Digital technology and business model innovation: a systematic literature review and future research agenda

DIGITAL TECHNOLOGY AND BUSINESS MODEL INNOVATION: A SYSTEMATIC LITERATURE REVIEW AND FUTURE RESEARCH AGENDA

Abstract

Digital technologies (e.g. Industry 4.0, Internet of Things, cloud computing, big data, blockchain, etc.), are profoundly affecting companies' activities and processes, thus leading to changes in firms' value creation, value delivery, and value capture mechanisms. Yet, despite significant investments in digital technologies and digital transformation, firms are struggling to yield the most out of them, thereby facing a digital paradox. This scenario has drawn the attention of academics and practitioners leading to a growing body of literature on the relationship between digital technology and business model innovation. Yet, the extant academic research in this area appears highly fragmented. Hence, this study conducts a systematic literature review to gather and synthesize the extant knowledge on this topic. The review identifies four main thematic areas, provides an interpretative framework, and suggests valuable future research directions within each thematic area. The article contributes to the theoretical and managerial discussion on digital-driven business model innovation

Keywords: Digital technology; Digitalization; Digital transformation; Business model innovation; Business model change; Literature review

1. Introduction

Digital technologies (DTs) are increasingly becoming a valuable source of future competitiveness for contemporary organizations (Coreynen et al., 2017; Kamalaldin et al., 2020; Kohtamäki et al., 2019). The rise of DTs is affecting innovative sectors as well as traditional ones, the latter of which are not typically characterized by high degrees of technological investment (Teece, 2010). DTs have been significantly taken up by companies, shaping industrial plants, activities, production processes, and the way companies create and capture value at large (Björkdahl, 2020; Kiel et al., 2017; Müller et al., 2018). In this regard, the literature describes business model innovation (BMI) as a promising avenue

to seize new opportunities introduced by these technologies (Chesbrough and Rosenbloom, 2002; Foss and Saebi, 2017; Li, 2020; Müller et al., 2018).

Despite this enormous potential for gain, companies are facing a so-called digitalization paradox, whereby they invest in DTs but struggle to achieve the expected results (Gebauer et al., 2020; Kohtamäki et al., 2020; Volberda et al., 2021). The accelerated wave of digital initiatives, in fact, does not always entail the real business transformations needed for success in the digital age (Leinwand and Mani, 2021). Most digital-enabled transformations do not yield the benefits that leaders expect, and many executives express concerns that they are actually falling behind in making the important choices that lead to differentiation (Leinwand and Mani, 2021; McKinsey, 2019). Notably, recent empirical evidence shows that a full transition toward digital-enabled BMI is far from having been achieved (Kohtamäki et al., 2019).

This complex scenario has fostered a growing interest in this topic; academics and practitioners alike have devoted increasing attention to the relationship between DTs and companies' BMI (Filser et al., 2021). While this has resulted in a significant stream of research (Caputo et al., 2021), it has been predominantly focused on highly diverse areas by adopting different perspectives. For instance, the literature has studied the relationship between DTs and BMI either by embracing a static view of the BMI or by trying to capture and underscore its dynamic nature. Similarly, scholars have focused on highly diverse technologies (e.g., Internet of Things [IoT], big data, and cloud computing), or they have adopted more general conceptualizations (e.g., digitization and digital transformation). Hence, although the studies have yielded valuable in- sights into the relationship between DTs and BMI, a high level of frag- mentation, hindering a thorough understanding of this topic, exists and presents a major roadblock to advancing academic research and practice in this area.

Recently, several literature reviews on BMs and BMI have been carried out in order to provide conceptual clarity on these concepts and on their nomological network (e.g., Andreini and Bettinelli, 2017; Foss and Saebi, 2017). Recent attempts have been made to systematize the extant research and to shed light on the role of specific DTs, such as additive manufacturing, in BMI (Florén et al., 2021).

Moreover, while a recent literature review article on digitalization and BMs provides valuable insights into the topic (see Caputo et al., 2021), it compares results from different bibliometric analyses, which offers a wide, panoramic view of the field rather than a detail-oriented and in-depth analysis of the extant literature.

Therefore, the purpose of the present paper is threefold. It aims to gather and synthesize the current knowledge on the relationship between DT and BMI by conducting a systematic literature review (SLR) in this area. Moreover, it also aims to provide an interpretative framework of this relationship and to identify valuable areas for future research. In so doing, this study contributes to the ongoing theoretical and managerial discussions on digital-driven BMI.

The remainder of this paper is organized as follows. First, we provide an overview of the theoretical constructs "digital technology," "business model," and "business model innovation." Second, we describe the methodology adopted to carry out the review. Third, we present a descriptive analysis of the selected publications, followed by an in-depth thematic analysis of the articles by identifying four main research areas and presenting the key findings within each group of studies. The final paragraphs offer theoretical implications as well as directions for future research, acknowledge the study's limitations, and highlight the most relevant managerial implications of the study.

2. Literature background

2.1 Digital Technology

The concept of "digital technology" has received considerable attention among both practitioners and scholars and is at the core of different research areas and disciplines ranging from engineering to information systems and on up to management (Fitzgerald et al., 2013). However, no commonly agreed-upon definition of what constitutes a DT exists as its fast-evolving nature has prevented scholars from limiting the concept's boundaries and providing a sound conceptualization (Nambisan, 2017; Yoo et al., 2010; Vial, 2019).

According to Hinings et al. (2018), the term "digital" refers to the conversion of analog information into the binary language understood by computers. Because all digital content assumes the same form, it can be processed by the same technologies. Hence, digitizing has the potential to remove the tight couplings between information types and their storage, transmission, and processing technologies (Tilson et al., 2010; Yoo et al., 2010).

In general, according to Nambisan (2017), DTs manifest in the form of three distinct but related elements: digital artifacts, digital platforms, and digital infrastructure. A digital artifact is a digital component, namely an application, or media content, that is part of a new product or service, and it provides a specific functionality or value to the end user (Elia et al., 2020). A digital platform refers to a shared and common set of services and architecture that host complementary offerings, such as digital artifacts (Nambisan, 2017). Digital infrastructure regards tools and systems characterized by communication, collaboration, and/or computing capabilities to support innovation processes (Nambisan, 2017).

Most of the DTs studied are related to social media, mobile devices, analytics, cloud computing, and IoT (Vial, 2019). Notably, the increasing pervasiveness of DT has drawn attention toward the so-called new-age technologies, falling under the Industry 4.0 or the IoT paradigm (Kiel et al., 2017; Kumar et al., 2020; Müller et al., 2018). Basically, they represent the integration of information and communication technology (ICT) into physical objects and include various applications, such as cyber-physical systems (CPS), additive manufacturing, augmented reality (AR), robotics, artificial intelligence (AI), big data, and the cloud, among others (Kagermann et al., 2013). Specifically, they relate to the interconnection of objects via the internet, by equipping them with sensors and actuators, to develop new applications and improve existing ones (Dijkman et al., 2015).

Research has historically focused on the impacts of DTs within organizations, especially on their processes and structural effects (Lyytinen et al., 2020). Although the rise of new DTs allows firms to go after new opportunities, as previous research has clearly shown, DT itself has no value per se; it is only the way these technologies interact with a company's BM that will potentially yield

positive outcomes. In this regard, DTs provide value when companies unlock their embedded potential through their BMs (see Chesbrough, 2010; Chesbrough and Rosenbloom, 2002) or when firms are able to leverage such technologies to uncover new ways to create value (Vial, 2019). In this view, DT creates value when implying the transformation of how firms do business (Berman, 2012; Kotarba, 2018; Li, 2020). This has led scholars to refer to the concept of digital transformation (Kotarba, 2018; Schallmo et al., 2017; Verhoef et al., 2021).

Digital transformation is described as a process in which DTs play a pivotal role in the creation and reinforcement of disruptions taking place at the society and industry levels, which trigger strategic responses by organizations that employ DTs to change value creation and value capture mechanisms to remain competitive (Vial, 2019). Hence, digital transformation can be seen as "the modification (or adaptation) of BMs, resulting from the dynamic pace of technological progress and innovation that trigger changes in consumer and social behaviors" (Kotarba, 2018, p. 123).

Thus, digital transformation goes beyond the changing of simple organizational processes and tasks to affect the whole company (Verhoef et al., 2021). Specifically, digital transformation involves the use of DTs to impact companies at three different levels: externally, with a focus on the digital enhancement of the customer experience and the value proposition; internally, shaping operations, organizational structures, and work processes; and holistically, where the whole organizational system is affected, leading to entirely new BMs (Kronblad and Pregmark, 2021). In pursuit of digital transformation, firms thus search for and implement BMI (Verhoef et al., 2021).

2.2 Business Model

The concept of BM itself is currently at the center of the academic debate although it cannot be understood as a "new" research topic (Massa and Tucci, 2013). While a complete review of the BM literature is beyond the scope of this article, some considerations regarding the concept may be useful to properly lay the foundations of our research (see Zott and Amit, 2013). The BM literature has developed according to various scholars' separate interests, confining the research streams to

different silos, which led to several BM definitions being advanced over the years (Zott et al., 2011). Therefore, there is still no consensus as to what constitutes a BM (Foss and Saebi, 2017).

Different BM interpretations have emerged from the extant body of literature. Such conceptualizations vary in terms of the degree to which they abstract from the reality they aim to describe (Massa et al., 2017; Massa and Tucci, 2013; Seddon et al., 2004). Thus, the proposed BM concepts are characterized by aggregate, moderately aggregate, and detailed definitions. For instance, at a higher abstraction level, BMs have been defined as "stories that explain how enterprises work" (Magretta, 2002, p. 4) or the "logic of the firm" (Linder and Cantrell, 2000). Similarly, patterns have been recognized in the structure of BMs, leading to the idea of understanding BMs as "role models" to be followed (see Baden-Fuller and Morgan, 2010) through BM archetypes (Massa and Tucci, 2013). In this regard, scholars have identified different ideal examples of BMs usually presented with a classifying label and a short description of the basic characteristics of each BM (e.g., Gassmann et al., 2014; Weill and Vitale, 2001). More detailed descriptions of the BM understand the concept as the "design or architecture of the value creation, delivery, and capture mechanisms" (Teece, 2010, p. 172). In this regard, scholars have also offered graphical frameworks, such as the BM Canvas, to visualize the BM as a "conceptual tool" (Osterwalder et al., 2005; Osterwalder and Pigneur, 2010). Thus, BMs are considered the configurations of multiple elements or "building blocks" (see Cortimiglia et al., 2016; Morris et al., 2005; Osterwalder and Pigneur, 2010), such as product, customer interface infrastructure management, and/or financial aspects (Osterwalder et al., 2005; Osterwalder and Pigneur, 2010). Importantly, a crucial tenet of Teece's definition of a BM is the notion of "architecture," not consisting of a mere list of the firm's mechanisms for creating, delivering, and capturing value but rather as a tool that specifies the functional relations among those mechanisms and the under- lying activities (Foss and Saebi, 2017). Notably, most recently, the literature is largely consistent with Teece's (2010) definition (Foss and Saebi, 2017; Müller et al., 2018; Paiola and Gebauer, 2020).

At a lower abstraction level, the BM has been defined as a system of interdependent choices and their consequences (Casadesus-Masanell and Ricart, 2010) or as "a system of interdependent activities that transcends the focal firm and spans its boundaries" (Zott and Amit, 2010, p. 216). This activity system perspective is recurrent even implicitly when scholars talk about processes (Zott et al., 2011).

The BM conceptualization as an activity system reflects the idea that value creation occurs together with many suppliers, partners, and coalitions in a value network (Zott et al., 2011). In this regard, the BM research contrasts with the traditional theories of strategy by contending that value creation is a supply-side phenomenon, emphasizing that value is created not only by producers but also by customers and other members of their value-creation ecosystems (Massa et al., 2017). The ecosystem is conceived as a community of interacting actors influencing each other through their activities (Teece, 2007) and sharing their fate in the community as a whole (Iansiti and Levien, 2004). Thus, ecosystems include providers of complementary innovations, products, or services, who may belong to different industries and not be bound by contractual arrangements though they have significant interdependence (Jacobides et al., 2018; Kohtamäki et al., 2019). Therefore, the BM literature has been given increasing attention in studying the interaction between the focal firm and the actors of the wider ecosystem (Burström et al., 2021a, 2021b; Kohtamäki et al., 2019).

2.3 Business model innovation

Most recently, while shifting the attention from start-ups to incumbent firms (Chesbrough, 2010; Christensen et al., 2016), scholars have started to look at the BM concept in a transformational way as a tool to address change and innovation in the organization (Demil and Lecocq, 2010). Indeed, scholars' views converge in suggesting that the BM is dynamic over time (Frankenberger et al., 2013). However, as a recent outgrowth of the BM literature, that on BMI suffers a similar lack of conceptual clarity and includes multiple definitions (Casadesus-Masanell and Zhu, 2013; Foss and Saebi, 2017, 2018; Schneider and Spieth, 2013).

To date, the concept of BMI has been defined in different ways: as the discovery of a fundamentally different BM in an existing business (Markides, 2006); as the search for new logics and new ways to generate revenue (Casadesus-Masanell and Ricart, 2011); and as a deliberate and observable change in a company's BM elements and/or architecture (Foss and Saebi, 2017; Sorescu et al., 2011; Bucherer et al., 2012; Khanagha et al., 2014; Santos et al., 2009). Notably, there does seem to be agreement on the system-wide nature of BMI: although the change may at first concern just one element (or "building block") of the BM, it also affects other components. An isolated change in one of the elements may, indeed, be an innovation but would not be considered a BMI unless the effects are system-wide (Sorescu et al., 2011). Regarding the degree of novelty, both incremental and radical perspectives exist (see Habtay and Holmén, 2014; Taran et al., 2015). While some scholars adopt a more radical and disruptive view of BMI regarding firms' disruptive reactions to changes in the sources of value creation (Schneider and Spieth, 2013), a more commonly held view sees BMI as a fine-tuning process that occurs over time (Frankenberger et al., 2013; Bucherer et al., 2012; Santos et al., 2009). Therefore, BMI is recognized as a dynamic process in which firms not only endeavor to maintain their competitive advantage by changing certain activities and functions within their BMs but also to explore new architectural designs that offer new possibilities related to new technologies' adoption in value creation, distribution, and capture (Foss and Saebi, 2017; Sorescu et al., 2011).

3. Methodology

The aim of this study is to comprehensively gather and summarize the extant knowledge on the relationship between DT and BMI in order to identify relevant themes and future research avenues. To this end, an SLR was employed as this methodology allows a replicable, transparent, and reliable evaluation of the extant knowledge on a given topic (Tranfield et al., 2003; Thorpe et al., 2005). In fact, while narrative and descriptive reviews provide a summary of the extant literature on a particular topic, SLRs go a step further by aggregating or integrating prior findings in order to

answer more specific research questions (Paré et al., 2015). Furthermore, SLRs can be highly useful when adopted for a certain topic or research field that is characterized by high heterogeneity (Andreini and Bettinelli, 2017), as is the case for the object of the present paper. In fact, as many researchers from different fields (e.g., management, technology, innovation, and marketing) have investigated the relationship between DT and BMI, their studies employ diverse perspectives in terms of how BMI is conceptualized as well as in terms of technological focus of the study.

Scholars have either adopted a static view of the BMI (Leminen et al., 2020; Li, 2020; Müller et al., 2018) or tried to describe its dynamic nature (Cozzolino et al., 2018; Kiel et al., 2017; Latilla et al., 2021). Moreover, the extant literature has focused on specific technologies, such as IoT (Haaker et al., 2021; Kiel et al., 2017; Paiola et al., 2021a, 2021b), blockchain (Schneider et al., 2020), and cloud computing (Berman et al., 2012; Khanagha et al., 2014), but also on more general conceptualizations of DTs (e.g., digitalization, digital transformation, etc.) (Brock et al., 2019; Kohtamäki et al., 2020; Verhoef et al., 2021).

3.1 Database search process: Selecting databases and keywords

The SLR process consists of several steps necessary to obtain a comprehensive list of articles (Tranfield et al., 2003). According to these steps, we firstly defined the inclusion and exclusion criteria for the literature review, deciding that the articles selected should use both DTs and BMI as major constructs, thereby excluding any articles focusing solely on technology adoption or limited to BMI only.

Second, two major internet-based research databases (i.e., Scopus and Web of Science) were selected because they extensively cover highly ranked scientific management journals and have built-in search functions to make the search process precise.

Third, the search string was developed according to the objectives of the review. In this regard, we referred to major articles in the field to identify appropriate keywords. Specifically, since the concept of DT is rather broad, scholars use a heterogeneous range of terms, such as digitalization

(cf. Kohtamäki et al., 2020), digital transformation (cf. Verhoef et al., 2021), IoT (cf. Kiel et al., 2017), and Industry 4.0 (cf. Müller et al., 2018). Hence, we decided to include more specific labels (e.g., "cyber-physical system" and "big data") to encompass as many different perspectives as possible.

Similarly, academics employ varied terminology when studying BMI as the concept has developed in many different research fields, such as management, marketing, accounting, entrepreneurship, strategy, operations management, and organizational studies, by adopting different theoretical perspectives (Andreini and Bettinelli, 2017). Therefore, we used a wide range of terms consistent with major systematic reviews on BMI, such as "business model innovation" (cf. Foss and Saebi, 2017; Schneider and Spieth, 2013), "business model transformation" (cf. Andreini and Bettinelli, 2017; Foss and Saebi, 2017), and "business model change" (cf. Andreini and Bettinelli, 2017). Thus, since the aim of this article is to focus on the relationship between DTs and BMI to identify relevant research areas, regardless of disciplinary boundaries, the following search string includes different keywords and research perspectives: ("digital technology" OR "digital platform" OR "industry 4.0" OR "internet of things" OR "digital transformation" OR digitaliza- tion OR digitization OR "cyber-physical system" OR "big data" OR "virtual reality" OR "cloud computing" OR cybersecurity) AND ("busi- ness model innov*" OR "innov* business model" OR "business model chang*" OR "chang* business model" OR "business model adapt*" OR "adapt* business model" OR "business model transform*" OR "trans- form* business model" OR "new business model" OR "novel business model").

3.2 Database search process: Selecting the relevant articles

The chosen keywords, to be found either in the title, the abstract, or the keywords list, were entered into the selected databases. The search process was designed to exclude conference papers and proceedings as well as book chapters; limiting the search process to peer-reviewed journals appears to be desirable in terms of validity (Podsakoff et al., 2005; Schneider and Spieth, 2013). In fact, peer-

reviewed journals are deemed to be validated knowledge and likely to have the highest impact on the academic community (Mustak et al., 2016; Podsakoff et al., 2005).

Furthermore, the search results were narrowed to the "business, management and accounting" research area in order to limit the number of articles with too-narrow perspectives on the technical aspects of DT adoption. For the sake of replicability, the search also selected English- language publications only (Hüttinger et al., 2012; Kraus et al., 2020). In total, this process yielded 399 results from the two databases (see Table 1).

Table 1. Database search process and results

Database	Number of journal articles
Scopus	280
Web of Science	+ 119
Database search total	**399**
Duplications	- 85
Exclusion based on abstract and intro analysis	- 158
Exclusion based on full text read	- 50
Selected publications total	**106**

Once duplicate articles (85) were found and eliminated, the remaining 314 articles were examined. First, the title and abstract of each article were read by all the authors and the article's relevance to the review was assessed using our inclusion and exclusion criteria, as outlined above. The title and abstract analysis led to the exclusion of 158 articles. If an abstract was unclear, the entire article was then read. This led to the exclusion of 50 articles. Whenever disagreement arose, we discussed whether the ambiguous article was appropriate for this study until we reached a common decision.

After this process, a total of 207 articles were removed because they did not meet the inclusion criteria. General articles on DT relating to opportunities for and barriers to DT adoption or articles discussing new areas of application for DTs were excluded, for instance, those exploring IoT-related benefits such as tracking behavior, enhancing situational awareness, producing analytics, and automating processes (Angeles, 2019; Viriyasitavat et al., 2019). Similarly, articles analyzing the

application of AI for document classification, information extraction, and predictive analytics (Bodenbender et al., 2019) or those focusing on how the volume, velocity, and variety of big data can help in addressing problems such as poverty, illness, conflict, migration, natural disasters, and so forth in developing countries were excluded (Chandy et al., 2017).

Additionally, studies were not included in the sample if they analyzed how DTs affect specific organizational areas (e.g., procurement, logistics, or accounting) rather than focusing on their impact on the overall BM (Al-Htaybat et al., 2019; Bienhaus and Haddud, 2018). This is the case with those papers that analyze the impact of digitization on procurement by uncovering barriers to and potentials for digitizing such activities or those that explore e-commerce-related challenges with and opportunities for logistics processes. In some cases, the excluded articles analyzed DT-driven industry innovation without adopting a BMI perspective and mentioned the term "business model innovation" (often in the abstract or keywords) without effectively using the concept (Andriulo et al., 2015; Srivastava et al., 2019; Zhan et al., 2021; see also Foss and Saebi, 2017; Teece, 2010).

Finally, a very limited number of excluded articles dealt with BMI or organizational change, often mentioning digitalization as a general innovation trend without specifically investigating the role of DTs in BMI, such as scholars investigating how customer experience drives BMI in ICT companies (Bawono and Mihardjo, 2020). As shown in Table 1, the entire process yielded a total of 106 publications selected for review.

3.3 Analysis of the articles

Once the selected articles were put in chronological order, a descriptive and thematic analysis (Thorpe et al., 2005; Tranfield et al., 2003) was conducted. Firstly, the descriptive analysis was run by recording general information (title, authors, etc.) and relevant data (theoretical perspective, methodology, etc.) in an Excel spreadsheet (see Appendix 1) (Tranfield et al., 2003). Secondly, we also performed a thematic analysis of the selected articles by identifying key concepts and main

contributions. These elements are usually expressed in the research questions, definitions, measurements, and findings/results (Andreini and Bettinelli, 2017; Thorpe et al., 2005).

Thematic analysis is a useful and flexible tool to investigate a fragmented and heterogeneous subject as it assists in understanding the key related research areas (Andreini and Bettinelli, 2017). In this regard, to fulfill the purpose of this review, each researcher individually performed an inductive data-driven thematic analysis without a predetermined coding scheme. Although we acknowledge that some articles might fall under more than one theme, we classified the articles according to their key concept and contribution. Since the themes identified from the first analysis were rather diverse, all the authors together conducted a further grouping procedure of the articles, comparing and refining the categories to build a higher-level conceptual classification, which ensures consistency within and across categories. The entire process was iterative, requiring articles to be read and codes to be refined several times in order to discern sub-themes and broader themes, ultimately resulting in the identification of four major research areas (see Appendix 2).

The first area, labeled *Digital technology-driven BMI archetypes*, comprises articles analyzing different categorizations of digital-driven BMs and is divided into two sub-categories, namely "Digital BMI taxonomies" and "The digital BM." Similarly, the second area, *Digital technology's effects on BMI*, encompasses studies investigating the impact of DTs on BMI and is further divided into two sub-categories of articles: "DT as antecedent of BMI" and "DT-driven changes on BM components." The third research area, labeled *Digital technology-driven BMI process*, includes a group of studies identifying and describing the phases of the digital-driven BM process. The fourth area, *Digital servitization (DS)*, refers to articles investigating digital-enabled servitization through the BMI lens. Finally, a few articles were grouped in a fifth area, labeled *Other topics*, as they did not fall into any of the identified main research areas.

4. Overview of the publications

In this section, we offer a descriptive overview of the 106 publications selected as the basis for a deeper thematic analysis of the reviewed articles. The overview is organized progressively by sources (journals), year of publication, methodology, and theoretical basis.

A first look at the publication sources reveals that more than 58 different journals have published articles on the topics at least once to date (see Table 2). This finding highlights that the existing research on DTs and BMI, although scattered across several different research areas and disciplines, has gained increasing importance for journals that discuss business and management topics related to innovation, marketing, entrepreneurship, and strategy. Additionally, the fact that these publications are spread across a considerable number of journals, which touch on a wide range of disciplines related to business management, consistent with the heterogeneity of the topics, suggests that the research activity on BMI has not yet found its "home base" and continues to attract the interest of scholars from various perspectives.

However, the analysis of the DT and BMI publication outlets over the last 20 years reveals that the Journal of Business Research, Technological Forecasting and Social Change, the International Journal of Innovation Management, Journal of Business Strategy, and Industrial Marketing Management count the highest number of publications on the topic, thus clearly showing that these five journals stand out in terms of interest in this specific area of research.

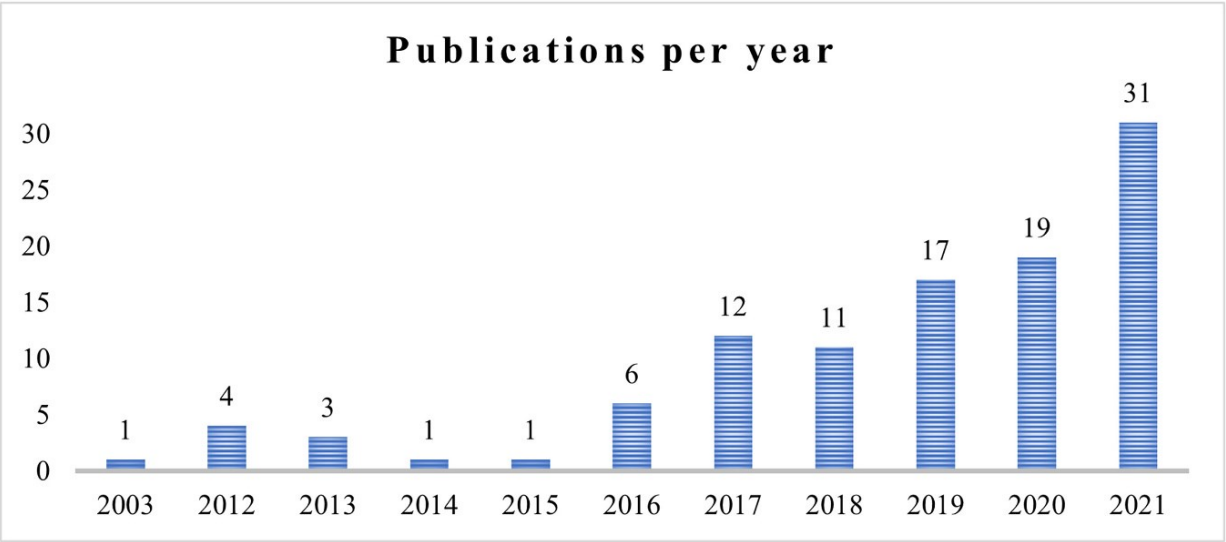
Table 2. Database search results: Publications per journal

Source Title	No. of Publications
Journal of Business Research	10
Technological Forecasting and Social Change	8
International Journal of Innovation Management	6
Journal of Business Strategy	5
Industrial Marketing Management	5
Technology Analysis and Strategic Management	3
IEEE Transactions on Engineering Management	3
Strategy and Leadership	3
Technovation	3
Polish Journal of Management Studies	2
Journal of Manufacturing Technology Management	2

Business Horizons	2
Management Decision	2
Journal of Business and Industrial Marketing	2
Management and Marketing	2
European Journal of Innovation Management	2
Long Range Planning	2
International Journal of Operations & Production Management	2
Journal of Media Business Studies	2
International Journal of Innovation and Technology Management	2
Other journals (one article each)	38
Total	**106**

Subsequently, the analysis focused on publications per year by showing a strong and increasing interest in the topic, as indicated by the rapid growth in the number of publications over the last five years. In fact, the numbers suggest that, since 2016, academics have been paying increasingly more attention to studying the relationship between DTs and BMI. There has been a steady annual increase in research outputs, which went from six papers published in 2016 to 31 papers published in 2021 (see Fig. 1). This trend is also consistent with, and could also be related to, the increasing adoption rate of DTs among firms.

Figure 1. Database search results: Publications per year



The third step analyzes the methodological orientation of the articles and shows that 28 out of the 106 studies are conceptual in nature, while the remaining 78 are empirical (see Table 3, below). Among the latter, the majority (54) rely on adopting multiple or single case studies, and 13 adopt other qualitative methodologies, while only 9 articles out of 78 have been conducted using quantitative methods (e.g., survey and exploratory cluster analysis), and 2 employ mixed methods. The high adoption rate of qualitative methodologies might be related to the explorative nature of the studies, which, in turn, could be due to the lack of the topic's theoretical maturity, as discussed in the previous sections.

Table 3. Database search results: Publications by methodology

Methodology	No. of Publications
Conceptual	**28**
Empirical	**78**
Multiple case study	*39*
Single case study	*15*
Survey	*8*
Other qualitative methodologies (e.g., semi-structured interviews, focus group, content analysis)	*13*
Exploratory cluster analysis	*1*
Mixed method	*2*

Finally, Table 4 below categorizes the publications by theoretical background adopted. Specifically, we followed recent approaches that highlight the theoretical perspectives frequently used within the

extant body of literature (see Guckenbiehl et al., 2021; Siemieniako et al., 2022). Such theories usually encompass precise models and constructs that have been studied over time by a variety of scholars in different settings (Edmondson and McManus, 2007). In this step, our analysis shows that, although the dynamic capability (4) and the resource-based view (3) emerge as the most popular approaches among the selected papers, these theoretical backgrounds were found in only seven articles out of 106. Worthy of note, 87 of the 106 articles do not clearly explain the theoretical lens adopted, meaning that scholars are still endeavoring to find relevant theoretical lenses through which a full understanding of this challenging topic can be ensured.

Table 4. Database research results: Publications by theoretical basis

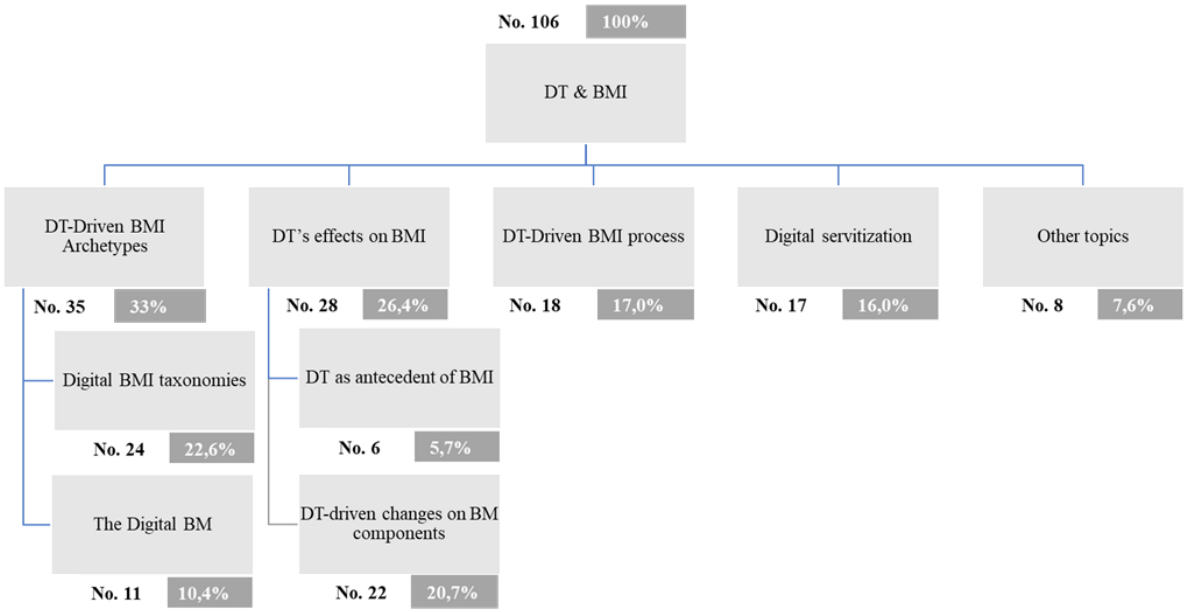
Theoretical Background	No. of Publications
Dynamic capabilities	4
Resource-based view	3
Multiple theoretical backgrounds	2
Institutional theory (effectuation and causation logics)	2
Stakeholder theory	1
Triple helix framework	1
Dynamic resource-based view	1
Network theory	1
Entrepreneurship and theories of the firms	1
Multilevel theory	1
Legitimation theory	1
Relational view	1
No “clear” theoretical basis	87

In sum, by overviewing the articles’ sources, years of publication, methodologies, and theoretical backgrounds, the present section suggests that there is a growing desire within the academic community to develop a deeper understanding of the relationship between DT and BMI and its subsequent implications. Thus, in the next section, the study presents the four main research areas that emerge from the thematic analysis of the reviewed articles (see Appendix 2 for more detail).

5. Thematic analysis

The thematic analysis resulted into four major research areas regarding the relationship between DT and BMI (see Section 3.3). Fig. 2 displays the results of such analysis by indicating the numbers and percentages of studies falling under each theme and sub-theme.

Figure 2. Thematic analysis



5.1 Digital technology-driven BMI archetypes

The first most-researched area encompasses articles addressing various taxonomies or models of DT-driven BMI. In doing so, they reflect the well-established standpoint of BM scholars who understand BMs as a higher-level abstract representation of some aspects of the firms' strategy (see Gassmann et al., 2014; Seddon et al., 2004). These articles conceptualize DTs either by referring to general concepts such as digitalization and digital transformation (Brock et al., 2019; Denicolai and Previtali, 2020; Hiteva and Timothy, 2021) or by describing specific disruptive technologies, such as IoT or blockchain (Leminen et al., 2020, 2018; Schneider et al., 2020). This group of studies can be further divided into two sub-categories, namely "Digital BMI taxonomies" and "The digital BM" (see Fig. 2; Appendix 2). Next, we summarize the main study findings of the two identified categories by highlighting how scholars have constructed various typologies and models of digital- driven BMI.

5.1.1 Digital BMI taxonomies

The first sub-category, labeled "Digital BMI taxonomies," entails articles offering conceptual typologies or empirically based kinds of digital-driven BMs. Conceptual articles provide frameworks for analyzing DT-driven BMs, which are built upon different dimensions centered either on the degree of digitalization (Bouncken et al., 2021; D'Ippolito et al., 2019) or the nature of the BM change itself (Krotov, 2017; Leminen et al., 2020; Volberda et al., 2021; Zaki, 2019). For instance, Krotov (2017) suggests that the BM might undergo incremental innovation when DTs are employed to change existing products or services or the way customers experience the product or the service itself; conversely, a radical BM innovation entails using DTs for envisioning an entirely new BM.

Scholars have also attempted to build *empirically grounded digital-driven BM taxonomies* to address the complexity of BMI. Studies underscore there is no such thing as a univocal digital-driven BMI; rather, a complete range of potential configurations of value creation, value delivery, and value capture mechanisms might exist. Hence, archetypes help researchers to discuss what a digital-driven BM must entail and how firms can innovate their BMs in a digital direction. In this regard, some BM categorizations result from grouping clusters of companies according to pre-established variables (Bourreau et al., 2012; Sanasi et al., 2020; Taüscher and Laudien, 2018).

Differently, other articles inductively build these BM types by looking at the extent to which DTs trigger changes in BM components (Kronblad and Pregmark, 2021; Li, 2020). For instance, Laudien and Daxböck (2016) identify three types of industrial IoT (IIoT)-based BMs: a technology adoption BM, a virtual diversification BM, and a full IIoT BM. While the first represents firms exploiting their extant BM and only implementing adjustments that are not substantial in nature, the second archetype entails a radical change of the value creation mechanisms and the need to redesign the value delivery and value capture dimensions. Finally, the third BM type requires a radical innovation of the firms' non- digitalized BM.

In this regard, the identified BMI taxonomies are largely focused on specific sectors, such as the fashion industry (Huynh, 2021), the energy sector (Chasin et al., 2020), and the healthcare industry (Denicolai and Previtali, 2020), and they describe changes to existing ways of doing business, from minor to more radical ones.

Interestingly, scholars also identify attributes or conditions, such as competitive pressure, opportunity recognition, and perceived growth potential, that explain why firms adopt a specific digital-driven archetype (e.g., Berman et al., 2012; Laudien and Daxböck, 2016). These factors influence the decision-making process regarding how radical the BM changes need to be. When very little competitive pressure and high perceived risk of exploration on the BM level exist, companies tend to adopt DTs to exploit the existing BM (Laudien and Daxböck, 2016). Differently, opportunity recognition and perceived very limited growth potential based on the extant BM act as accelerators of more digital- driven types of BM change (Laudien and Daxböck, 2016).

Moreover, both conceptual and empirical studies highlight that innovative digital-driven BM types might depend on a different inter- play between the ecosystem actors involved (Brock et al., 2019; Leminen et al., 2020; Leminen et al., 2018; Volberda et al., 2021). In this regard, the different DT-driven BMI typologies might be the product of co- evolutionary interactions between DTs, institutions, user practices, and business strategies and ecosystems (Hiteva and Timothy, 2021).

5.1.2 The digital BM

The second sub-category, labeled "The digital BM," includes articles that describe and analyze a single BM archetype enabled by DTs, such as the freemium BM, the multi-sided digital platform BM, the cloud BM, and the smart circular BM (Casero-Ripollés and Izquierdo-Castillo, 2013; del Vecchio et al., 2021; Gwangwava et al., 2018; Hänninen et al., 2018; Hoch and Brad, 2021). Researchers widely leverage the Business Model Canvas as a toolkit for modeling the digital BM archetype, thus high- lighting the major features of such a model and pointing out the major differences compared to more long-standing BMs (Gwangwava et al., 2018; Hänninen et al., 2018; Kaltum et al., 2016). For

instance, Hänninen et al. (2018) show that while traditional retailers coordinate key activities, such as purchasing, marketing, and logistics, through a hierarchical chain coordination model with little input from suppliers, in the platform model, the most important activities and resources are coordinated together with suppliers and managed through open data solutions.

These rather descriptive studies are often based on anecdotal cases of industry disruptors (e.g., Amazon, Alibaba, etc.) or on secondary data (Hänninen et al., 2018; Kaltum et al., 2016; Koudal and Wellener, 2003). An original exception is Sengupta et al.'s (2021) study analyzing the digitized BMI at the bottom of the pyramid (BoP), which goes beyond the simple description of the BM by showing that the successful digital BM at the BoP depends on the technology provider's ability to present the digital platform in a readily acceptable way (i.e., technological capability) and on efforts to make entrepreneurs knowledgeable about the platform (i.e., technological awareness effort) as well as on the stakeholder network stability and stakeholder incentives across the supply chain.

Moreover, there are also studies that highlight the major challenges of specific digital BMs (Dellermann et al., 2017; Hazée et al., 2020; Peng, 2016). For instance, Hazée et al. (2020) show that collaborative consumption, which is characterized by an intermediating digital platform, is hindered by a complex set of multidimensional functional and psychological barriers.

5.2 Digital technology's effects on BMI

The second most-investigated research theme deals with the main effects on BMI of adopting and implementing DTs. Within this broad research area, two sub-categories were identified: "DT as antecedent of BMI" and "DT-driven changes on BM components."

5.2.1 DT as antecedent of BMI

The first sub-category encompasses articles that aim to show how DTs exert significant pressure on BMI; to this end, the authors adopt predominantly quantitative methods. More specifically, this stream of research treats DTs as an external driver of BMI (Bouwman et al., 2018; Garzella et al.,

2021), or it focuses on digital-related capabilities as an internal driver of BMI (Arifiani, 2019; Ciampi et al., 2021; Mihardjo et al., 2019, 2018). Interestingly, it is worth noting that such studies show no agreement on how DT and BMI should be conceptualized and measured. For instance, Garzella et al. (2021) measure digitalization as the relevance of DTs for small and medium-sized enterprises (SMEs) through a four-item scale adapted from previous studies, while Mihardjo et al. (2018) employ an adapted scale for digital organizational capabilities. Similarly, BMI has been measured with scales by Asemokha et al. (2019) (see Ciampi et al., 2021) and Zott and Amit (2007) (see Garzella et al., 2021).

5.2.2 DT-driven changes on BM components

The second sub-category, "DT-driven changes on BM components," includes a relatively large portion of the reviewed articles (see Fig. 2), which provide a detailed analysis of how DTs affect BM components. Two main aspects of this research area merit underscoring. First, given that DTs are largely categorized as falling within the broad Industry 4.0 domain, the majority of articles investigate the process of the digitized connection of industrial manufacturing resulting in the so-called "smart factory" (Arnold et al., 2016; Kiel et al., 2017; Müller et al., 2018; Pietrewicz, 2019) rather than focusing on a single DT (e.g., Schneider et al., 2020). Second, DTs are presented as tools that have the potential to make changes in each component of the BM. Therefore, below we discuss such changes following Osterwalder et al.'s (2005) BM building blocks (i.e., product, customer interface, infrastructure management, financial aspects) (see, for instance, Arnold et al., 2016; Kiel et al., 2017). Research shows that the product is the most digitally affected BM component since DTs provide new and accurate data and insights into what customers would like to buy and how they want to pay for and use products and services, thus allowing companies to be better equipped to offer new products, services, and solutions (Arnold et al., 2016; Baber et al., 2019; Dasí et al., 2017; DaSilva et al., 2013; Müller, 2019; Schneider et al., 2020) as well as customer-tailored products and ser- vices (Kiel et al., 2017; Müller, 2019). Interestingly, especially in business to consumer (B2C) contexts, DTs allow

enhancing the overall customer experience by providing features that leverage customers' hedonism (Ammirato et al., 2021).

The previously mentioned changes in the value proposition usually affect the customer interface (Kiel et al., 2017). In this regard, the literature seems to widely acknowledge that the use of DTs intensifies customer relationships thanks to new digital product configuration tools (Alshawaaf and Lee, 2021; Müller et al., 2018; Wikström and Ellonen, 2012). Furthermore, the increasing complexity of DT-equipped products and services (i.e., smart products and services) requires frequent provider-customer consultation (Kiel et al., 2017). However, conflicting views emerge regarding taking advantage of new DTs to reach new customers. While some articles highlight this potential (Endres et al., 2020; Müller et al., 2018), other authors emphasize that companies find DTs most valuable to address the needs and problems of existing customers (Arnold et al., 2016; Kiel et al., 2017).

In addition, the empirical evidence also shows that DTs profoundly affect infrastructure management as new DTs can collect, process, and handle relevant data for production traceability purposes, such as monitoring production status quo or detecting bottlenecks (Arnold et al., 2016; Björkdahl, 2020; Müller et al., 2018; Schneider et al., 2020). This enhances firms' production efficiency and optimization (e.g., regarding resource usage, energy, time, and equipment effectiveness) (Kiel et al., 2017; Rachinger et al., 2019). Closely related to DTs' impact on pro- duction processes is the need to acquire completely new skills and core competencies, such as data analysis or human intervention in cases of machine failures (Arnold et al., 2016; Müller et al., 2018; Rachinger et al., 2019; Ruggieri et al., 2018; Wikström and Ellonen, 2012). In this regard, the extant literature emphasizes that the lack of company expertise might be overcome by cooperation and value creation innovation with partnering companies (e.g., IT suppliers) and institutions (Arnold et al., 2016; Björkdahl, 2020; Klos et al., 2021; Müller, 2019; Tavoletti et al., 2021), thus driving changes in the firm's partner network structure. Real-time data exchange and transparency along the entire supply chain (Müller et al., 2018) might indeed build unprecedented levels of trust, which can form the foundation for novel ways of collaboration within the business ecosystem (Schneider et al., 2020). Interestingly, Metallo et al.

(2018) show that while young and small firms focus on a given technological area and tend to look for external partnerships, large incumbents with prior technological competencies place more emphasis on strengthening their internal capabilities, such intra-group synergies and complementarities.

Finally, the literature highlights that DTs affect financial aspects. On one hand, the data-driven nature of the new DTs enables new revenue models (e.g., dynamic pricing, pay-per-use, freemium) (Dasí et al., 2017; Müller et al., 2018). On the other hand, the adoption of new DTs brings about changes in the cost structure due to significant investments in IT infrastructures (Arnold et al., 2016) and cost savings through increases in productivity (Kiel et al., 2017; Müller, 2019).

Interestingly, some articles show that the influence of DTs on BMI might differ across industries (Arnold et al., 2016; Rachinger et al., 2019; Ruggieri et al., 2018). For instance, digital-driven changes in the revenue model seem to be a long way off in the manufacturing industry (Kiel et al., 2017), while they are more frequent in the media and tourism industries as these sectors were influenced by DTs earlier than others and have a strong B2C focus, causing the companies to place greater emphasis on value proposition and value capture aspects (Ammirato et al., 2021; Rachinger et al., 2019).

5.3 Digital technology-driven BMI process

The third group of studies sheds light on the underlying process that defines how digital-driven BMs are developed to grasp the pervasiveness of the digital change as well as the dynamic nature of BMI. Given their focus on the BMI process, these studies largely conceptualize DTs by referring to the "digital transformation" concept, which inherently sees DTs as part of the BMI process (Cozzolino et al., 2018; Latilla et al., 2021, 2020; McGrath and McManus, 2020, Schallmo et al., 2017; Sund et al., 2021; Verhoef et al., 2021).

Whether conceptual or empirical, these studies largely adopt a stage process logic to analyze digital-driven BMI, usually identifying and describing the phases companies go through when innovating the BM (Khanagha et al., 2014; Warner and Wäger, 2019, among others). The number of phases, as

well as their key features, differs across studies as the digital-driven BMI process is organization-specific (Berman, 2012; Tesch et al., 2017), thus being strictly dependent on the investigated companies. For instance, Khanagha et al. (2014) identify the following five major phases in the Telco's transition process, characterized by different structural forms and strategic intents as well as key activities and challenges encountered: (1) screening and speculation, (2) initiating experimentation through an embedded temporary organization, (3) continuation of experimentation through an independent structure, (4) shrinkage of the separated structure and delegation of tasks, (5) dissolution of the temporary organization and full integration of exploratory activities. Differently, through a multiple case study, Tesch et al. (2017) find two major decision points, whose occurrence and distance on a timeline is individual for each case, which divides the overall IoT-driven BMI process into phases. The first phase regards the elaboration and evaluation of the BM through analytical work and ends with a decision on whether to continue the elaboration of the BM sketch primarily based on financial viability. The second phase entails further elaboration and evaluation of the BM through prototype-related means and ends with a decision on whether to commit the firm to the implementation and rollout of the BM with all risks involved.

Moreover, although there are some articles that focus on new ventures (Najmaei, 2016), scholars who adopt a process stage view of digital-driven BMI have devoted much more attention to incumbent firms as they are less likely to start a digital transformation journey from scratch, needing, instead, to take an incremental approach (Berman, 2012; Cozzolino et al., 2018; Khanagha et al., 2014; Latilla et al., 2021; McGrath and McManus, 2020).

Thus, the extant research shows that companies might take different and gradual paths to digital transformation, paying attention to the role of DTs in this process. Indeed, as suggested by Verhoef et al. (2021), different degrees of DT pervasiveness exist in each phase for companies that undertake a digital transformation process. In the first phases, digital resources are used for digitalizing existing activities and optimizing existing business processes, whereas in later phases, they are employed to reconfigure the firm's assets when developing new BMs.

In this regard, the literature has emphasized three interconnected aspects of the digital-driven BMI process. First, digital-driven BMI in incumbent firms is an ongoing process of strategic renewal as these firms introduce new DTs into established BMs (Warner and Wäger, 2019).

Second, although characterized by different phases, the process is not linear but iterative as it requires experimenting with new technologies; companies may need to go back to investing in their old business before they fully adapt their BM and should embrace a trial-and-error approach to learn from unexpected events and outcomes (Brenk et al., 2019; Cozzolino et al., 2018). For instance, Brenk et al.'s (2019) case study shows that when the BMI implementation process, although designed with all the tools prescribed in the dominant literature, failed, the BMI project team selected a different set-up with a separated and experimental approach rather than following its established planning and validation logic by deciding to treat the BM realization as an intrapreneurial experiment in parallel to the existing business operations. Hence, experimenting with new DTs in BMI requires organizational redesign, in terms of structural change or adaptation, because separating the innovative digital BM from the existing business helps to limit, at least to some extent, the bias toward the existing BM (Brenk et al., 2019; Khanagha et al., 2014; Latilla et al., 2021). Organizing new business units or departments and internal processes as well as decentralizing the authority and actions aimed at establishing a new organizational culture allow the creation of a new innovation locus (Latilla et al., 2020). For example, to explore with BMI, incumbents might establish innovation laboratories that hold a dual role in driving radical innovation while supporting the core business (Sund et al., 2021).

Third, the different phases might be influenced by enabling or hindering factors (Brenk et al., 2019; Khanagha et al., 2014; Sund et al., 2021; Warner and Wäger, 2019). For instance, institutional barriers may hamper digital-driven BMI and the subsequent need to gain internal and external legitimacy among employees, customers, suppliers, and financing institutions, above all, in order to succeed in BMI (Biloslavo et al., 2020; Brenk et al., 2019; Laïfi and Josserand, 2016).

5.4 Digital servitization

The fourth group of articles focuses on DS as a form of DT-enabled BMI. The concept of "servitization" has been a well-established research priority and domain in the management literature (Gebauer et al., 2010; Ulaga and Reinartz, 2011), and it is largely acknowledged as the process of creating value by adding services to products and devel- oping service-based BMs in manufacturing industries (Paiola and Gebauer, 2020). The transformation toward a service-oriented business is so deeply rooted in the product firms' value architecture that it acts as a manifestation of the firm's business strategy and is seen as a BMI of product firms themselves (Kohtamäki et al., 2019; Paiola and Gebauer, 2020).

More recently, researchers have emphasized the interplay between DT and companies' servitization (Grieger and Ludwig, 2019; Kohtamäki et al., 2019; Latilla et al., 2020; Paiola and Gebauer, 2020; Simonsson et al., 2020). In this regard, the idea of DTs is embedded into the DS conceptualization. In fact, the literature understands DTs as inherently related to servitization (Kohtamäki et al., 2019). Specifically, DS has been defined as "the transition toward smart product-service-software systems that enable value creation and capture through monitoring, control, optimization, and autonomous function" (Kohtamäki et al., 2019, p. 383). Thus, the concept of DS denotes a research stream focusing on how DT enables the shift from manufacturing and selling products to delivering services in innovative ways (Paiola and Gebauer, 2020).

Notably, extant studies show that the kind and complexity of the DT might lead to different BMI destinations (Coreynen et al., 2017; Frank et al., 2019; Kohtamäki et al., 2019; Paiola and Gebauer, 2020) and trajectories (Chen et al., 2021; Tian et al., 2021). In fact, there is no one- size-fits-all approach to leveraging DTs for servitization purposes (Coreynen et al., 2017). Companies can move gradually toward digital and smart services by exploring and combining different BMI approaches rather than undertaking a pre-planned and disruptive servitization journey (Tian et al., 2021). The literature suggests that the relationship between three levels of digitalization (i.e., low, moderate, and high) and three types of services (i.e., smoothing, adapting, and substituting ser- vices) results in different DS models (Frank et al., 2019; Haaker et al., 2021). Differently, according to Coreynen et

al. (2017), investing in back-end DTs (i.e., used for automating internal operations) drives industrial servitization, investing in front-end DTs (i.e., used to interact with customers) leads to commercial servitization, while companies investing in both kinds of DTs might pursue a value servitization (see also Tian et al., 2021 for transition framework based on front-end and back-end DTs).

Moreover, the strategic role of technology in BMI varies depending on the complexity of the service (Frank et al., 2019; Haaker et al., 2021; Paiola and Gebauer, 2020). For instance, Paiola and Gebauer (2020) show that for basic product-oriented services, DTs act as streamlining and enhancing tools, while they are game-changers for intermediate and advanced services, where they act as strategic enablers of process- and outcome-oriented DS BMs.

While describing DS, researchers have also unpacked the main challenges (Gebauer et al., 2020; Simonsson et al., 2020; Struyf et al., 2021) and resources and capabilities requirements that manufacturers should develop; these might vary depending on the specific DS model (Coreynen et al., 2017; Kohtamäki et al., 2019). In fact, a central tenet of this research stream is that resources and capabilities, experience, and organizational routines might help companies in creating and capturing value from DT-related investments (Paiola et al., 2021a; Sjödin et al., 2021). For instance, Paiola et al. (2021a) show that prior knowledge is crucial to properly envision DS projects. The richness of corporate's prior knowledge concerning technologies, customers, suppliers, and so forth effectively directs a firm's choice of the most suitable BMI paths driven by DS.

Additionally, the literature suggests that more advanced DS configuration requires more sophisticated organizational capabilities. For instance, platform providers, which represent one of the most advanced forms of DS (Gebauer et al., 2020; Simonsson et al., 2020), require advanced technologies (e.g., AI, IoT) and relationship management capabilities with providers and customers as well as data analysis capabilities to generate a variety of new business opportunities (Kohtamäki et al., 2019).

Finally, another set of articles emphasizes inter-firms' relationships in DS (e.g., Gebauer et al., 2020; Grieger and Ludwig, 2019; Kohtamäki et al., 2019; Paiola et al., 2021b). These scholars highlight that DS is not limited to the focal firm; rather, it involves companies beyond the firm's boundaries,

such as component manufacturers, system suppliers, system integrators, solution providers, operators, distributors, and customers.

Through the creation of dedicated partnerships, firms might support the ongoing development of DS (Chen et al., 2021; Linde et al., 2021; Sjödin et al., 2021; Struyf et al., 2021). Interestingly, the literature has advanced the idea of studying DS from an ecosystem perspective to highlight the interdependency and alignment between actors within the ecosystem (Chen et al., 2021; Kohtamäki et al., 2019; Sjödin et al., 2021). Through the involvement of ecosystem partners, a manufacturing firm is able to expand the scope of the value proposition to its customers (Chen et al., 2021). Remarkably, the ecosystem is pivotal not only in crafting the new value proposition around smart services and solutions but also for capturing value from DS. In this regard, Chen et al. (2021) identify several mechanisms (i.e., efficiency, accountability, shared customer value, and novelty) through which firms capture value thanks to the well-functioning ecosystems. For instance, co-creation with customers is highly important when designing revenue models for digital services as, for customized digital services, value is created through the provider staying closer to the customer's operational processes than in traditional product offerings (Linde et al., 2021). Therefore, a scalable ecosystem integration is seen as a key principle of BMI toward DS (Sjödin et al., 2021). This implies that firms should understand the BM configurations of other firms within the ecosystem to create strategic fit between BMs as well as to manage power dynamics that may arise among different actors (Kohtamäki et al., 2019).

5.5 Other topics

Lastly, a few of the selected studies deal with specific topics that did not relate to the identified categories. Some studies try to identify best practices for digital-driven BMI (Saarikko et al., 2020; Sorescu, 2017). In this regard, Saarikko et al. (2020) suggest five strategies needed to become digitally conscious and undertake a digital transformation process. For instance, they emphasize that such a transformative process is not expressed in the technological artifact itself but rather that

companies need to identify how DTs might solve their problems to carry on a digital transformation process and ensure an organization-wide commitment to make sure that the technological development is grounded in both strategy and practice. Moreover, they highlight that digital transformation entails careful consideration of the legal and practical implications of data ownership and management.

Scholars are also devoting increasing attention to the role of external actors in digital-driven BMI from different perspectives (Burström et al., 2021a, 2021b; Cucculelli et al., 2021; Hakanen and Rajala, 2018; Lardo et al., 2020). Lardo et al. (2020) investigate the involvement of capability providers in sustainable BMI in a digitalized context. This standpoint considers new BMs (i.e., smart sustainable BMs) as the link between sustainability and Industry 4.0 at the macro level. Differently, Hakanen and Rajala (2018) investigate collaborative value creation by adopting an ecosystem perspective by showing that IoT provides a wealth of information that can change the ways in which value is generated and shared in industry ecosystems. Interestingly, the presence of external actors, such as public institutions and universities, has been found to offset the lower propensity of family managers to innovate BMs in an Industry 4.0 context (Cucculelli et al., 2021).

Finally, other studies tackle the role of family influence and dynamic capabilities in driving digital BMI (Soluk et al., 2021) and the effects of digitization at the organizational and societal levels and consider how big data analytics reshape firms' BMs and transform society (Loebbecke and Picot, 2015).

The identified thematic areas and the results of the revised papers are synthesized in an interpretative framework, which is presented and discussed in the next section.

6. Theoretical implications

6.1 The relationship between DTs and BMI: An interpretative framework

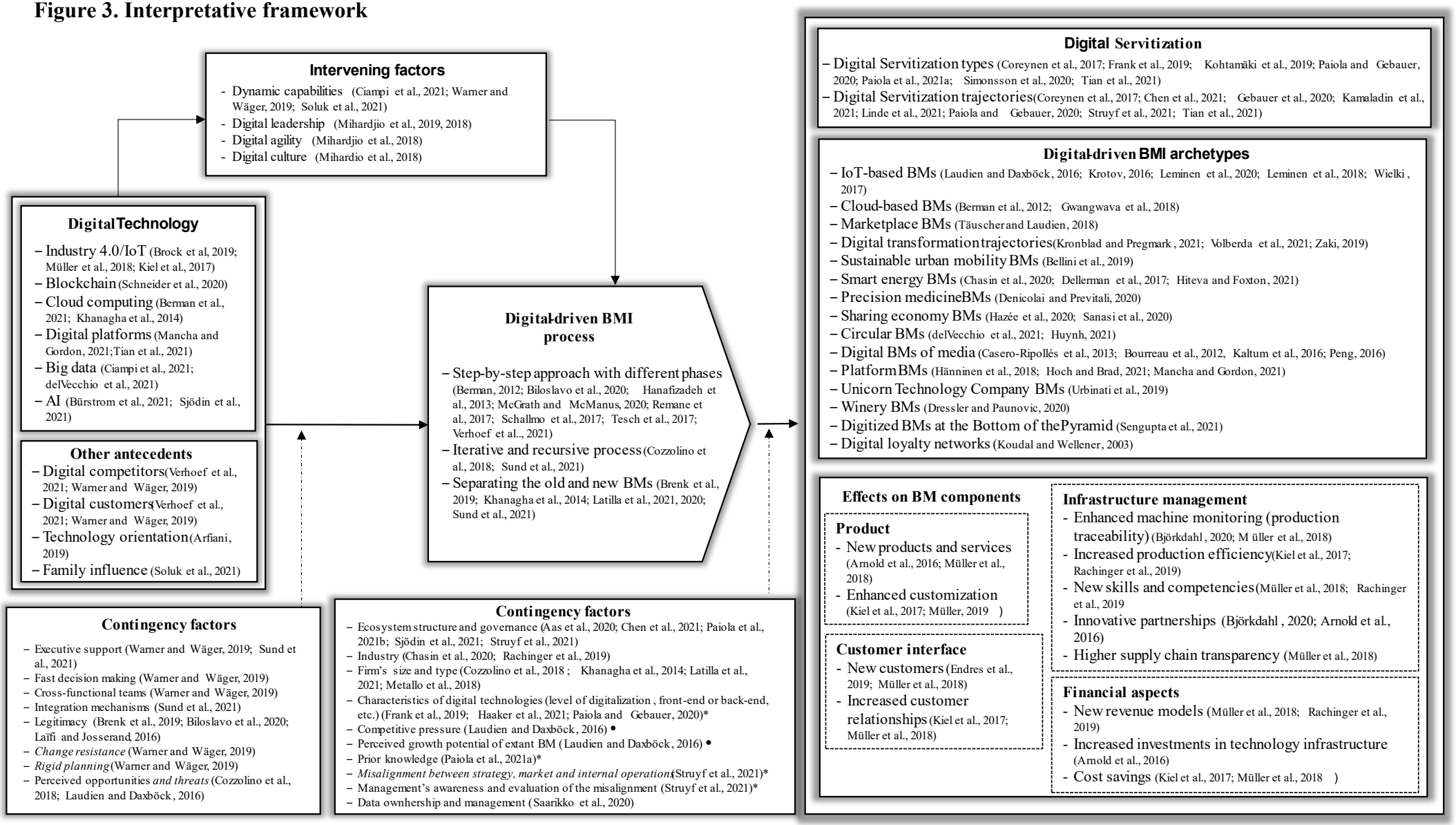
The extant research provides valuable background knowledge to develop an interpretative framework for understanding the relationship between DTs and BMI (see Fig. 3). Importantly, the framework's

constituents do not represent theoretical constructs. Rather, they summarize the results of the reviewed articles and show how the dimensions of the thematic analysis (see Fig. 2) are related.

Bearing in mind the results of the SLR, the framework proposes that several DTs (IoT, big data, cloud computing, etc.) represent a significant driver of BMI processes. On one hand, such technologies have the potential to update firms' back-end operations by shifting their manufacturing systems from analogue (i.e., non-digital, traditional manufacturing) to digital (i.e., IT-enabled manufacturing) to, finally, smart systems (i.e., autonomous systems based on IoT) (see Coreynen et al., 2017; Tian et al., 2021). On the other hand, DTs allow a renewal of the firms' front-end operations by introducing new digital platforms at the customer interface, thus influencing the overall firm's value logic.

Specifically, since there is no commonly agreed-upon definition of the DT concept, different understandings exist according to authors' perspectives. In this regard, we encourage scholars to clearly state and explain the concepts applied to answer research questions in their respective field of interest. For instance, the literature focused on uncovering DTs' effects on BMI largely refers to the broad Industry 4.0 paradigm or IoT concept to analyze BMI in smart manufacturing (see Ghobakhloo, 2020 for the included technology trends; Müller et al., 2018 for a three-dimension definition of Industry 4.0). Differently, the literature on the BMI process largely employs the "digital transformation" concept (see Verhoef et al., 2021; Warner and Wäger, 2019). Interestingly, although focused on studying the role of DTs, the literature has also highlighted other antecedents, such as digital competitors and digital customers (e.g., Verhoef et al., 2021; Warner and Wäger, 2019), which might be relevant in fostering digital-driven BMI processes.

Figure 3. Interpretative framework



Notes: Italics: negative effects; Dash-dot arrows: positively or negatively affecting the relationship; Asterisk: factors affecting DS; Bullet: factors affecting digital-driven BMI archetypes.

The BMI process is an incremental, step-by-step approach characterized by the different phases companies go through when innovating the value creation, value delivery, and value capture mechanisms. Such process is iterative, meaning that firms may keep investing in the old BM before fully adapting to the new one, thereby pursuing mixed BMs (i.e., portfolio BMs). To this end, the BMI process might entail separating the old BM from the new one by assigning the responsibility for exploring how to adapt the established BM or design the new one to a dedicated innovation team, department, or business unit (e.g., Brenk et al., 2019; Cozzolino et al., 2018).

The proposed framework also suggests that the BMI process results in different configurations of value creation, value delivery, and value capture mechanisms, which have been analyzed at different abstraction levels. In doing so, the literature shows many different BM conceptualizations, and each perspective emphasizes certain functions while overlooking others.

The idea of BMs as higher-level abstractions of the strategy is widespread among the researchers investigating the relationships be- tween DTs and BMs. This view is largely embraced when addressing DS to provide categorizations of digital service-oriented BMs (e.g., Aas et al., 2020; Paiola and Gebauer, 2020). Such perspective is also adopted for uncovering new DT-driven BMI archetypes (e.g., Laudien and Daxböck, 2016; Li, 2020). These studies label typical kinds of BMs and describe firms' different behaviors while classifying individual organizations accordingly (Baden-Fuller and Morgan, 2010). The identified taxonomies provide a nuanced understanding of the different BM types and a summary of the characteristics for each type. They are useful to highlight that there is no one-size-fits-all approach to digital-driven BMI and to assist managers in recognizing strategic paths that might be pursued, expected benefits, tactics that might be employed, and conditions that influence the choice of a specific BM type (see Coreynen et al., 2017; Tian et al., 2021).

At a lower abstraction level, studies have conceptualized the BM by

leveraging Osterwalder et al.'s models (Osterwalder et al., 2005; Osterwalder and Pigneur, 2010), which have been proven to be valuable analytic frameworks for analyzing specific digital BMs (e.g., the multi- sided digital platform BM and the cloud BM) to pinpoint major differences compared to

more traditional BMs (e.g., Gwangwava et al., 2018; Hänninen et al., 2018). Similarly, studies addressing the effects of DTs on BM components follow this logic by highlighting how each BM's "building block" changes due to new technologies as well as their architecture (Kiel et al., 2017). In doing so, these studies favor a higher descriptive accuracy of the innovative BM.

In this regard, we also encourage future studies to clearly state the abstraction level of the adopted BM conceptualization (see Massa and Tucci, 2013 for a comprehensive view on abstraction levels) as well as to clarify their understanding regarding the degree of novelty and scope of change in BMI (see Foss and Saebi, 2017 for a BMI definition based on a SLR) (see Table 5; section 6.2).

Based on the SLR, we suggest potential intervening and contingency factors that may become involved in the relationship between DTs and the BMI.

Specifically, extant literature has focused on digital-related capa- bilities as an internal driver of BMI (see Ciampi et al., 2021; Mihardjo et al., 2019, 2018). Hence, the framework proposes that such factors may help in understanding the mechanisms through which DTs affect the BMI process. As the mere investment in DTs can be insufficient on its own to foster such processes, the development of organizational capabilities, mainly dynamic capabilities (e.g., analytic capabilities, customer needing interpretation capability, and hybrid offering development capability), may represent the key to getting the most out of DTs.

Interestingly, the extant research has also shown that various conditions may positively or negatively affect the relationship between DTs and the BMI process as well as influence the relationship between the BMI process and the resulting configuration of value creation, delivery, and capture mechanisms. Various factors such as executive support, the internal and external legitimacy of new BMs, and perceived opportunities are likely to support digital-driven BMI processes, while change resistance, perceived threats, and rigid planning might hamper such processes (e.g., Brenk et al., 2019; Cozzolino et al., 2018; Sund et al., 2021).

Similarly, the resulting configurations of value creation, delivery, and capture mechanisms may depend on various factors such as the ecosystem structure and governance, the industry, the firm's

size and type, and the characteristics of DT (e.g., Aas et al., 2020; Haaker et al., 2021; Laudien and Daxböck, 2016). Notably, a cross-cutting interest among academics investigating digital-driven BMI in understanding the role of external actors (customers, partners, governments, etc.) in supporting firms' digital BM is remarkable. Scholars widely embrace the boundary-spanning and activity system perspective of BMs where value is created through the focal firm together with its partners (Zott et al., 2011). Notwithstanding the different concepts and emphasis employed, this aspect of BMs is recurrent across thematic areas as a fundamental condition for exploiting DTs in BMI. For instance, the literature on DTs' effects on BMI highlights that DTs significantly affect the infrastructure management component of the BM due to changes in the firms' network structure (Björkdahl, 2020; Kiel et al., 2017; Müller et al., 2018). Moreover, the literature suggests that new digital BM kinds might depend on the ecosystem governance and structure (Leminen et al., 2020; Volberda et al., 2021). Likewise, scholars investigating DS widely advocate the role of the ecosystem in fostering such BMI (Chen et al., 2021; Kohtamäki et al., 2019; Sjödin et al., 2021).

Importantly, the identified factors are not meant to be exhaustive; instead, they represent the elements most frequently investigated in the extant literature. Hence, we encourage researchers to conduct additional studies on contingency factors (see Table 5; section 6.2).

Besides these general considerations, each area might be analyzed separately for charting the next research priorities. We discuss below the contribution of these research areas and the consequent implications for future research.

6.2 Future research agenda

6.2.1 Digital technology-driven BMI archetypes

This thematic area is particularly valuable in describing the key characteristics of digital-driven BMs. In this regard, DT-driven BM archetypes usually represent domain-specific innovative BMs that serve as examples for firms. The goal of these studies is to develop taxonomies of digital-enabled BMI strategies currently employed by firms and to identify company characteristics and common patterns

related to following a particular strategy. Basically, they are conceived as ideal roadmaps that firms should use to effectively innovate their BM. This group of studies deeply explores several digital-driven innovative BMs and shows that various potential configurations of value capture, value delivery, and value creation mechanisms might exist (e.g., Brock et al., 2019; Li, 2020).

Despite this notable merit, these studies provide a mere snapshot of digital-enabled BMI. Few studies have adopted a more dynamic perspective when studying digital BMI archetypes (see Chasin et al., 2020; Leminen et al., 2018). Therefore, we encourage scholars to analyze how digital BMs change over time to better understand how firms include DTs for BMI as well as to devote more efforts in identifying possible evolutionary paths among digital-driven BM archetypes. In this regard, longitudinal studies, by examining the chronological timelines of events or changes in real-world organizations' characteristics across time, may help in grasping the transformation process in more detail and in gaining a more thorough understanding regarding the role of DTs. Specifically, thus far, researchers have often developed and analyzed BMI archetypes by collecting cross-sectional data when case firms have already changed their BMs. Differently, longitudinal studies allow observing the progressions of events, stages, and activities that firms experience. Hence, by repeatedly gathering empirical data over the years from the same company or sample, researchers can explore and pinpoint potential change patterns throughout firms' lifecycles. Additionally, collecting data at certain intervals in time allows reflection upon the previous situation in light of the present situation, thus linking earlier circumstances to the later outcomes, as well as comparisons of what is presently seen with expectations of the future (Aaboen et al., 2012). Hence, this approach can be useful for researchers interested in analyzing changes in a single archetype as well as for those who develop taxonomies to show changes across different archetypes.

Furthermore, studying the relationship between DTs and BMI through archetypes has proven to be a valuable approach to explore new phenomena and related BMs, such as precision medicine or smart energy (Chasin et al., 2020; Denicolai and Previtali, 2020). In this regard, additional studies might be conducted in other domains (e.g., precision agriculture, smart public services/e-government, and

smart education) to thoroughly investigate other industry-specific phenomena. Moreover, due to the nature of BM archetypes, which represent recurring patterns of BMs, the literature could have missed rare BMs. However, BMs that are new to industry or seldom applied could become successful in the future and, thus, particularly interesting to analyze. Therefore, we encourage future studies to examine the emergence of new BM archetypes.

6.2.2 Digital technologies' effects on BMI

Firstly, although the articles in this group are quite clear regarding the core BM and BMI constructs adopted (Arnold et al., 2016; Müller, 2019; Müller et al., 2018), they fail to identify relationships among BM components, thereby lacking a framework and systemic perspective on BMI, which is commonly acknowledged in the existing literature (see Foss and Saebi, 2017; Zott et al., 2011). Notably, except for the study by Kiel et al. (2017), which explores the direct and indirect interrelationships of single BM component changes due to DTs, the extant research investigating how DTs affect BMI components focuses on single changes in one or more components of the BM. Despite the valuable insights that have emerged from the findings, more research should be carried out to investigate how DTs might directly or indirectly affect the interrelationships among the BM components. This represents a major research avenue for future investigations: existing knowledge would benefit from a deeper understanding of which BM components are firstly and most profoundly affected by DTs and how this leads to changes in other components. In this regard, studies might also shed light on whether common patterns exist and can be identified according to company size or industry type. Moreover, the extant research shows that, notwithstanding the DTs' potential to enable novel revenue models such as pay-per-feature, pay-per-use, and dynamic pricing (Müller et al., 2018), companies still experience difficulties in changing this BM component (Arnold et al., 2016; Kiel et al., 2017). The literature has found that this may depend on the industry, yet future studies investigating DTs' effects on BM components might devote particular attention in providing

additional empirical evidence on this aspect. This would further enhance the understanding of the role of DTs in BMI.

Secondly, studies investigating the effects of DTs on BMI are largely qualitative in nature. Quantitative studies could have been hindered by the lack of conceptual clarity that characterizes both the DT and the BMI constructs. In fact, the SLR shows that there is no agreed understanding of such concepts, which has led scholars to adopt diverse measurement scales (see, for instance, Ciampi et al., 2021; Garzella et al., 2021). Therefore, more research is needed by employing commonly agreed and validated constructs and measures. Specifically, the extant literature has studied DTs as an antecedent of BMI, suggesting that DTs might act as an external driver, and this can entail the development of digital-related capabilities internally. Future research might investigate the impact of digital-enabled BMI on firms' performance. Moreover, qualitative studies have highlighted how DTs bring about changes to the BM; this, in turn, may represent an opportunity for future research to quantitatively test these relationships. Thus, future quantitative studies may examine whether these findings hold in large-scale studies of companies.

6.2.3 Digital technology-driven BMI process

The attempt to grasp a more systemic and dynamic view characterizing the BM and BMI constructs has resulted in studies approaching the BMI process. Although these articles do not show the interdependencies occurring among various components in the digital-driven BMI, they provide a more comprehensive view on the phenomenon under investigation by studying the whole process. Specifically, as the process is organization-specific, there is no such univocal BMI process, and each study identifies different phases companies might go through when innovating the BM.

Nevertheless, they often fail to unravel the specific role of DTs throughout the various stages of the BMI process; their focus is on identifying barriers (e.g., institutional barriers) to and enablers (e.g., experimentation, trial-and-error approach, etc.) of the BMI process, which have been extensively covered by previous studies on BMI (see Foss and Saebi, 2017; Sosna et al., 2010). A possible

explanation is that DTs alone are acknowledged not to provide a long-term advantage; rather, only when intertwined with a particular organizational context do DTs enable firms to create and capture value from such investments. Yet, academics suggest that DTs undertake a different role in the early and later phases of the digital transformation process (see Verhoef et al., 2021), thus future studies might offer a more thorough investigation of such differences. An interesting future research avenue would be to explore how DTs might help or challenge specific phases of the BMI process. For instance, DTs allow data collection on products, customers, and production processes that can provide valuable information to convert a new BM conceptualization into practice, which is likely to help companies in shifting from the first stages of BM ideation toward BM actualization. Differently, as implementing DTs requires the development of new skills and capabilities, DTs could even challenge the BMI transformation process toward the most advanced stages of digital transformation as companies may struggle to find the right competences within and outside the organization. In fact, the extant literature suggests that the digital-driven BMI process is iterative and requires experimenting with the level of digitalization.

6.2.4 Digital servitization

Finally, the literature has largely pointed out that DTs increasingly enable servitization models (Müller et al., 2018; Kiel et al., 2017), and, more importantly, the SLR shows that there is an entire research area specifically addressing DS whereby studies shed light on the interplay between DTs and servitization as a form of BMI.

These studies pay attention to the role of DT in leading toward different BMI paths and to the resources and capabilities involved as well as the value of inter-firm relationships. In this regard, although the extant research suggests that ecosystems are becoming increasingly important in BMI processes toward DS, most studies on DS are still firm centric (e.g., Paiola et al., 2021a, 2021b; Sjödin et al., 2021; see also Kohtamäki et al., 2019). Thus, we call for future studies to embrace dyadic or

multi-firm perspectives by simultaneously investigating suppliers, customers, partners, and so forth to understand how companies align BMs within the ecosystem.

Moreover, as studies suggest that power dynamics may arise among different actors involved in DS (Kohtamäki et al., 2019), future research can investigate the effects of DTs on ecosystem governance mechanisms as well as the emergence of new types of shared revenue models enabled by such technologies. Additionally, as the extant empirical evidence on the topic is largely based on large manufacturers (Chen et al., 2021; Sjödin et al., 2021; Tian et al., 2021), we encourage future research to investigate DS in SMEs to uncover differences in the pathways, challenges, resources, and capabilities involved in such processes.

Finally, future studies could focus on the interplay between DS and sustainability. It is indeed of utmost importance to understand how companies create and capture value in ways that do not negatively affect the environment and the society (Geissdoerfer et al., 2018). The extant servitization literature argues that the shift from products to product- service systems helps to maintain, upgrade, and re-manufacture products, which extends their lifespan and decreases product turnover, thus entailing significant environmental benefits (Kastalli and Van Looy, 2013). Companies can decide to provide service contracts instead of one- time sales, thus creating longer-lasting products and offering maintenance, repair, and recycling services, which generate profits over a longer time while benefitting the environment (Tukker, 2004). Therefore, product-service systems are often considered sustainable BM types (Evans et al., 2017; Geissdoerfer et al., 2018; Tukker, 2004). Moreover, digitalization is deemed to be one of the most promising transformations toward sustainable economic, environmental, and social development (Castro et al., 2021; Paiola et al., 2021b; Paschou et al., 2020). For instance, Ghobakhloo (2020) identifies several sustainability functions of Industry 4.0, such as energy and resource efficiency, reduction of carbon emissions, and risk and safety management. Specifically, when highly resource-consuming manufacturing companies embark on a DS process and transform their BMs, they can produce significant impacts on the overall efficiency of customers' processes, allowing them to lower energy consumption rates, improve resource

utilization, and reduce the waste of materials and consumable products (Paiola et al., 2021b). In addition, digitally enabled service BMs where the firm is a platform provider connecting various providers and customers (e.g., car sharing platform) are often related to sustainability as they reduce energy consumption and waste by effectively leveraging economies of scope and foster sustainable consumption (Kohtama¨ki et al., 2019). Therefore, the interplay between DS and sustainability offers a promising future research avenue.

Although, scholars have begun to approach the topic (see Paiola et al., 2021b), the literature is still in its infancy. Notably, while the literature has focused on the environmental-related benefits of DS, less attention has been paid to the social and economic dimensions of sustainability. In fact, the literature emphasizes that new DTs might profoundly affect human resource development and job creation as well as economic sustainability opportunities (Beier et al., 2020; Ghobakhloo, 2020). In this regard, future research on DS would benefit from a much closer understanding of its effects in terms of sustainable BMI by considering the economic, social, and environmental dimensions of sustainability.

Table 5 below provides a summary of the proposed future research directions.

Table 5. Future research directions

General future research directions	
Clearly stating the abstraction level of the adopted BM conceptualization Clarifying the understanding regarding the degree of novelty and scope of change in BMI Additional studies on contingency factors	
Future research agenda for each thematic area	
Thematic area	**Future research avenues**
DT-driven BMI archetypes	Analyzing how specific digital-driven BM archetypes might change over time
	Identifying possible evolutionary paths among digital-driven BM archetypes
	Examining the emergence of new BMs that are currently rare but may become successful in the future
	Exploring new industry-specific phenomena and related digital BMs (e.g., precision agriculture, smart public services/e-government, and smart education)
DTs' effects on BMI	Investigating the role of DTs in directly or indirectly affecting interrelationships among the BM components
	Investigating how DTs enable new revenue models
	Empirically testing the impact of digital-enabled BMI on firms' performance
	Large-scale studies to test DTs' effects on BMI

DT-driven BMI process	Providing additional empirical evidence on the role of DTs in the different phases of the BMI process
Digital servitization	Investigating the effects of DTs on ecosystem governance mechanisms and the emergence of new types of shared revenue models enabled by such technologies
	Investigating the interplay between DS and sustainable BMI
	Providing additional empirical evidence in SMEs to uncover differences with large manufacturers
	Adopting a dyadic or multi-firm perspective by simultaneously investigating suppliers, customers, and partners to understand how companies align digital BMs within the ecosystem

Notes: Red: content-related recommendations; Blue: context-related recommendations; Green: method-related recommendations

7. Conclusion

The relationship between DTs and BMI is a core concern in current academic research and business practice. Research on this topic has been published in a broad range of scientific journals spanning multiple research fields. This suggests its relevance to a variety of disciplines, including innovation, marketing, accounting, and strategy.

Overall, the extant literature adopts many different perspectives to study the relationship between DTs and BMI. This results in high fragmentation among the studies and makes their findings difficult to compare. Hence, the article's contribution to the extant literature is threefold. First, we gather the current knowledge on the relationship between DTs and BMI and highlight the four most-investigated thematic areas. Second, we provide an interpretative framework to facilitate a more thorough understanding and meaningful systematization of what is already known on this topic. Specifically, our analysis and framework integrate the identified thematic areas and the results of the revised articles into an overall picture that offers an overview of the theories and approaches used, which is useful for comparative studies in the future. Such framework can be employed by researchers to collect information on aspects that have already been studied and to guide future research as well. Third, we identify both general research directions and specific research avenues for each thematic area.

Moreover, the present study provides valuable managerial implications, which are discussed next.

7.1 Managerial implications

The study supports managers in facing the so-called digitalization paradox by providing a thorough understanding of the relationship between DTs and BMI. Overall, the present research can support managers in making complex business decisions by informing their choices regarding DTs' adoption according to their effects on the BM. Managers can grasp a comprehensive perspective about digital-driven BMI, which helps them to become aware of the main elements that come into play when adopting DTs. Managers can better understand the antecedents and consequences of digital-driven BMI processes. In this regard, they can learn beforehand what to expect from investing in and adopting DTs in terms of changes on the BM side, thus being better equipped to manage the digital-related effects on the BM. For instance, they can acknowledge that there is no "one-size-fits-all" approach when developing digital-driven BMI. In fact, such processes cannot be ascribed to a single and specific recipe or checklist of tasks. Rather, when renovating their BM, firms undergo different phases that are not linear but rather iterative and recursive, thus requiring going back and forth between the old and new BMs and managing multiple BMs at the same time (i.e., portfolio models). Hence, managers should adopt a more flexible approach toward BMI. Reducing rigidities when planning and forecasting future scenarios allows managers to seize emerging and unknown opportunities. In addition, managers can learn that DTs may produce various effects in each BM component and lead to different results in terms of BM archetypes. Furthermore, managers can learn about the factors that can play a relevant role in digital-driven BMI processes: instead of setting high expectations in the mere adoption of DTs, managers should recognize that positive results in terms of BMI might be achieved if the company invests in using such technologies to grow valuable organizational capabilities that, in turn, may influence BMI processes. This would help them in developing the appropriate managerial capabilities—that complement DT-specific competencies—to steer the whole BMI process. Finally, the study and the proposed framework also shed light on the

main conditions that may occur when the adoption of new DTs lead the firm to renovate its BM or develop a new BM. Notably, managers can understand which factors positively or negatively influence the relationship between DTs and BMI processes and associated results. Thus, they may act accordingly to limit the effects of the factors that have a negative impact while strengthening those that have a positive effect. For instance, managers can favor debates and joint thinking within the company to counteract rigid planning and change resistance as well as to provide support and encourage cross-functional teams to support digital-driven BMI processes.

7.2 Limitations

As with any other research work, this study reveals some limitations. Firstly, the review is limited to the articles identified from the search terms chosen, which ultimately dictated which publications would be included. Consequently, contributions using other (related) keywords to study the same topic were inevitably excluded. However, we carefully created the search string by including generic as well as specific keywords for both the "digital technology" and the "business model innovation" concepts. In an effort to limit this shortcoming, we included various research perspectives and disciplines as well. Secondly, we narrowed the search to the "business, management, and accounting" area to control for search results relating to computer science or engineering, which adopt too narrow of a perspective on the technical aspects of DTs. Although this area encompasses several disciplines such as marketing, strategy, management, and operations, we acknowledge that some articles classified under different categories might have been excluded. Moreover, we purposefully did not select a pre-defined timeframe or pre-established academic outlets as bookends within which to conduct the review, thus extending our search area to include a larger set of research studies. Had we focused only on selected journals, we would have missed the wide scope of journals and disciplines that have also addressed the relationship between DTs and BMI. Nevertheless, future studies might also consider repeating the review process using different inclusion and exclusion criteria. Additional limitations relate to other technical aspects of conducting SLRs. Although the electronic databases

we selected include most peer-reviewed international journals, there might have been some publications that were not listed in these databases and were thus excluded from this study. Similarly, we deliberately limited the search to peer-reviewed articles published in English, thereby excluding books, book chapters, conference proceedings, and publications in other languages that might have provided additional insights.

References

Aaboen, L., Dubois, A., Lind, F., 2012. Capturing processes in longitudinal multiple case studies. Ind. Mark. Manag. 41 (2), 235–246. https://doi.org/10.1016/j. indmarman.2012.01.009.

Aas, T.H., Breunig, K.J., Hellstr¨om, M.M., Hydle, K.M., 2020. Service-oriented business models in manufacturing in the digital era: toward a new taxonomy. Int. J. Innov. Manag. 24 (08), 2040002. https://doi.org/10.1142/S1363919620400022.

Al-Htaybat, K., Hutaibat, K., von Alberti-Alhtaybat, L., 2019. Global brain-reflective accounting practices: forms of intellectual capital contributing to value creation and sustainable development. J. Intellect. Cap. 20 (6), 733–762. https://doi.org/ 10.1108/JIC-01-2019-0016.

Alshawaaf, N., Lee, S.H., 2021. Business model innovation through digitisation in social purpose organisations: a comparative analysis of Tate Modern and Pompidou Centre. J. Bus. Res. 125, 597–608. https://doi.org/10.1016/j.jbusres.2020.02.045.

Ammirato, S., Felicetti, A.M., Linzalone, R., Carlucci, D., 2021. Digital business models in cultural tourism. Int. J. Entrep. Behav. Res. 1 22. https://doi.org/10.1108/IJEBR-01- 2021-0070.

Andreini, D.,Bettinelli, C., 2017. Business model innovation. In: From Systematic Literature Review to Future Research Directions. Springer International Publishing AG, Cham, Switzerland.

Andriulo, S., Elia, V., Gnoni, M.G., 2015. Mobile self-checkout systems in the FMCG retail sector: a comparison analysis. Int. J. RF Technol. Res. Appl. 6 (4), 207–224. https:// doi.org/10.3233/RFT-150067.

Angeles, R., 2019. Internet of things (IOT)-enabled product monitoring at steadyserv: interpretations from two frameworks. J. Cases Inf. Tech. 21 (4), 27–45. https://doi. org/10.4018/JCIT.2019100103.

Arifiani, L., 2019. The effect of disruption technology, opportunities and challenges of telecommunication industry 4.0 in Indonesia. Int. J. Rec. Tech. Eng. 7 (6), 808–819.

Arnold, C., Kiel, D., Voigt, K.I., 2016. How the industrial internet of things changes business models in different manufacturing industries. Int. J. Innov. Manag. 20 (8), 1–20. https://doi.org/10.1142/S1363919616400156.

Asemokha, A., Musona, J., Torkkeli, L., Saarenketo, S., 2019. Business model innovation and entrepreneurial orientation relationships in SMEs: implications for international performance. J. Int. Entrep. 17 (3), 425–453. https://doi.org/10.1007/s10843-019- 00254-3.

Baber, W.W., Ojala, A., Martinez, R., 2019. Effectuation logic in digital business model transformation: insights from Japanese high-tech innovators. J. Small Bus. Enterp. Dev. 26 (6–7), 811–830. https://doi.org/10.1108/JSBED-04-2019-0139.

Baden-Fuller, C., Morgan, M.S., 2010. Business models as models. Long Range Plan. 43 (2–3), 156–171. https://doi.org/10.1016/j.lrp.2010.02.005.

Bawono, M., Mihardjo, L., 2020. Driving transformation performance through innovation and experience model. Man. Sci. Lett. 10 (6), 1259–1264. https://doi. org/10.5267/j.msl.2019.11.032.

Beier, G., Ullrich, A., Niehoff, S., Reißig, M., Habich, M., 2020. Industry 4.0: how it is defined from a sociotechnical perspective and how much sustainability it includes–a literature review. J. Clean. Prod. 259, 1 13. https://doi.org/10.1016/j. jclepro.2020.120856.

Bellini, F., Dulskaia, I., Savastano, M., D'Ascenzo, F., 2019. Business models innovation for sustainable urban mobility in small and medium-sized European cities. Manag. Market. Challen. Knowl. Soc. 14 (3), 266–277. https://doi.org/10.2478/mmcks- 2019-0019.

Berman, S.J., 2012. Digital transformation: opportunities to create new business models. Strat. Lead. 40 (2), 16–24. https://doi.org/10.1108/10878571211209314.

Berman, S.J., Kesterson-Townes, L., Marshall, A., Srivathsa, R., 2012. How cloud computing enables process and business model innovation. Strat. Lead. 40 (4), 27–35. https://doi.org/10.1108/10878571211242920.

Bienhaus, F., Haddud, A., 2018. Procurement 4.0: factors influencing the digitisation of procurement and supply chains. Bus. Process. Manag. J. 24 (4), 965 984. https://doi. org/10.1108/BPMJ-06-2017-0139.

Biloslavo, R., Bagnoli, C., Massaro, M., Cosentino, A., 2020. Business model transformation toward sustainability: the impact of legitimation. Manag. Decis. 58 (8), 1643–1662. https://doi.org/10.1108/MD-09-2019-1296.

Björkdahl, J., 2020. Strategies for digitalization in manufacturing firms. Calif. Manag. Rev. 62 (4), 17–36. https://doi.org/10.1177/0008125620920349.

Bodenbender, M., Kurzrock, B.M., Müller, P.M., 2019. Broad application of artificial intelligence for document classification, information extraction and predictive analytics in real estate. J. Gen. Manag. 44 (3), 170–179. https://doi.org/10.1177/ 0306307018823113.

Bouncken, R.B., Kraus, S., Roig-Tierno, N., 2021. Knowledge-and innovation-based business models for future growth: digitalized business models and portfolio considerations. Rev. Manag. Sci. 15 (1), 1–14. https://doi.org/10.1007/s11846-019- 00366-z.

Bourreau, M., Gensollen, M., Moreau, F., 2012. The impact of a radical innovation on business models: incremental adjustments or big bang? Ind. Innov. 19 (5), 415–435. https://doi.org/10.1080/13662716.2012.711026.

Bouwman, H., Nikou, S., Molina-Castillo, F.J., de Reuver, M., 2018. The impact of digitalization on business models. Dig. Pol. Reg. Gov. 20 (2), 105–124. https://doi. org/10.1108/DPRG-07-2017-0039.

Brenk, S., Lüttgens, D., Diener, K., Piller, F., 2019. Learning from failures in business model innovation: solving decision-making logic conflicts through intrapreneurial effectuation. J. Bus. Econ. 89 (8), 1097–1147. https://doi.org/10.1007/s11573-019- 00954-1.

Brock, K., den Ouden, E., van der Klauw, K., Podoynitsyna, K., Langerak, F., 2019. Light the way for smart cities: lessons from Philips lighting. Technol. Forecast. Soc. Chang. 142, 194 209. https://doi.org/10.1016/j.techfore.2018.07.021.

Bucherer, E., Eisert, U., Gassmann, O., 2012. Towards systematic business model innovation: lessons from product innovation management. Creat. Innov. Manag. 21 (2), 183–198. https://doi.org/10.1108/10878571211242920.

Burström, T., Parida, V., Lahti, T., Wincent, J., 2021. AI-enabled business-model innovation and transformation in industrial ecosystems: a framework, model and outline for further research. J. Bus. Res. 127, 85 95. https://doi.org/10.1016/j. jbusres.2021.01.016.

Caputo, A., Pizzi, S., Pellegrini, M.M., Dabi´c, M., 2021. Digitalization and business models: where are we going? A science map of the field. J. Bus. Res. 123, 489 501. https://doi.org/10.1016/j.jbusres.2020.09.053.

Casadesus-Masanell, R., Zhu, F., 2013. Business model innovation and competitive imitation: the case of sponsor-based business models. Strateg. Manag. J. 34 (4), 464 482. https://doi.org/10.1002/smj.2022.

Casadesus-Masanell, R., Ricart, J.E., 2011. How to design a winning business model. Harv. Bus. Rev. 89 (1–2), 100–107. https://doi.org/10.1016/j.lrp.2010.01.004. Casadesus-Masanell, R., Ricart, J.E., 2010. From strategy to business models and onto tactics. Long Range Plan. 43 (2–3), 195–215. https://doi.org/10.1016/j. lrp.2010.01.004.

Casero-Ripollés, A., Izquierdo-Castillo, J., 2013. Between decline and a new online business model: the case of the spanish newspaper industry. J. Media Bus. Stud. 10 (1), 63–78. https://doi.org/10.1080/16522354.2013.11073560.

Castro, G.D.R., Fern´andez, M.C.G., Colsa, ´A.U., 2021. Unleashing the convergence amid digitalization and sustainability towards pursuing the Sustainable Development Goals (SDGs): a holistic review. J. Clean. Prod. 280, 122204 https://doi.org/ 10.1016/j.jclepro.2020.122204.

Chandy, R., Hassan, M., Mukherji, P., 2017. Big data for good: insights from emerging markets. J. Prod. Innov. Manag. 34 (5), 703–713. https://doi.org/10.1111/ jpim.12406.

Chasin, F., Paukstadt, U., Gollhardt, T., Becker, J., 2020. Smart energy driven business model innovation: an analysis of existing business models and implications for business model change in the energy sector. J. Clean. Prod. 269, 122083 https://doi. org/10.1016/j.jclepro.2020.122083.

Cheah, S., Wang, S., 2017. Big data-driven business model innovation by traditional industries in the Chinese economy. J. Chin. Econ. For. Trade Studies 10 (3), 229–251. https://doi.org/10.1108/JCEFTS-05-2017-0013.

Chen, Y., Visnjic, I., Parida, V., Zhang, Z., 2021. On the road to digital servitization–The (dis) continuous interplay between business model and digital technology. Int. J. Oper. Prod. Manag. 41 (5), 694–722. https://doi.org/10.1108/IJOPM-08-2020- 0544.

Chesbrough, H., 2010. Business model innovation: opportunities and barriers. Long Range Plan. 43 (2–3), 354–363. https://doi.org/10.1016/j.lrp.2009.07.010.

Chesbrough, H., Rosenbloom, R.S., 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. Ind. Corp. Chang. 11 (3), 529–555. https://doi.org/10.1093/icc/ 11.3.529.

Christensen, C.M., Bartman, T., van Bever, D., 2016. The hard truth about business model innovation. MIT Sloan Manag. Rev. 58 (1), 31–40.

Ciampi, F., Demi, S., Magrini, A., Marzi, G., Papa, A., 2021. Exploring the impact of big data analytics capabilities on business model innovation: the mediating role of entrepreneurial orientation. J. Bus. Res. 123, 1 13. https://doi.org/10.1016/j. jbusres.2020.09.023.

Coreynen, W., Matthyssens, P., Van Bockhaven, W., 2017. Boosting servitization through digitization: pathways and dynamic resource configurations for manufacturers. Ind. Mark. Manag. 60, 42 53. https://doi.org/10.1016/j.indmarman.2016.04.012.

Cortimiglia, M.N., Ghezzi, A., Frank, A.G., 2016. Business model innovation and strategy making nexus: evidence from a cross-industry mixed-methods study. R&D Manag. 46 (3), 414–432. https://doi.org/10.1111/radm.12113.

Cozzolino, A., Verona, G., Rothaermel, F.T., 2018. Unpacking the disruption process: new technology, business models, and incumbent adaptation. J. Manag. Stud. 55 (7), 1166–1202. https://doi.org/10.1111/joms.12352.

Cucculelli, M., Dileo, I., Pini, M., 2021. Filling the void of family leadership: institutional support to business model changes in the Italian industry 4.0 experience. J. Technol. Transf. 1 29. https://doi.org/10.1007/s10961-021-09847-4.

Dasí, `A., Elter, F., Gooderham, P.N., Pedersen, T., 2017. New business models in-the-making in extant MNCs: digital transformation in a telco. Adv. Int. Man. 30, 29 53. https://doi.org/10.1108/S1571-502720170000030001.

DaSilva, C.M., Trkman, P., Desouza, K., Lindi˘c, J., 2013. Disruptive technologies: a business model perspective on cloud computing. Tech. An. Strat. Man. 25 (10), 1161–1173. https://doi.org/10.1080/09537325.2013.843661.

Dellermann, D., Fliaster, A., Kolloch, M., 2017. Innovation risk in digital business models: the German energy sector. J. Bus. Strateg. 38 (5), 35–43. https://doi.org/ 10.1108/JBS-07-2016-0078.

del Vecchio, P., Malandugno, C., Passiante, G., Sakka, G., 2021. Circular economy business model for smart tourism: the case of Ecobnb. EuroMed J. Bus. 1–17. https:// doi.org/10.1108/EMJB-09-2020-0098. Demil, B., Lecocq, X., 2010. Business model evolution: in search of dynamic consistency. Long Range Plan. 43, 227 246. https://doi.org/10.1016/j.lrp.2010.02.004.

Denicolai, S., Previtali, P., 2020. Precision medicine: implications for value chains and business models in life sciences. Technol. Forecast. Soc. Chang. 151, 119767 https:// doi.org/10.1016/j.techfore.2019.119767.

D'Ippolito, B., Messeni Petruzzelli, A., Panniello, U., 2019. Archetypes of incumbents' strategic responses to digital innovation. J. Intellect. Cap. 20 (5), 662–679. https:// doi.org/10.1108/JIC-04-2019-0065.

Dijkman, R.M., Sprenkels, B., Peeters, T., Janssen, A., 2015. Business models for the internet of things. Int. J. Inf. Manag. 35 (6), 672–678. https://doi.org/10.1016/j. ijinfomgt.2015.07.008.

Dressler, M., Paunovic, I., 2021. Converging and diverging business model innovation in regional intersectoral cooperation–exploring wine industry 4.0. Eur. J. Innov. Manag. 24 (5), 1625–1652. https://doi.org/10.1108/EJIM-04-2020-0142.

Edmondson, A.C., McManus, S.E., 2007. Methodological fit in management field research. Acad. Manag. Rev. 32 (4), 1246–1264. https://doi.org/10.5465/ amr.2007.26586086.

Elia, G., Margherita, A., Passiante, G., 2020. Digital entrepreneurship ecosystem: how digital technologies and collective intelligence are reshaping the entrepreneurial process. Technol. Forecast. Soc. Chang. 150, 119791 https://doi.org/10.1016/j. techfore.2019.119791.

Endres, H., Stoiber, K., Wenzl, N.M., 2020. Managing digital transformation through hybrid business models. J. Bus. Strateg. 41 (6), 49–56. https://doi.org/10.1108/JBS- 07-2019-0142.

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E.A., Barlow, C. Y., 2017. Business model innovation for sustainability: towards a unified perspective for creation of sustainable business models. Bus. Strateg. Environ. 26 (5), 597–608. https://doi.org/10.1002/bse.1939.

Filser, M., Kraus, S., Breirer, M., Nenova, I., Puumalainen, K., 2021. Business model innovation: identifying foundations and trajectories. Bus. Strateg. Environ. 30 (2), 891–907. https://doi.org/10.1002/bse.2660.

FitzGerald, E., Ferguson, R., Adams, A., Gaved, M., Mor, Y., Thomas, R., 2013. Augmented reality and mobile learning: the state of the art. Int. J. Mobile Blend. Learn. 5 (4), 43–58. https://doi.org/10.4018/ijmbl.2013100103.

Florén, H., Barth, H., Gullbrand, J., Holmén, M., 2021. Additive manufacturing technologies and business models – a systematic literature review. J. Manuf. Technol. Manag. 32 (1), 136–155. https://doi.org/10.1108/JMTM-01-2020-0009.

Foss, N.J., Saebi, T., 2017. Fifteen years of research on business model innovation: how far have we come, and where should we go? J. Manag. 43 (1), 200–227. https://doi. org/10.1177/0149206316675927.

Foss, N.J., Saebi, T., 2018. Business models and business model innovation: Between wicked and paradigmatic problems. Long Range Plan. 51 (1), 9–21. https://doi.org/ 10.1016/j.lrp.2017.07.006.

Frank, A.G., Mendes, G.H., Ayala, N.F., Ghezzi, A., 2019. Servitization and industry 4.0 convergence in the digital transformation of product firms: a business model innovation perspective. Technol. Forecast. Soc. Chang. 141, 341 351. https://doi. org/10.1016/j.techfore.2019.01.014.

Frankenberger, K., Weiblen, T., Csik, M., Gassmann, O., 2013. The 4I-framework of business model innovation: a structured view on process phases and challenges. Int. J. Prod. Dev. 18 (3–4), 249–273. https://doi.org/10.1504/IJPD.2013.055012.

Garzella, S., Fiorentino, R., Caputo, A., Lardo, A., 2021. Business model innovation in SMEs: the role of boundaries in the digital era. Tech. Anal. Strat. Manag. 33 (1), 31–43. https://doi.org/10.1080/09537325.2020.1787374.

Gassmann, O., Frankenberger, K., Csik, M., 2014. The Business Model Navigator: 55 Models That Will Revolutionise Your Business. Pearson, UK.

Gebauer, H., Arzt, A., Kohtamäki, M., Lamprecht, C., Parida, V., Witell, L., Wortmann, F., 2020. How to convert digital offerings into revenue enhancement–conceptualizing business model dynamics through explorative case studies. Ind. Mark. Manag. 91, 429 441. https://doi.org/10.1016/j.indmarman.2020.10.006.

Gebauer, H., Edvardsson, B., Gustafsson, A., Witell, L., 2010. Match or mismatch: strategy-structure configurations in the service business of manufacturing companies. J. Serv. Res. 13 (2), 198–215. https://doi.org/10.1177/ 1094670509353933.

Geissdoerfer, M., Vladimirova, D., Evans, S., 2018. Sustainable business model innovation: a review. J. Clean. Prod. 198, 401 416. https://doi.org/10.1016/j. jclepro.2018.06.240.

Ghobakhloo, M., 2020. Industry 4.0, digitization, and opportunities for sustainability. J. Clean. Prod. 252, 119869 https://doi.org/10.1016/j.jclepro.2019.119869.

Grieger, M., Ludwig, A., 2019. On the move towards customer-centric business models in the automotive industry - a conceptual reference framework of shared automotive service systems. Electron. Mark. 29, 473 500. https://doi.org/10.1007/s12525-018- 0321-6.

Guckenbiehl, P., de Zubielqui, G.C., Lindsay, N., 2021. Knowledge and innovation in startup ventures: a systematic literature review and research agenda. Technol. Forecast. Soc. Chang. 172, 121026 https://doi.org/10.1016/j. techfore.2021.121026.

Gwangwava, N., Ude, A.U., Ogunmuyiwa, E., Addo-Tenkorang, R., 2018. Cloud based 3D printing business modeling in the digital economy. Int. J. E-Entrep. Innov. 8 (2), 25–43. https://doi.org/10.4018/IJEEI.2018070103.

Haaker, T., Ly, P.T.M., Nguyen-Thanh, N., Nguyen, H.T.H., 2021. Business model innovation through the application of the internet-of-things: a comparative analysis. J. Bus. Res. 126, 126 136. https://doi.org/10.1016/j.jbusres.2020.12.034.

Habtay, S.R., Holm´en, M., 2014. Incumbents' responses to disruptive business model innovation: the moderating role of technology vs market-driven innovation. Int. J. Entrep. Innov. Manag. 18 (4), 289–309. https://doi.org/10.1504/ IJEIM.2014.064211.

Hakanen, E., Rajala, R., 2018. Material intelligence as a driver for value creation in IoT-enabled business ecosystems. J. Bus. Ind. Mark. 33 (6), 857–867. https://doi.org/ 10.1108/JBIM-11-2015-0217.

Hanafizadeh, P., Hatami, P., Analoui, M., Albadvi, A., 2021. Business model innovation driven by the internet of things technology, in internet service providers' business context. IseB 19, 1175 1243. https://doi.org/10.1007/s10257-021-00537-0.

Hänninen, M., Smedlund, A., Mitronen, L., 2018. Digitalization in retailing: multi-sided platforms as drivers of industry transformation. Balt. J. Manag. 13 (2), 152–168. https://doi.org/10.1108/BJM-04-2017-0109.

Hazée, S., Zwienenberg, T.L., Van Vaerenbergh, Y., Faseur, T., Vandenberghe, A., Keutgens, O., 2020. Why customers and peer service providers do not participate in collaborative consumption. J. Serv. Manag. 31 (3), 397–419. https://doi.org/ 10.1108/JOSM-11-2018-0357.

Hinings, B., Gegenhuber, T., Greenwood, R., 2018. Digital innovation and transformation: an institutional perspective. Inf. Org. 28 (1), 52–61. https://doi.org/ 10.1016/j.infoandorg.2018.02.004.

Hiteva, R., Timothy, T.J., 2021. Beware the value gap: creating value for users and for the system through innovation in digital energy services business models. Technol. Forecast. Soc. Chang. 166, 120525 https://doi.org/10.1016/j. techfore.2020.120525.

Hoch, N.B., Brad, S., 2021. Managing business model innovation: an innovative approach towards designing a digital ecosystem and multi-sided platform. Bus. Process. Manag. J. 27 (2), 415–438. https://doi.org/10.1108/BPMJ-01-2020-0017.

Hüttinger, L., Schiele, H., Veldman, J., 2012. The drivers of customer attractiveness, supplier satisfaction and preferred customer status: a literature review. Ind. Mark. Manag. 41 (8), 1194–1205. https://doi.org/10.1016/j.indmarman.2012.10.004.

Huynh, P.H., 2021. Enabling circular business models in the fashion industry: the role of digital innovation. Int. J. Product. Perform. Manag. https://doi.org/10.1108/IJPPM- 12-2020-0683.

Iansiti, M., Levien, R., 2004. The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability. Harvard Business Press.

Jacobides, M.G., Cennamo, C., Gawer, A., 2018. Towards a theory of ecosystems. Strateg. Manag. J. 39 (8), 2255–2276. https://doi.org/10.1002/smj.2904.

Kagermann, H., Wahlster, W., Helbig, J., 2013. Recommendation for Implementing the Strategic Initiative Industrie 4.0 – Final Report of the Industrie 4.0 Working Group. Communication Promoters Group of the Industry-science Research, Frankfurt.

Kaltum, U., Widodo, A., Yanuardi, A.W., 2016. Local TV goes to global market through digital transformation. Acad. Strateg. Manag. J. 15, 221 229.

Kamalaldin, A., Linde, L., Sj¨odin, D., Parida, V., 2020. Transforming provider-customer relationships in digital servitization: a relational view on digitalization. Ind. Mark. Manag. 89, 306 325. https://doi.org/10.1016/j.indmarman.2020.02.004.

Kastalli, I.V., Van Looy, B., 2013. Servitization: disentangling the impact of service business model innovation on manufacturing firm performance. J. Op. Man. 31 (4), 169–180. https://doi.org/10.1016/j.jom.2013.02.001.

Khanagha, S., Volberda, H., Oshri, I., 2014. Business model renewal and ambidexterity: structural alteration and strategy formation process during transition to a cloud business model. R&D Manag. 44, 322 340. https://doi.org/10.1111/radm.12070.

Kiel, D., Arnold, C., Voigt, K.I., 2017. The influence of the industrial internet of things on business models of established manufacturing companies–a business level perspective. Tech. 68, 4 19. https://doi.org/10.1016/j.technovation.2017.09.003.

Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., Baines, T., 2019. Digital servitization business models in ecosystems: a theory of the firm. J. Bus. Res. 104, 380 392. https://doi.org/10.1016/j.jbusres.2019.06.027.

Klos, C., Spieth, P., Clauss, T., Klusmann, C., 2021. Digital transformation of incumbent firms: a business model innovation perspective. IEEE Trans. Eng. Manag. 1 17. https://doi.org/10.1109/TEM.2021.3075502.

Kohtamäki, M., Parida, V., Patel, P.C., Gebauer, H., 2020. The relationship between digitalization and servitization: the role of servitization in capturing the financial potential of digitalization. Technol. Forecast. Soc. Chang. 151, 119804 https://doi. org/10.1016/j.techfore.2019.119804.

Kotarba, M., 2018. Digital transformation of business models. Found. Man. 10 (1), 123 142. https://doi.org/10.2478/fman-2018-0011.

Koudal, P., Wellener, P., 2003. Digital loyalty networks: continuously connecting automakers with their customers and suppliers. Strat. Lead. 31 (6), 4–11. https:// doi.org/10.1108/10878570310505541.

Kraus, S., Filser, M., Puumalainen, K., Kailer, N., Thurner, S., 2020. Business model innovation: a systematic literature review. Int. J. Innov. Technol. Manag. 17 (06), 2050043 https://doi.org/10.1142/S021987702050043.

Kronblad, C., Pregmark, J.E., 2021. Responding to the COVID-19 crisis: the rapid turn toward digital business models. J. Sci. Tech. Pol. Man. 1 17. https://doi.org/ 10.1108/JSTPM-10-2020-0155.

Krotov, V., 2017. The internet of things and new business opportunities. Bus. Horiz. 60 (6), 831–841. https://doi.org/10.1016/j.bushor.2017.07.009.

Kumar, R., Singh, R.K., Dwivedi, Y.K., 2020. Application of industry 4.0 technologies in SMEs for ethical and sustainable operations: analysis of challenges. J. Clean. Prod. 275, 124063 https://doi.org/10.1016/j.jclepro.2020.124063.

Laïfi, A., Josserand, E., 2016. Legitimation in practice: a new digital publishing business model. J. Bus. Res. 69 (7), 2343–2352. https://doi.org/10.1016/j. jbusres.2015.10.003.

Lardo, A., Mancini, D., Paoloni, N., Russo, G., 2020. The perspective of capability providers in creating a sustainable I4.0 environment. Manag. Decis. 58 (8), 1759–1777. https://doi.org/10.1108/MD-09-2019-1333.

Latilla, V.M.M., Urbinati, A., Cavallo, A., Franzò, S., Ghezzi, A., 2021. Organizational re-design for business model innovation while exploiting digital technologies: a single case study of an energy company. Int. J. Innov. Technol. Manag. 18 (02), 2040002 https://doi.org/10.1142/S0219877020400027.

Latilla, V.M., Frattini, F., Franzo, S., Chiesa, V., 2020. Organisational change and business model innovation: an exploratory study of an energy utility. Int. J. Innov. Manag. 24 (04), 2050036 https://doi.org/10.1142/S136391962050036X.

Laudien, S.M., Daxböck, B., 2016. The influence of the industrial internet of things on business model design: a qualitative-empirical analysis. Int. J. Innov. Manag. 20 (08), 1640014 https://doi.org/10.1142/S1363919616400144.

Leinwand, P., Mani, M.M., 2021. Digitizing Isn't the same as digital transformation. Harv. Bus. Rev. 26. https://hbr.org/2021/03/digitizing-isnt-the-same-as-digital-transformation.

Leminen, S., Rajahonka, M., Wendelin, R., Westerlund, M., 2020. Industrial internet of things business models in the machine-to-machine context. Ind. Mark. Manag. 84, 298 311. https://doi.org/10.1016/j.indmarman.2019.08.008.

Leminen, S., Rajahonka, M., Westerlund, M., Wendelin, R., 2018. The future of the internet of things: toward heterarchical ecosystems and service business models. J. Bus. Ind. Mark. 33 (6), 749–767. https://doi.org/10.1108/JBIM-10-2015-0206.

Li, F., 2020. The digital transformation of business models in the creative industries: a holistic framework and emerging trends. Tech 92, 102012. https://doi.org/10.1016/ j.technovation.2017.12.004

Linde, L., Frishammar, J., Parida, V., 2021. Revenue models for digital servitization: a value capture framework for designing, developing, and scaling digital services. IEEE Trans. Eng. Manag. https://doi.org/10.1109/TEM.2021.3053386.

Linder, J., Cantrell, L., 2000. In: Changing Business Models: Surveying the Landscape, 15. Accenture Institute for Strategic Change, pp. 142–149.

Loebbecke, C., Picot, A., 2015. Reflections on societal and business model transformation arising from digitization and big data analytics: a research agenda. J. Strateg. Inf. Syst. 24 (3), 149–157. https://doi.org/10.1016/j.jsis.2015.08.002.

Lyytinen, K., Nambisan, S., Yoo, Y., 2020. A transdisciplinary research agenda for digital innovation: key themes and directions for future research. In: Nambisan, S., Lyytinen, K., Yoo, Y. (Eds.), Handbook of Digital Innovation. Edward Elgar Publishing.

Magretta, J., 2002. Why business models matter. Harv. Bus. Rev. 80 (5), 86–133. Mancha, R., Gordon, S., 2021. Multi-sided platform strategies for organizations: transforming the business model. J. Bus. Strat. https://doi.org/10.1108/JBS-09- 2020-0203.

Markides, C., 2006. Disruptive innovation: in need of better theory. J. Prod. Innov. Manag. 23 (1), 19–25. https://doi.org/10.1111/j.1540-5885.2005.00177.x.

Massa, L., Tucci, C.L., Afuah, A., 2017. A critical assessment of business model research. Acad. Manag. Ann. 11 (1), 73–104. https://doi.org/10.5465/annals.2014.0072.

Massa, L., Tucci, C.L., 2013. Business model innovation. In: Dodgson, M., Gann, D.M., Phillips, N. (Eds.), The Oxford Handbook of Innovation Management. Oxford University Press, Oxford.

McGrath, R., McManus, R., 2020. Digital Transformation, learning your way to a new business model. What's your digital strategy? Harv. Bus. Rev. 98 (3), 125–133.

McKinsey, 2019. Unlocking success in digital transformations. Accessed March 2021. https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations#.

Metallo, C., Agrifoglio, R., Schiavone, F., Mueller, J., 2018. Understanding business model in the internet of things industry. Technol. Forecast. Soc. Chang. 136, 298 306. https://doi.org/10.1016/j.techfore.2018.01.020.

Mihardjo, L.W., Sasmoko, S., Alamsjah, F., Elidjen, E., 2019. Digital leadership role in developing business model innovation and customer experience orientation in industry 4.0. Man. Sci. Lett. 9 (11), 1749–1762. https://doi.org/10.5267/j. msl.2019.6.015.

Mihardjo, L.W., Sasmoko, S., Alamsjah, F., Elidjen, E., 2018. The role of distinctive organisational capability in formulating co-creation strategy and business model innovation. Pol. J. Manag. Stud. 18 (2), 197–208. https://doi.org/10.17512/ pjms.2018.18.2.16.

Morris, M., Schindehutte, M., Allen, J., 2005. The entrepreneur's business model: toward a unified perspective. J. Bus. Res. 58 (6), 726–735. https://doi.org/10.1016/j. jbusres.2003.11.001.

Müller, J.M., 2019. Business model innovation in small- and medium-sized enterprises: strategies for industry 4.0 providers and users. J. Manuf. Technol. Manag. 30 (8), 1127–1142. https://doi.org/10.1108/JMTM-01-2018-0008.

Müller, J.M., Buliga, O., Voigt, K.I., 2018. Fortune favors the prepared: how SMEs approach business innovations in industry 4.0. Technol. Forecast. Soc. Chang. 132, 2 17. https://doi.org/10.1016/j.techfore.2017.12.019.

Mustak, M., Jaakkola, E., Halinen, A., Kaartemo, V., 2016. Customer participation management: developing a comprehensive framework and a research agenda. J. Serv. Man. 27 (3), 250–275. https://doi.org/10.1108/JOSM-01-2015-0014.

Najmaei, A., 2016. How do entrepreneurs develop business models in small high-tech ventures? An exploratory model from Australian IT firms. Entrep. Res. J. 6 (3), 297–343. https://doi.org/10.1515/erj-2014-0037.

Nakano, D., Fleury, A., 2017. Recorded music supply network reconfiguration: the dual effect of digital technology. Int. J. Manuf. Technol. Manag. 31 (1/2/3), 153–175. https://doi.org/10.1504/IJMTM.2017.082009.

Nambisan, S., 2017. Digital entrepreneurship: toward a digital technology perspective of entrepreneurship. Enterp. Theory Pract. 41 (6), 1029–1055. Osterwalder, A., Pigneur, Y., 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.

Osterwalder, A., Pigneur, Y., Tucci, C.L., 2005. Clarifying business models: origins, present, and future of the concept. Commun. Assoc. Inf. Syst. 16 (1), 1–25. https:// doi.org/10.17705/1CAIS.01601.

Paiola, M., Schiavone, F., Khvatova, T., Grandinetti, R., 2021. Prior knowledge, industry 4.0 and digital servitization. An inductive framework. Technol. Forecast. Soc. Chang. 171, 1–12. https://doi.org/10.1016/j.techfore.2021.120963.

Paiola, M., Schiavone, F., Grandinetti, R., Chen, J., 2021. Digital servitization and sustainability through networking: some evidences from IoT-based business models. J. Bus. Res. 132, 507–516. https://doi.org/10.1016/j.jbusres.2021.04.047.

Paiola, M., Gebauer, H., 2020. Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms. Ind. Mark. Manag. 89, 245 264. https://doi.org/10.1016/j.indmarman.2020.03.009.

Paré, G., Trudel, M.C., Jaana, M., Kitsiou, S., 2015. Synthesizing information systems knowledge: a typology of literature reviews. Inf. Manag. 52 (2), 183–199. https:// doi.org/10.1016/j.im.2014.08.008.

Paschou, T., Rapaccini, M., Adrodegari, F., Saccani, N., 2020. Digital servitization in manufacturing: a systematic literature review and research agenda. Ind. Mark. Manag. 89, 278 292. https://doi.org/10.1016/j.indmarman.2020.02.012.

Peng, Y., 2016. Mobile and digitally-mediated publishing strategies in China: an overview of evolving business models. Publ. Res. Q. 32, 247 260. https://doi.org/ 10.1007/s12109-016-9467-2.

Pietrewicz, L., 2019. Technology, business models and competitive advantage in the age of industry 4.0. Prob. Zarządzania Man. 17 (2 (82)), 32–52. https://doi.org/10.7172/ 1644-9584.82.2.

Podsakoff, P.M., MacKenzie, S.B., Bachrach, D.G., Podsakoff, N.P., 2005. The influence of management journals in the 1980s and 1990s. Strateg. Manag. J. 26 (5), 473–488. https://doi.org/10.1016/j.im.2014.08.008.

Rachinger, M., Rauter, R., Müller, C., Vorraber, W., Schirgi, E., 2019. Digitalization and its influence on business model innovation. J. Manuf. Technol. Manag. 30 (8), 1143–1160. https://doi.org/10.1108/JMTM-01-2018-0020.

Remane, G., Hanelt, A., Nickerson, R.C., Kolbe, L.M., 2017. Discovering digital business models in traditional industries. J. Bus. Strateg. 38 (2), 41–51. https://doi.org/ 10.1108/JBS-10-2016-0127.

Ruggieri, R., Savastano, M., Scalingi, A., Bala, D., D'Ascenzo, F., 2018. The impact of digital platforms on business models: an empirical investigation on innovative start-ups. Manag. Mark. 13 (4), 1210–1225. https://doi.org/10.2478/mmcks-2018-0032.

Saarikko, T., Westergren, U.H., Blomquist, T., 2020. Digital transformation: five recommendations for the digitally conscious firm. Bus. Horiz. 63 (6), 825–839. https://doi.org/10.1016/j.bushor.2020.07.005.

Sanasi, S., Ghezzi, A., Cavallo, A., Rangone, A., 2020. Making sense of the sharing economy: a business model innovation perspective. Tech. Anal. Strat. Manag. 32 (8), 895–909. https://doi.org/10.1080/09537325.2020.1719058.

Santos, J., Spector, B., der Heyden, L.Van, 2009. In: Toward a Theory of Business Model Innovation Within Incumbent Firms. INSEAD, Fontainebleau, France, pp. 1–53. https://doi.org/10.2139/ssrn.1362515.

Schneider, S., Spieth, P., 2013. Business model innovation: towards an integrated future research agenda. Int. J. Innov. Manag. 17 (01), 1340001 https://doi.org/10.1142/ S136391961340001X.

Schallmo, D., Williams, C.A., Boardman, L., 2017. Digital transformation of business models—best practice, enablers, and roadmap. Int. J. Innov. Manag. 21 (08), 1740014. https://doi.org/10.1142/S136391961740014X.

Schneider, S., Leyer, M., Tate, M., 2020. The transformational impact of blockchain technology on business models and ecosystems: a symbiosis of human and technology agents. IEEE Trans. Eng. Manag. 67 (4), 1184–1195. https://doi.org/ 10.1109/TEM.2020.2972037.

Seddon, P.B., Lewis, G.P., Freeman, P., Shanks, G., 2004. The case for viewing business models as abstractions of strategy. Commun. Assoc. Inf. Syst. 13, 427 442. https:// doi.org/10.17705/1CAIS.01325.

Sengupta, T., Narayanamurthy, G., Hota, P.K., Sarker, T., Dey, S., 2021. Conditional acceptance of digitized business model innovation at the BoP: a stakeholder analysis of eKutir in India. Technol. Forecast. Soc. Chang. 170, 120857 https://doi.org/ 10.1016/j.techfore.2021.120857.

Siemieniako, D., Mitręga, M., Kubacki, K., 2022. The antecedents to social impact in inter-organizational relationships–a systematic review and future research agenda. Ind. Mark. Manag. 101, 191 207. https://doi.org/10.1016/j. indmarman.2021.12.014.

Simonsson, J., Magnusson, M., Johanson, A., 2020. Organizing the development of digital product-service platforms. Technol. Innov. Manag. Rev. 10 (3), 37–48. https://doi.org/10.22215/timreview/1335.

Sjödin, D., Parida, V., Palmi´e, M., Wincent, J., 2021. How AI capabilities enable business model innovation: scaling AI through co-evolutionary processes and feedback loops. J. Bus. Res. 134, 574 587. https://doi.org/10.1016/j.jbusres.2021.05.009.

Smirnov, A., Sandkuhl, K., Shilov, N., 2013. Multilevel self-organisation of cyber-physical networks: synergic approach. Inter. J. Integ. Sup. Manag. 8 (1/2/3), 90–106. https://doi.org/10.1504/IJISM.2013.055070.

Soluk, J., Miroshnychenko, I., Kammerlander, N., Massis, A.De, 2021. Family influence and digital business model innovation: the enabling role of dynamic capabilities. Enterp. Theory Pract. 45 (4), 867–905. https://doi.org/10.1177/ 1042258721998946.

Sorescu, A., 2017. Data-driven business model innovation. J. Prod. Innov. Manag. 34 (5), 691–696. https://doi.org/10.1111/jpim.12398. Sorescu, A., Frambach, R.T., Singh, J., Rangaswamy, A., Bridges, C., 2011. Innovations in retail business models. J. Retail. 87, 3–16. https://doi.org/10.1016/j. jretai.2011.04.005.

Sosna, M., Trevinyo-Rodríguez, R.N., Ramakrishna Velamuri, S., 2010. Business model innovation through trial-and-error learning: the Naturhouse case. Long Range Plan. 43 (2–3), 383–407. https://doi.org/10.1016/j.lrp.2010.02.003.

Srivastava, S., Bhadauria, A., Dhaneshwar, S., Gupta, S., 2019. Traceability and transparency in supply chain management system of pharmaceutical goods through blockchain. Int. J. Sci. Technol. Res. 8 (12), 3201–3206.

Struyf, B., Galvani, S., Matthyssens, P., Bocconcelli, R., 2021. Toward a multilevel perspective on digital servitization. Int. J. Oper. Prod. Manag. 41 (5), 668–693. https://doi.org/10.1108/IJOPM-08-2020-0538.

Sund, K.J., Bogers, M.L., Sahramaa, M., 2021. Managing business model exploration in incumbent firms: a case study of innovation labs in european banks. J. Bus. Res. 128, 11 19. https://doi.org/10.1016/j.jbusres.2021.01.059.

Taran, Y., Boer, H., Lindgren, P., 2015. A business model innovation typology. Decis. Sci. 46 (2), 301–331. https://doi.org/10.1111/deci.12128.

Täuscher, K., Laudien, S.M., 2018. Understanding platform business models: a mixed methods study of marketplaces. Eur. Manag. J. 36 (3), 319–329. https://doi.org/ 10.1016/j.emj.2017.06.005.

Tavoletti, E., Kazemargi, N., Cerruti, C., Grieco, C., Appolloni, A., 2021. Business model innovation and digital transformation in global management consulting firms. Eur. J. Innov. Manag. https://doi.org/10.1108/EJIM-11-2020-0443.

Teece, D.J., 2010. Business models, business strategy and innovation. Long Range Plan. 43 (2–3), 172–194. https://doi.org/10.1016/j.lrp.2009.07.003.

Teece, D.J., 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strat. Manag. J. 28 (13), 1319–1350. https:// doi.org/10.1002/smj.640.

Tesch, J.F., Brillinger, A.S., Bilgeri, D., 2017. Internet of things business model innovation and the stage-gate process: an exploratory analysis. Int. J. Innov. Manag. 21 (5), 1740002 https://doi.org/10.1142/S1363919617400023.

Thorpe, R., Holt, R., Macpherson, A., Pittaway, L., 2005. Using knowledge within small and medium-sized firms: a systematic review of the evidence. Int. J. Manag. Rev. 7 (4), 257–281. https://doi.org/10.1111/j.1468-2370.2005.00116.x.

Tian, J., Coreynen, W., Matthyssens, P., Shen, L., 2021. Platform-based servitization and business model adaptation by established manufacturers. Tech, 102222. https://doi. org/10.1016/j.technovation.2021.102222.

Tilson, D., Lyytinen, K., Sørensen, C., 2010. Research commentary—digital infrastructures: the missing IS research agenda. Inf. Syst. Res. 21 (4), 748–759. https://doi.org/10.1287/isre.1100.0318.

Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Br. J. Manag. 14 (3), 207–222. https://doi.org/10.1111/1467-8551.00375.

Tsvetkov, N., Chekanov, A., 2019. The data dilemma: how availability can threaten the competitive advantage of data-based firms. J. Bus. Strat. 42 (3), 177–187. https:// doi.org/10.1108/JBS-08-2019-0165.

Tukker, A., 2004. Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. Bus. Strateg. Environ. 13 (4), 246–260. https://doi. org/10.1002/bse.414.

Ulaga, W., Reinartz, W.J., 2011. Hybrid offerings: how manufacturing firms combine goods and services successfully. J. Mark. 75 (6), 5–23. https://doi.org/10.1509/ jm.09.0395.

Urbinati, A., Chiaroni, D., Chiesa, V., Frattini, F., 2019. The role of business model design in the diffusion of innovations: an analysis of a sample of unicorn-tech companies. Int. J. Innov. Technol. Manag. 16 (01), 1950011. https://doi.org/10.1142/ S0219877019500111.

Verhoef, P.C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J.Q., Fabian, N., Haenlein, M., 2021. Digital transformation: a multidisciplinary reflection and research agenda. J. Bus. Res. 122 (889), 901. https://doi.org/10.1016/j. jbusres.2019.09.022.

Vial, G., 2019. Understanding digital transformation: a review and a research agenda. J. Strateg. Inf. Syst. 28 (2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003.

Viriyasitavat, W., Anuphaptrirong, T., Hoonsopon, D., 2019. When blockchain meets internet of things: characteristics, challenges, and business opportunities. J. Inf. Int. 15, 21 28. https://doi.org/10.1016/j.jii.2019.05.002.

Volberda, H.W., Khanagha, S., Baden-Fuller, C., Mihalache, O.R., Birkinshaw, J., 2021. Strategizing in a digital world: overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms. Long Range Plan. 54 (5), 1–18. https:// doi.org/10.1016/j.lrp.2021.102110.

Warner, K.S., W¨ager, M., 2019. Building dynamic capabilities for digital transformation: an ongoing process of strategic renewal. Long Range Plan. 52 (3), 326–349. https:// doi.org/10.1016/j.lrp.2018.12.001.

Weill, P., Vitale, M., 2001. Place to Space: Migrating to eBusiness Models. Harvard Business Press.

Wielki, J., 2017. The impact of the internet of things concept development on changes in the operations of modern enterprises. Pol. J. Manag. Stud. 15 https://doi.org/ 10.17512/pjms.2017.15.1.25.

Wikström, P., Ellonen, H.K., 2012. The impact of social media features on print media firms' online business models. J. Media Bus. Stud. 9 (3), 63–80. https://doi.org/ 10.1080/16522354.2012.11073552.

Yoo, Y., Henfridsson, O., Lyytinen, K., 2010. Research commentary—the new organizing logic of digital innovation: an agenda for information systems research. Inf. Syst. Res. 21 (4), 724–735. https://doi.org/10.1287/isre.1100.0322.

Zaki, M., 2019. Digital transformation: harnessing digital technologies for the next generation of services. J. Serv. Mark. 33 (4), 429–435. https://doi.org/10.1108/ JSM-01-2019-0034.

Zhan, Y., Han, R., Tse, M., Ali, M.H., Hu, J., 2021. A social media analytic framework for improving operations and service management: a study of the retail pharmacy industry. Technol. Forecast. Soc. Chang. 163, 120504 https://doi.org/10.1016/j. techfore.2020.120504.

Zott, C., Amit, R., 2013. The business model: a theoretically anchored robust construct for strategic analysis. Strateg. Organ. 11 (4), 403–411. https://doi.org/10.1177/ 1476127013510466.

Zott, C., Amit, R., 2010. Business model design: an activity system perspective. Long Range Plan. 43 (2–3), 216–226. https://doi.org/10.1016/j.lrp.2009.07.004.

Zott, C., Amit, R., 2007. Business model design and the performance of entrepreneurial firms. Organ. Sci. 18 (2), 181–199. https://doi.org/10.1287/orsc.1060.0232.

Zott, C., Amit, R., Massa, L., 2011. The business model: recent developments and future research. J. Manag. 37 (4), 1019–1042. https://doi.org/10.1177/ 2F0149206311406265.

Appendix 1. Descriptive and Thematic Analysis

N	Authors	Title	Year	Source title	Theoretical basis	Typology	Methodology	Digital technology	Key concept under study	Key findings
1	Bellini F., Dulskaia I., Savastano M., D'Ascenzo F.	Business Models Innovation for Sustainable Urban Mobility in Small and Medium-Sized European Cities	2019	Management and Marketing	-	Empirical	Focus group Secondary data	-	Digital BMI taxonomies	The study depicts different digital sustainable BM archetypes related to urban mobility in small and medium European cities: car on-demand, micro-mobility, car sharing, ride sharing, bike sharing, public transport, parking, integrate mobility.
2	Berman S.J., Kesterson-Townes L., Marshall A., Srivathsa R.	How cloud computing enables process and business model innovation	2012	Strategy and Leadership	-	Empirical	Survey	Cloud computing	Digital BMI taxonomies	The study recognizes six key cloud attributes to foster BMI: cost flexibility; business scalability; market adaptability; masked complexity; context-driven variability; ecosystem connectivity. The article proposes a 'Cloud Enablement Framework', which identifies three BMI archetypes: optimizers, innovators, and disruptors. Key actions to help business leaders reap the potential of cloud-enabled BMs are suggested.
3	Bourreau M., Gensollen M., Moreau F.	The Impact of a Radical Innovation on Business Models: Incremental Adjustments or Big Bang?	2012	Industry and Innovation	-	Empirical	Survey	-	Digital BMI taxonomies	The study suggests that digitization has led to a considerable number of new BMs in the music industry. Considering the way value is captured and the way it is created, there are five potential digital BMs representing a change from the dominant BM of the recorded music industry. For each BM, the study provides an illustrative case of an existing music service that fits the model. Using data from a survey, they map record labels on the identified digital business models.
4	Bouncken R.B., Kraus S., Roig-Tierno N.	Knowledge- and innovation-based business models for future growth: digitalized business models and portfolio considerations	2021	Review of Managerial Science	-	Conceptual		-	Digital BMI taxonomies	The study develops a conceptual matrix of digital-driven BMI based on the level of digitalization and the firm's focus into one or several BMs. The matrix identifies four BMI typologies: non-digital approach, focused digital transformation, digital development, and high digital diversification.

5	Brock K., den Ouden E., van der Klauw K., Podoynitsyna K., Langerak F.	Light the way for smart cities: Lessons from Philips Lighting	2019	Technological Forecasting and Social Change	-	Empirical	Longitudinal single case study	IoT	Digital BMI taxonomies	The study identifies four types of BMs in the smart city context (i.e. marble, tetris, jenga, and jigsaw puzzle BMs) and contends that by exploring diverse BMs in parallel (i.e. BM portfolio), an incumbent firm can respond to the rapidly changing smart cities ecosystem.
6	Chasin F., Paukstadt U., Gollhardt T., Becker J.	Smart energy driven business model innovation: An analysis of existing business models and implications for business model change in the energy sector	2020	Journal of Cleaner Production	-	Empirical	Content Analysis	IoT	Digital BMI taxonomies	The study shed lights on how current BMs might be renovated through the adoption of IoT in the energy context. The study identifies eight new archetypes and focuses on BM changes (BM termination, BM extension, BM revision, BM creation) from the perspective of a traditional energy utility to show how energy companies include DTs for BMI.
7	Denicolai S., Previtali P.	Precision Medicine: Implications for value chains and business models in life sciences	2020	Technological Forecasting and Social Change	-	Empirical	Multiple case study	-	Digital BMI taxonomies	Precision medicine enabled by DTs is redefining the boundaries of healthcare value chains, leading to adaptive platform ecosystems. Four main typologies in precision medicine are identified: precision treatment, precision therapeutic platform; precision patient care; precision health system. The former is focused on biomedical and technology-based innovation, whereas the latter is focused on BMI.
8	D'Ippolito B., Messeni Petruzzelli A., Panniello U.	Archetypes of incumbents' strategic responses to digital innovation	2019	Journal of Intellectual Capital	-	Conceptual		-	Digital BMI taxonomies	The study explores how incumbents' responses to DTs may differ depending on the resources or assets to be employed. It proposes a conceptual matrix built around two dimensions: the nature of the digital innovation impact (radical/incremental) and the source of disruption (within/outside the industry). The matrix shows that four BM archetypes might develop in accordance with specific types of technological innovations.
9	Dressler M., Paunovic I.	Converging and diverging business model innovation in regional intersectoral cooperation–exploring wine industry 4.0	2020	European Journal of Innovation Management	-	Empirical	Semi-structured interviews	-	Digital BMI taxonomies	The study identifies BM archetypes to support wineries with new DTs based on possible stakeholder cooperation configurations: disruptively convergent BMI (multistakeholder cooperation), partially convergent BMI (cooperation between two different), stakeholder groups) and divergent BMI (focused on core competencies and with no major stakeholder cooperation needed).

10	Hiteva R., Foxon T.J.	Beware the value gap: Creating value for users and for the system through innovation in digital energy services business models	2021	Technological Forecasting and Social Change	-	Empirical	Semi-structured interviews	-	Digital BMI taxonomies	The study sheds light on the different BM archetypes in the energy industry. Innovative BMs can be organized in a hierarchical Ladder of Innovation: technology-based BMs, local smart system integration BMs, and fully integrated local energy systems. The ladder is the product of co-evolutionary interactions between technologies, ecosystems, institutions, business strategies and user practices.
11	Huynh P.H.	Enabling circular business models in the fashion industry: the role of digital innovation	2021	International Journal of Productivity and Performance Management	-	Empirical	Multiple case study	Various	Digital BMI taxonomies	The article identifies three digital-driven circular BMI typologies in the fashion industry: blockchain-based supply chain model, the service-based model, and the pull demand-driven model. Differences in the adoption of the BMI typologies between small and large firms exist. Large and medium-sized firms tend to adopt a BM diversification strategy that adds new business functions (e.g. clothes renting, subscription, blockchain-based model) to existing model, whereas the pull-demand driven model is more likely to derive from circular startups.
12	Kronblad C., Envall Pregmark J.	Responding to the COVID-19 crisis: the rapid turn toward digital business models	2021	Journal of Science and Technology Policy Management	-	Empirical	18 Semi-structured interviews	-	Digital BMI taxonomies	The study argues that digital transformation of BMs can be a way to overcome the crisis brought by COVID-19. It identifies four types of organizational responses to COVID according to the intensity of the firm digital transformation: thrivers, accelerators, crisispreneurs, and endurers.
13	Krotov V.	The Internet of Things and new business opportunities	2017	Business Horizons	-	Conceptual		IoT	Digital BMI taxonomies	This article suggests two different approaches for innovating BMs by using the IoT technologies: the bottom-up or sustaining approach and the visionary or disruptive approach.
14	Laudien, SM; Daxbock, B	The influence of industrial Internet of Things on Business Model Design: a qualitative empirical analysis	2016	international journal of innovation management	-	Empirical	Multiple case study	IoT	Digital BMI taxonomies	The study identifies three archetypes of IIoT-based BMs: technology adoption BM, virtual diversification BM, and full IIoT BM. Moreover, situational factors such as competitive pressure, perceived growth potential, and opportunity recognition might act as accelerators of BMI.
15	Leminen S., Rajahonka M., Wendelin R., Westerlund M.	Industrial internet of things business models in the machine-to-machine context	2020	Industrial Marketing Management	-	Conceptual		IoT	Digital BMI taxonomies	The study identifies four types of IIoT BMs based on innovations in BM architecture and BM modules: company-specific business models, which are based on incremental BMI; systemic business

										models, based on modular BMI; value designs, based on architectural BMI; and systemic value designs, based on radical BMI where both the modules and architecture of the business model are radically new.
16	Leminen S., Rajahonka M., Westerlund M., Wendelin R.	The future of the Internet of Things: toward heterarchical ecosystems and service business models	2018	Journal of Business and Industrial Marketing	-	Empirical	Multiple case study	IoT	Digital BMI taxonomies	The study outlines a framework for analyzing emerging service BMs for the IoT. The dimensions of the framework describe the BM architecture ("unchanged" versus "complex, multilayered") and the BM module ("unchanged" versus "systemic, connected"). Four distinctive IIoT BMs are presented: company-specific BMs, systemic BMs, value designs, and systemic value design. The study suggests three new concepts (i.e. value space, value base, and value potential) in the context of complex networks to understand the variety of IIoT BMs.
17	Li F.	The digital transformation of business models in the creative industries: A holistic framework and emerging trends	2020	Technovation	-	Empirical	Multiple case study	-	Digital BMI taxonomies	The study argues that DTs are key drivers of BMI. The study contends that DT leads to different BMI archetypes based on automating, extending, or transforming the BM. Also, one significant trend emerging from the case studies is the increasing adoption of portfolio models.
18	Mancha R., Gordon S.	Multi-sided platform strategies for organizations: transforming the business model	2021	Journal of Business Strategy	-	Conceptual		Digital platforms	Digital BMI taxonomies	The study focuses on multi-sided platforms as enabler of BM by identifying and developing five BM archetypes: expanded offering, marketplace, expanded market, complement co-innovation, and industry co-innovation.
19	Sanasi S., Ghezzi A., Cavallo A., Rangone A.	Making sense of the sharing economy: a business model innovation perspective	2020	Technology Analysis and Strategic Management	-	Empirical	Exploratory cluster analysis	Digital platforms	Digital BMI taxonomies	The study contends there is no such thing as a univocal 'Sharing Economy Business Model'. Thus, it develops Sharing Economy startups BM archetypes grouped into five clusters: pseudo-sharing; gig economy; crowd-based economy; pooling economy; and P2P rental.
20	Täuscher K., Laudien S.M.	Understanding platform business models: A mixed methods study of marketplaces	2018	European Management Journal	-	Empirical	Mixed-method (content analysis and cluster analysis)	-	Digital BMI taxonomies	The study identifies taxonomic clusters by suggesting six distinguishable types of marketplace BMs: efficient product transactions, digital product community, product aficionados, on-demand offline services, online services, and peer-to-peer offline services.

21	Volberda H.W., Khanagha S., Baden-Fuller C., Mihalache O.R., Birkinshaw J.	Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms	2021	Long Range Planning	-	Conceptual		-	Digital BMI taxonomies	The study develops a matrix model showing four different digital-driven BMI archetypes. The matrix combines the type of change and the strategic orientation of the firm in relation to the ecosystem by identifying the following archetypes: holistic digital transformation, facilitated digital transformation, directed digital transformation, connected digital transformation.
22	Urbinati A., Chiaroni D., Chiesa V., Frattini F.	The Role of Business Model Design in the Diffusion of Innovations: An Analysis of a Sample of Unicorn-Tech Companies	2019	International Journal of Innovation and Technology Management	-	Empirical	Historical Analysis	-	Digital BMI taxonomies	Two BM configurations are identified based on the role of external partners, namely “Larger Partners Ecosystem” and “Smaller Partners Ecosystem”. These configurations explain the role of different BM design and innovation choices in the diffusion of new products and services enabled by DTs.
23	Wielki J.	The impact of the internet of things concept development on changes in the operations of modern enterprises	2017	Polish Journal of Management Studies	-	Conceptual		Various	Digital BMI taxonomies	The study proposes ten basic types of digital-driven BMs based on the opportunities associated with the implementation of new BMs.
24	Zaki M.	Digital transformation: harnessing digital technologies for the next generation of services	2019	Journal of Services Marketing	-	Conceptual		-	Digital BMI taxonomies	The article proposes four BMI archetypes as the outcome of the digital service transformation: digital technology trajectory, digital strategy trajectory, customer experience trajectory, and data-driven business model trajectory.
25	Casero-Ripollés A., Izquierdo-Castillo J.	Between decline and a new online business model: The case of the spanish newspaper industry	2013	Journal of Media Business Studies	-	Empirical	Multiple case study	-	The digital BM	The study sheds light on strategies adopted by newspaper publishing groups in Spain in the face of emerging new online BMs, by focusing on newspapers’ main sources of income: sales and advertising. The study contends that the new technologies allow firms to adopt a new BM, namely the “freemium” BM.
26	Dellermann D., Fliaster A., Kolloch M.	Innovation risk in digital business models: the German energy sector	2017	Journal of Business Strategy	-	Empirical	Multiple case study	IoT	The digital BM	The study analyzes the virtual power plant as a digital BM in the energy sector. This BMI results from recent technological innovations, such as the IoT. The study focuses on the risks associated with BMI resulting from interdependencies between multiple partners who take part in such process and advances a four-step framework for 24the management of such risks.
27	del Vecchio P., Malandugno C.,	Circular economy business model for smart	2021	EuroMed Journal of Business	-	Empirical	Single case study	Big Data	The digital BM	The paper contributes to the debate on smart tourism and circular economy by adopting the perspective of the business

	Passiante G., Sakka G.	tourism: the case of Ecobnb								model. The paper analyzes a single case study operating into the promotion of green hospitality as an example of circular economy business model. The analysis demonstrates how DTs can be employed for sustainable value creation processes.
28	Gwangwava N., Ude A.U., Ogunmuyiwa E., Addo-Tenkorang R.	Cloud based 3D printing business modeling in the digital economy	2018	International Journal of E-Entrepreneurship and Innovation	-	Conceptual		3D printing	The digital BM	The study analyzes the innovative BM of cloud-based 3D printing inspired by multi-sided platform businesses. The Business Model Canvas is used as a toolkit for modelling 3DCloud. For instance, the study highlights that 3DCloud benefits from segmenting both sides of the market, i.e. makerspaces and manufacturing industry and revenue model for 3DCloud comes from 3D printing fees charged to the industry and 'prosumers'.
29	Hänninen M., Smedlund A., Mitronen L.	Digitalization in retailing: multi-sided platforms as drivers of industry transformation	2018	Baltic Journal of Management	-	Conceptual		Digital platforms	The digital BM	The study analyzes the multi-sided platform BM in the fashion industry. Platforms transform the transaction logic of retailing as they simply intermediate transactions between buyers and suppliers rather than handling the entire supply and logistics chain themselves.
30	Hazée S., Zwienenberg T.J., Van Vaerenbergh Y., Faseur T., Vandenberghe A., Keutgens O.	Why customers and peer service providers do not participate in collaborative consumption	2020	Journal of Service Management	-	Empirical	Focus group In-depth interviews Critical incident technique	Digital platforms	The digital BM	The study investigates a collaborative consumption BM. Switching from a traditional BM focused on ownership to a digital platform-enabled BM creates a complex set of unintended functional and psychological barriers – related to complexity, value, risk, compatibility, contamination, image, and responsibility - that impede actors from participating in collaborative consumption.
31	Hoch N.B., Brad S.	Managing business model innovation: an innovative approach toward designing a digital ecosystem and multi-sided platform	2021	Business Process Management Journal	Network theory	Empirical	Semi-structured interviews Single case study Structured interviews with experts	-	The digital BM	The study focuses on how digital technologies enable BMI at the ecosystem level and proposes a framework for systematic BMI. The innovated BM shows how different DTs and services can be implemented systematically and how added value is created through new offerings and collaborations, within a business ecosystem.
32	Kaltum U., Widodo A., Yanuardi A.W.	Local TV goes to global market through digital transformation	2016	Academy of Strategic Management Journal	-	Empirical	Direct interviews Focus group	-	The digital BM	The study unfolds a new digital BM archetype for local TV. The study is based on the BM canvas and provides suggestions on how to survive the digital era and overcome the limited

										broadcasting coverage problem by adopting new BMs.
33	Koudal P., Wellener P.	Digital loyalty networks: continuously connecting automakers with their customers and suppliers	2003	Strategy and Leadership	-	Conceptual		-	The digital BM	The study describes digital loyalty networks as a disruptive BM in the automotive industry. The BM allows automotive players to find new way of customer management and sales. The article provides anecdotal cases of large automotive companies employing such models.
34	Peng Y.	Mobile and Digitally-Mediated Publishing Strategies in China: An Overview of Evolving Business Models	2016	Publishing Research Quarterly	-	Empirical	Multiple case study	-	The digital BM	The study analyzes the digital publishing BM and identifies two main typologies: content plus Apps, and content plus devices. These typologies are identified as the leading ones, though various sub-categories exist in each of them.
35	Sengupta T., Narayanamurthy G., Hota P.K., Sarker T., Dey S.	Conditional acceptance of digitized business model innovation at the BoP: A stakeholder analysis of eKutir in India	2021	Technological Forecasting and Social Change	Stakeholder theory	Empirical	Single case study	Digital platforms	The digital BM	The study focuses on digitized business model innovation (DBMI) at the Bottom of the Pyramid (BoP). It explores the reason behind success and failure of DBMI in the BoP market by revealing that technological capability, technological awareness effort, stakeholder stability and stakeholder incentives are critical contingencies in the acceptance of DBMI.
36	Arifiani L.,	The effect of disruption technology, opportunities and challenges of telecommunication industry 4.0 in Indonesia	2019	International Journal of Recent Technology and Engineering	-	Empirical	Multiple case study	Industry 4.0	DT as antecedent of BMI	The study suggests that market orientation and technology orientation are antecedents of BMI. These two dimensions influence BMI, which in turn influences firms' competitive advantage.
37	Bouwman H., Nikou S., Molina-Castillo F.J., de Reuver M.	The impact of digitalization on business models	2018	Digital Policy, Regulation and Governance	-	Empirical	Mixed-method (survey and case studies)	Various	DT as antecedent of BMI	The study illustrates that drivers related to innovation, strategy and technology turbulence affect BM experimentation. BM experimentation influences BM practices, which in turn have an impact on innovativeness and overall performance.
38	Ciampi F., Demi S., Magrini A., Marzi G., Papa A.	Exploring the impact of big data analytics capabilities on business model innovation: The mediating role of entrepreneurial orientation	2021	Journal of Business Research	Dynamic Capabilities	Empirical	Survey	Big Data	DT as antecedent of BMI	The study finds a direct and positive relationship between big data analytics capabilities (BDAC) and BMI. It demonstrates how BDAC, besides representing enabling capabilities for co-innovation and new product development, also have a significant impact on BMI. Entrepreneurial orientation has a positive mediating role in the BDAC-BMI 36relationship.
39	Garzella S., Fiorentino R.,	Business model innovation in SMEs: the	2021	Technology Analysis and	-	Empirical	Survey	-	DT as antecedent of BMI	The study shows that digitalization and firms' boundaries affect BMI in SMEs.

	Caputo A., Lardo A.	role of boundaries in the digital era		Strategic Management						DTs positively affect SMEs' boundary size, shifting the attention to new forms of strategic development in which boundaries are the site of new value creation and value appropriation pathways. Boundary size positively affects SMEs' BMI. The results also confirm previous studies claiming that managing boundaries requires a set of capabilities (i.e. technological, cultural and relational management capabilities) forces and resources.
40	Mihardjo L.W.W., Sasmoko S., Alamsjah F., Elidjen E.	Digital leadership role in developing business model innovation and customer experience orientation in industry 4.0	2019	Management Science Letters	-	Empirical	Survey	Industry 4.0	DT as antecedent of BMI	Study results show that digital leadership has a significant impact on BMI. The study also finds that customer experience orientation has a supportive impact as mediating role on relationship between BMI and digital leadership.
41	Mihardjo L.W.W., Sasmoko, Alamsjah F., Elidjen	The role of distinctive organizational capability in formulating co-creation strategy and business model innovation	2018	Polish Journal of Management Studies	Resource-based view	Empirical	Survey	Industry 4.0	DT as antecedent of BMI	The study argues that distinctive organization capability (i.e. digital leadership, digital culture, digital agility) has indirect influence on BMI, while co-creation strategy has a mediating role in the relationship between distinctive organizational capability and BMI.
42	Alshawaaf N., Lee S.H.	Business model innovation through digitisation in social purpose organizations: A comparative analysis of Tate Modern and Pompidou Centre	2021	Journal of Business Research	-	Empirical	Multiple case study	Various	DT-driven changes on BM components	The study shows that digitization leads to BMI outcomes and improves organizational performance. Digitization (i.e. interacting services, services robots, AI) leads to BMI through innovating and digitizing services to interact with customers by building relationships, creating new experiences, and engaging with audiences.
43	Ammirato S., Felicetti A.M., Linzalone R., Carlucci D.	Digital business models in cultural tourism	2021	International Journal of Entrepreneurial Behavior and Research	-	Empirical	Secondary data	Mobile app	DT-driven changes on BM components	Through the review of mobile apps providing services for cultural tourists, the paper proposes a framework to analyze value proposition, value creation and value capture dimensions. The main component of the value creation is the type of information services provided (i.e. the utility component): budget monitoring, price comparison, time savings, etc. The value proposition is focused on five utility dimensions: convenience, risk reduction, enhancing experience, sociability, and practicality. Cultural tourism apps adopt well-established revenue methods based on three-party advertising

44	Arnold, C; Kiel, D; Voigt, KI	How the industrial Internet of Things changes Business Mdoels in manufacturing industries	2016	International Journal of Innovation Management	-	Empirical	Multiple case study	IoT	DT-driven changes on BM components	The study analyzes how IIoT affects the BM's components of companies in various industries. Relative frequencies of BM element changes by industry and industry-spanning are identified. Study findings also show that machine and plant engineering companies are mainly experiencing changes in workforce qualifications, electrical engineering, and information. ICT manufacturers are particularly facing novel key partner networks.
45	Baber W.W., Ojala A., Martinez R.	Effectuation logic in digital business model transformation: Insights from Japanese high-tech innovators	2019	Journal of Small Business and Enterprise Development	Entrepreneurship (effectuation and causation logics)	Empirical	Multiple case study	Digital platforms	DT-driven changes on BM components	Relating to entrepreneurship effectuation and causation logics, the study argues that former logic has the most impact on the BM components, whilst the latter logic dominates the other elements of the digital BM (i.e. value delivery, value networks, revenue model, information flow).
46	Björkdahl J.	Strategies for Digitalization in Manufacturing Firms	2020	California Management Review	-	Conceptual		-	DT-driven changes on BM components	The study contends the use of new DTs is a prerequisite for digital transformation, but successful efforts require re-optimization to allow effective use of DTs for value creation and value capture. The effects of digitalization for firms are more efficient product development, more efficient manufacturing, more sophisticated products and services, and more integrated value chains. Challenges and strategic implications are also presented.
47	Cheah S., Wang S.	Big data-driven business model innovation by traditional industries in the Chinese economy	2017	Journal of Chinese Economic and Foreign Trade Studies	Resource-based view	Empirical	Multiple case study	Big Data	DT-driven changes on BM components	The study adopts an integrated framework to highlight the elements of big data-driven BMI. The framework comprises three elements: perspectives (market, strategic, economic), BM processes (value discovery, value creation, value realization) and big data-driven BMI (e.g. data collection, data processing, product innovation, improved operational efficiency, etc.). The study shows that big data impact on value discovery, value creation and value realization.
48	Dasí A., Elter F., Gooderham P.N., Pedersen T.	New business models in-the-making in extant mncs: Digital transformation in a telco	2017	Advances in International Management	-	Empirical	Single case study	-	DT-driven changes on BM components	The study analyzes changes in the BM components (value proposition, value creation, value capture) of a multinational mobile telecom company brought by DTs. Such changes mainly regard what to offer, revenue streams, key resources, and

										activities. The study also suggests the future value proposition, value creation and value capture.
49	DaSilva C.M., Trkman P., Desouza K., Lindič J.	Disruptive technologies: A business model perspective on cloud computing	2013	Technology Analysis and Strategic Management	-	Conceptual		Cloud computing	DT-driven changes on BM components	The study shows how three large companies faced a disruptive technology (Cloud) adoption in terms of BMI effects. The study analyzes DT-driven changes in the BM's components (i.e. customer value, earning logic, value network, resources and capabilities) of Siebel, Salesforce and Amazon.
50	Endres H., Stoiber K., Wenzl N.M.	Managing digital transformation through hybrid business models	2019	Journal of Business Strategy	-	Conceptual		-	DT-driven changes on BM components	BM hybridization is proposed as an adaption of existing BMs to the digital age. The study suggests that BMI hybridization in the betting context impacts on the four building blocks (i.e. value propositions, customer segments, channels and cost structure).
51	Kiel D., Arnold C., Voigt K.-I.	The influence of the Industrial Internet of Things on business models of established manufacturing companies – A business level perspective	2017	Technovation	-	Empirical	Multiple case study	IoT	DT-driven changes on BM components	The study finds the prevalent BM component modifications driven by the IIoT. The most frequent changes occur in the value proposition, core competencies, relationships, value configuration, and cost structure. The study also highlights the interrelations between different BM components. For instance, every change in target customers goes hand in hand with an alteration in the value proposition. Similarly, changes in the distribution channels toward direct sales, is due to changing customer relationships or a modified value proposition.
52	Klos C., Spieth P., Clauss T., Klusmann C.	Digital Transformation of Incumbent Firms: A Business Model Innovation Perspective	2021	IEEE Transactions on Engineering Management	-	Empirical	Multiple case study	-	DT-driven changes on BM components	The study provides an aggregated framework of digital transformation toward BMI. It represents a preparatory phase and different design options according to the different constitutive business model dimensions (or building blocks).
53	Metallo C., Agrifoglio R., Schiavone F., Mueller J.	Understanding business model in the Internet of Things industry	2018	Technological Forecasting and Social Change	-	Empirical	Multiple case study	IoT	DT-driven changes on BM components	Using the BM Canvas, the study shows how incumbent and newcomer firms respond to disruptive technology. The most important building blocks are key activities, key resources, and value proposition. Study findings also show that the main difference in BMI depends on capabilities and competencies.
54	Müller J.M.	Business model innovation in small- and medium-sized enterprises: Strategies	2019	Journal of Manufacturing Technology Management	-	Empirical	Multiple case study	Industry 4.0	DT-driven changes on BM components	The study argues that Industry 4.0 affects the BM's building blocks of SMEs. Key resources and value proposition are among the most affected elements,

		for industry 4.0 providers and users								whereas channels are the least affected. Differences between Industry 4.0 providers and users can be found as providers' BMs are significantly more affected than users, except for key partners and customer relationships.
55	Müller J.M., Buliga O., Voigt K.-I.	Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0	2018	Technological Forecasting and Social Change	-	Empirical	Multiple case study	Industry 4.0	DT-driven changes on BM components	The study investigates companies' common understanding of Industry 4.0. It also sheds light on BM-related changes in the value creation, value offer, and value capture dimensions. Changes in the production equipment, workforce, product and services, partner network and customer interactions are the most widely experienced by SMEs.
56	Ruggieri R., Savastano M., Scalingi A., Bala D., D'Ascenzo F.	The impact of Digital Platforms on Business Models: An empirical investigation on innovative start-ups	2018	Management and Marketing	-	Empirical	Multiple case study	Digital platforms	DT-driven changes on BM components	The study discusses common patterns of business platforms regarding BM components. Similarities according to the business structure (e.g. highly skilled human resources and distribution channels), and the key activities are identified. The investigated companies are very different in the relationships with key partners as well as in the specific strategies used to get the highest revenues (e.g. transaction fees, subscriptions, advertising, sales, etc.).
57	Pietrewicz, L	Technology, Business Models and Competitive Advantage in the Age of Industry 4.0	2019	Problemy zarzadzania-management issues	-	Conceptual		Industry 4.0	DT-driven changes on BM components	The study suggests that Industry 4.0 relates to BMI. Technology alone is not sufficient to create competitive advantage, rather the way it is included into BMs. Notably, the use of IoT demands and enables innovating some key components of BMs: customer relationships, key activities, key resources.
28	Rachinger M., Rauter R., Müller C., Vorraber W., Schirgi E.	Digitalization and its influence on business model innovation	2019	Journal of Manufacturing Technology Management	Dynamic Capabilities	Empirical	Multiple case study	-	DT-driven changes on BM components	Study findings indicate that digitalization influences BM's elements (i.e. value proposition, value creation, and value capture). However, such influence depends greatly on the company's industry. BM's changes are allocated to dynamic capabilities phases, namely sensing, seizing, reconfiguring.
29	Schneider S., Leyer M., Tate M.	The Transformational Impact of Blockchain Technology on Business Models and Ecosystems: A Symbiosis of Human and Technology Agents	2020	IEEE Transactions on Engineering Management	Various	Conceptual		Blockchain	DT-driven changes on BM components	The study proposes a theoretical framework to analyze blockchain technology's effects on BM components. The paper also adopts the perspective of the ecosystem to underline the impact of the blockchain on BM components.

60	Smirnov A., Sandkuhl K., Shilov N.	Multilevel self-organization of cyber-physical networks: Synergic approach	2013	International Journal of Integrated Supply Management	-	Conceptual		Cyber-Physical Systems	DT-driven changes on BM components	The study shed lights on how blockchain impacts on BM components. It suggests that, due to the nature of blockchain technology, adaptable BMs are essential to create and deliver value to customers.
61	Tavoletti E., Kazemargi N., Cerruti C., Grieco C., Appolloni A.	Business model innovation and digital transformation in global management consulting firms	2021	European Journal of Innovation Management	-	Empirical	Multiple case study	-	DT-driven changes on BM components	The study sheds lights on how management consulting firms' BM has changed after the adoption of DTs. It focuses on understanding these changes according to three specific dimensions of BM: value creation (e.g. acquiring and developing capabilities, leveraging on networks), value proposition (e.g. service complementarity, establishing new customer relationships) and value capture (e.g. new revenue streams).
62	Tsvetkov N., Chekanov A.	The data dilemma: how availability can threaten the competitive advantage of data-based firms	2019	Journal of Business Strategy	Resource-based view	Empirical	Multiple case study	Big Data	DT-driven changes on BM components	The study employs the theoretical lens of the resource-based view to interpret how the increased data availability and business model transformation affected the competitive positioning of the investigated firms. The study focuses on identifying observed changes in IBM's and Yahoo's BMs.
63	Wikström P., Ellonen H.-K.	The impact of social media features on print media firms' online business models	2012	Journal of Media Business Studies	-	Empirical	Multiple case study	Social media	DT-driven changes on BM components	The study uses Osterwalder et al.'s (2005) BM framework to explore how the firms' social media investments have affected or transformed their online businesses. Social media lead to online BMI, particularly linked to the firms' value propositions. Changes in the firms' relationship with customers and traditional content contributors are also identified. The modified value proposition also requires firms to acquire new competencies to harvest from their social media investments.
64	Cozzolino A., Verona G., Rothaermel F.T.	Unpacking the Disruption Process: New Technology, Business Models, and Incumbent Adaptation	2018	Journal of Management Studies	-	Empirical	Single case study	-	DT-driven BMI process	The paper unfolds that there are two separate forces in the disruptive process: the initial advent of disruptive technologies; and the subsequent entry of disruptors introducing new BMs. The study develops a process model of incumbents' BM adaptation after disruption. The model focuses on the antecedents, moderators, mechanisms of BM adaptation, and outcomes.
65	Berman S.J.	Digital transformation: Opportunities to create new business models	2012	Strategy and Leadership	-	Conceptual		-	DT-driven BMI process	The study unfolds three strategic paths to digital transformation. These are summarized by three basic approaches:

										focusing on customer value propositions; transforming the operating model; combining those two approaches by simultaneously transforming the customer value proposition and organizing operations for delivery.
66	Biloslavo R., Bagnoli C., Massaro M., Cosentino A.	Business model transformation toward sustainability: the impact of legitimation	2020	Management Decision	Legitimation theory	Empirical	Single case study	-	DT-driven BMI process	The study identifies three phases of a sustainable BMI process supported by DTs: the triggers of the new BM, the supply chain development, the extension to other supply chains. According to the authors, legitimacy covers a central role because such BMI should be supported by both internal and external stakeholders of the firm.
67	Brenk S., Lüttgens D., Diener K., Piller F.	Learning from failures in business model innovation: solving decision-making logic conflicts through intrapreneurial effectuation	2019	Journal of Business Economics	Entrepreneurship (effectuation and causation logics)	Empirical	Longitudinal single case study	-	DT-driven BMI process	The study develops a narrative along the various stages of a BMI process by Frankenberger et al. 2013: initiation, design ideation, design integration, and realization. The study suggests that latent conflicts result from the dominant (established) value logic and the new logic when deploying BMI processes. It suggests separating the alternative BM from the existing one can reduce cognitive uncertainty associated with BMI processes through logic pluralism.
68	Hanafizadeh, P; Hatami, P; Analoui, M; Albadvi, A	Business model innovation driven by the internet of things technology, in internet service providers' business context	2021	Information systems and e-business management	-	Empirical		IoT	DT-driven BMI process	The study adopts a four-stage BMI process framework by Frankemberger et al. (2013) to describe and analyze the IoT-driven business model innovation process in the specific business context of Internet Service Providers.
69	Khanagha S., Volberda H., Oshri I.	Business model renewal and ambidexterity: Structural alteration and strategy formation process during transition to a Cloud business model	2014	R and D Management	-	Empirical	Longitudinal single case study	Cloud Computing	DT-driven BMI process	The study unfolds five major phases in the Telco's transition process to a new cloud BM. For each phase, the strategic intent, the structural form, the key roles, and the targeted outcomes are described. They focus on the nature and implications of interrelationships among strategic intent, structure, and BM renewal, showing that rather than adopting any particular structural form, iterating between different modes of separated and integrated structural forms offers the potential to experiment with the new BM and revise the strategy through a collective learning process.
70	Latilla V.M.M., Urbinati A.,	Organizational Re-Design for Business model innovation while	2021	International Journal of Innovation and	-	Empirical	Single case study	-	DT-driven BMI process	The study investigates the organizational impact of DT-driven BMI in the energy context. The study shows that the BMI

	Cavallo A., Franzò S., Ghezzi A.	exploiting digital technologies: A single case study of an energy company		Technology Management						process requires organizational re-design in terms of new units and functions with proper know-how and capabilities to exploit the adoption of digital technologies.
71	Latilla V.M., Frattini F., Franzo S., Chiesa V.	Organisational Change and Business Model Innovation: an exploratory study of an energy utility	2020	International Journal of Innovation Management	-	Empirical	Single case study	-	DT-driven BMI process	The study argues that BMI process requires separating the traditional business unit from the innovation loci where the new solutions are developed. The decentralization of authority, the creation of weak management hierarchies, the extension of the firm's boundaries through collaboration, and an appropriate organizational culture, constitute the cornerstones for BMI.
72	Laïfi A., Josserand E.	Legitimation in practice: A new digital publishing business model	2016	Journal of Business Research	-	Empirical	Longitudinal single case study	-	DT-driven BMI process	The study identifies three steps in the digital publishing BMI. The first phase is focused on pragmatic and moral legitimation, while the second phase entailed seeking pragmatic legitimation in a new context. Finally, the third phase regards the inter-contextual legitimacy and is based on the acquisition of moral legitimacy.
73	McGrath, R; McManus, R	Digital Transformation Learning your way to a new business model What'sa your digital strategy	2020	Harvard Business Review	-	Conceptual		-	DT-driven BMI process	The study suggests an incremental approach to BM transformation over time and develops a five-step approach to digital transformation process.
74	Najmaei A.	How Do Entrepreneurs Develop Business Models in Small High-Tech Ventures? An Exploratory Model from Australian IT Firms	2016	Entrepreneurship Research Journal	Entrepreneurship and theories of the firms	Empirical	Multiple case study	Cloud computing	DT-driven BMI process	The study presents three phases of the BMI process in high-tech context, focusing on small companies in Australia. The phases are business model ideation (BMI); business modeling strategic commitment (BMSC) and business model actualization (BMAC).
75	Nakano D., Fleury A.	Recorded music supply network reconfiguration: The dual effect of digital technology	2017	International Journal of Manufacturing Technology and Management	-	Conceptual		-	DT-driven BMI process	The study investigates how DTs affected the recorded music supply network over time. Two phases might be identified: a first phase where DT started to be used in the production process, and a second phase where DT was employed in the distribution process, thus having a much deeper effect on BMI.
76	Remane G., Hanelt A., Nickerson R.C., Kolbe L.M.	Discovering digital business models in traditional industries	2017	Journal of Business Strategy	-	Conceptual		-	DT-driven BMI process	The study describes a three-step process to BMI through digitization. These steps are identifying existing products and services, deconstructing business models, discovering new configurations.

77	Schallmo D., Williams C.A., Boardman L.	Digital transformation of business models-best practice, enablers, and roadmap	2017	International Journal of Innovation Management	-	Conceptual		-	DT-driven BMI process	The study provides a clear definition, examples, and enablers of the digital transformation of BMs. It also proposes a five-step roadmap to manage the BMI process that enables companies to take advantage of DT's potential (e.g., sensors, big data) and reimagine their BM.
78	Sund K.J., Bogers M.L.A.M., Sahramaa M.	Managing business model exploration in incumbent firms: A case study of innovation labs in European banks	2021	Journal of Business Research	-	Empirical	Multiple case study	-	DT-driven BMI process	The study explores the emerging barriers and challenges of digital technologies-driven BMI processes. Innovation labs are challenged by existing resources and capabilities as well as by the need to satisfy both top management and managers in the core business units. They seek to overcome such difficulties by using integration mechanisms and by balancing incremental and radical innovation.
79	Tesch, JF; Brillinger, AS; Bilgeri, D	Internet of Thing Business Model Innovation and the stage-gate process: an exploratory analysis	2017	international journal of innovation management	-	Empirical	Multiple case study	IoT	DT-driven BMI process	By analyzing the BMI process, the study contends that IoT BMI has two gates: the commitment to further developments of BMI process and the need to decide how to set up the scale of the business.
80	Verhoef P.C., Broekhuizen T., Bart Y., Bhattacharya A., Qi Dong J., Fabian N., Haenlein M.	Digital transformation: A multidisciplinary reflection and research agenda	2021	Journal of Business Research	-	Conceptual		-	DT-driven BMI process	The article identifies three external drivers of digital transformation, namely digital technology, digital competition, and digital customer behavior. Three are the stages of digital transformation: digitization, digitalization, and digital transformation. Each phase places specific demands on firms' digital resources, organization structure, growth strategies and metrics.
81	Warner K.S.R., Wäger M.	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	2019	Long Range Planning	Dynamic Capabilities	Empirical	Multiple case study	-	DT-driven BMI process	The study sheds light on how incumbents in traditional industries build dynamic capabilities for digital transformation. The study provides a process model of digital-driven BMI. The starting point is represented by external triggers (e.g. disruptive digital technologies, changing consumer behaviors, etc.), which foster the development of dynamic capabilities (i.e. digital sensing, digital seizing, digital transforming). The model also highlights core enablers (e.g. functional teams, executive support, etc.) and barriers (e.g. rigid planning, change resistances, etc.).
82	Aas T.O.R.H., Breunig K.J.,	Service-oriented business models in manufacturing in the	2020	International Journal of	-	Empirical	Multiple case study	-	Digital Servitization	The study empirically explores the characteristics of BMs implemented in digital servitization. In the value creation

	Hellström M.M., Hydle K.M.	digital era: Toward a new taxonomy		Innovation Management						dimension, firms' BMs varied regarding the degree of the suppliers' ownership of products. In the value delivery dimension, firms' BMs varied according to the degree of smartness of the services provided to customers. In the value capture dimension, firms' BMs varied based on the degree of performance orientation of contracts between the suppliers and their customers. The study develops a PSS (product-service-systems) BM framework displaying a digital servitisation taxonomy.
83	Chen, YH; Visnjic, I; Parida, V; Zhang, ZG	On the road to digital servitization - The (dis)continuous interplay between business model and digital technology	2021	International Journal of Operations & Production Management	-	Empirical	Single case study	Various	Digital Servitization	The study aims to advance the understanding of digital servitization as BMI. The study suggests that servitization and digitalization evolve in parallel from the beginning and digital servitization has both continuous and discontinuous process features. Moreover, the study argues that to offer smart solutions, a manufacturer needs an ecosystem composed of suppliers, distributors, partners, and customers.
84	Coreynen, W; Matthyssens, P; Van Bockhaven, W	Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers	2017	Industrial Marketing Management	Dynamic resource-based view	Empirical	Multiple case study	-	Digital Servitization	Study findings illustrate different approaches for companies to exploit digitization as a servitization enabler based on front-end and back-end digitization: industrial servitization; commercial servitization; value servitization. Each pathway differs in terms of digital means, services, barriers, resources, capabilities, and competitive benefits.
85	Frank A.G., Mendes G.H.S., Ayala N.F., Ghezzi A.	Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective	2019	Technological Forecasting and Social Change	-	Conceptua		Industry 4.0	Digital Servitization	The study provides a conceptual framework for servitization and Industry 4.0 convergence. When considering the different configurations between levels of digitization and types of servitization, nine configurations and different levels of complexity of the BMI result.
86	Gebauer H., Arzt A., Kohtamäki M., Lamprecht C., Parida V., Witell L., Wortmann F.	How to convert digital offerings into revenue enhancement – Conceptualizing business model dynamics through explorative case studies	2020	Industrial Marketing Management	-	Empirical	Interviews Focus group Single case study	-	Digital Servitization	The study provides a framework for revenue enhancement through digital offerings. The framework distinguishes between three phases of BM dynamics: augmenting products through a "hardware plus" logic, developing a portfolio of multiple logics for creating customer value, integrating this portfolio through platform logic. It highlights three barriers (i.e. confidence, mixing, and

										collaboration barrier) hindering the progress from phase one to phase three. Each phase requires modifications of BM components.
87	Grieger M., Ludwig A.	On the move towards customer-centric business models in the automotive industry - a 85conceptual reference framework of shared automotive service systems	2019	Electronic Markets	-	Conceptual		-	Digital Servitization	The study explores innovative BMs related to the automotive service system. It provides a conceptual reference framework for automotive service systems, whose constructs are abstracted from the Business Model Canvas and adapted to the service system domain.
88	Haaker T., Ly P.T.M., Nguyen-Thanh N., Nguyen H.T.H.	Business model innovation through the application of the Internet-of-Things: A comparative analysis	2021	Journal of Business Research	-	Empirical	Multiple case study	IoT	Digital Servitization	The study conducts a morphological analysis which underlines the common aspects of IoT-BMs with subsequent generic design options. The study provides design guidelines for IoT BMI in the emerging Vietnamese market.
89	Kamalaldin A., Linde L., Sjödin D., Parida V.	Transforming provider-customer relationships in digital servitization: A relational view on digitalization	2020	Industrial Marketing Management	Relational view	Empirical	Multiple case study	-	Digital Servitization	The study provides a relational transformation framework to support digital servitization. It demonstrates relational engagements and a relational view as key to progressing in digital servitization, the interdependence of the activities along the transformation process and the role of different approaches of governance emerging in digital servitization.
90	Kohtamäki M., Parida V., Oghazi P., Gebauer H., Baines T.	Digital servitization business models in ecosystems: A theory of the firm	2019	Journal of Business Research	Various	Conceptual		-	Digital Servitization	The study advances the idea of combining four theories (i.e. industrial organization, the resource-based view, organizational identity, and the transaction cost approach) to study digital servitization. Moreover, based on those theories, the study distinguishes between five BMs: product-oriented service provider, industrializer, customized integrated solution provider, platform provider, and outcome provider.
91	Linde L., Frishammar J., Parida V.	Revenue Models for Digital Servitization: A Value Capture Framework for Designing, Developing, and Scaling Digital Services	2021	IEEE Transactions on Engineering Management	-	Empirical	Multiple case study	-	Digital Servitization	The article sheds light on the relevant aspects that should be considered when manufacturing companies design new revenue models for digital services. Two themes emerged from the analysis: revenue model design principles and revenue model design phases. The principles (i.e. agile development and co-creation with customers) describe the underlying logic of the revenue model design process, while the phases (i.e. initiation, development, implementation)

										represent the key activities companies undertake when designing revenue models for digital services.
92	Paiola M., Schiavone F., Grandinetti R., Chen J.	Digital servitization and sustainability through networking: Some evidences from IoT-based business models	2021	Journal of Business Research	-	Empirical	Multiple case study	IoT	Digital Servitization	Study findings confirm that new digital services provided by manufacturers have inherent valuable impacts on the sustainability of their customers. The study contends that sustainability is achieved with the simultaneous and aligned exploitation and evolution of digital servitization and networking. Effective management, design, and exploitation of inter-organizational networks are crucial for achieving and offering more sustainable performance for their customers.
93	Paiola, M; Schiavone, F; Khvatova, T; Grandinetti, R	Prior knowledge, industry 4.0 and digital servitization. An inductive framework	2021	Technological Forecasting and Social Change	-	Empirical	Multiple case study	Industry 4.0	Digital Servitization	The study finds that three main factors affect successful digital servitization: the chances of capitalizing on valuable prior knowledge; networking by partnering with selected actors; and seizing opportunities for replication economies. The study inductively develops a multi-dimensional matrix of digital servitization ideal types: experienced industrializer, explorative industrializer, explorative solutioner, experienced solutioner.
94	Paiola M., Gebauer H.	Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms	2020	Industrial Marketing Management	-	Empirical	Multiple case study	IoT	Digital Servitization	The study sheds light on how B2B manufacturing firms are leveraging IoT technologies to expand their service-oriented offerings and innovate their BMs. It provides a map of digital servitization that helps in understanding firms' strategic transitions caused by DTs. Vertical and horizontal moves in the map offer different opportunities and pose specific challenges.
95	Simonsson J., Magnusson M., Johanson A.	Organizing the development of digital product-service platforms	2020	Technology Innovation Management Review	-	Empirical	Single case study	Digital Platforms	Digital Servitization	This study sheds light on how industrial companies should approach digital product-service platforms in terms of both scope definition and process.
96	Sjödin D., Parida V., Palmié M., Wincent J.	How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops	2021	Journal of Business Research	-	Empirical	Multiple case study	Artificial Intelligence	Digital Servitization	The study reveals three sets of critical AI capabilities: data pipeline, algorithm development, and AI democratization. To incorporate these capabilities into their businesses, manufacturers need to transform their business models by focusing on the key principles relating to agile customer co-creation, data-driven delivery operations, and scalable ecosystem integration. The study

										provides a coevolutionary framework for scaling AI capabilities through BMI.
97	Struyf, B; Galvani, S; Matthyssens, P; Bocconcelli, R	Toward a multilevel perspective on digital servitization	2021	International Journal of Operations & Production Management	Multilevel theory	Empirical	Multiple case study	-	Digital Servitization	The study seeks to understand the challenges behind digital servitization. Study findings show that companies implementing digital servitization are faced with a wicked problem consisting of interconnected barriers that span across different levels of analysis, that is, the network, organizational and microfoundational level.
98	Tian J., Coreynen W., Matthyssens P., Shen L.	Platform-based servitization and business model adaptation by established manufacturers	2021	Technovation	-	Empirical	Multiple case study	Digital platforms	Digital Servitization	This study empirically explores how manufacturers adopt digital platforms for digital servitization. Based on a cross-case analysis of four textile and apparel manufacturers, it reveals distinct platform-based servitization strategies (i.e. non-digital servitization, digital servitization, and smart servitization) and BMI paths (i.e. sequential BMI and simultaneous BMI).
99	Burström T., Parida V., Lahti T., Wincent J.	AI-enabled business-model innovation and transformation in industrial ecosystems: A framework, model and outline for further research	2021	Journal of Business Research	-	Empirical	Multiple case study	Artificial Intelligence	Other topics: external actors and digital BMI	The study sheds light on how AI technology enables BMI in industrial ecosystems. Four AI-related functionalities (i.e. forecasting, monitoring and control, optimization, autonomy) are key drivers in BMI. The paper also identifies three ecosystem-related strategies: reconfiguration, revitalization, and resilience.
100	Cucculelli M., Dileo I., Pini M.	Filling the void of family leadership: institutional support to business model changes in the Italian Industry 4.0 experience	2021	Journal of Technology Transfer	Triple Helix framework	Empirical	Survey	Industry 4.0	Other topics: external actors and digital BMI	The paper shows that the interaction between firms, universities and public institutions is an important driver for developing Industry 4.0 BMs in family firms. The study argues that family firms run by family members are more likely to adopt disruptive technologies when the “Triple Helix” is at play.
101	Hakanen E., Rajala R.	Material intelligence as a driver for value creation in IoT-enabled business ecosystems	2018	Journal of Business and Industrial Marketing	-	Empirical	Single case study	IoT	Other topics: external actors and digital BMI	The study investigates the ways in which the IoT changes value creation in business ecosystems. The study finds that material intelligence may have a significant role in changing the ways value is created in the steel industry as the intelligence of things stimulates collaboration and information sharing in industrial ecosystems
102	Lardo A., Mancini D., Paoloni N., Russo G.	The perspective of capability providers in creating a sustainable I4.0 environment	2020	Management Decision	-	Empirical	Single case study	IoT	Other topics: external actors and digital BMI	The study suggests sustainability might be created by integrating Industry 4.0 technologies into new BMs. The study

										focuses on the contribution of the capability provider in the sustainable I4.0 BM transformation.
103	Loebbecke C., Picot A.	Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda	2015	Journal of Strategic Information Systems	-	Conceptual		Big Data	Other topics: digital BMI and societal effects	The study argues that digitization and big data technology enables the identification of new BMs. The identification of new digitally-enabled BMs has profound impact on societal changes. Desirable and critical societal effects are identified.
104	Saarikko T., Westergren U.H., Blomquist T.	Digital transformation: Five recommendations for the digitally conscious firm	2020	Business Horizons	-	Empirical	Semi-structured interviews	IoT	Other topics: best practices of digital BMI	The paper develops five recommendations to manage digital BMI: start small and build on firsthand benefits; team up and create competitive advantage from brand recognition; engage in standardization efforts; take responsibility for data ownership and ethics; and own the change and ensure organization-wide commitment.
105	Soluk J., Miroshnychenko I., Kammerlander N., De Massis A.	Family Influence and Digital Business Model Innovation: The Enabling Role of Dynamic Capabilities	2021	Entrepreneurship: Theory and Practice	Dynamic capabilities	Empirical	Survey	-	Other topics: antecedents of digital BMI	The study finds that increased levels of family influence are positively related to digital BMI. The study reveals that the level of a firm's digital BMI is influenced by the available dynamic capabilities. Empirical insights show that knowledge exploitation capabilities have the strongest effect on digital BMI.
106	Sorescu A.	Data-Driven Business Model Innovation	2017	Journal of Product Innovation Management	-	Conceptual		Big Data	Other topics: best practices of digital BMI	The study sheds light on the opportunities and drawbacks related to the adoption of a data-driven approach when firms aim to update their old BMs or to create new ones.

Appendix 2. Thematic analysis

Research theme	Sub-theme	Description	Exemplary studies
Digital technology-driven BMI archetypes	Digital BMI taxonomies	Articles providing categorizations of digital-driven BMs	Bellini et al., 2019; Berman et al., 2012; Bourreau et al., 2012; Brock et al., 2019; Chasin et al., 2020; D'Ippolito et al., 2019; Denicolai and Previtali, 2020; Dressler and Paunovic, 2021; Krotov, 2017; Laudien and Daxböck, 2016; Leminen et al., 2020; Leminen et al., 2018; Li, 2020; Mancha and Gordon, 2021; Sanasi et al., 2020; Täuscher and Laudien, 2018; Urbinati et al., 2019; Wielki, 2017
	The digital BM	Articles analyzing a single digital BM archetype (e.g. the multi-sided digital platform BM; the cloud BM, etc.)	Casero-Ripollés and Izquierdo-Castillo, 2013; Dellermann et al., 2017; Gwangwava et al., 2018; H¨anninen et al., 2018; Hazée et al., 2020; Kaltum et al., 2016; Koudal and Wellener, 2003; Peng, 2016
Digital technology's effects on BMI	DT as antecedent of BMI	Articles investigating the overall impact of DTs on BMI	Arifiani, 2019; Bouwman et al., 2018; Ciampi et al., 2021; Garzella et al., 2021; Mihardjo et al., 2019, 2018
	DT-driven changes on BM components	Articles describing how the adoption of new DTs allows to innovate each BM component (e.g. value proposition, revenue model, etc.)	Alshawaaf and Lee, 2021; Arnold et al., 2016; Baber et al., 2019; Björkdahl, 2020; Cheah and Wang, 2017; Dasí et al., 2017; DaSilva et al., 2013; Endres et al., 2020; Kiel et al., 2017; Müller, 2019; Müller et al., 2018; Pietrewicz, 2019; Rachinger et al., 2019; Ruggieri et al., 2018; Schneider et al., 2020; Smirnov et al., 2013; Tavoletti et al., 2021; Tsvetkov and Chekanov, 2019; Wikström and Ellonen, 2012
Digital technology-driven BMI process	-	Articles describing digital-driven business model innovation as a stage process	Berman, 2012; Biloslavo et al., 2020; Brenk et al., 2019; Cozzolino et al., 2018; Hanafizadeh et al., 2021; Khanagha et al., 2014; Laïfi and Josserand, 2016; Latilla et al., 2021; Latilla et al., 2020; McGrath and McManus, 2020; Najmaei, 2016; Nakano and Fleury, 2017; Remane et al., 2017; Schallmo et al., 2017; Tesch et al., 2017; Verhoef et al., 2021; Warner and Wäger, 2019
Digital servitization	-	Articles dealing with digital-enabled servitization as business model innovation	Aas et al., 2020; Coreynen et al., 2017; Frank et al., 2019; Gebauer et al., 2020; Grieger and Ludwig, 2019; Kamalaldin et al., 2020; Kohtamäki et al., 2019; Paiola and Gebauer, 2020; Simonsson et al., 2020; Struyf et al., 2021
Other topics	-	Articles addressing different topics related to best practices of digital-driven BMI, the role of	Cucculelli et al., 2021; Hakanen and Rajala, 2018; Lardo et al., 2020; Loebbecke and Picot, 2015; Saarikko et al., 2020; Sorescu, 2017

		external actors in digital-driven BMI, etc.	