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Digital Transformation: Drivers, Success Factors, and Implications

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DIGITAL TRANSFORMATION: DRIVERS, SUCCESS FACTORS, AND IMPLICATIONS

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General Track

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Abstract

In this paper, we explore drivers, objectives, success factors, and implications of digital transformation. This investigation is conducted through a systematic literature review that focuses on empirical contributions in the Information Systems (IS) field. By reviewing prevailing empirical contributions on digital transformation, we provide insight into why organizations undergo digital transformation, how to accomplish such a transformation, and how digital transformation affects an organization.

Keywords: Digital transformation, Literature review, Digitalization, Digital innovation.

1 Introduction

Pervasive and ubiquitous digitalization has brought new disruptive changes to the economy (Yoo, 2013), and environmental conditions are undergoing rapid change due to digital technology and digitalization (Hartl and Hess, 2017; Porter and Heppelmann, 2014). Digital technology, digital innovation, and digitalization are fundamentally altering business processes, products, services, and relationships (Karimi and Walter, 2015), and organizations need to fundamentally change the way they do business and employees' mindset, as well as restructure to survive (Hartl and Hess, 2017; Porter and Heppelmann, 2014). In other words, many organizations have undergone or are currently undergoing a digital transformation.

The concept digital transformation currently lacks a clear definition (Haffke, Kalgovas, and Benlian, 2016, 2017). However, researchers typically characterize digital transformation as a major organizational change driven by, built on, or enabled by digital technology, altering how business is conducted (Bilgeri, Wortmann, & Fleisch, 2017; Haffke et al., 2016, 2017; Hartl & Hess, 2017; Heilig, Schwarze, & Voß, 2017; Mueller & Renken, 2017). The concept digital transformation is often used interchangeably with concepts such as digitalization and digital innovation. However, although some similarities exist, it is important to distinguish the three to obtain a more informed dialogue based on a consistent use of terminology.

Digitalization is about leveraging digital technology to alter socio-technical structures. By structures, we refer to anything composed of parts arranged together, such as a product, service, user experience, process, etc. By socio-technical structures, we refer to the social (human interactions, relationships, norms, etc.) and technical (technology, tasks, routines, etc.) aspects of the structure. The material and social aspects of the constructs change in the digitalization process. Thus, digitalization goes beyond a mere technical process of encoding analog information in a digital format (i.e., *digitization*; Yoo, Lyytinen, et al., 2010).

Many researchers refer to Yoo, Henfridsson, and Lyytinen (2010) and Fichman Dos Santos, and Zheng (2014) when discussing digital innovation. They have somewhat different approaches to defining digital innovation, but what is common is that it is something novel or perceived as new, and that it relies on digital technology. Yoo and colleagues (2010) further define digital innovation as a *process* (i.e., to innovate) whereas Fichman and colleagues (2014) focus on the *outcome* of a digital innovation. We draw on both approaches to digital innovation and suggest that digital innovation is a process and an outcome, and is about combining digital technology in new ways or with physical components that enables socio-technical changes and creates new value for adopters.

Digitalization, digital innovation, and digital transformation are closely related and are linked to one another in different ways. Figure 1 illustrates a conceptual model of how we understand these concepts are connected.

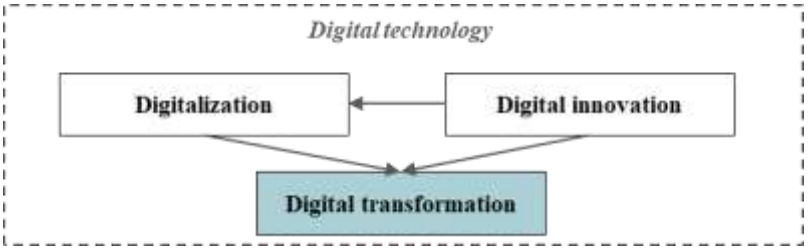

Figure 1. Conceptual model of digital transformation and related concepts.

First, these concepts build on digital technology. Second, the outcome of a digital innovation can lead to digitalization through individuals' absorption in the diffusion stage of the digital innovation process (Fichman et al., 2014). Third, we suggest that digitalization and digital innovation can enable major changes in how business is conducted, leading to digital transformation of organizations or entire industries.

Based on the characteristics of digital transformation and links from digitalization and digital innovation, we suggest defining digital transformation as when digitalization or digital innovation over time is applied to enable major changes to how business is conducted, leading to a significant transformation of an organization or an entire industry.

In this paper, we investigate digital transformation in the organizational context, based on a literature review of empirical contributions on the topic. Some literature reviews have been conducted on this topic (Henriette, Feki, and Boughzala, 2015; Morakanyane, Grace, and Reilly, 2017). However, in this review we explore empirical contributions to answer three research questions:

- RQ1: Why do organizations undergo digital transformation?
- RQ2: How can an organization accomplish a digital transformation?
- RQ3: How does a digital transformation affect an organization?

By answering these questions, we provide insight into what has empirically been identified in the literature as drivers and objectives, success factors, and implications of digital transformation in organizations. Thus, this literature review supplements previous reviews of digital transformation. In section 2, we briefly describe how the literature review was conducted. In section 3, we present some of the findings from the review, and in section 4, we discuss the findings and conclude the paper.

2 Method

This paper is based on an extension of a systematic literature review of digitalization, which initially investigated how digitalization is conceptualized in prevailing research. The first step in the review

was a keyword search to identify publications on digitalization. The reproducibility of the results was ensured by adapting a structured and well-established approach (Webster and Watson, 2002). To find relevant articles that did not use the terminology directly, we included keywords related to "digitalization" in the search: digital transformation, digital movement, digital master, digital initiative, digital disruption, digital innovation, digital strategy, digital business strategy, digital vision, and chief digital officer (CDO). We chose keywords based on concepts that frequently appeared in media and reports, and on an analysis of the terminology used in Westerman, Bonnet, and McAfee's (2014) highly acknowledged book *Leading Digital* and the frequently cited Bharadwaj et al. (2013) article, "Digital Business Strategy: Towards a Next Generation of Insights."

The aim of the search was to identify research articles of validated quality. As major contributions are most likely found in leading journals with a high reputation for quality (Webster and Watson, 2002), we searched for information management-related articles in journals with a score of 3 or 4 in the Academic Journal Quality Guide 2015[1]. There were 21 journals within information management with this rating at the time of the search. The search for articles in these journals was conducted in SCOPUS[2]. Taking into account the long review cycles of journals and the availability of high-quality conferences in the Information Systems (IS) field, we also conducted searches in four reputable conference proceedings: the International Conference on Information Systems (ICIS), the Americas Conference on Information Systems (AMCIS), the European Conference on Information Systems (ECIS), and the Hawaii International Conference on Systems Sciences (HICSS), via the AIS electronic library (AISeL)[3]. In total, we searched in 21 journals and four international conferences. The search targeted articles discussing digitalization and similar concepts, published between January 1, 2010, and December 6, 2017. Only articles written in English were included. Regarding articles from the four conferences, only conference papers were included (and not series). The compound search strings resulted in 54 journal articles and 128 conference papers.

The papers obtained from the keyword search were screened for whether they actually discussed or conceptualized digitalization or related phenomena. Given the broad search strings, we excluded a considerable number of papers that did not meet these criteria. Papers were excluded if they were not relevant according to the search words or research focus.

The initial screening resulted in 69 papers, 26 from journals and 43 from conferences. To answer the research questions, we analyzed the empirical contributions from the papers that examined digital transformation. This led to the identification of 21 relevant empirical articles: two journal articles and 19 conference papers. We chose only empirical contributions at this point to better capture actual findings from organizations undergoing digital transformation. The articles are specified in appendix A.

3 Findings

We focused on empirical contributions, and excluded theoretical and conceptual contributions. We analyzed the 21 contributions according the research questions, and grouped the papers into three categories based on where the research could contribute valuable insights: Drivers and Objectives, Success Factors, and Implications. Some papers touched upon more than one category. Table 1 shows the categories and the articles that discuss each topic.

[1] https://charteredabs.org/academic-journal-guide-2015-view/

[2] https://www.scopus.com/search/form.uri?display=basic

[3] http://aisel.aisnet.org/

Research topic	#	Article ID
Drivers and objectives	8	2, 5, 9, 14, 15, 18, 19, 20
Success factors	15	1, 2, 4, 5, 7, 8, 9, 10, 11, 13, 16, 17, 18, 19, 21
Implications	14	3, 4, 5, 6, 7, 10, 11, 12, 14, 15, 16, 19, 20, 21

Table 1. Categorization of empirical research topics.

Drivers and objectives refer to the attributes and goals that initiate and influence digital transformation (Morakanyane et al., 2017), as identified in the empirical studies in this review. Success factors refer to essential organizational elements for accomplishing digital transformation. Implications refer to the effects organizations experience as a result of digital transformation (Morakanyane et al., 2017). In the following sub-sections, insights from prevailing research findings are presented to shed light on the research questions. The findings are summarized in table 2.

Drivers and Objectives	**Source Article ID**
Drivers	
Customer behavior and expectations	8, 14, 18
Digital shifts in the industry	18
Changing competitive landscape	3, 5, 18
Regulative changes	18
Objectives	
Ensure digital readiness	18
Digitally enhance products	20
Embrace product innovation	18
Develop new business models	18, 20
Improve digital channels	15, 18, 19, 20
Increase customer satisfaction and dialogue	15, 18, 19, 20
Success factors	**Source Article ID**
A supportive organizational culture	9, 14
Well-managed transformation activities	18
Leverage external and internal knowledge	5, 11, 17, 19
Engage managers and employees	4, 5, 10, 13, 21
Grow IS capabilities	7
Develop dynamic capabilities	1, 16, 18
Develop a digital business strategy	2, 7, 8, 16
Align business and IS	2, 7, 8, 16
Implications	**Source Article ID**
Reformed IS organization	3, 5, 6, 14, 15, 19
New business models	11, 12, 20
Effects on outcome and performance	7

Table 2. Summary of findings.

3.1 Drivers and objectives: why do organizations undergo digital transformation?

The increased use and the generative character of digital technology have altered the way business is conducted and how organizations compete and interact, and have led to changes in customer and end-user behaviors and expectations. Organizations' environments are becoming increasingly unstable, and to leverage the opportunities of digital technologies, an organizational transformation is necessary (Hartl and Hess, 2017). Many organizations realize the need to transform their organization in order to stay relevant and competitive, and to keep up with the digital development in their industry. Berghaus and Back (2017) examined the motivations behind different organizations' digital transformation programs, and found many of the same drivers and objectives despite differences in industry and company size.

Drivers

Drivers can be seen as external or internal triggers for why organizations engage in digital transformation. Organizations report a need to keep up with digital shifts occurring in the industry in which they operate. Digital transformation is found to often be triggered by changing customer behaviors and expectations (Haffke et al., 2017; Schmidt, Drews, and Schirmer, 2017), digital shifts in the organization's industry, and changes in the competitive landscape (Berghaus and Back, 2017). Organizations face new competitive challenges and compete with an expanding range of rivals and non-industry entrants (Berghaus and Back, 2017; Piccinini, Hanelt, Gregory, and Kolbe, 2015). Moreover, organizations experience digitalization pressure through competitors' demonstration of digital advances, new market entrants with disruptive digital business models, and technological progress in general, which, in turn, drives companies to engage in organizational transformation (Haffke et al., 2016). Further, if the pressure becomes intense and accumulates rapidly, it may result in the need for an organization to express its digital ambitions by establishing a CDO role to drive digital transformation (Haffke et al., 2016). Berghaus and Back (2017) also found that some organizations faced regulatory changes, which forced the firms to re-think the way they do business and transform their organization.

Objectives

Berghaus and Back (2017) found that one of the main objectives of a digital transformation is related to organizations wanting to ensure digital readiness, meaning that they want to make sure they are alert to changing contexts to be able to react quickly when necessary. The aims to digitally enhance existing products (Mocker and Fonstad, 2017), to engage in product innovation (Berghaus and Back, 2017), and to explore and develop new, potentially disruptive, business models in order to stay competitive and generate new revenue (Berghaus and Back, 2017; Mocker and Fonstad, 2017) were also found to be objectives motivating digital transformation. Other common objectives are found to improve digital channels and customer-facing processes, and deliver up-to-date digital products, in order keep up with the changing customer behaviors and expectations, and improve and maintain customer satisfaction and dialogue (Berghaus and Back, 2017; Bilgeri et al., 2017; Isaksson and Hylving, 2017; Mocker and Fonstad, 2017).

3.2 Success factors: what is necessary to accomplish digital transformation?

Supportive and agile organizational culture

Embracing digital transformation is not straightforward, and there is much to consider before and during digital transformation. One aspect is the organizational culture, which can have an effect on the process and outcome of a digital transformation (Mueller and Renken, 2017). For a successful digital transformation, the organization as a whole must adopt a supportive culture in which joint business and IT initiatives can flourish (Haffke et al., 2017). Hartl and Hess (2017) conducted a Delphi study to

examine what cultural values are considered supportive of digital transformation and crucial for digital transformation success. The most prominent organizational values identified were openness to change (i.e., openness to new ideas and readiness to embrace change) and customer centricity (i.e., designing activities to meet customer needs). An organization that values openness to change fosters a willingness to accept, implement, promote, and establish a change-oriented mindset, which is essential for mastering digital transformation (Hartl and Hess, 2017). Organizational values such as innovativeness, willingness to learn, tolerance of failure, risk affinity, and entrepreneurial mindset were emphasized, as well as trust, participation, cooperation, and communication (Hartl and Hess, 2017). These findings propose an organizational culture emphasizing agility (rather than control) in order to support digital transformation, including internally and externally driven values.

Well-managed transformation activities

Agility may be essential for any organization embracing digital transformation; however, empirical evidence shows there is no "one size fits all" approach to digital transformation and that the situational context of the organization often determines the appropriate approach (Berghaus and Back, 2017). Berghaus and Back (2017) identified transformation activities that organizations typically engage in before, or during, digital transformation. One activity that appeared to be important in several case studies was improving the organization's digital channels, that is, setting up, operating, and improving the channels (Berghaus and Back, 2017), moving toward a multi-/omni-channel strategy for reaching end users. The authors also pointed out the importance of managing the initiation and set-up of simplified processes and updated infrastructures. Further, organizations were found to also engage in innovation activities and develop a digital strategy (Berghaus and Back, 2017). Such activities were often carried out by designated teams, and in collaboration with external parties. Although not all activities the authors identified are relevant for every organization's digital transformation, different organizations create a path to digital transformation through different variants and combinations of these activities (Berghaus and Back, 2017).

Leverage knowledge

Some researchers have found evidence for the importance of leveraging internal and external knowledge in a digital transformation. By studying organizations engaging in mergers and acquisitions (M&A) of digital technology–related companies, Hildebrandt, Hanelt, Firk, and Kolbe (2015) found that through acquiring, integrating, and commercializing complementary and heterogeneous knowledge of digital technology, these organizations became better prepared for mastering the digital transformation of their business (Hildebrandt et al., 2015). Other studies emphasized the importance of leveraging customer- and end-user knowledge to deliver customized, up-to-date digital products and services (Piccinini et al., 2015), and collaborating with start-ups to develop more agile project methodologies and implement start-up mentalities to reduce resistance to innovation (Bilgeri et al., 2017; Piccinini et al., 2015). Particularly in the automotive industry, building partnerships, reducing gaps, and improving information exchange among different players and business units were found to be key issues for designing new business models, creating new digital value, and enabling a seamless customer experience (Piccinini et al., 2015). These issues were also highlighted by Bilgeri et al. (2017), who found that business unit collaboration and external partnerships are essential for large manufacturing companies undergoing digital transformation. However, many large manufacturing firms struggle to incentivize their business units to collaborate because of internal pricing conflicts and lack the capability to identify and establish potential partnerships in the digital context (Bilgeri et al., 2017).

Further, internal knowledge is also found to be essential in digital transformation. In particular, internally focused digital transformation depends not only on identifying and implementing innovative digital technologies but also on helping employees leverage these technologies to be more innovative in their work and become digital transformers themselves (Mueller and Renken, 2017). To ensure that digital technologies are leveraged in people's work and contribute to digital transformation, Mueller and Renken (2017) identified four "lessons learned." Their first

recommendation was that organizations establish a hybrid project structure, which emphasizes roles from IS functions and non-IS functions to ensure that the technology actually reaches employees. Second, the authors emphasized the importance of building collectives for transformation success, for providing specific and localized input for requirements and for customizing communication. Third, they emphasized the importance of communication to employees, in a way that employees easily understand what the technology can do and how they can leverage it. The fourth recommendation highlighted the need for an organizational culture that supports transformation (Mueller and Renken, 2017).

Engage managers and employees

The human capital of organizations undergoing digital transformation plays an important role in the process and outcome of the transformation in several ways. First, if a CDO is appointed to the organization, this role is dependent on building and achieving sufficient influence in the organization to pursue the intended transformation activities and achieve responses (Horlacher, Klarner, and Hess, 2016). Second, employees working on processes affected by digital transformation need to engage in the changes in order for the transformation to reach its full potential. In the case of implementing electronic healthcare record (EHR) systems in a hospital, it was found that employees who continued and maintained their traditional work practices even after the EHR implementation contributed to limited organizational transformation (Mihailescu and Mihailescu, 2017; Mihailescu, Mihailescu, and Schultze, 2015). Third, for employees to embrace the digital transformation and engage in adopting new technologies in their respective fields, it is important that managers consider employees' concerns and include employees as active parts of the transformation (Mueller and Renken, 2017; Petrikina et al., 2017), for instance, by informing, consulting, involving, or collaborating with these internal stakeholders. Participating in change processes can reduce employee resistance to the processes and in turn, enhance goal achievement and organizational commitment (Petrikina et al., 2017). Fourth, research points out the importance of attracting, hiring, and keeping people with new talent and the ability to integrate digital technology expertise with business know-how (Piccinini et al., 2015)

Grow IS capabilities

Other internal capabilities are also found to enable digital transformation, such as IS capability (Nwankpa and Roumani, 2016). IS capability is an organization's ability to assemble and deploy IS-based resources in combination with other resources, and Nwankpa and Roumani (2016) measured IS capability as a multi-dimensional variable with three dimensions: IS infrastructure capability, IS business spanning capability, and IS proactive stance. The authors found that IS capability positively influences digital transformation. They further suggested that firms with superior IS capabilities are better able to create digital transformation by redesigning and rethinking existing business processes, and by transforming traditional offerings into digital offerings (Nwankpa and Roumani, 2016).

Develop dynamic capabilities

Digital technology and innovations can lead to the disruption of organizations and entire industries. Digital disruption describes the groundbreaking impact of digital innovations, as opposed to sustaining and incremental changes, and highlights the urgent need to take responsive action (Berghaus and Back, 2017). Karimi and Walter (2015) studied digital disruption in the newspaper industry and found that to respond to such disruptions, organizations need to develop dynamic capabilities. Dynamic capabilities allow a firm to identify and respond to opportunities by transforming the organization, reconfiguring resources, and building digital platform capabilities, and thus, respond to industry changes and digital disruptions (Karimi and Walter, 2015; Leischnig, Wölfl, Ivens, and Hein, 2017). Karimi and Walter (2015) pointed out that digital platform capabilities are essential in responding to the disruptive changes in the newspaper industry, whereas Leischnig et al. (2017) emphasized the importance of market intelligence capability in order to sense environmental changes, identify opportunities and threats, and respond to them accordingly.

Develop a digital business strategy, and align business and IS

To accomplish a digital transformation, the organization must align the changes with its strategies. Several organizations have acknowledged the need for a fusion of the IS strategy and the business strategy into what is referred to as a digital business strategy. A digital business strategy is an "organizational strategy formulated and executed by leveraging digital resources to create differential value" (Bharadwaj et al., 2013, p. 472). A digital business strategy can support an organization in transforming and achieving the intended objectives of digital transformation, by emphasizing digital leadership abilities, agile and scalable digital operations, digitally enabled customer experiences, and emerging digital innovations (Leischnig et al., 2017). At the same time, to be able to reach the objectives of a digital business strategy, a digital transformation is necessary (Nwankpa and Roumani, 2016). However, Yeow, Soh, and Hansen (2017) found that as an organization shifts toward a digital business strategy, misalignments between the emergent strategy and resources can give rise to internal tensions. As organizations embark on new strategic directions, it is essential to develop resource configurations better aligned to the new digital business strategy (Yeow et al., 2017). By studying the strategic alignment gaps within German banks, Schmidt et al. (2017) found that banks' digital business strategies are often well aligned with customer needs, but that digital business strategies and customer needs are weakly aligned with the internal organization and the IS. This finding indicates that internal processes and IS systems in the banks studied were not prepared to meet the demands of strategic and customer perspectives, which has an inhibiting effect on the organizations' digital agenda (Schmidt et al., 2017). To reduce alignment gaps and respond to tensions and changes in the environment, organizations should actively pursue appropriate aligning actions (i.e., sense, transform, and seize) to reconfigure organizational resources and redefine the strategy (Yeow et al., 2017).

3.3 Implications: what does digital transformation imply for an organization?

With the drivers and objectives of a digital transformation, and the available resources and tools to undergo such an organizational transformation, organizations face different implications as effects of the transformation. Digital transformation entails much more than incrementing the business with digital technologies; it requires rethinking and restructuring the entire business logics of an organization (Piccinini et al., 2015). An interviewee in Yeow et al.'s (2017) study stated, "Digital is not only a technical thing. It is certainly a transformational and organizational thing" (p. 9). Researchers have studied the effects of digital transformation in organizations and found that such transformations may lead to organizational changes (Hylving and Schultze, 2013; Isaksson and Hylving, 2017) and new business models (Mocker and Fonstad, 2017; Remane et al., 2016) and may also have effects on specific outcomes and performance measures (Nwankpa and Roumani, 2016).

Reformed IS organization

Bilgeri et al. (2017) looked into how digital transformation and integration of the physical and digital world affects large manufacturing companies' organizational structures. Based on a multiple-case study of large manufacturing companies, the authors identified specific organizational issues related to digital transformation, all of which are reflected in the uncertainty of where and how to allocate and align digital capability within organizational structures (Bilgeri et al., 2017), and several of which were also found in other empirical studies in this review. One organizational issue addressed a new executive role for managing digital activities; digital transformation has led many firms to implement a CDO role to oversee the establishment of digital capabilities in the organization (Haffke et al., 2016). However, in large manufacturing companies, how to design this role and where to position this function within existing organizational structures often remain unclear (Bilgeri et al., 2017). Further, characteristics such as company size, digitalization experience, degree of fragmentation, company culture, and the level of cross-functional collaboration were found to affect the need for a CDO to orchestrate changes that digital transformation brings about (Haffke et al., 2016).

With digital transformation, IS is becoming increasingly intertwined with business (Haffke et al., 2016). As a result, tighter alignment between the CDO (business side) and the chief information officer (CIO) is important, which requires a mutual understanding of each other's roles and responsibilities. Further, it was found that introducing a CDO has implications for the CIO role in the organization (Haffke et al., 2016). One common implication is the CDO becomes an ambassador for the IS function, with close relations to the business, and thus, enhances the CIO's role and activities within the rest of the organization (Haffke et al., 2016). Another common implication was the CDO takes over some of the CIO's former responsibilities, which could lead to tension between the CIO and the CDO, as well as relief from the CIO's perspective (Haffke et al., 2016), who now can focus on delivering on a more confined area. Further, even without a CDO digital transformation is still found to imply changes in the CIO role, in that the CIO tends to take on some of the typical CDO responsibilities, such as highlighting opportunities and threats of digitalization, increasing business executives' digital literacy, orchestrating internal digital initiatives, and setting up digital innovation units (Haffke et al., 2016).

With digital transformation, the role of the IS function in the organization tends to become increasingly strategic, and the traditional expectations of the IS function are challenged. As IS is becoming a more integral part of the organization with new leadership roles and changes in responsibilities and cultures, organizations often need to redesign the relationship between the IS and the business (Piccinini et al., 2015). In examining the effects of digital transformation on large manufacturing companies, Bilgeri and colleagues (2017) found the role and organization of the IS function is a major organizational issue. Digitally transformed organizations need to manage traditional IS activities in combination with new digital activities. Consequently, many organizations explore and embrace a bimodal approach to IS (Haffke et al., 2017), which takes into account a balance between stability (to accommodate the long lifecycles of traditional IS activities) and agility (to accommodate short lifecycles of digital activities and technology innovation; Piccinini et al., 2015). Bimodal IT is based on the idea that traditional IS function design is not well suited to balance exploratory and exploitive tasks, and that the IS function instead should operate in two parallel modes: One mode represents the traditional approach to IT governance, and the other mode emphasizes agility and speed (Haffke et al., 2017). However, in many organizations, there is rivalry between the traditional IS function and new digital IS entities and teams (Bilgeri et al., 2017).

Haffke, Kalgovas, and Benlian (2017) found that organizing for bimodal IT can take different approaches: bimodal IT on a project basis, structural subdivisions of IS into two modes, or implementing the second mode as a separate organizational division from the first mode. They also found that bimodal IT often is a temporary transition stage and is executed during the phase of a larger transformational process undergone in the IS function as the organization demands more effective and agile support from IS in developing digital business solutions (Haffke et al., 2017). However, a transformation of the IS function eventually enables IS to support the business more effectively in its digital transformation (Haffke et al., 2017).

New business models

In a study of an automotive organization undergoing a digital transformation, Mocker and Fonstad (2017) found that the case organization was developing a new business model as a result of their digital transformation. The organization shifted from being a traditional car manufacturer to becoming a developer of digitally connected car products and a provider of mobility services (Mocker and Fonstad, 2017).

Transformations of business models as responses to digital transformation in industries are particularly common for automotive organizations, which operate in an Industrial Age industry influenced by new digital technologies (Remane et al., 2016). Incumbent automotive companies are increasingly introducing new business models in order to compete in the mobility sector. Remane et al. (2016) conducted a longitudinal study of the development of start-up business models in the mobility sector and found that the type of business models changed considerably from 2006 to 2015, enabled by

advances in digital technology. Further, Hildebrandt and colleagues (2015) found that changes in business models of automotive organizations, in particular, automotive manufacturers, may come from acquiring digital technology firms and thus, enhancing knowledge of digital technology. Acquiring such complementary and heterogeneous knowledge of digital technology, and being able to integrate and commercialize this knowledge, better prepares these organizations for digital transformation (Hildebrandt et al., 2015).

Although in this review most of the evidence for new business models as a result of digital transformation was found in the automotive industry, we expect similar effects in other industries. When studying digital transformation, many researchers have looked to the automotive industry, in that it is particularly relevant as physical products in this industry are increasingly permeated with digital layers (Remane et al., 2016), and new digital competitors are increasingly penetrating the industry, driving incumbent organizations to digitally transform and introduce new business models to stay competitive. However, other industries are also increasingly experiencing this type of influence by new digital technologies. Industries such as media, retail, and logistics have experienced the emergence of new business models (Remane et al., 2016). The financial sector is another example (Remane et al., 2016), where increased use of digital technology, new types of competitors, and regulatory changes have now led many banks to consider themselves digital companies rather than traditional banks. Another example is the healthcare sector, where digital technology is increasingly changing tools, work processes, and patient care practices (Thorseng and Grisot, 2017), which may lead to some organizations finding themselves delivering a different type of service than first anticipated.

Effects on outcome and performance

Digital transformation may also have direct or indirect effects on firm outcomes and different performance measures. For instance, through collecting data from U.S. CIOs, Nwankpa and Roumani (2016) found that digital transformation positively influences firm performance (measured by profitability, customer retention, return on investment (ROI), and sales growth, compared to direct competitors) and organizations' degree of innovation. Drawing on previous research, Nwankpa and Roumani (2016) suggested that as digital transformation in an organization evolves, the organization is able to achieve increased customization and customer satisfaction, and reduced selling costs. Digitally embedded business processes increase performance benefits from IS capabilities, and digital integration with other parties can reduce costs through communication, transparency, and monitoring (Nwankpa and Roumani, 2016). The authord found that organizations that have undergone a digital transformation matured and are better able to leverage digital technology to improve firm performance.

Further, drawing on previous research, the authors suggested that organizations that have embraced digital transformation are better able to take advantage of new digital technology, nurture digital strategies leading to process improvement and modularization, and are able to introduce new practices and innovative initiatives in their organizations (Nwankpa and Roumani, 2016). Thus, the authors found that organizations that integrate and build on digital technologies to drive change and new business processes and shift business operations are also more innovative as organizations.

4 Discussion and Conclusion

In this study, we systematically reviewed empirical research articles on digital transformation. We analyzed the contributions with respect to research topics, their findings, and our research questions. This literature review contributes to the literature in two ways and to practice.

First, this review provides a systematic overview of the prevailing research in this area. We identified 21 significant empirical contributions that studied drivers and objectives, success factors, or implications of digital transformation. The small number of contributions in this field is in line with Nwankpa and Roumani's (2016) observation that empirical evidence for the role of digital

transformation is lacking, as limited antecedents and consequences of digital transformation have been identified in theoretical frameworks. Digital transformation is a novel concept; 91% of the identified articles were published between 2015 and 2017 (55% in 2017). Among the articles examined in this review, we identified 17 theoretical approaches. The variety of theories employed in the studies reflects that the concept may be too broad to be examined within a single theory or framework (Fichman et al., 2014), and that the IS discipline is still far away from having a consistent body of theory to explain important concepts related to digital transformation (Ciriello and Richter, 2015).

Second, based on a thorough analysis of empirical findings we provide an overview of (1) why organizations undergo digital transformation, (2) how an organization can accomplish digital transformation, and (3) how digital transformation affects an organization. The findings presented in this paper are limited to empirical studies, which mainly consist of single-case studies (approximately 40% of the articles are single-case studies) within a limited selection of industries. Research on digital transformation would benefit from including other, and comparative, case studies from a larger spectrum of organizations and industries.

This study also contributes to practice, and managers would benefit from this review. The analysis and discussions of different empirical findings shed light on the success factors and implications of digital transformation, which many organizations face today or are likely to face in the near future. The importance of a supportive and agile organizational culture, well-managed activities, engaged managers and employees, and leveraged external and internal knowledge is emphasized in this review. In addition, we highlight the need to grow and develop IS capabilities and dynamic capabilities, align business and IS, as well as develop a digital business strategy. An overview of the underlying reasons for organizations undergoing digital transformation, what it takes to accomplish digital transformation, and the implications such transformations may have for organizations, is helpful for managers in understanding what may lie ahead of them and help them prepare for and structure their own approach to digital transformation.

However, we were surprised not to find more emphasis on change management in relation to the digital transformations studied in the reviewed articles. Relevant themes such as conflicts, discrepancies, uncertainty, and power struggles, are issues we would expect to arise to some extent with digital transformation. Moreover, insight into both positive and negative consequences of digital transformation, specifically effects on employees and management, is important for both research and practice. Future research on digital transformation could benefit from including such a perspective. Additionally, we find it peculiar that the role of IT governance is barely discussed in relation to digital transformation in the reviewed articles. IT governance has traditionally has been portrayed as an important factor for organizations succeeding with IT investments, and IT governance performance has been found to correlate with other desired measures of success, such as profits, asset utilization, and growth (Weill and Ross, 2005). However, it does not come across as an important success factor in the digital transformations studied in the reviewed articles. Research on the role of IT governance in relation to digital transformation could provide valuable insights to the IS field, and to practitioners.

We based this literature review on literature sources within the IS field, top-rated information management journals, and international conferences on information systems. Admittedly, 21 empirical articles from this very prominent research area may seem like a small sample. The research could benefit from extending the review to include sources such as practitioner-scientific outlets and journals and conferences within other research fields. The research could be further extended by selecting other keywords, using other inclusion and exclusion criteria, and choosing a broader time frame.

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Appendix A

Article ID	Source	Title	Year	Author(s)
1	Journal of Management Information Systems	The role of dynamic capabilities in responding to digital disruption: A factor-based study of the newspaper industry	2015	Karimi, J. and Walter, Z.
2	Journal of Strategic Information Systems	Aligning with new digital strategy: A dynamic capabilities approach	2017	Yeow, A., Soh, C. and Hansen, R.
3	ICIS	The role of the CIO and the CDO in an organization's digital transformation	2016	Haffke, I. Kalgovas, B. J. and Benlian, A.
4	AMCIS	Crossing boundaries: Organization design parameters surrounding CDOs and their digital transformation activities	2016	Horlacher, A., Klarner, P. and Hess, T.
5	ICIS	Transforming industrial business: The impact of digital transformation on automotive organizations	2015	Piccinini, E., Hanelt, A., Gregory, R. and Kolbe, L.
6	ICIS	Evolving the modular layered architecture in digital innovation: The case of the car's instrument cluster	2013	Hylving, L. and Schultze, U.
7	ICIS	IT capability and digital transformation: A firm performance perspective	2016	Nwankpa, J. K. and Roumani, Y.
8	AMCIS	Digitalization of the banking industry: A multiple stakeholder analysis on strategic alignment	2017	Schmidt, J., Drews, P. and Schirmer, I.
9	AMCIS	The role of cultural values for digital transformation: Insights from a Delphi study	2017	Hartl, E. and Hess, T.
10	ICIS	The generative mechanisms of healthcare digitalization	2015	Mihailescu, M., Mihailescu, D. and Schultze, U.
11	ICIS	Entering the digital era – The impact of digital technology-related M&As on business model innovations of automobile OEMs	2015	Hildebrandt, B., Hanelt, A., Firk, S. and Kolbe, L.
12	AMCIS	Changes in digital business model types – A longitudinal study of technology startups from the mobility sector	2016	Remane, G., Hanelt, A., Hildebrandt, B. and Kolbe, L.
13	AMCIS	Improving the readiness for change – Addressing information concerns of internal stakeholders in the smartPORT Hamburg	2017	Petrikina, J., Krieger, M., Schirmer, I., Stoeckler, N., Saxe, S. and Baldauf, U.
14	HICSS	The transformative role of bimodal IT in an era of digital business	2017	Haffke, I., Kalgovas, B. and Benlian, A.
15	HICSS	The effect of anarchistic actions in digital product innovation networks: The case of "over the air" software updates	2017	Isaksson, V. and Hylving, L.

16	ICIS	From digital business strategy to market performance: Insights into key concepts and processes	2017	Leischnig, A., Wölfl, S., Ivens, B. S. and Hein, D.
17	ICIS	Helping employees to be digital transformers – The Olympus.connect case	2017	Mueller, B. and Renken, U.
18	ICIS	Disentangling the fuzzy front end of digital transformation: Activities and approaches	2017	Berghaus, S. and Back, A.
19	ICIS	How digital transformation affects large manufacturing companies' organization	2017	Bilgeri, D., Wortmann, F. and Fleisch, E.
20	ICIS	Driving digitization at Audi	2017	Mocker, M. and Fonstad, N. O.
21	ICIS	Understanding healthcare digitalization: A critical realist approach	2017	Mihailescu, M. and Mihailescu, D.