transform a business and maintain its competitiveness is regarded as a managerial task that includes the development of digital skills of employees to leverage digital tools. This drives managers to advance from purely deciding on technology adoption to digital tool adoption.

Research design

The qualitative multiple-case study research design (Eisenhardt, 1989; Yin, 2018) of this study is commonly adopted in management and strategy (Gibbert *et al.*, 2008), entrepreneurship and small business/SME (Chetty, 1996; Perren and Ram, 2004) and information systems (Benbasat *et al.*, 1987) research. The focus of this paper on providing a first managerial analysis of SME digital transformation draws on the strengths of this design to generate new insights (Gibbert *et al.*, 2008) and incremental theory building (Eisenhardt, 1989; Ridder *et al.*, 2014). We adopt the design to incrementally develop a managerial understanding of digital transformation in Swiss SMEs.

Digital transformation and Switzerland

Digital transformation of Swiss SMEs represents a unique case. In the latest global innovation study (WIPO, 2021), Switzerland was ranked first in terms of overall innovation strength as well as knowledge and technology outputs. In terms of its economic strength, Switzerland was ranked first as the world's most resilient economy (Fan *et al.*, 2020), and it benefits from the most highly skilled workforce globally (Desjardins, 2019). In addition, due to its central location in Europe, Switzerland benefits from the proximity to other economically strong countries such as Germany, Italy and France and provides an interesting cultural context with its four official national languages (German, French, Italian, Romansh) and many immigrant languages (Lüdi, 2008). Finally, digital transformation and digital tool adoption are well embedded as an innovation and management concept in Switzerland, as the country is ranked highly for its capacity and readiness of the economy to adopt digital technologies (IMD, 2020).

Multiple-case study design

Respondents to the survey on digital transformation of Swiss SMEs indicated a meaningful difference in the perceived contemporary relevance and degree of progress with digital

transformation for their firms. The perceived managerial relevance and progress with digital transformation are two key criteria for understanding managers' engagement with and understanding of digital transformation (Eller *et al.*, 2020; Verhoef *et al.*, 2021). These responses thus allowed us to theoretically sample our cases (Eisenhardt, 1989; Yin, 2018) based on the degree of perceived contemporary relevance and degree of progress with digital transformation (see Figure 2). This suggested four cases of Swiss SME digital transformation embedded in the broader context of the contemporary digital transformation of the Swiss economy. As the study analyzes qualitative data, the qualitative multiple-case study research design of Yin (2018) was adopted, which allows such "theoretical sampling" of cases to ensure that cases are appropriate and provide rich examples for the intended analysis (Eisenhardt, 1989; Yin, 2018).

Individual SME managers are the units of data collection for the study, and their responses are allocated to one of the four cases, depending on their individual perceptions of the perceived contemporary relevance and degree of progress with digital transformation at their firm. The respondents are mainly in senior or other leadership roles in Swiss SMEs, namely managing directors (58%), division managers (12%), department managers (7%), project leaders (7%), team leaders (4%), no leadership function (8%) and other (4%). The functional expertise of the respondents includes (multiple responses were possible) marketing (43%), information technology (37%), product management (34%) and finance (32%).

The study has four embedded units of analysis (Yin, 2018): managerial understanding of digital transformation, the domain and priority of digital transformation in firms, the tools used to implement digital transformation, challenges with digital transformation and sustainable and positive business change resulting from digital transformation. This study has a theoretical replication logic, as the responses of Swiss SME managers are expected to differ across the four cases of Swiss businesses' perceptions of their digital transformation.

Data collection and organization

The data analyzed for this study were collected via open questions in a larger online survey of Swiss SME businesses in Switzerland, on their efforts related to the digital transformation of

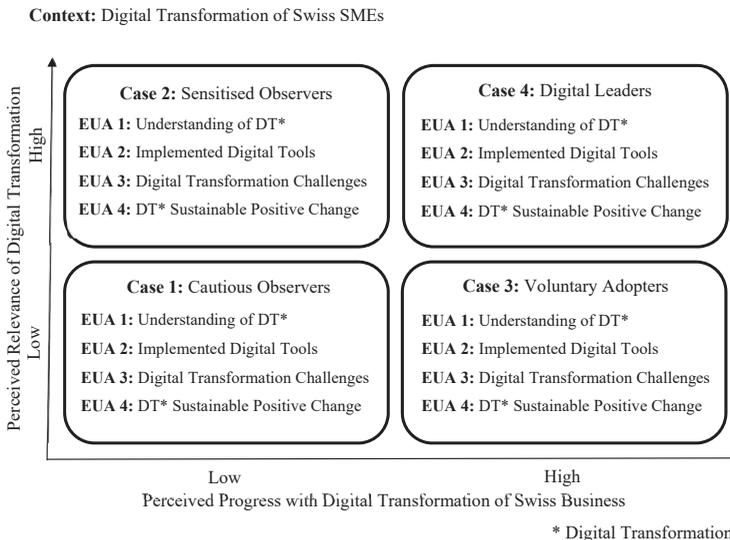


Figure 2. Case Study Design

their businesses. A total of 1,593 completed surveys were received during April and May 2017; data collection was stopped when daily responses slowed to such a degree that significant effort would be required to acquire further completed surveys. While it is a convenience sample, the data collected as part of this study closely correspond to the Swiss STATENT data set (BFS, 2016) that represents the broader Swiss economy. The respondents thus reflect the broader Swiss SME distribution by company size (survey%/Swiss economy %) for medium-sized firms with 50–249 employees (18%/20%), small-sized firms with 10–49 employees (20%/22%) and micro-sized firms with 1–9 employees (26%/28%). As case studies do not seek to generalize to a population, but rather to generalize to theory (analytical generalization) (Yin, 2018), this provided a rich source of qualitative data for analyzing the digitalization of Swiss SMEs.

The use of survey method data, however, requires a careful case study design and justification. This study exploits the potential of the difference between the unit of analysis and the unit of data collection (Yin, 2018) to allocate the data collected by the survey from 1,593 unique respondents to one of the four conceptually specified cases for the study (see Figure 3).

Validity and reliability of the design

This study actively integrates design choices to ensure the four criteria used to evaluate the rigor of qualitative multiple-case study research designs are realized, reinforced by as far as possible integrating four different types of triangulation in the study (Yin, 2018). This study primarily relies on data and investigator triangulation to achieve construct validity. Internal and external validity are ensured through a priory construct conceptualization and investigator triangulation. The reliability of the study is ensured through a clear specification of the research design in this chapter, which again benefited from investigator triangulation.

Total Unique Respondents: 1,593		Perceived Progress with Digital Transformation of Swiss SMEs			
		None or Limited Progress	Some Progress	Progress	Significant Progress
Perceived Relevance of Digital Transformation to Swiss SMEs	Very Relevant	253 15.9%	273 17.1%	234 14.7%	62 3.9%
	Relevant	Sensitized Observers Total: 792 (49.7%)		Digital Leaders Total: 373 (23.4%)	
		148 9.3%	118 7.4%	64 4.0%	13 0.8%
	Some Relevance	160 10.0%	69 4.3%	29 1.8%	11 0.7%
None or Limited Relevance	Cautious Observers Total: 352 (22.1%)		Voluntary Adopters Total: 76 (4.8%)		
		106 6.7%	17 1.1%	19 1.2%	17 1.1%

Figure 3. Survey respondents (unit of data collection) distribution by case type

Analytical approach

The qualitative data were analyzed using thematic coding of the qualitative material that relied on clear *a priori* specification of key constructs (Eisenhardt, 1989; Yin, 2018); Table A1 in the online supplementary materials presents the full codebook for the study. These codes and subcodes were used to analyze the qualitative answers about the respondents' understanding of digital transformation, the tools adopted by respondents' SMEs, the challenges experienced and positive change realized from DT.

The coding (Saldaña, 2021) of the data was conducted by a research assistant and under the supervision of the authoring team; the assistant and team reviewed initial coding of the data to ensure accuracy before the full data set was coded (this was repeated for each dimension coded). Based on this coding, two members of the authoring team reviewed the coding and developed the category combinations used to describe respondents' understanding of digital transformation, the nature of the managerial and operational work and technology combinations used in the analytical tables. A similar procedure was used to categorize the types of challenges and sustained positive changes perceived by respondents.

The resulting coding patterns were then analyzed using a within- and cross-case analytical strategy and a pattern-matching approach adopted for sense-making of the patterns (Yin, 2018). Specifically, the patterns of SME managers' understanding of digital transformation and the actual digital tools adopted by their firms for managerial and operational work were systematically compared in terms of the nature of the work being done and technologies identified. The challenges experienced and the positive sustained change are described for each case as well to allow their comparison in the cross-case analysis, in addition to the comparison of the understanding of digital transformation and tool adoption analyzes in each case.

Within-case analysis

We now proceed to present the findings for each within-case analysis, focusing on the most important patterns in our analysis.

Case 1: Cautious observers

The first case includes SMEs that perceive the least relevance and progress in responding to digital transformation. Interestingly, even in this case, managers show a clear understanding of digital transformation from an operational work and technological perspective.

Tools adopted in digital transformation. Managers in this case did not address themes related to the four categories of managerial work in 77.8% of descriptions of their understanding of digital transformation; the work of leading was most clearly recognized (9.9%). This contrasts clearly with actual tool adoption that shows 26.4% of SMEs have adopted at least one tool related to workflow and/or workforce management, while 31.3% of SMEs in the case have adopted at least one tool that addresses workflow and team management, with some leadership relevance. This suggests that SME managers are not fully aware of the implications of the associated changes for managerial work. Very few SMEs adopt two or more tools in the managerial work categories.

The explanations of digital transformation by respondents are clearly focused on operational work, with a strong technological emphasis. Understandings of digital transformation focus on the implications for organizing operational work (20.2%) and the related interaction with the changing way people are working (29.5%). Tool adoption is aligned with the understanding of the implications of digital transformation for operational work: 19% of SMEs adopted a single tool related to the changing way people work, 17% adopted a single tool reflecting the relationship between the changing nature of work and the associated different ways of working and a further 11.1% of individual tools additionally included elements of organizing these new ways of working (see Table 2). Interestingly,

Table 2.
Cautious observers – comparison of understanding of digital transformation and tools adopted in Swiss SMEs

Managerial Work Category Combinations	UDT ^{a,b}		No. Tools Adopted (%) ^a			Operational Work Category Combinations	UDT ^{a,b}		No. Tools Adopted (%) ^a		
	1	2	3	4	1		2	3	4		
Leading (L)	9.9	00.0	00.0	00.0		Nature of Work (N)	1.1	5.7	00.0	00.0	
Workflow (W)	0.0	10.8	0.6	00.0		Organisation (O)	20.2	00.0	00.0	00.0	
Workforce (M)	0.3	7.4	00.0	00.0		Way of Working (W)	3.7	19.0	3.4	00.0	
Team (T)	0.0	00.0	00.0	00.0		N & O	0.6	00.0	00.0	00.0	
L & W	0.6	2.8	00.0	00.0		N & W	0.6	17.3	0.3	00.0	
W & M	0.3	8.2	0.3	00.0		O & W	29.5	11.1	2.0		
M & T	0.0	00.0	00.0	00.0		No Op. Work	26.7	2.0	00.0	0.00	
L & T	0.0	1.7	00.0	00.0		All 3 Included	7.1	20.5	3.1	0.3	
L & M	0.0	00.0	00.0	00.0		Digital Technology Category Combinations ^a					
W & T	0.0	18.5	4.5	0.3		Information (IT)	32.4	26.1	9.1	2.0	
L, W & M	0.0	0.00	00.0	00.0		Communication (Com)	5.4	00.0	00.0	00.0	
W, M & T	0.0	0.9	00.0	00.0		Connectivity (Con)	7.1	6.8	0.3	00.0	
L, M & T	0.0	00.0	00.0	00.0		IT & Com	5.1	00.0	00.0	00.0	
L, W & T	0.0	12.8	0.9	0.00		IT & Conn	6.0	12.5	1.1	00.0	
No Man. Work	77.8	6.0	00.0	00.0		Com and Con	2.3	13.4	1.1	0.00	
All 4 Included	0.9	11.6	0.00	00.0		No Digi. Tech.	27.8	00.0	00.0	00.0	
No Answer Given	10.5					All 3 Included	3.4	5.1	0.3	00.0	

Notes: a) Columns that do not sum to 100 do not include missing answers; b) Understanding of Digital Transformation
Significance Key:

□ No clear evidence of Relevance □ Partial Significance □ Significant □ Highly Significant

20.5% of single tool adoptions were of tools that addressed the changing nature of operational work, its organization and the changing ways of working.

The technological understanding of digital transformation and the tool adoption of SMEs are highly aligned for single tool adoption. Information technology (32.4%) is central to SMEs' understanding of digital transformation in this case, followed by communication and connectivity technologies, also in combination with information technology. Single tool adoption by SMEs shows 26.1% as focused on information technology, followed by 13.4% focused on communication and connectivity and 12.5% on tools related to information and connectivity technology. Only information technology related tools are adopted in pairs by SMEs to any significant degree (9.1%).

Change management challenges experienced in digital transformation. SMEs in this case did not report clear challenges in responding to digital transformation within the four categories of change management adopted for the study: 66.5% of descriptions of the challenges were not related to any of the four categories of people, technology, structure or task-related challenges. People (8.5%) and technology (5.1%) were the main sources of challenges.

Positive sustained change experienced in digital transformation. Respondents describing the realized benefits, addressed topics that emphasized value creation from realizing more effectiveness in existing activities (14.8%) and a combination of effectiveness- and efficiency-related sources of new value from existing activities due to digital transformation (10.5%). A total of 66.8% in this case, unsurprisingly, reported no sources of new value, and only 0.6% reported new value from innovations related to digital transformation.

Case 2: Sensitized observers

This case represents those SMEs that perceive a high relevance of digital transformation but do not perceive significant progress in the firm's response at the time of the survey. This is the largest case by number of responses included.

Tools adopted in digital transformation. The understanding of digital transformation in terms of the categories of managerial work shows that in 76.4% of explanations, none of the four categories used in this study were addressed (see Table 3). In 18.1% of explanations, the managerial work of leading was addressed. This possibly suggests that progress with responding to digital transformation is seen as needing managerial leadership, but not impacting managerial work. Interestingly, when firms have adopted single tools, SMEs have adopted those related to workflow management (17.2%), workflow and workforce management (14.5%), workflow and team management (27.1%), or a combination of leading, workflow and team (19.9%) related managerial work. Thus, there is clear evidence that the adopted tools reported by respondents show their relevance and impact on managerial work (see Table 3).

The understanding of operational work and digital transformation is more clearly aligned with the reported single tool adoptions. While the organization of work (24.2%) is important in the understanding of digital transformation, also in combination with understandings of the changing way people work (33.3%), the tool adoption does not directly match these categories of operational work in this case (see Table 3). The adoption of a single tool by an SME is typically associated with different ways of working (28.3%), the changing nature of work and ways of working (20.5%) and, finally, the organization and changing way of working (24.3%). This suggests that in the adoption of digital tools, enabling different ways of working substitutes for a perceived need to organize work differently, possibly limiting the need for change in SMEs. It should also be noted that 33.3% of the single tool adoptions were for tools that were related to all three dimensions of operational work. Digital transformation is again clearly understood as an information technology transformation (34.8%), as some degree of connectivity technologies, as standalone (8.7%) and as information technology (8.3%). This is reflected in 34.2% of single tool adoptions being related to information technology, 30.4% having information and connectivity technology elements and 19.7% include all three digital technologies. Additionally, 14.8% of respondents reported adopting two information technology related tools.

Managerial Work Category Combinations	UDT ^{a,b}			No. Tools Adopted (%) ^a			Operational Work Category Combinations	UDT ^{a,b}			No. Tools Adopted (%) ^a		
	1	2	3 / 4	1	2	3 / 4		1	2	3 / 4	1	2	3 / 4
Leading (L)	18.1	00.0	00.0	00.0			Nature of Work (N)	0.5	12.9	1.4	00.0		
Workflow (W)	0.3	17.2	1.4	00.0			Organisation (O)	24.2	00.0	00.0	00.0		
Workforce (M)	0.3	8.7	00.0	00.0			Way of Working (W)	7.7	28.3	5.7	0.5		
Team (T)	0.1	00.0	00.0	00.0			N & O	0.1	00.0	00.0	00.0		
L & W	1.6	3.0	00.0	00.0			N & W	0.3	20.5	1.8	00.0		
W & M	0.0	14.5	0.6	00.0			O & W	33.3	24.2	4.7	0.3		
M & T	0.0	00.0	00.0	00.0			No Op. Work	21.7	4.4	00.0	0.00		
L & T	0.3	6.4	00.0	00.0			All 3 Included	11.7	33.3	10.0	1.4		
L & M	0.4	00.0	00.0	00.0			Digital Technology Category Combinations ^a						
W & T	0.0	27.1	8.0	1.6			Information (IT)	34.8	34.2	14.8	5.3		
L, W & M	1.3	0.8	00.0	00.0			Communication (Com)	3.0	00.0	00.0	00.0		
W, M & T	0.0	8.0	00.0	00.0			Connectivity (Con)	8.7	13.1	0.1	00.0		
L, M & T	0.1	00.0	00.0	00.0			IT & Com	7.6	00.0	00.0	00.0		
L, W & T	0.0	19.9	2.8	0.1			IT & Conn	8.3	30.4	4.3	0.4		
No Man. Work	76.4	6.9	00.0	00.0			Com and Con	1.6	17.8	1.3	0.00		
All 4 Included	0.9	24.6	4.5	00.0			No Digi. Tech.	32.8	00.0	00.0	00.0		
No Answer Given	0.4						All 3 Included	2.7	19.7	1.3	00.0		

Notes: a) Columns that do not sum to 100 do not include missing answers; b) Understanding of Digital Transformation

Significance Key:

No clear evidence of Relevance
 Partial Significance
 Significant
 Highly Significant

Table 3. Sensitized observers – comparison of understanding of digital transformation and tools adopted in Swiss SMEs

Change management challenges experienced in digital transformation. SMEs in this case did report challenges in responding to digital transformation. Within the four categories of change management categories adopted, only 29.0% of descriptions of the challenges were not related to one of the four categories of people, technology, structure or task-related challenges. People (14.0%) and technology (8.7%) were the main sources of challenges, while combinations of people and technology (6.4%) and people and structure (6.3%) were also notable sources of challenges.

Positive sustained changes experienced in digital transformation. Sustained positive changes experienced from responding to digital transformation in terms of value creation showed a clear pattern. The realized benefits emphasized value creation from more effectiveness in existing activities (27.1%) and a combination of effectiveness- and efficiency-related (27.3%) sources of new value from existing activities due to digital transformation. Only 29.2% of respondents in this case reported no sources of new value, while the reported new value from innovations related to digital transformation was again low at 1.8%.

Case 3: Voluntary adopters

This case is arguably one of the most interesting ones. These 76 SMEs perceive themselves to have made significant progress in responding to digital transformation, despite perceiving limited relevance of the phenomenon.

Tools adopted in digital transformation. The explanations of the understanding of digital transformation for these SMEs show very limited awareness of the relevance of managerial work, even in terms of leading (2.6%). At the same time, when SMEs in this case adopt a single tool, they are related to workflow management (21.1%), workflow and workforce management (14.5%), workflow and team management (25.0%) and finally leading, workflow and team management (21.1%). Interestingly, 22.4% of single tool adoptions were relevant to all four categories of managerial work in this case. However, the significant importance of the relationship between managerial work and digital transformation of SMEs does not seem to be recognized by SME managers in this case (see [Table 4](#)).

Understanding of digital transformation in terms of operational work is also more balanced around the organization (15.8%), the way people work (15.8%) and a combination of the two (25%). The single tool adoption also shows an even distribution of tools that reflect the changing nature of operational work (18.4%), the changing way people work (25.0%), a combination of the nature and way people work (22.4%) and the organization and the way people carry out operational work (22.4%). Adoption of single tools (31.6%) and two tools (10.5%) that address all three dimensions of operational work is higher, but still contributes to a balanced approach.

The understanding of digital transformation in terms of technologies shows a clear emphasis on information technology (28.9%), with SMEs adopting single (34.2%), two (19.7) and more than two (1.3%) tools related to information technology. Connectivity technologies (6.6%) and a combination of information and connectivity technologies (7.9%) are the next most important tools and matched by respective adoption of a single tool by 18.4 and 21.1% of SMEs, respectively. Additionally, 17.1% of SMEs adopted a single tool integrating communication and connectivity, and a single tool with all three technologies was adopted 19.3% of the time.

Change management challenges experienced in digital transformation. Challenges reported in relation to digital transformation included the categories of people (10.5%), technology (15.8%) and the task (5.3%). For this case, 42.1% of the answers indicated that none of the categories of challenges used in this paper were present.

Positive sustained change experienced in digital transformation. Sustained positive change from responding to digital transformation, in terms of value creation, showed a clear pattern.

Managerial Work Category Combinations	UDT ^{a,b}	No. Tools Adopted (%) ^a			Operational Work Category Combinations	UDT ^{a,b}	No. Tools Adopted (%) ^a		
		1	2	3 / 4			1	2	3 / 4
Leading (L)	2.6	00.0	00.0	00.0	Nature of Work (N)	0.0	18.4	00.0	00.0
Workflow (W)	1.3	21.1	2.6	00.0	Organisation (O)	15.8	00.0	00.0	00.0
Workforce (M)	0.0	9.2	00.0	00.0	Way of Working (W)	15.8	25.0	2.6	
Team (T)	0.0	00.0	00.0	00.0	N & O	1.3	00.0	00.0	00.0
L & W	0.0	2.6	00.0	00.0	N & W	0.0	22.4	1.3	00.0
W & M	2.6	14.5	1.3	00.0	O & W	25.0	22.4	3.9	1.3
M & T	0.0	00.0	00.0	00.0	No Op. Work	27.0	6.6	00.0	0.00
L & T	1.3	2.6	00.0	00.0	All 3 Included	3.9	31.6	10.5	0.00
L & M	0.0	00.0	00.0	00.0	Digital Technology Categories ^a				
W & T	0.0	25.0	6.6	0.00	Information (IT)	28.9	34.2	19.7	1.3
L, W & M	0.0	2.6	00.0	00.0	Communication (Com)	3.9	00.0	00.0	00.0
W, M & T	0.0	9.2	00.0	00.0	Connectivity (Con)	6.6	18.4	0.00	00.0
L, M & T	0.0	00.0	00.0	00.0	IT & Com	2.6	00.0	00.0	00.0
L, W & T	0.0	21.1	2.6	00.0	IT & Conn	7.9	21.1	3.9	00.0
No Man. Work	81.6	5.3	00.0	00.0	Com and Con	2.6	17.1	1.3	0.00
All 4 Included	0.0	22.4	2.6	00.0	No Digi. Tech.	31.6	00.0	00.0	00.0
No Answer Given	10.5				All 3 Included	5.3	19.3	1.9	00.0

Notes: a) Columns that do not sum to 100 do not include missing answers; b) Understanding of Digital Transformation

Significance Key:

No clear evidence of Relevance Partial Significance Significant Highly Significant

Table 4.
Voluntary adopters – comparison of understanding of digital transformation and tools adopted in Swiss SMEs

The realized benefits emphasized value creation from more effectiveness in existing activities (25.0%) and a combination of effectiveness- and efficiency-related (21.1%) sources of new value from existing activities due to digital transformation. In this case, 43.4% of respondents reported no sources of new value, including no new value from innovations related to digital transformation.

Case 4: Digital leaders

The SMEs in this case represent the firms that perceive the most urgency to respond to digital transformation and perceive themselves as having made significant progress. The respondents are a noteworthy group of firms for a better understanding of how SMEs are responding to digital transformation.

Tools adopted in digital transformation. The understanding of digital transformation given by SMEs in the digital leaders case clearly shows an emphasis on the management work of leading (12.3%) and leading and workflow management (2.7%). Still, 79.9% of descriptions include no material reference related to the four categories of managerial work used in this paper. The tool adoption, however, shows that managerial work is relevant to digital transformation, with single tools being adopted in relation to workflow management (19.8%), workflow and workforce management (16.6), workflow and team management (29.0%) and leading, workflow and team management (21.2%). In this case, the descriptions of digital transformation by SME managers show that they have not recognized the relevance of the managerial work within the process of digital transformation.

Operational work is recognized most in the descriptions of digital transformation in relation to the organization of operational work (26.8%) and organization and the changing nature of the way work is carried out (36.2%, see Table 5). While in general aligned, the single tool adoption pattern is slightly different from the understanding of digital transformation. The adoption of a single tool is related to the changing nature of work (16.1), the new ways

Table 5.
Digital leaders –
comparison of
understanding of
digital transformation
and tools adopted in
Swiss SMEs

Managerial Work Category Combinations	UDT ^{a,b}	No. Tools Adopted (%) ^a			Operational Work Category Combinations	UDT ^{a,b}	No. Tools Adopted (%) ^a		
		1	2	3 / 4			1	2	3 / 4
Leading (L)	12.3	00.0	00.0	00.0	Nature of Work (N)	0.8	16.1	00.0	00.0
Workflow (W)	0.0	19.8	1.3	00.0	Organisation (O)	26.8	00.0	00.0	00.0
Workforce (M)	0.3	6.4	00.0	00.0	Way of Working (W)	5.9	29.8	11.0	0.8
Team (T)	0.5	00.0	00.0	00.0	N & O	0.5	00.0	00.0	00.0
L & W	2.7	2.4	00.0	00.0	N & W	0.3	24.7	1.6	00.0
W & M	0.0	16.6	0.00	00.0	O & W	36.2	34.9	8.6	0.00
M & T	0.0	00.0	00.0	00.0	No Op. Work	18.2	4.3	00.0	0.00
L & T	0.0	8.3	00.0	00.0	All 3 Included	10.2	31.9	11.5	1.1
L & M	0.3	00.0	00.0	00.0	Digital Technology Categories ^a				
W & T	0.0	29.0	15.3	4.3	Information (IT)	31.9	38.6	13.7	5.1
L, W & M	1.6	0.5	00.0	00.0	Communication (Com)	3.5	00.0	00.0	00.0
W, M & T	0.0	6.4	00.0	00.0	Connectivity (Con)	7.5	10.7	0.8	00.0
L, M & T	0.0	00.0	00.0	00.0	IT & Com	7.8	00.0	00.0	00.0
L, W & T	0.0	21.2	0.5	0.3	IT & Conn	7.2	37.0	8.6	0.8
No Man. Work	79.9	8.3	00.0	00.0	Com and Con	1.6	26.8	2.4	0.00
All 4 Included	1.3	35.7	4.8	00.0	No Digi. Tech.	35.4	00.0	00.0	00.0
No Answer Given	10.5				All 3 Included	4.0	23.6	3.5	00.0

Notes: a) Columns that do not sum to 100 do not include missing answers; b) Understanding of Digital Transformation
Significance Key:

No clear evidence of Relevance Partial Significance Significant Highly Significant

that work is carried out (29.8%), the changing nature and new ways of working combined (24.7%), organization and changing ways of working (34.9%) and all three types of operational work associated with a given tool (31.9%). Some SMEs adopted two tools in the categories of the changing way operational work is being completed (11.0%) and in combination with the organization of work (8.6%). There were also single tool (31.9%), two tools (11.5%) and more than two tools (1.1%) adopted that related to all three dimensions of operational work.

While the understanding of digital transformation clearly emphasizes information technology (31.9), there is a balanced account of connectivity technologies (7.5%), information and communication technologies (7.8%) and information and connectivity technologies (7.2%). Information technology in single tool (38.6%), two tools (13.7%) and two or more tools (5.1%) is clearly central to the significant progress made by digital leaders. Tools and the understanding of digital transformation, however, also match well for connectivity technology alone and information and connectivity technologies combined. Single tool adoption by SMEs in the case has also focused on communication and connectivity (26.8%), while single tool adoption that incorporates all three technologies is present in 23.6% of SMEs.

Change management challenges experienced in digital transformation. As expected from firms that have sought to achieve a greater degree of digital transformation, the primary sources of challenges in responding to digital technology are people (16.4%) and technology (12.6%), followed by people in combination with technology (7.0%) and structure (6.4%). This is quite a clear pattern of where the challenges for SMEs lie in responding to digital transformation.

Positive sustained changes experienced in digital transformation. The pattern of sustained positive change is a familiar one in terms of new sources of value creation. The realized benefits emphasize value creation from more effectiveness in existing activities (30.3%) and a

combination of effectiveness- and efficiency-related (35.1%) sources of new value from existing activities and due to digital transformation. In this case, only 17.2% of respondents reported no sources of new value, including new value from innovations (2.1%) related to digital transformation.

Cross-case comparative analysis

A comparison of the four cases reveals consistent patterns across the very different four SME cases, based on their perceptions of the relevance of and the progress with digital transformation. There are some variations in the degree, as would be expected given the purposeful theoretical sampling for the cases in the study. But these are nowhere near as large as one may have expected, and the resulting consistencies provide a sound foundation for drawing conclusions about SMEs' responses to digital transformation from a managerial perspective.

Tools adopted in digital transformation

In the cautious observers, sensitized observers and digital leaders cases, the understanding of digital transformation of managerial work either does not fall into any of the four categories used in this study or it focuses clearly on leading. The voluntary adopters case shows no clear understanding of any one of the four types of managerial work. At the same time, there are two groups of tool adoption patterns that are highly consistent across all four cases for managerial work for single and multiple tool adoption; the first emphasizes workflow and workforce management, and the second emphasizes workflow and team management. Leading and teamwork management combined are often mentioned, but with very low frequency compared to the previous three patterns. The cautious observers case is clearly different in the degree to which these two pattern groups are present. Across the other three cases, the patterns emerge in very similar ways, arguably reflecting the engaged nature of the firms in these cases.

The operational work lens on understandings of digital transformation across the cases is again remarkably consistent, despite the different perceptions of relevance and progress, focusing on the organization of operational work or alternatively on the combination of organization and the changing way people work. SMEs in the voluntary adopters case are an exception – here, the standalone operational work category of the changing way people work is in addition also clearly important in understanding of digital transformation. This may be one part of the explanation for why these SMEs are investing in digital transformation progress when its relevance is perceived as relatively low. Two digital tool adoption patterns also emerge across the cases: the first is specific to the cautious observers case and shows tools adopted that are related to the changing way people work, and the combination of the changing nature of and way that people work, the organization of work and changing way people work, or tools related to all three dimensions of operational work. The cases of sensitised observers, voluntary adopters and digital leaders have the same pattern with the addition that some tools are specifically related to the changing nature of work only. These three cases are distinguished by the degree of tool adoption, with the digital leaders clearly including firms with far more intense tool adoption and little to differentiate the patterns for the other two cases.

These findings suggest that SME managers see the managerial task in digital transformation (Andersson *et al.*, 2018; Andriole, 2017; Gimpel *et al.*, 2018; Heavin and Power, 2018; Loonam *et al.*, 2018) as managing the digital transformation of operational work. The digital tool adoption in operational work points to the focus in the literature on the digital skills of operational employees (Eller *et al.*, 2020; Ko *et al.*, 2021; Proksch *et al.*, 2021; Scutto *et al.*, 2021). There is thus an indication that managerial work in Swiss SMEs is not being

digitally transformed to the same degree of operational work, as managers are adopting fewer digital tools to support them in leading, managing workflows, workforce and teams.

The understanding of digital transformation in terms of the technologies involved shows the SMEs in the cautious observers case emphasizing information technology or none of the three digital technology categories, while the sensitised observer and digital leaders cases have the same four patterns emphasizing information or connectivity, information and communication, information and connectivity or none of the three technologies. The voluntary adopters case sees a focus on information, connectivity or a combination of information and connectivity technologies, as well as some understandings without any of the three technologies. The actual adoption of single tools by SMEs in the different cases reflects these patterns. SMEs in the cautious observers case adopt tools related to information, information and connectivity, and communication and connectivity. SMEs in the sensitised observers, voluntary adopters and digital leaders cases all adopt tools focused on information, connectivity or information and connectivity technologies, or all three technologies. The voluntary adopters and digital leaders additionally also include SMEs adopting tools that combine communication and connectivity technologies, arguably reflecting their leading roles.

These findings on the understanding of digital transformation and actual technology adoption suggest that Swiss SME managers have far greater clarity on the technological vision and execution of digital transformation. This is a finding that speaks to the insights from [Ko et al. \(2021\)](#), where managerial aspects are found to be far more important than technology to understand differences in performance outcomes for digitally transforming SMEs.

Change management challenges experienced in digital transformation

The primary sources of challenges in responding to digital transformation are people and technology, followed by people in combination with technology and structure, again reflecting the focus of [Ko et al. \(2021\)](#). This is quite a clear pattern of SME challenges and responses to digital transformation. One thing to note is that the SMEs in the cautious observers case are far more likely not to identify the conceptual challenge categories used in this paper, followed by the early adopters case.

Positive sustained changes experienced in digital transformation

Across all cases, a consistent pattern of the realized benefits in terms of value creation can be identified. Digital transformation seems to drive SMEs to, first, seek more effectiveness in existing activities to create new value, followed via a combination of effectiveness- and efficiency-related sources of new value from existing activities. This suggests that Swiss SMEs are not pursuing the perceived advantages of business model innovation associated with digital transformation and digital tool adoption ([Akpan and Ibidunni, 2021](#); [Bouwman et al., 2019](#); [Garzella et al., 2021](#)). These findings suggest that digital technologies are still being seen as supportive technologies, despite calls to move beyond this understanding ([Priyono et al., 2020](#)). While the pattern may be familiar, the degree of value creation being realized through digital transformation can vary significantly but does reflect the theoretical replication logic. Cautious observers report new value creation least and no new value most. Digital leaders report new value creation, both from greater effectiveness and a combination of greater effectiveness and efficiencies in existing activities of the SMEs. Sensitized observers and voluntary adopters raise new value from greater effectiveness in existing activities to roughly the same degree, but sensitized observers describe more new value creation from effectiveness and efficiency than voluntary adopters. Across all four cases, there is limited evidence to suggest that Swiss SMEs are realizing more new value from innovation activities related to digital transformation.

A managerial work agenda for SME digital transformation

With people in SMEs clearly at the center when it comes to the successful completion of digital transformation, the importance of understanding the role of managerial work in realizing this transformation, as well as the potential of digital tools for enabling this work, is essential. Yet the findings from this study suggest that while the necessary tools are being implemented, the understanding of the role of managerial work in digital transformation of SMEs remains poorly appreciated. The findings of this study, therefore, clearly call for a research agenda that is focused on better understanding managerial work within digital transformation of SMEs, especially in relation to operational work and an ever-evolving technological landscape. This agenda requires shared conceptual categories, and we suggest adopting the four categories of leading, workflow management, workforce management and team management as a contemporary conceptualization of managerial work. Alternatively, scholars could return to the earlier work on which this categorization is built. Secondly, the conceptualization of operational work remains rudimentary, compared to the more coherent and intuitive categories developed for managerial work, and needs to be developed if a productive research agenda is to be set. Our study has incorporated managerial and operational work categories, as well as the digital technologies to analyze adopted digital tools. Here, work is also at its infancy, and there is much potential for developing more nuanced and independent conceptualizations of digital tools. These efforts promise a rich and fruitful research agenda with clear practice implications in realizing digital transformation of SMEs.

Conclusion

The findings about the managerial understanding of SME digital transformation and the alignment of managerial and operative work with digital tool adoption have clear implications for practice and research, while the study does have some limitations.

Implications for practice

The implications of our work for SME owners and managers are the realization that there is a clear coherence and solid insight in their firms on the understanding of digital transformation and digital tools in relation to operational work and different technological alternatives. SME owners and managers, however, need to prioritize their understanding of managerial work for digital transformation of their SMEs to fully benefit from their efforts in transforming operational work in their businesses and ultimately adapt their business strategies and business models to the potential of the new tools. Digital transformation of managerial work will also benefit the ongoing transformation of operational work and make it more likely that the benefits of business model innovation are realized, as this would necessitate the transformation of the way Swiss SMEs are managed.

Implications for research

Digital transformation of SMEs is a complex and multifaceted phenomenon that requires further research into the relationship between managerial work, operational work and the digital tools available to SMEs to realize successful digital transformation of these critical actors in national economies. This exploratory study has only added to the evidence that managerial- and employee-focused research is needed if digital transformation of SMEs is to be fully realized. Research is required to show how understandings of digital transformation and the adoption of technologies can be better aligned, a long-standing theme in SME research (Nguyen *et al.*, 2015); further research is needed to show how managerial understanding and commitment (Ko *et al.*, 2021; Nguyen *et al.*, 2015) can embrace the potential

Limitations of the study

The data in this study are by now becoming slightly dated, and there is the potential that managers of Swiss SMEs may have changed their understandings and approaches to digital transformation. The study is exploratory in nature and is not conducted in such a manner that it is possible to generalize to the broader population of Swiss SMEs. While data were obtained from Swiss SME only, some limitations in terms of generalizability to other countries and regions exist. However, due to its unique position as an innovation leader, it provides for that reason meaningful insights into digital tool adoption in an innovative economy, and thus possible adoption potentials for other regions. The conceptualization uses general conceptual categories to enable the comparison of a large number of SMEs across common analytical dimensions, given the importance of industry membership to understanding outcomes from digital transformation (Ko *et al.*, 2021); this may obscure more specific patterns for firms in the same industry.

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Appendix

Table A1.
Codebook

EUA ^a	Primary code	Subcodes	Description
Understanding of DT	Macro	Information technology (IT)	This technology enables collecting, processing, storing and retrieving information, e.g. computer and computer networks
		Communication technology (CT)	This technology enables and facilitates communication in human to human and/or human to machine communication, e.g. IT plus unified communications (standard protocols), telecommunications, etc.
Implemented tools		Connectivity technologies	This technology enables and facilitates more convenient or effective connectivity between human(s) with machines and/or machine to machine connectivity, e.g. Internet of things, WiFi, Bluetooth, etc.
		Extension of the body	This refers to the tangible/physical world, including, for example, tools like engines and electricity, that enable the extension of the human body
		Extension of the mind	This refers to the immaterial world and includes, for example, knowledge, information and connectivity, that enable the extension of the human mind
	Micro	Leading	Managers lead through their roles as strategic planner, negotiator, motivator, (resource) allocator, spokesperson and innovation and entrepreneurial effort leadership
Implementation challenges		Workflow management	Managers manage the workflow of a firm in their role as operational (task) planners, (task/responsibility) delegators and interunit (task) coordinators
		Workforce management	Managers ensure appropriate staffing for the firm and organization of staff
		Team management	This role includes specific human relations activities at the team level, such as disturbance handler, team player and team builder, as well as technical problem solver and monitoring responsibilities
		Nature of work	Digital transformation changes the nature of the tasks that are operational employees' work
		Organization of work	Digital transformation is changing the way the work of operational employees is organized
		Way people work	Digital transformation is changing the way operational employees' work
Sustainable positive change		Information technology in tools	These tools are primarily focused on the collection, processing, storage and retrieval of information
		Communication technology in tools	These tools enable and facilitate more convenient or effective communication in human to human and/or human to machine communication
Implementation challenges		Connectivity technology in tools	These tools enable and facilitate more convenient or effective connectivity between human(s) with machines and/or machine to machine connectivity
		People	Changes that affect the nature of the tasks/work need the skills and attitudes of the affected people to be considered. People may not be able and/or willing to perform new, additional or even established tasks
Sustainable positive change		Technology	Technology refers to tools that help to solve specific problems associated with completing the tasks required in work. Challenges arise when technology proves more complex than anticipated, is difficult to integrate into existing systems or has difficulties in its implementation
		Structure	When people perform tasks, they find themselves in structures that regulate things like communication, authority and workflow, for example. Reorganizing the management and execution of work in response to digital transformation can be a source of challenges for managers
Implementation challenges		Task	Tasks are the activities that need to be completed to allow the firm to achieve its reason for existing, e.g. producing goods and services. The complexity and diversity of these tasks is today more diverse and specialized than ever, and digital transformation only adds to these trends
		Value created	Increased effectiveness of existing value creation activities, such as being able to market better and increase the willingness-to-pay of customers or achieve more demanding production performance standards
Implementation challenges		Greater value from efficiencies	Increased efficiency of existing value creation activities, which realize the same output for less inputs or more output for the same inputs into the activities of the firm
		Greater value from efficiencies	The realization of new sources of value creation, from innovation, enabled by digital transformation, can include both incremental and more radical innovation of products and services, and processes