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Digital Transformation-Driven Business Model Innovation – Current State and Future Research Directions

Completed Research Paper

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Abstract

Existing research on digital transformation agrees that digital transformation impacts the transforming firms' existing business models in manifold ways. However, research examining the underlying mechanisms and the specific impact is still rare. This study introduces the concept of digital transformation-driven business model innovation, subsequently conceptualizes and summarizes the existing literature in this field, and finally presents recommendations on future research directions. Based on a systematic literature review, we show that digital transformation-driven business model innovation gained increasing importance in the information systems and management literature in recent years. Existing research primarily focuses on conceptual foundations, antecedents, processes, outcomes, and the evaluation of digital transformation-driven business model innovation. Nevertheless, research in this field is still in its infancy, which is reflected by research gaps that we have identified in all of these research directions.

Keywords: Digital Transformation, Business Models, Business Model Innovation, Literature Review, Qualitative Research

Introduction

The emergence of new disruptive digital technologies impacts firms across industries. Changing customer needs and the emergence of new competitors with novel, often digital, business models (BMs) put pressure on firms' existing BMs. To stay competitive in an increasingly digitized environment, firms need to undergo a digital transformation (DT). A DT can be defined as the transformational process of using digital technologies and appropriate human and technical capabilities to adapt the existing BM for the requirements of the digital age (Bharadwaj et al. 2013; Fitzgerald et al. 2013; Vial 2019). The process of DT has various effects on firms' existing BMs (e.g., Levkovskyi et al. 2020; Metzler and Muntermann 2020). In that regard, various definitions of DT refer to the reconfiguration of existing BMs as the expected outcome of DT (Vial 2019). Thereby, a DT can end up in altered existing BMs or entirely new (often digital) BMs (Levkovskyi et al. 2020). However, whereas research on DT agrees that DT has a huge impact on existing BMs, research focusing on analyzing how DT impacts and innovates existing BMs of firms is still rare. In order to access the current state of research in that field, it is of great importance to structure the existing literature and to derive future research opportunities. Based on this, future research can expand the existing field of research with new insights.

As two of the first researchers, Buck and Eder (2018) aimed at structuring the field of DT concerning BMs. However, their article's focus was rather on the digitization of BMs (i.e., a purely technical

process) instead of the impact of DT on BMs (i.e., an organizational process with a transformational impact) (Tilson et al. 2010). Other researchers conducted literature analyses that only partially bring together the concepts DT and BM (e.g., Böttcher and Weking 2020), only focus on specific industries (e.g., Caliskan et al. 2020), or differ in their research focus or applied methodology (e.g., Parida et al. 2019; Caputo et al. 2021). What is still missing is an all-encompassing analysis of the current state of research regarding the impact of DT on existing BMs and DT as a driver of business model innovation (BMI). With this study, we want to close this research gap by analyzing the current state of research and giving recommendations for future research to encourage researchers to extend the existing knowledge. Thereby, our study helps to draw a holistic picture of DT-driven BMI and to better understand the relationship between DT and BMI. Against this background, this paper investigates the following research questions (RQ):

RQ1: How can existing research on digital transformation-driven business model innovation be systemized and what are major insights?

RQ2: What are worthwhile future research directions concerning digital transformation-driven business model innovation?

To answer these research questions, we conducted a systematic literature review across various relevant databases following the guidelines of Webster and Watson (2002). Our results show that DT-driven BMI gained increasing importance in the information systems (IS) and management literature during the last years. Nevertheless, research in this field is still in an early stage.

In order to provide sound theoretical foundations and to gain valuable insights, this paper is structured as follows: Starting with the theoretical foundations, we introduce DT and BMs as the main underlying concepts. Second, we describe the methodological foundation of the study. Third, we present the findings. Fourth, the discussion highlights the implications, limitations, and future research directions. Finally, the conclusion summarizes the most important findings.

Theoretical Foundations

Digital Transformation of Firms and Industries

The ongoing emergence of new digital technologies is shaping businesses across different geographical regions and industrial sectors. Digital technologies can be defined as a combination of information, computing, communication, and connectivity technologies (Bharadwaj et al. 2013). Some of the most common digital technologies include social media, mobile, analytics, and cloud computing (Sebastian et al. 2017). The use of digital technologies with the aim to “*improve an entity by triggering significant changes to its properties*” can be described as DT (Vial 2019, p. 118). In a business context, DT has implications that reach far beyond an organization’s processes and its immediate value network (Vial 2019). Instead, DT has the power to automate organizational processes, replace or enhance products and services by digital offerings, transform supply chains into networks, and innovate and disrupt the sales and communication channels of firms (Matt et al. 2015; Böttcher and Weking 2020; Metzler and Muntermann 2020). Overall, DT comprises of various transformational processes with the power to lead to an innovation (e.g., through an alteration or (re)definition) of existing BMs (e.g., Vial 2019).

Although the term DT differs significantly from the terms “digitization” and “digitalization,” some researchers use these terms synonymously. Therefore, it is important to distinguish the terms from each other. Whereas the term digitization describes a purely technical process of transforming analog signals into a digital format, digitalization refers to a socio-technical phenomenon at a societal and institutional level (Tilson et al. 2010). Finally, the term DT, which is a relatively new concept in IS research, goes far beyond these terms by referring to a transformational process of using digital technologies and appropriate human and technical capabilities to adapt the existing BM for the requirements of the digital age (Bharadwaj et al. 2013; Lucas Jr. et al. 2013; Vial 2019). Thereby, DT differs from other concepts of strategic change in that regard that changes driven by digital technologies are particularly fast, resulting in a more volatile, uncertain, and complex environment (Matt et al. 2015; Warner and Wäger 2019). With its power of altering or (re)defining a firms’ BM and changing its whole identity, DT also exceeds earlier forms of IT-enabled organizational change (Vial 2019; Wessel et al. 2021).

DT is especially relevant for incumbent firms. Since these firms typically have to deal with long-grown corporate structures and legacy IT infrastructures, it is even more important to adapt the corporate culture and reinvent the BM for the digital age (Metzler and Muntermann 2020). Without undergoing a DT, these firms risk losing market share to emerging firms with novel BMs based on using digital technologies (Veit et al. 2014). In that regard DT has the potential to force changes to a part of an existing BM or even to change the whole BM in a way that a completely new one is created (Levkovskyi et al. 2020).

Risanow et al. (2019) found that DT literature can be divided into 12 different schools of thought. BMs are one of these. However, although existing literature on DT agrees that DT has a major impact on the BM of firms, this school of thought is rather underrepresented in DT research.

Digital Transformation-Driven Business Model Innovation

In DT research, the BM has emerged as a promising analytical framework highlighting its increasing importance for research and practice (Al-Debei and Avison 2010; Veit et al. 2014). While existing literature builds upon different definitions of the BM, most of them agree that a BM aims at structuring a business into value creation functions, delivery functions, and capturing functions (e.g., Chesbrough and Rosenbloom 2002; Osterwalder and Pigneur 2010; Teece 2010; Zott et al. 2011). Thereby, a BM can be seen as a blueprint representing the architecture of a firm's overall business and describing how a firm creates value and how the firm delivers this value to relevant stakeholders (Osterwalder and Pigneur 2010; Foss and Saebi 2017). The existing literature agrees that a firm's BM consists of different elements. For example, Osterwalder and Pigneur (2010) structure a BM into the following nine elements: (1) key resources, (2) key activities, (3) key partners, (4) value proposition, (5) customer relationships, (6) channels, (7) customer segments, (8) cost structure, and (9) revenue streams. This so-called business model canvas (BMC) is especially characterized by its granularity and industry-independence. Ojala (2016), in turn, defines the BM in a more compact way comprising four elements: (1) product/service, (2) value network, (3) value delivery, and (4) revenue model. As the BM of a firm is of great importance for value creation and market success, it is also important for innovation processes within firms (Chesbrough and Rosenbloom 2002; Teece 2010). Research in that field is mostly undertaken under the term BMI, which can be defined as "*designed, novel, nontrivial changes to the key elements of a firm's business model and/or the architecture linking these elements*" (Foss and Saebi 2017, p. 201). More recently, the concept "digital business model innovation" (DBMI) emerged in the literature, referring to BMI triggered by digital technologies (Böttcher and Weking 2020). The existing literature agrees that (D)BMI is a constitutive element of DT (Risanow et al. 2019). However, both concepts do not necessarily have to occur in the context of DT. Further, DT does not inevitably comprise a BM transformation (e.g., Fitzgerald et al. 2013; Vial 2019). Finally, some research is done under the rather less frequently used term "digital business model transformation" (e.g., Kurti and Haftor 2014; Baber et al. 2019; Priyono et al. 2020), which refers to transforming a BM through digitalization.

Although there exist various concepts concerning BMI, current literature lacks a common concept that brings together existing concepts in order to describe (D)BMI in the explicit context of DT (i.e., how DT impacts and innovates existing BMs). As a first attempt to close this gap and to structure the field, we conceptualize this phenomenon under the term "digital transformation-driven business model innovation" (DTBMI), which we define as a strategic renewal (i.e., through significant changes) of an existing BM, or at least critical elements of an existing BM, as part of a firm's DT. Thereby, DTBMI can be described as the process of (D)BMI as part of the DT of a firm, which can either result in a digitally enhanced traditional BM or a newly created (digital) BM. The strategic aim of DTBMI is to adapt the existing BM for the digital age. As illustrated in Figure 1, DTBMI can be seen as a subset of DBMI with a substantial difference in the way that DTBMI not only focuses on simply implementing digital technologies into the existing BM. Instead, it considers the whole process of transforming the existing BM as part of DT. This, among other things, includes challenges and tensions that arise from BM changes colliding with existing organizational structures, as well as appropriate strategic responses (Metzler and Muntermann 2020; Rof et al. 2020). Furthermore, DTBMI is different to other forms of BMI as digital technology-driven changes are particularly fast. Firms, therefore, need to adapt and reconfigure their BMs accordingly fast and more frequently (Matt et al. 2015; Warner and Wäger 2019).

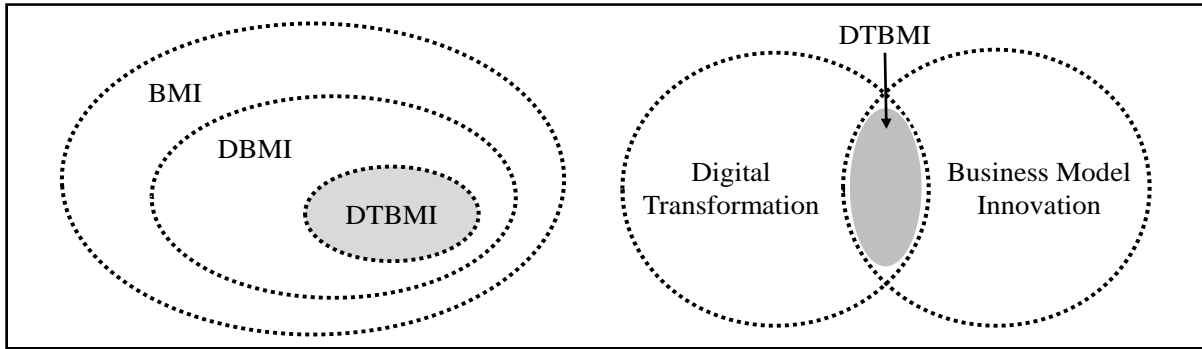


Figure 1: The Context of DTBMI

Within the last years, research on DT gained increasing attention across disciplines. Recently, especially the BM of firms has become a central unit of analysis (e.g., Metzler and Muntermann 2020; Soto Setzke et al. 2020). Thereby, researchers analyzed a variety of different aspects of this field of research. Additionally, few literature analyses exist regarding DT and BMs. However, these studies either only partially bring together the concepts DT and BM (e.g., Böttcher and Weking 2020), only focus on specific industries (e.g., Caliskan et al. 2020), or differ in their research focus or applied methodology (e.g., Buck and Eder 2018; Parida et al. 2019; Caputo et al. 2021). Overall, this article, to the best of our knowledge, is the first that rigorously systematizes and structures existing literature analyzing how DT impacts and innovates existing BMs of firms (i.e., DTBMI). In addition, based on the main findings, this article identifies relevant research gaps and derives potential research directions for the future.

Methodology

To answer the formulated research questions, we conducted a systematic literature review based on the guidelines of Webster and Watson (2002). Since this article aims to analyze the current state of research regarding DTBMI, a systematic literature review was selected as an appropriate method to identify relevant scientific work. At first, based on our research questions, an appropriate search string for the subjects DT and BM was derived. Based on this selection, we identified the first fundamental literature to derive further relevant key terms for the search string. For example, we found that some researchers use the terms digitization, digitalization, and DT synonymously – therefore, we included all these terms in our final search string. Since we only consider articles that clearly refer to the BM concept, we refrained from adding additional keywords for every single BM element. We subsequently tested the final search string in the used databases to ensure its functionality. The final search string was applied to the title, abstract, and keywords in seven different databases. This provides a broad selection of relevant articles. The final composition of the search string can be obtained from Figure 2.

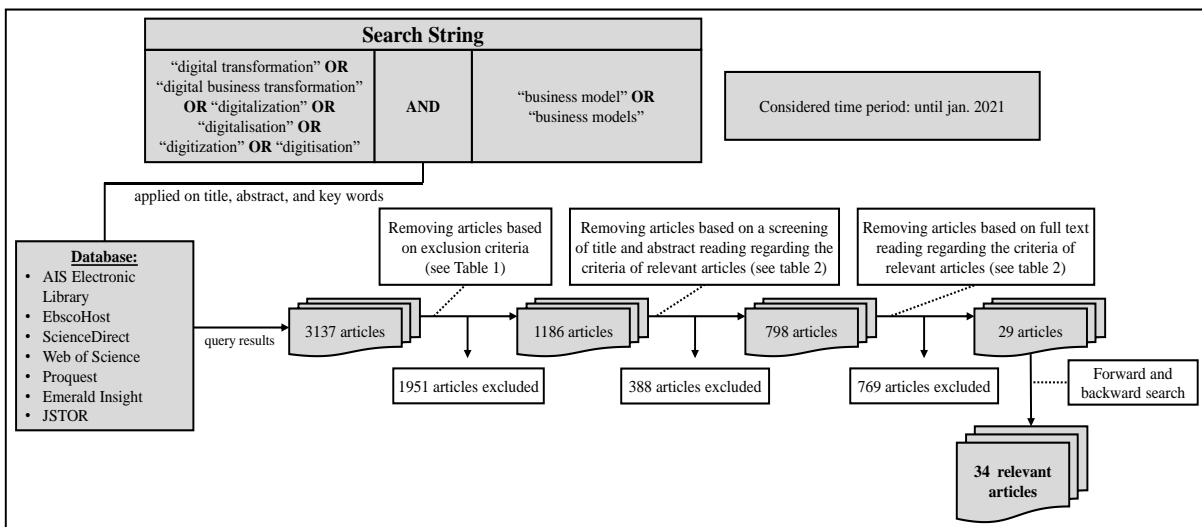


Figure 2: Process of the Systematic Literature Review

Figure 2 illustrates the different process steps to identify relevant articles. We conducted several queries for each database over time. This increases the probability that even the latest publications can be considered. Furthermore, we have refrained from limiting the time period for our literature search. Hence, our literature review considers all scientific articles until January 2021. Since the research field under investigation is still young, conference and journal papers are included. After applying the search string on the different databases, duplicates and irrelevant articles were eliminated based on our exclusion criteria. The overall criteria for exclusion can be obtained from Table 1.

Criteria	Description
1	Removing publications not published in a peer-reviewed journal or conference.
2	Removing articles that are not written in the English language.
3	Removing white papers, commentaries, editorials, and similar articles as they were often rather vague and did not undergo a comprehensive review process.

Table 1: Exclusion Criteria

Afterward, we eliminated articles that do not deal with the subject under investigation. We removed some publications after reading the title and some publications after reading the abstract. To finally decide whether an article is relevant or not, two researchers independently read through the pre-selected articles. For each article, both researchers decided whether it is relevant or not. After that, the results were compared, and mismatches were discussed to reach a consensus on their relevance. As part of our decision process, we pre-defined some relevance criteria, which can be obtained from Table 2. To get an all-encompassing overview and not avoid important insights, also previous topic-relevant literature reviews (as discussed in the introduction and theoretical foundations) with relevant information were considered.

Criteria	Description
1	Relevant articles must examine DTBMI (i.e., focusing on (D)BMI as part of DT).
2	Relevant articles must be anchored clearly in the DT literature stream and therefore explicitly refer to the concept of DT.
3	Articles are classified as irrelevant if they only briefly pick up the concept DT and/or the concept BM.
4	Irrelevant are articles that examine the implementation of specific technologies and their impact on BMs (i.e., focusing on digitization instead of DT).
5	Irrelevant are articles that examine the development or emergence of new (digital) BMs without referring to the transformational process of DT regarding existing BMs.

Table 2: Criteria of Relevant Articles

Lastly, we conducted a forward and backward search based on the remaining relevant articles. During this last step, we found five additional publications not included in the previous database search. This led to a total of 34 relevant publications suitable for answering our research questions.

After selecting the relevant articles, we applied coding techniques borrowed from the grounded theory methodology to identify the relevant concepts of interest (Wolfswinkel et al. 2011). Thereby, we followed the core principles of open coding, axial coding, and selective coding (Corbin and Strauss 1990). As a first coding step, we read the identified articles and coded all relevant excerpts that refer to the general idea of DTBMI as described in the theoretical foundations. Afterwards, we started the process of axial coding. While axial coding, we related the identified codes to each other. As a result of axial coding, first categories and subcategories emerged. Finally, while selective coding, we connected all categories and subcategories and came up with one core category: DTBMI. All related categories can be seen as relevant aspects of research concerning DTBMI. The subcategories represent different expressions of the categories. The coding process ended after a theoretical saturation was achieved. To ensure reliability, the coding process has been done by two researchers.

According to the guidelines of Webster and Watson (2002), the categories and subcategories were transferred to a concept matrix. The final concept matrix, a derived organizing framework, as well as the main insights of the identified articles are discussed in the following chapter.

Results

The main results of our literature review are presented in the form of a concept matrix connecting the identified research articles with the specified concepts of interest (Webster and Watson 2002). The final concept matrix can be obtained from Table 3.

Authors & Year	Research Method	Industry Focus	Concept. Found.	Transformation Aspects			
				Antecedents	Processes	Outcome	Evaluation
Ahmad et al. 2020	Lit. Analysis	not specified				X	
Baber et al. 2019	Case Study	software publ.				X	
Berman 2012	Framework	cross-industry		X	X		
Bican/Brem 2020	Case Study	cross-industry	X				
Bleicher/Stanley 2016	Case Study	cross-industry			X		
Bock/Wiener 2017	Framework	not specified				X	
Böttcher/Weking 2020	Lit. Analysis	not specified		X			
Bouwman et al. 2019	Survey	cross-industry				X	
Caliskan et al.2020	Lit. Analysis	marketing serv.				X	
Delmond et al. 2017	Case Study	cross-industry				X	
Demlehner/Laumer 2020	Lit. Analysis	manufacturing				X	
Doukidis et al. 2020	Framework	cross-industry	X		X	X	
Hanelt et al. 2015	Cont. Analysis	automotive				X	
Hildebrandt et al. 2015	Math. Model	automotive			X		
Klos et al. 2017	Case Study	cross-industry			X	X	
Kotarba 2018	Framework	not specified				X	
Kurti/Haftor 2015	Case Study	book publ.			X		
Levkovskyi et al. 2020	Lit. Analysis	not specified	X	X		X	X
Li 2020	Lit. Analysis	media ind.				X	
Loebbecke/Picot 2015	Lit. Analysis	not specified	X			X	
Mancha/Gordon 2020	Case Study	cross-industry		X	X		
Metzler/Muntermann 2020	Case Study	cross-industry				X	
Nastjuk et al. 2016	Framework	automotive				X	
Priyono et al. 2020	Case Study	manufacturing			X	X	
Remane et al. 2017	Framework	not specified				X	
Rof et al. 2020	Case Study	high. education			X	X	
Sathananthan et al. 2017	Framework	cross-industry			X		
Schallmo et al. 2017	Lit. Analysis	cross-industry		X	X		
Soto Setzke et al. 2020	Case Study	cross-industry			X		
Toutaoui/Benlian 2020	Case Study	cross-industry			X		
Van Tonder et al. 2020	Lit. Analysis	not specified	X				
Venkatesh et al. 2019	Lit. Analysis	service prov.	X				
Warner/Wäger 2019	Case Study	cross-industry	X	X		X	
Weill/Woerner 2015	Framework	cross-industry	X			X	

Table 3: Results of the Systematic Literature Review

Descriptive Analysis

As illustrated in the following Figure 3, research regarding DTBMI gained increasing attention in recent years. More than half of the analyzed articles were published within the last two years. Most papers were published in IS journals or IS conference proceedings. Others were published in management or technology and innovation (incl. computer science) literature. Thereby, we distinguished between the different subject areas according to the classification of the VHB Jourqual 3 (<https://vhbonline.org/en/vhb4you/vhb-jourqual/vhb-jourqual-3/complete-list>). The number of articles per subject area is shown in Figure 4.

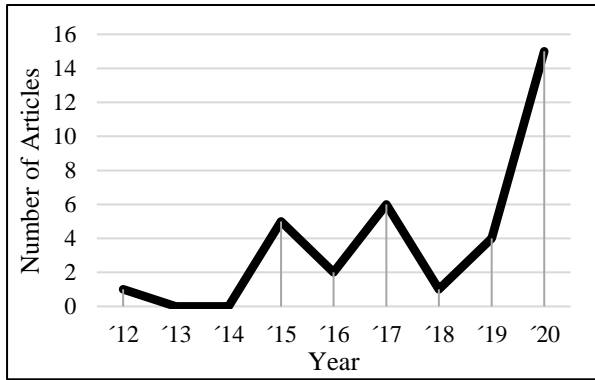


Figure 3: Number of Articles by Year

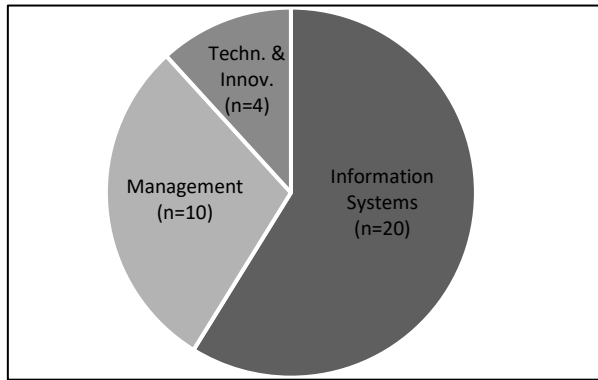


Figure 4: Articles by Subject Area

The distribution of the applied research methods can be obtained from Figure 5. We distinguish between different research methods as proposed by Palvia et al. (2004). Our results show that existing research on DTBMI is primarily qualitative, especially including case studies, literature analyses (not only reviews), and the conceptual development of frameworks and models. Thereby, each article covers only partial areas of DTBMI. In addition, existing literature covers a wide range of industries. Whereas some articles focus on specific industries, others focus on cross-industry phenomena or are written independently of specific industries. The automotive, manufacturing, and specific media industries are strongly represented, whereas other industries, such as the financial services industry and the public sector, are rather underrepresented. The entire distribution of articles by industry is shown in Figure 6.

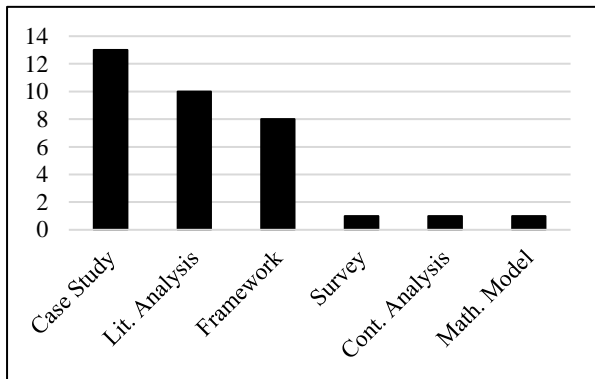


Figure 5: Articles by Research Method

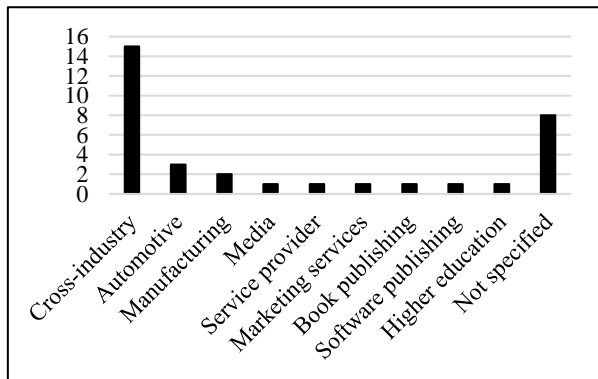


Figure 6: Articles by Industry

Organizing Framework of Research on DTBMI

As a result of our analysis, we came up with five main categories (i.e., concepts) representing different perspectives on DTBMI. Across the main categories, we further identified specific subcategories. The final organizing framework serving as a systematization of DTBMI research is represented in Figure 7.

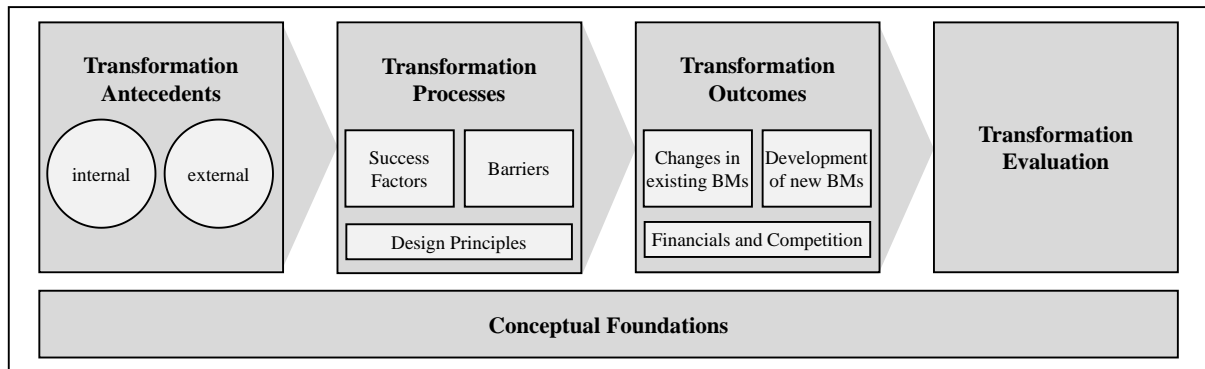


Figure 7: Organizing Framework of Research on DTBMI

Whereas some articles are related to the conceptual foundations of DTBMI, most articles focus on specific transformation-related aspects. Research focusing on transformation antecedents addresses internal and external antecedents that trigger DTBMI (Böttcher and Weking 2020). Those articles focusing on the processes of DTBMI primarily examine related design principles, success factors, and barriers to DTBMI. Research focusing on outcomes on DTBMI implies that there are two different possible BM-related transformation outcomes: (1) changes in an existing BM or (2) the development of a new (digital) BM. In addition, existing research found financial and competitive outcomes of DTBMI. Finally, literature on transformation evaluation deals with different success measures concerning DTBMI. In the following, we discuss the main insights of each category.

Conceptual Foundations

Some of the identified articles deal, at least partially, with the conceptual foundations regarding the connection of the concepts DT and BM. Authors agree that the BM represents a core element concerning the DT of firms (e.g., Warner and Wäger 2019; Bican and Brem 2020; Soto Setzke et al. 2020). DTBMI, thereby, should be anchored in a firm's digitalization strategy (Rof et al. 2020). Especially the digitalization of firms' ecosystems makes innovating the BM indispensable (Bican and Brem 2020). In that regard, existing research indicates that BM transformation is one central element of DT leading to digital organizational modifications, the establishment of new BMs, and an international digital expansion (Doukidis et al. 2020; Levkovskiy et al. 2020; Soto Setzke et al. 2020). Warner and Wäger (2019) highlight that a strategic renewal of the existing BM is an intermediary step of DT to achieve a cultural change within an organization.

Transformation Antecedents

External Antecedents

Existing research agrees that changing customer needs and market conditions are among the most important triggers demanding a strategic renewal of the existing BM (Warner and Wäger 2019; Böttcher and Weking 2020). For example, due to advances in mobile technology, more customers are always connected, leading to the possibility to interact with them anytime (Schallmo et al. 2017). Furthermore, an ongoing need for a servitization logic triggers the replacement of traditional product logics with a BM combining digital products and personal services (Warner and Wäger 2019). In addition, ongoing technological developments are enablers for DTBMI (Berman 2012; Schallmo et al. 2017). In this context, Schallmo et al. (2017) categorized digital enablers and applications into four categories: digital data (e.g., big data and IoT), automation (e.g., robotics and drones), networking (e.g., cloud computing, platforms, and smart factory), and digital customer access (social networks, e-commerce, mobile internet). In addition, Mancha and Gordon (2020) as well as Warner and Wäger (2019) found that digital platforms drive DTBMI in many incumbent firms. Finally, competitive pressure is another antecedent for DTBMI (Böttcher and Weking 2020).

Internal Antecedents

Internal antecedents that trigger DTBMI include financial need (e.g., shrinking profits), technology exploitation (e.g., existing technological skills that could be exploited by BMI), or BM limitations (e.g., when an existing BM is not suitable for further growth) (Böttcher and Weking 2020).

Transformation Processes

Design Principles

Some researchers developed roadmaps describing a BM design process as part of DTBMI. For example, Schallmo et al. (2017) introduced a five-step roadmap for a successful DT of BMs: (1) digital reality, (2) digital ambition, (3) digital potential, (4) digital fit, and (5) digital implementation. Other researchers introduced BM design processes (e.g., Bleicher and Stanley 2016; Remane et al. 2017; Sathanathan et al. 2017). All these models have in common that they highlight the importance of describing the current BM, identifying existing and potential value drivers, and exploiting digitization to discover new BMs.

Success Factors

The importance of different capabilities to succeed in DTBMI is highlighted in many articles (e.g., Berman 2012; Soto Setzke et al. 2020). For example, Soto Setzke et al. (2020) investigated pathways for successful BMI in the context of DT and found that particularly IT capabilities and dynamic capabilities are major success factors. Concerning IT capabilities, Mancha and Gordon (2020) and Warner and Wäger (2019) emphasize that especially digital platforms and mobile technologies play a major role in innovating the BM as part of a DT and, therefore, represent major success factors. For example, digital platforms and mobile technology can be used to create supplementary multisided value propositions or to develop a servitization logic (Warner and Wäger 2019). On the other hand, dynamic capabilities are especially important in terms of learning from failure to develop the capabilities that are needed to implement and realize future changes (Soto Setzke et al. 2020). Due to the need for a large-scale organizational and cultural transformation, a digital enrichment of an existing BM requires more capabilities than establishing a completely new BM. Firms that establish completely new BMs mostly build subsidiaries or new departments, implying that existing parts of the organization can remain unaffected by transformation. Transforming a traditional BM, however, requires evolving the whole existing organization (Soto Setzke et al. 2020). Other important capabilities include the ability to navigate innovation ecosystems to collaborate with external partners, strategic agility, and the development of a prosumer logic (Warner and Wäger 2019).

As many firms lack essential capabilities, Hildebrandt et al. (2015) argue that executing mergers and acquisitions (M&As) is an appropriate way to obtain missing capabilities. Specifically, their research results indicate that incumbent firms can use M&As to acquire complementary capabilities relevant for developing BMs that combine physical and digital components (Hildebrandt et al. 2015).

Barriers

The process of DTBMI holds various barriers and organizational challenges. Especially the transformation from traditional/analog to digital causes major difficulties in manifold ways (e.g., Kurti and Haftor 2015; Rof et al. 2020). Recently, Rof et al. (2020) identified a list of tensions and corresponding solutions arising within the process of DTBMI. The tensions and solutions are structured across the value creation, value proposition, and value capturing function of a BM. In addition, Warner and Wäger (2019) found that balancing potential new (digital) BMs with existing BMs is another major challenge requiring transformational leadership and decentralization for a good alignment. In that regard, a good alignment can lead to multiple synergy effects as a benefit for both the digital and the traditional BM (Toutaoui and Benlian 2020). These synergies mainly concern existing key resources, the established cost structure, shared channels, and customer relationship issues where the new BM can profit from and an enhanced value proposition and complementary key resources where the traditional BM can benefit from (Toutaoui and Benlian 2020). Overall, firms that successfully align the physical and digital components of both variants are particularly successful in DTBMI (Berman 2012).

Transformation Outcomes

Our analysis indicates that DT can enable two different kinds of BMI – transformational changes within the existing BM or the invention of a new (digital) BM (e.g., Warner and Wäger 2019; Doukidis et al. 2020; Levkovskiy et al. 2020). In that regard, Li (2020) argues that DT-driven changes in BMs can be classified into automation (digital technologies are used to enhance or automate existing processes and tasks), extension (using digital technologies to supplement existing activities and processes through new ways of conducting business), and transformation (using digital technologies to replace the traditional business). Irrespective of this, existing research suggests that DT concerning BMs involves more than implementing minor adjustments to a selected BM element (e.g., introducing new distribution channels). Rather, it impacts the entire BM of a firm or at least major parts of it (e.g., Ahmad et al. 2020; Metzler and Muntermann 2020). However, its impact differs across industries. Whereas firms of some selected industries (e.g., music industry, banking industry) are undergoing revolutionary changes within their BMs, firms of other industries (e.g., manufacturing industry) lag behind (Demlehner and Laumer 2020). These findings reflect the specific dynamics of DT varying across different industries.

Finally, according to Weill and Wörner (2015), firms should choose between four promising BMs for the digital era: omnichannel business, ecosystem driver, supplier, or modular producer. A related choice depends on the end customer's knowledge and the business design (value chain or ecosystem).

Changes in existing Business Models

There is already a rich amount of research on the changes that DT causes within BMs (e.g., Hanelt et al. 2015; Caliskan et al. 2020; Li 2020; Metzler and Muntermann 2020; Rof et al. 2020). Mostly, BM frameworks (e.g., the BMC) are used to highlight such changes within each BM element of firms (e.g., Kotarba 2018; Baber et al. 2019; Li 2020; Metzler and Muntermann 2020). Researchers indicate that usually the whole BM of a firm (i.e., all its elements) is affected by DT endeavors (Li 2020; Metzler and Muntermann 2020). Thereby, Metzler and Muntermann (2020), as well as Rof et al. (2020), indicate that DT-driven changes within a BM evoke major challenges that need to be addressed by the management through appropriate organizational responses. Research analyzing changes in existing BMs indicates that the impact of DT on BMs differs across different BM elements. Whereas some elements are rather strongly affected by DT ventures, others experience rather small changes (Metzler and Muntermann 2020; Rof et al. 2020). Major changes especially comprise a co-production of the value proposition, an increasing importance of complementary key resources and partnerships, and a closer customer relationship (e.g., Delmond et al. 2017; Metzler and Muntermann 2020). Whereas most research articles examine incumbent firms across traditional industries (e.g., Hanelt et al. 2015; Metzler and Muntermann 2020), Baber et al. (2019) indicate that digital entrepreneurial firms are also affected by DTBMI. In the BM of these firms, effectuation logic and causation logic play an important role, especially when moving from physical distribution channels to digital distribution platforms.

Finally, a few articles found negative impacts of DT on specific BM elements. Loebbecke and Picot (2015) indicate a negative impact on the key resource human labor (e.g., human labor gets replaced by robots). Nastjuk et al. (2016) found a negative impact of digitalized BMs on customer relationships through an increased stress perception of customers (e.g., through automated pricing systems).

Development of new Business Models

DT has the power to fuel the development of entirely new BMs driven by the use of digital technologies (e.g., Remane et al. 2017; Ahmad et al. 2020). Existing literature primarily refers to such BMs as digital BMs, which can be defined as “*the mixed utilization of smart products and digital smart services, the digitization of internal processes, the operation within an ecosystem, the accessibility of a platform, as well as the utilization of data analytics*” (Ahmad et al. 2020, p. 4553). As part of taxonomy development, Bock and Wiener (2017) found that these digital BMs can be conceptualized across five dimensions: (1) digital offering, (2) digital experience, (3) digital platform, (4) data analytics, and (5) digital pricing, differentiating digital BMs from traditional BMs.

Even though the transformation of an existing BM can be seen as an elementary component of DT, Warner and Wäger (2019) argue that transforming the BM is just an intermediate step to trigger more profound changes in a firm's corporate culture.

Financial and Competitive Outcomes

Very few articles deal with the financial and competitive outcomes of DTBMI. Bouwman et al. (2019) found that firms allocating more resources to BMI as part of their DT have an increased level of BM experimentation, finally leading to increased firm performance. In addition, Böttcher and Weking (2020) found seven possible financial and competitive outcomes: funding, stock value, market share, cannibalization, expansion, financial improvement, and intangibles.

Transformation Evaluation

Concerning evaluation measures, Levkovskiy et al. (2020) introduced some financial measures to evaluate the success of DTBMI. The authors indicate that appropriate success measures are: (1) Net revenue, (2) return on investment, and (3) market share.

Discussion

Future Research Directions

Our study shows that DTBMI is a growing field of research but still at an early stage. To synthesize worthwhile future research directions, we especially analyzed the discussion part (i.e., limitations and future research opportunities) of our final sample of literature. For each concept of our literature review, we derived open research questions, which can be found in Table 4.

Concept	Selected Open Research Questions
Conceptual Foundations	How do the different concepts of BMI relate to DT?
	To what extent does the success of DT depend on DTBMI?
DTBMI Antecedents	How do DTBMI antecedents differ across industries and geographical regions?
	How do DTBMI antecedents differ across incumbent and non-incumbent firms?
DTBMI Processes	How do specific IT and dynamic capabilities create a competitive advantage concerning DTBMI?
	How can firms be divided concerning individual needs of specific capabilities concerning DTBMI?
	How does the process of DTBMI differ across incumbent and non-incumbent firms?
	How should the process of DTBMI be implemented in a firm's DT strategy?
DTBMI Outcomes	How can the specific DTBMI outcomes be further unraveled and categorized?
	How does DTBMI impact the customer perception of the transforming firms?
DTBMI Evaluation	What are appropriate financial and non-financial success measures of DTBMI?
	How should an appropriate (re-)evaluation process of DTBMI look like?

Table 4: Selected Open Research Questions

Research referring to the *conceptual foundations* of DTBMI agrees that the BM is an important concept in the DT of firms and BMI is an essential tool to drive such DT. However, it remains unclear how the existing BMI concepts relate to DT and which concrete role DTBMI plays in the success of DT. Furthermore, whereas existing research found that internal and external DTBMI antecedents exist, future research on *transformation antecedents* could explore and discuss industrial and geographical differences as well as differences between incumbents and non-incumbents. We found relatively much research regarding *transformation processes*. However, it is, for example, not yet clear how specific IT and dynamic capabilities create a competitive advantage concerning DTBMI and how firms can be divided concerning individual needs of specific capabilities concerning DTBMI. Regarding *transformation outcomes*, most articles focus on changes within existing BMs or the emergence of new BMs. However, it would be interesting to see how DTBMI outcomes can be further unraveled and categorized, e.g., by taxonomy development. Furthermore, little is known about the impact of DTBMI on the customer perception of the transforming firms. Future research could elaborate on this. Finally, future research on *transformation evaluation* should investigate how to measure and (re-)evaluate the success of DTBMI. In addition, elaborating an evaluation process of DTBMI would be beneficial.

Implications and Limitations

In this study, we conceptualized DTBMI, which can be seen as an essential and growing DT research stream and provide an organizing framework serving as a systematization of DTBMI research. Based on our literature review, we can confirm existing statements in the sense that DT has a massive impact on existing BMs (e.g., Bharadwaj et al. 2013; Fitzgerald et al. 2013; Hess et al. 2016). This impact is primarily reflected in changes within the existing BM or the development of an entirely new (digital) BM. However, innovating the BM as part of DT is a complex endeavor. Literature examining this process primarily focuses on design principles, success factors, and barriers. Other identified articles examine relevant antecedents or evaluation opportunities regarding DTBMI. The results of our literature review show that research on DTBMI is still at an early stage. In each of the identified research avenues, we found relevant research gaps that can be addressed by future research.

Despite the careful design of our research approach, this study is subject to some limitations. First, the methodological approach could be enhanced by additionally applying the search string on the full text

of potential articles. The search string could also be adjusted by adding specific keywords for different BM elements. In addition, since this study primarily focuses on examining the content-related state of research, other aspects such as the identified articles' underlying research methods and theoretical lenses could be analyzed in more detail in future research. Finally, since we first introduced the concept of DTBMI in this paper, we analyzed articles that refer to this concept in different ways (e.g., BMI and DBMI as part of DT). Overall, all of these potential extensions provide the opportunity for gaining more information. However, some of these potential extensions also entail the risk of losing the research focus.

Conclusion

Many definitions of DT indicate that it has a major impact on firms' BMs. However, existing research regarding the impact of DT on BMs is still in its infancy. Against this background, we aimed to structure the existing literature in this field and derive future research directions. By conducting a systematic literature review, we found that the insights of the existing literature can be classified into five categories: (1) conceptual foundations, (2) transformation antecedents, (3) transformation processes, (4) transformation outcomes, and (5) transformation evaluation. Research concerning DTBMI is still rare and future research is encouraged to close research gaps to make the picture of DTBMI clearer.

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