Digital Transformation of Logistics and SCM: The Long Way from Digitization to Digital Business Models

Birgit von See, Beverly Grafe, Sebastian Lodemann, and Wolfgang Kersten

Abstract

The need to digitally transform is omnipresent in almost every company. Nevertheless, many companies are currently still failing to holistically apply the implications of increasing digitalization to their business model. Thus, this paper aims to analyze drivers, technological elements as well as the success of companies on their way from digitization efforts to a digital business model. This study utilizes a representative longitudinal online survey that covers key stakeholders in logistics and SCM. Our findings show that on the way from digitization (simply transferring analog processes to digital ones) to a digital business model, companies perceive increased opportunities and reduced risks. They expand their focus on cost reductions to new ways of increasing revenues. Technological concepts that contribute to generate a digital twin of the material flow, as well as the usage of platforms/IT services and forecasting methods, are of essential and increasing importance. Companies in the early stages of their way to a digital business model seem to misjudge the potential of concepts like predictive analytics. We finally can show that it is worth taking the long way. The further companies are on their path, the higher is their adaptability to key trends. Our results contribute to the research on digital business models and provide insights for practitioners on how to effectively tread the path to a digital business model.

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1 Introduction

Owing to their multifunctional as well as inter-organizational character, digital transformation is of particular relevance for the areas of logistics and supply chain management (ten Hompel & Henke, 2017, p. 247). There is a big variety of potential value-adding initiatives for digital supply chain management (SCM), such as digital transport marketplaces, optimization and visibility data services, as well as digitally supported fulfillment and warehouse service providers (Möller et al., 2019, p. 12). In this context, digital transformation may improve efficiency in operations, increase customer value as well as offer new ways of creating data-based services and platform business models in logistics and SCM (Cichosz et al., 2020, pp. 218-219). New technological concepts like blockchain, artificial intelligence, big data analytics, cloud computing platforms, or IoT-sensor-driven applications, which are currently often in trial phases, may pave the way for the transparency in supply chains that has always been required and asked for, especially from a sustainability perspective (Ebinger & Omondi, 2020, p. 11).

Digitalization in logistics and SCM is not a new phenomenon but has experienced a surge in awareness since the proclamation of Industry 4.0 in 2011 (von See, 2019, p. 20). The innovation shift is reflected in the growing number of startups in SCM and logistics. Within the logistics sector, their growth in 2017 was over 30% (Borreck et al., 2018, p. 13). The start-ups are mainly focusing on business models such as online platforms, last-mile delivery concepts, transparency, and control of supply chains (Borreck et al., 2018, p. 13; Göpfert & Seeßle, 2019, p. 263).

Since the Covid-19 pandemic at the latest, the need to further digitalize is ubiquitous in almost every company. The crisis has given a boost to the digital transformation in companies (Carroll & Conboy, 2020, p. 1; Dell Technologies, 2020, pp. 7–12; Falk et al., 2020, p. 2; Schroeder et al., 2021, p. 14). Concerning established companies, the scope ranges from incremental process optimizations to radical innovations of the entire business model (Leyh & Gäbel, 2017, pp. 36–37). As already indicated in the title of this paper, it is a long way from individual digitization to digital business models. Intending to provide companies with guidelines on the long way from digitization to digital business models, we analyze in the following paper how different actors in logistics and SCM (in the following L&SCM) proceed and how successful they are in doing so. Our research questions (RQs) are:

RQ 1 What drives companies in L&SCM on the path to a digital business model?
RQ 2 Which role do technological elements play in L&SCM for the path to a digital business model?
RQ 3 How successful are the players along the path to a digital business model?

Before answering those research questions based on an online survey, we give a brief introduction to the theoretical background.

2 Theoretical Background

In this paper, we discuss the path from digitization to digital business models in L&SCM. For this reason, we will briefly present the theoretical foundations of digital transformation and the central concepts of digital business models in the following.

2.1 Digital Transformation in L&SCM

As already mentioned above, a digital transformation is of particular relevance for logistics and SCM (ten Hompel & Henke, 2017, p. 247). From a unionist perspective (Larson, Poist & Halldórsson, 2007, pp. 3–5; Mentzer et al., 2001), SCM can be seen as "the logical progression of developments in logistics management" (Metz, 1998, p. 48). According to Mentzer et al. (2001), we define SCM as "the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole" (Mentzer et al., 2001, p. 18). In addition to the primarily unidirectional flow of materials in logistics, the bidirectional flow of information is thus of central importance.

There are various terms, some of which are used inconsistently and misleadingly: 'digitization', 'digitalization', 'digital (business) transformation', 'digital business model', and 'Industry 4.0' are just a few of them. Based on a comparison of different definitions by von See (2019, pp. 21–22), however, a clear distinction can be made, which will serve as a basis for this paper and is summarized in Fig. 1.

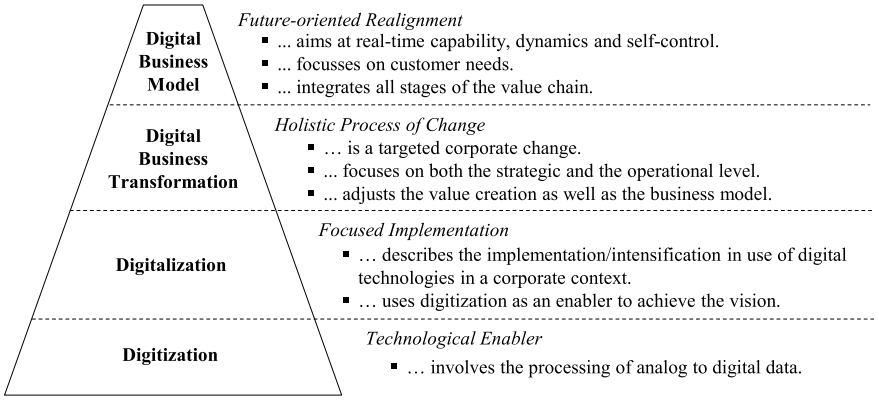

Fig. 1 Systematization of central terms of the digital Transformation (extended representation based on Kersten, von See & Indorf, 2018, p. 104 and von See, 2019, p. 24)

According to Brennen and Kreiss (2016), digitization can be defined "as the material process of converting analog streams of information into digital bits" (Brennen & Kreiss, 2016, p. 556). Digitalization, in contrast, is the "adoption or increase in use of digital or computer technology by an organization, industry, country, etc." (Brennen & Kreiss, 2016, p. 556, based on Oxford English Dictionary). When solely focusing on individual digitization actions, many companies fail to fundamentally question those processes. Digitalization considers the aggregate of multiple digitization efforts (Gobble, 2018, p. 56), leading to meta-structures such as organizations being perceived 'digital' (which previously was a characterization only assigned to products or processes). From the perspective of a corporate context, digitalization thus involves the consideration of individual framework conditions when implementing new digital technologies. Enabling digital technologies discussed within this context are, for example, cloud computing, big data analytics, and Internet of Things (Agrawal & Narain, 2018, p. 3; Büyüközkan & Göçer, 2018, p. 166; Garay-Rondero et al., 2020, pp. 895–897).

Taking a holistic supply chain perspective, digital business transformation highlights the process of change (Bowersox et al., 2005, p. 22). Within this digital transformation process, several authors point out the need to take a socio-technical perspective (Brödner, 2018, p. 247; Dregger et al., 2016, p. 3; Kagermann, Wahlster, & Helbig, 2013, p. 28) – a theory that originally emerged over 60 years ago and further evolved interdisciplinarily (Davis et al., 2014, pp. 171–172). A digital business model builds the top of the 'digitization pyramid'. It is the culmination of this process and entails fundamental changes to businesses leading to digital business models which cover a holistic perspective. It focuses on customer needs and digital value creation (Berman, 2012 p. 18) and incorporates customers as well as partners digitally (Galimova et al., 2019, pp. 2–3). A detailed description follows in the next section.

2.2 Digital Business Models in Logistics and SCM

Even though the term 'business model' has been discussed for many years (Kersten, 2018, p. 1289), a commonly accepted and widespread definition of the phrase is still missing (Weking et al., 2020, p. 3). Nevertheless, there is a converging understanding regarding the core elements that characterize business models (Foss & Saebi, 2017, p. 201); Kersten, 2018, p. 1290: The design of the value creation process, the value proposition as well as the mechanisms to capture value mark central components of business models (Foss & Saebi, 2017, p. 202; Johnson et al., 2008, pp. 52–53; Kersten, 2018, p. 1290; Teece, 2018, p. 40). In this paper, business models are defined as "the architecture of the value creation process that aims at generating benefits for customers and value-added partners and based on that the model to achieve revenue" (Kersten, 2018, p. 1290). Business models can therefore be understood as the interface between the corporate strategy and the business processes (Guggenberger et al., 2020, p. 3; Kersten, 2018, p. 1291).

As business models consist of various components and elements, several tools for describing and operationalizing business models have been developed so far (Möller

et al., 2019, p. 3). The most common concepts are represented by the Business Model Canvas (Osterwalder & Pigneur, 2010) and the St. Gallen Business Model Navigator (Gassmann, Frankenberger & Csik, 2014). According to Osterwalder and Pigneur (2010), business models can be described with the help of nine building blocks that touch upon customers, infrastructure, offer, and financial viability as the four central elements of a business (Osterwalder & Pigneur, 2010, p. 15). Inspired by a painter's canvas, the nine blocks – customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure – form the Business Model Canvas (Osterwalder & Pigneur, 2010, pp. 43–44). As the sections on the canvas are addressed and filled in several iterative steps, the Business Model Canvas allows developing as well as frequently questioning business models (Kersten, 2018, p. 1293).

Compared to the Business Model Canvas, the St. Gallen Business Model Navigator by Gassmann et al. (2014) appears to be less complex but offers a more focused and holistic reflection of business models at the same time (Kersten, 2018, p. 1293). To describe business models, Gassmann et al. (2014) propose four dimensions that are presented in a 'magic triangle'. The first dimension concentrates on the customer and is related to the question "Who are our target customers?" (Gassmann et al., 2014, p. 6). Second, the value proposition, which deals with the products and services that are valuable for customers and the question of "What do we offer to customers?" (Gassmann et al., 2014, p. 6) needs to be addressed. The question "How do we produce our offerings?" (Gassmann et al., 2014, p. 6) is raised in the third dimension and focuses on the value chain. Lastly, the fourth dimension describes the profit mechanisms and "Why does the business model generate profit?" (Gassmann et al., 2014, p. 7). As soon as a minimum of two of the four dimensions is subject to a change, one can call it a business model innovation (Gassmann et al., 2014, pp. 6–8).

The innovation of business models does not only comprise the development of completely new business models but also includes the incremental refinement of existing business models (Schallmo, 2013, p. 29). In light of the digital transformation during the past years, business model innovation has primarily been driven by advances in IT (Fichman et al., 2014, p. 335). Against this background, the innovation of digital business models presents "a significantly new way of creating and capturing business value that is embodied in or enabled by IT" (Fichman et al., 2014, p. 335), meaning that if new digital technologies cause fundamental changes of the business, a business model can be called digital (Veit et al., 2014, p. 48). Especially the logistics sector will be shaped by technological developments triggering the digital transformation of business models (Möller et al., 2019, p. 1; Remane et al., 2017, p. 41). "Effects on the corresponding supply chains are inevitable" (Pflaum et al., 2020, p. 4504), which stresses the importance of adapting accompanying business models.

The concept of Osterwalder and Pigneur as well as the operationalization by Gassmann et al. as global approaches (Kersten, 2018, p. 1298) form an essential prerequisite that helps to innovate business models systematically (Kersten, 2018, p. 1294). Based on this, several researchers have developed operationalizations to describe business models in the framework of digitalization and to map accompanying changes. A selection of exemplary operationalizations is listed in Table 1.

Table 1 Overview of exemplary operationalizations for digital business models

References	Type of Operationalization	Specification of Operationalization	Data Basis/Data Source
Staub et al. (2021)	Taxonomy based on the St. Gallen Business Model Navigator	Digital business models in general	Ten digital platform cases from the real estate industry and literature on digital platforms and business ecosystems
Kifokeris and Koch (2020)	Business model canvas	Logistics	Observations, interviews, participant mapping, and photo-elicitation
Schlimbach and Asghari (2020)	Business model canvas	Digital business models in general	Online survey and 16 semi-structured expert interviews
Weking et al. (2020)	Taxonomy	Industry 4.0	32 Industry 4.0 business model innovation cases
Möller et al. (2019)	Taxonomy	Logistics	Randomized samples from the startup database AngelList
Bock and Wiener (2017)	Taxonomy	Digital business models in general	56 empirical and key conceptual business model studies that are digitally related
VDI/VDE (2016)	Business model canvas	Industry 4.0	Not specified
Alias et al. (2015)	Business model canvas	Logistics	Expert interviews

To give an example, Weking et al. (2020) derive a taxonomy that enables to describe, classify, and analyze Industry 4.0 business models (Weking et al., 2020). The developed taxonomy comprises five meta-dimensions that address and complement the dimensions of the St. Gallen Business Model Navigator (Weking et al., 2020, p. 8). Moreover, the taxonomy facilitates the evaluation of the Industry 4.0 status of companies' business models and shows opportunities for leveraging Industry 4.0 (Weking et al., 2020, p. 1).

To face the challenges of digital transformation, business models must be continuously benchmarked, put into question, and adapted to changes that emerge from new technologies (Becker et al., 2020, p. 53). Operationalizations of business models do not only pave the way for the digital transformation of business models but also constitute a guideline for firms, which helps to innovate business models toward digitalization. The current status of the digital transformation of business models in companies, more specifically the extent to which questioned companies have transformed their business models digitally, will be discussed in the following analysis.

3 Research Methodology

The data was collected as part of a large-scale study on trends and strategies in L&SCM in cooperation with the German Logistics Association (BVL). BVL is an interest group for L&SCM with more than 10,000 members. Owing to its membership structure, BVL reflects a broad view of the considered core roles in supply chains: manufacturing industry, logistics services, and retail. An online questionnaire was designed in 2016 based on an extensive mixed-methods approach in which expert interviews served as the starting point (Kersten et al., 2017). To be able to make statements that are as representative as possible, the questionnaire was distributed via the network. Data were collected in two periods from mid-July to mid-October 2016 and from the beginning of February to the beginning of March 2020. The first phase of the survey in 2016 was characterized by a period in which many digitalization efforts were being pursued. The second survey period in 2020 extended immediately before or during the Covid-19 pandemic outbreak. This circumstance must therefore be taken into account when discussing and reflecting on the results.

In 2016, 331 responses were generated from German company representatives compared to 276 in 2020. The respective breakdown of the samples can be seen in Fig. 2. A large proportion of the respondents come from the manufacturing industry (approx. 43% in both years) or logistics services (approx. 41% and 40%) and a smaller proportion from the retail sector (approx. 15 and 17%). This distribution corresponds to the membership structure of the BVL with a deviation of max. 5.3% in each case (BVL, 2017, pp. 4–58, 2020, pp. 3–57) and can be regarded as representative. Our breakdown into three different size classes is based on Grüninger et al. (2013). Almost half of the respondents come from large companies and approx. 30% and 20% from medium-sized to small companies, respectively.

To answer the research questions raised in Sect. 1, we use the following survey questions: First, we classify the respondents into groups based on their assessment of the progress of digital transformation in their business model. Second, we discuss

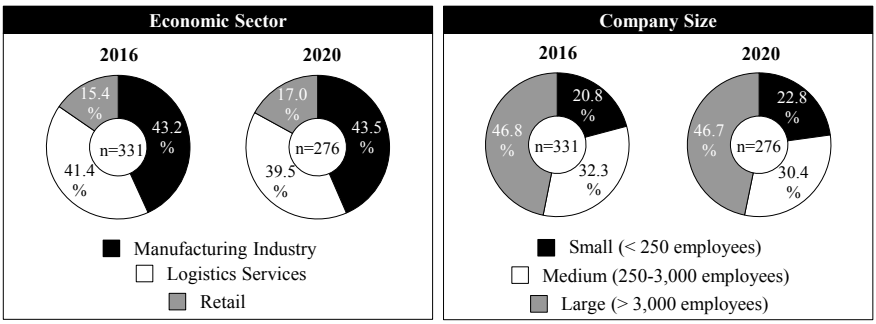

Fig. 2 Demographics of the sample

why the respondents transform their business model based on their opportunity and risk as well as cost and revenue assessment. Third, a look into the assessment of central technological concepts which are relevant for L&SCM gives us the opportunity to discuss how respondents digitalize. Finally, we assess the respondents' success based on their ability to adapt to key trends. Descriptive evaluation is carried out with the software IBM® SPSS® Statistics Version 23 and will be presented in the following section.

4 Findings

For evaluation purposes, we divide our sample into four groups. These groups represent different strategy types for digitally transforming companies' business models. Table 2 shows a description of the strategy types identified. Allocation of participants to groups is based on respondents' answers on the extent of their company's business model transformation.[1]

Figure 3 shows a breakdown of the groups. Comparing those groups, we can first observe that from 2016 to 2020 the share of followers pursuing strategy type A has decreased in favor of the other strategy types B, C, and D. This means that there has been a shift toward an increasing digital business model transformation. Some of the digital observers seem to have put forward first implementation actions, digital adapters, and transformers have focused and expanded their previous activities. Many companies seem to have successfully completed the first steps and have been able to reap the first fruits of their digital business model transformation.

Nevertheless, the proportion of each strategy type is still nearly equally distributed – thus allowing a statistical comparative analysis. In the following, we first analyze why companies in L&SCM digitally transform their business model. We second focus on how (on a technological basis) they actually digitalize, and finally third elaborate their success in doing so.

4.1 What Drives Companies in L&SCM on the Path to a Digital Business Model?

The above observation of a shift toward the digital transformation of the entire business model can be justified by the potential that companies increasingly see in digital transformation. Figure 4 shows that regardless of the type of strategy pursued, opportunities seen in digital transformation by the companies increased in

[1]Related questions were asked as follows: To what extent will the business model of your company be digitally transformed? (I) We extend our offer by digital services in addition to our current offerings. (II) We are extending our business model by a business division for digital services and goods. (III) We are transforming our existing business model to a digital one. The answers are based on a Likert-type scale: not planned, planned > 5 years, planned < 5 years, already today to a minor extent, already today partially, already today to a broad extent.

Table 2 Strategy types identified for digitally transforming companies' business models

#	Strategy Type	Companies that…
A	Digital Observers	… do not digitally transform their business model at all
B	Digital Adapters	… extend their offer by digital services and/or extend their business model by a business division for digital services and products
C	Digital Transformers	… transform their existing business model to a digital one
D	Digital Pioneers	… have already completed a digital transformation of their business model to a digital one

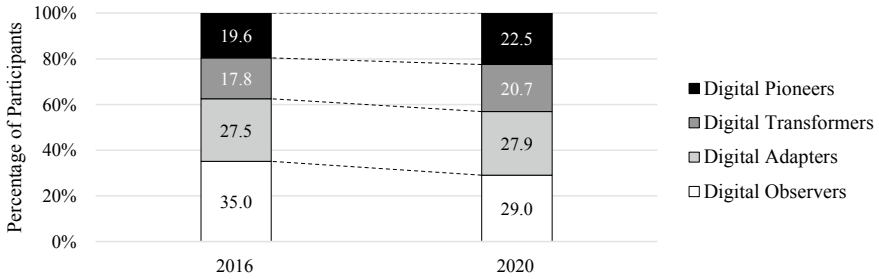

Fig. 3 Longitudinal breakdown of the distribution of strategy types

importance and risks decreased in importance from 2016 to 2020. While the opportunities are rated as high to very high on average, the risks associated with digital transformation are rated as medium on average. What is striking here is that digital pioneers in particular rate the opportunities higher and the risks lower than the other groups. This is certainly a potential explanation for the pioneer strategy they are pursuing.

Digital transformation in L&SCM is often seen as a measure to cut costs and make complexity manageable (Agrawal & Narain, 2018, p. 3; Kersten et al., 2017, p. 19). In that vein, Osterwalder and Pigneur's Business Model Canvas contrasts the cost structure with the revenue sources. In the following, we focus on the respondents' assessment of the impact of digital transformation on their cost and revenue situation.[2] In general, the companies agree with the statement that digital transformation enables a reduction in costs and an increase in revenue, irrespective of the strategy pursued. While in 2016, the average level of agreement regarding the revenue increase option was still higher (mean = 0.60) than the average level of agreement regarding the cost reduction option (mean = 0.53), both have increased

[2]Questions: (i) The digital transformation allows our company to generate additional revenues. (ii) The digital transformation allows our company additional cost reduction. Rated on a bipolar likert-scale: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

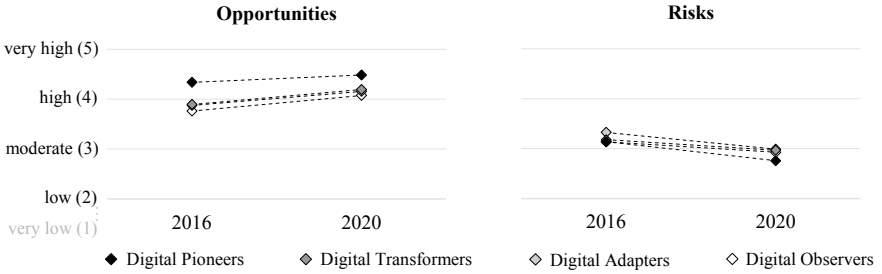

Fig. 4 Longitudinal assessment of the opportunities and risks of digital transformation

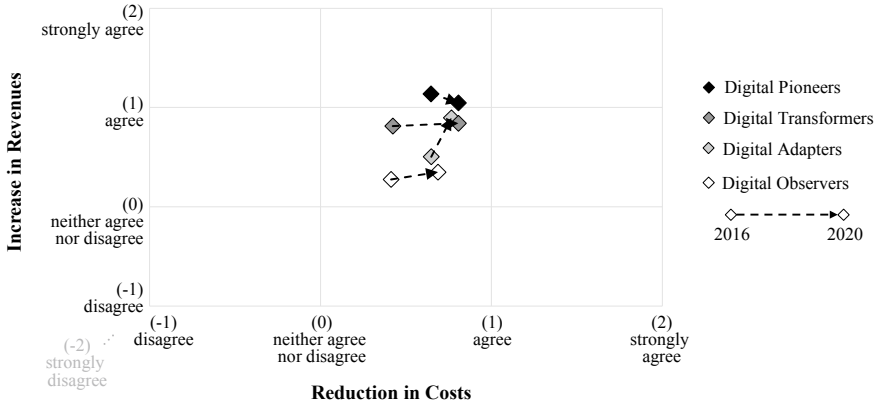

Fig. 5 Evaluation of the opportunity to reduce costs and increase revenues in the longitudinal section of the strategy types

in 2020 and have settled at an even level (mean = 0.76 both). This signals a focus of our respondents on cost-cutting measures during the past 5 years. Figure 5 shows a detailed breakdown of the group responses.

A comparison of the different strategy types revealed the following patterns in 2016: Digital pioneers saw a high degree of opportunities to reduce costs and increase revenues. While digital transformers rather focused on revenue increases, digital adapters prioritized the ability to reduce costs. Compared to the others, digital observers agreed with the possibility of revenue increases or cost reductions to an only proportionally smaller degree. Five years later, in 2020 we see a coalescence of the groups in terms of their prioritization. Digital pioneers, transformers as well as adapters rate the opportunities to achieve cost reductions and revenue increases through digital transformation equally highly. Only the digital observers rate the opportunities for revenue growth much lower. Thus, all three different strategy types for digitally transforming companies' business models

(pioneers, transformers as well as adapters) have recognized the opportunity to not only reduce their internal costs through a digital transformation but more importantly to achieve potential revenue increases and new revenue streams.

4.2 Which Role do Technological Elements Play in L&SCM for the Path to a Digital Business Model?

Digital technologies are decisively shaping the digital transformation of the business model. In a previous analysis, von See (2019, p. 107) clustered relevant technological concepts to SCM technology groups, namely assistance systems, automation, digital twin, forecasting tools, business management systems, platforms, IT services, and customer interfaces, which will be used as a basis for our further analysis. The following section analyzes the relevance of individual technologies for the respondents and the extent to which they have been implemented. For the sake of clarity, the comparative analysis is based on two strategy types, namely digital pioneers and digital observers.

Figure 6 provides an overview of the relevance and implementation status of the technologies that enable digitization along with the material flow. When comparing digital pioneers with observers, a clear difference emerges: Digital pioneers rate all technologies as more relevant than digital observers. Thus, technologies are also more common among the pioneers. In SCM, technologies that enable a digital twin

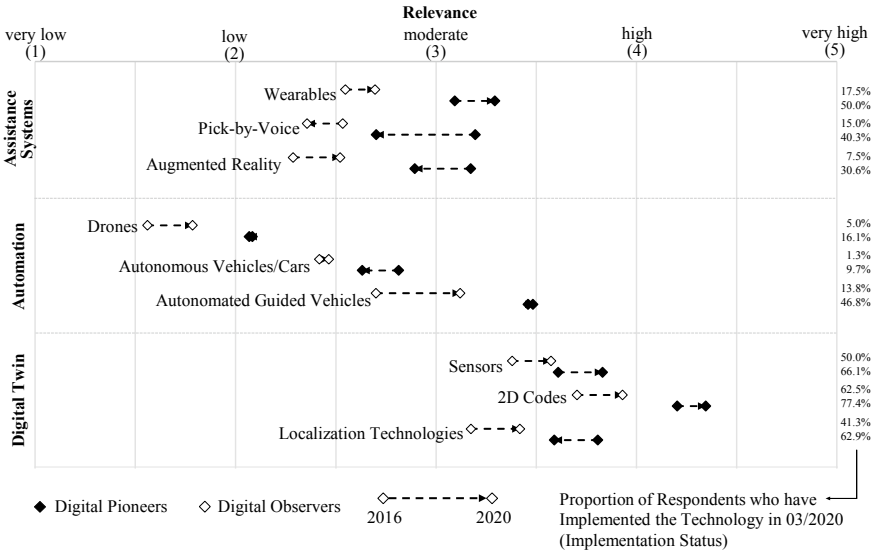

Fig. 6 Importance and implementation of technologies for digitalization along with the material flow in L&SCM

of the material flow are considered particularly relevant: sensor technology, 2D codes, and localization technologies. Automated guided vehicles that serve to automate the flow of materials also occupy an accentuated position. Digital observers, in particular, rate its relevance in 2020 much higher than in 2016. They seem to have recognized their importance for a digital transformation of the companies' business model, even if they have not yet introduced them to the same extent. Among the digital assistance systems, wearables are particularly noteworthy. Based on the relevance rating, augmented reality on the other hand does not seem to have achieved the desired success among the pioneers.

Technologies that support the flow of information are considered to be even more important than the technology-based digitization of the material flow. Figure 7 shows the relevance and implementation status of related technologies. Again, digital pioneers rate those technologies as more relevant than the observers and, accordingly, show a more advanced stage of implementation. Of utmost importance and thus the highest degree of implementation are established business management systems like warehouse management and enterprise resource planning systems. Newer concepts such as platform as a service and digital marketplaces have gained importance in recent years.

Against the background that the value proposition and customer relationship are central building blocks of the business model, it is particularly striking that the

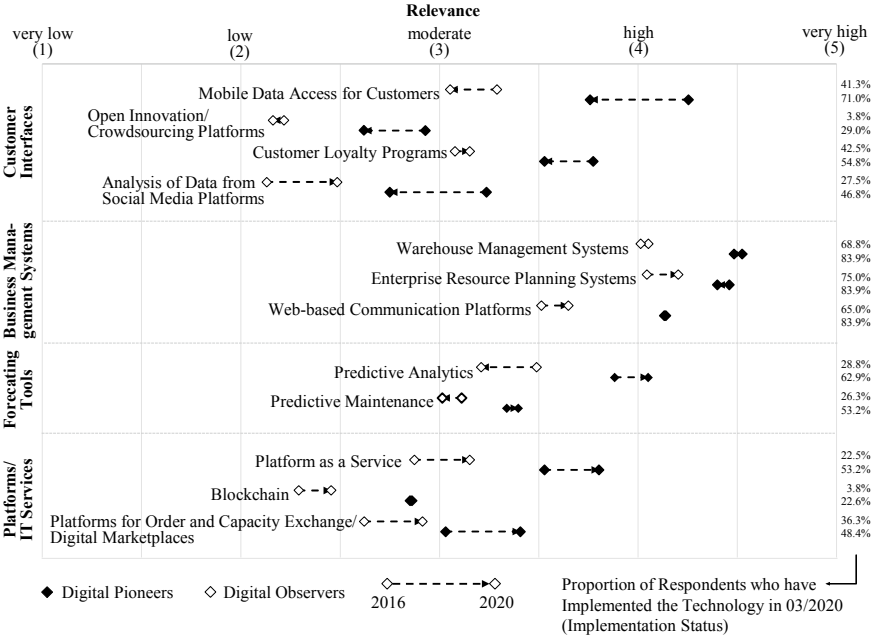

Fig. 7 Importance and implementation of technologies that support the flow of information in L&SCM

technologies that map the customer interfaces are rated as declining in relevance from 2016 to 2020. Especially digital pioneers seem to rather rely on, for example, predictive analytics to create concepts of higher customer value. Surprisingly, digital observers on the other hand estimate this technology to be of decreasing importance in the last 5 years and seem to be in danger of misjudging its potential.

4.3 How Successful Are the Players Along the Path to a Digital Business Model?

To evaluate the success of different strategies, we use the respondents' perceived ability to adapt to key trends from the field of SCM. Figure 8 provides a strategy type-specific evaluation of six central trends from which several key insights can be drawn:

First, the perceived relevance of trends has mostly increased or remained constantly high from 2016 to 2020 in all groups analyzed, except for e-commerce among the digital pioneers, demand fluctuations among digital adapters as well as business analytics among digital transformers and digital observers.

Second, from 2016 to 2020, across all groups and trends – except for digital observers' adaptability to e-commerce – respondents' perceived adaptability decreased. This means that, from today's perspective, respondents are less able to deal with the trends despite their increasing relevance. This effect can possibly be attributed to the fact that, when looking back, respondents have found that their adaptability in the past was lower than originally assessed. But third, with the trends of e-commerce, demand fluctuations, complexity, and transparency primarily impacting the company from the outside, an ascending adaptability can be seen from strategy type A to D. This leads to the conclusion that with an increasing degree of digital transformation of the business model, an increasing adaptability to key trends can be expected.

5 Conclusions

This paper aimed to analyze the long way from digitization to digital business models, providing companies with guidelines on how to proceed in the future. Based on a longitudinal online survey in 2016 and 2020 with 331 and 276 participants, respectively, the following core findings related to the research questions were obtained:

In general, we observed a shift toward an increasing digital business model transformation during 2016 and 2020. Many companies seem to be on a good path of this long way. Regardless of the type of strategy pursued, increasing opportunities and decreasing risks seem to drive companies in L&SCM on the path to a digital business model (RQ 1). Hereby the particularly high assessment of opportunities and low assessment of risks puts digital pioneers one step ahead in

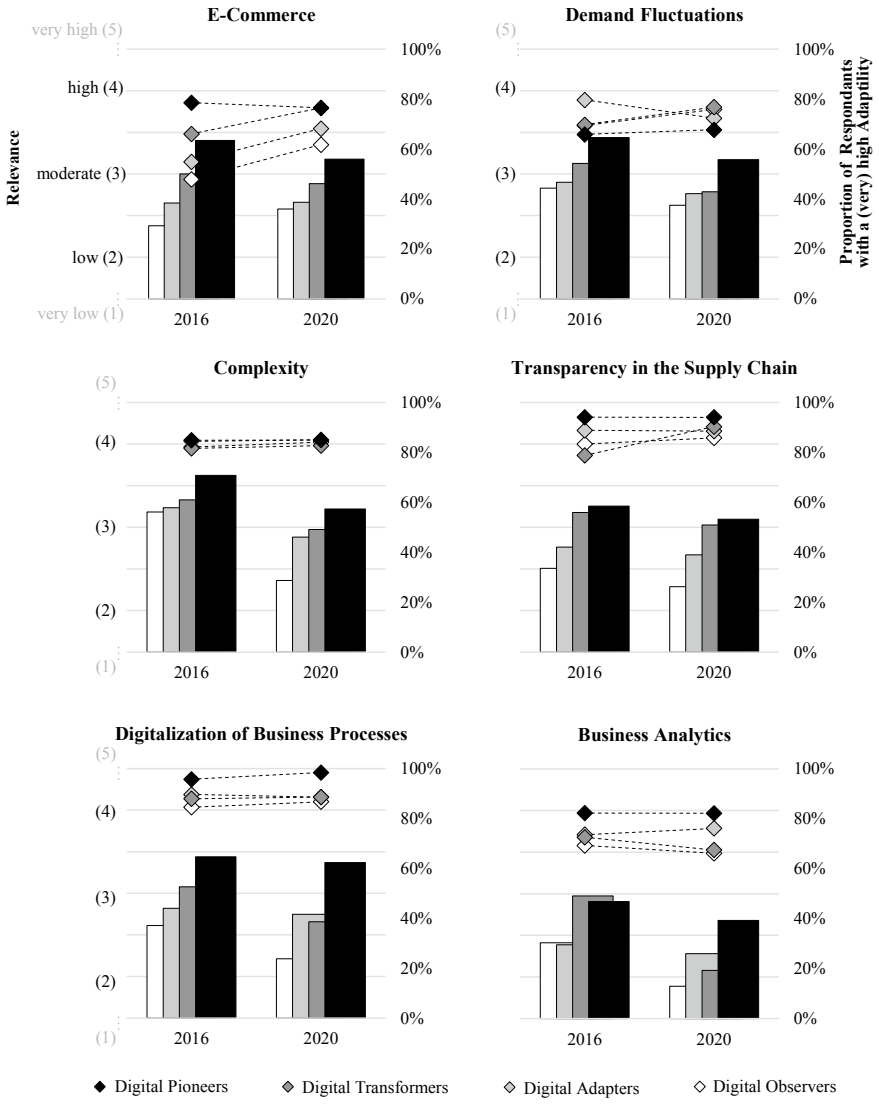

Fig. 8 Relevance and adaptability of respondents to key trends in logistics and SCM

implementation. Furthermore, while digital observers tend to see only minor potential in cost reductions through a digital transformation, companies that are already on their path to a digital business model tend to be driven by both, cost reductions as well as revenue increases. This indicates a holistic consideration of all components of the business model (see Sect. 2.2).

In addition to the customer perspective and thus the revenue sources, the core resources of the digital business model should also be addressed. A variety of technologies exist that come into play along the path toward a digital business model in L&SCM (RQ 2). In terms of material flow, there is a particular focus on technologies that create a digital twin of the physical flow of materials. Additionally, automated guided vehicles and wearables are increasingly supporting employees. Our comparison of different strategy types shows that digital pioneers are clearly ahead of digital observers in the implementation of these technologies. This is also true for technologies that support the flow of information in L&SCM. Here, platform technologies/IT services, as well as forecasting tools, have recently been in the focus of digital pioneers. Concerning companies that are taking their first steps on the way to a digital business model, we observed the danger of misjudging the potential of technologies, for example, predictive analytics. Especially in the early stages, companies, therefore, need to question the digitization of their core resources and closely link it to potential revenue streams in their business model. Our results finally clearly show that the further companies are on their way from digitization to a digital business model, the better they are positioned to deal with future requirements (RQ 3).

Despite it being a long way from individual digitization to digital business models, it is a path certainly worth exploring. Hereby, companies have to bear different things in mind: First, there is no one-size-fits-all approach. Diversity of company backgrounds implies a variety of potential business model adaptations. Second, there are different maturities and connected development processes. Thus, it is initially worth exploring 'digital add-ons' before jumping into entirely digital business models (Bouwman, Nikou & Reuver, 2019, p. 3). Third, of course, the core business of the company must not be neglected despite the hype and potential lure around 'digital-first' companies. Core competence remains a central element of the business model which must not be sacrificed for the sake of digitalization. A clear focus should lie on value addition.

It is one of the success factors of value-adding digital transformation initiatives to find, through intellectual openness and conscious reflection, the right balance between the limitations on the one hand and the potentials of digital innovations on the other (Pearce & Pearce, 2020, p. 23). This is embodied by the 'fast failure' mentality which accepts failure in the knowledge of the big potential upsides of fast progress regarding a company's digital transformation (Neus et al., 2017, p. 35). Trying out digital products or processes in this exploratory way is a sign of digital maturity (Gudergan et al., 2019, p. 8). Following this approach, even though one may not be sure of the eventual value-adding potential of an individual initiative, still retaining a firm grasp of the underlying factors in the organization enable competitiveness – that is the pinnacle of digitalization competence. Doing so will take companies one step further on the way to the digital business model either way.

Our results must be considered in light of their limitations. In determining the sample, a regional restriction was made to Germany. Consequently, it is not possible to transfer the findings to other regions without restrictions. For future research, therefore, it makes sense to extend our investigation toward various other

countries as well and to reveal commonalities and differences through comparative analyses. The results are based on self-assessments by the companies on the basis of selected Likert scales. Although the questions were formulated to the best of our knowledge and belief, a bias in the answers cannot be ruled out because of this design. Making digital transformation objectively and better measurable should be the focus of further research. Our findings are based on descriptive evaluations. Further statistical comparative analyses will help to better substantiate them. Besides, we were only able to highlight technological aspects as support for the path to the digital business model. As mentioned in Sect. 2.1 and 2.2, following a socio-technical perspective as well as addressing all parts of a business model is essential. Future research should therefore expand our analyses to include investigations considering employee, organizational as well as customer perspectives.

Despite the continued need for research, this paper made an important contribution to research on digital business models. With the recommendations derived, we were also able to give, in particular, those companies which are already on their path to a digital business model implications for their further course of action.

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