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How digitalization supports a sustainable business model: A literature review☆

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ABSTRACT

New digital technologies are becoming widespread and have radically redefined business processes and practices. Simultaneously, numerous companies are implementing sustainable business models (SBMs), expecting to integrate sustainability considerations and increase competitive advantage. These two megatrends—digitalization and sustainability—are radically changing firms. However, the relationship between digitalization and the implementation of SBMs is yet to be investigated in detail. This is a key issue, as digital tools could assist companies in transforming their current business models toward sustainability. Through a literature review, we explore the link between digitalization and SBMs, illustrating the main potential impacts of digitalization for each block of SBM and propose a list of the potential benefits that digitalized SBMs can bring. We identify these potential benefits and elaborate on them considering their economic, social, and environmental impacts. Moreover, our study identifies a potential virtuous circle generated by digitalization, while highlighting the necessary alignment of digital tools and key business factors to attain economic, social, and environmental value.

1. Introduction

In the context of global economic growth, rising social inequalities, and depleting natural resources, businesses are under greater pressure to consider sustainability (Bocken et al., 2013). These demands can be external, such as those coming from policymakers and consumers, or internal, such as those from employees (Dubey et al., 2019). Owing to these increasing pressures, numerous companies have adapted their business models to include environmental, social, and economic considerations. These sustainable business models (SBMs) are designed to integrate sustainability into companies (Broccardo and Zicari, 2020; Geissdoerfer et al., 2018; Rashid et al., 2013; Stubbs and Cocklin, 2008; Wells, 2013) while becoming a source of competitive advantage (Nidumolu et al., 2009; Kramer and Porter, 2011). SBMs create value in not only financial, but also ecological and social domains (Bocken et al., 2014; Lüdeke-Freund and Dembek, 2017; Schaltegger et al., 2016).

One of the most cited definitions of SBMs is that of Bocken et al. (2013), wherein the SBM represents "Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organization and its value-network create, deliver value and capture…" (p. 44). In most SBM definitions, two common elements are as follows: i) a model that includes sustainability goals, concepts, and principles, and ii) integration of sustainability into a value proposition (Geissdoerfer et al., 2018). Additionally, SBMs do not occur by chance. Instead, achieving an SBM involves conscious, deliberate effort (Geissdoerfer et al., 2018), changes in business practices (Amit and Zott, 2012), and involvement of different stakeholders (Sommer, 2012).

New digital technologies[1] are involved in this move toward SBMs. Indeed, these technologies arguably constitute the pillars of the ongoing fourth industrial revolution. Moreover, they drastically redesign how companies manufacture or deliver services, facilitating their transition to sustainability (Bressanelli et al., 2018). Ross et al. (2017) explain that the systematic use of these technologies leads to digital transformation in companies, or a redefinition of business processes and practices. However, the depth of this transformation may differ among firms

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[1] These new technologies include the Internet of Things, big data and related analytics, and virtual and augmented reality.

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(Cavélius et al., 2020). In this paper, we use the terms "digital transformation" and "digitalization" interchangeably, and this follows an increasingly common practice in the literature (e.g., Trittin-Ulbrich et al., 2021).

Despite the growing importance of digitalization, its role and influence in the implementation of SBMs are yet to be investigated in detail (Dubey et al., 2019; Bressanelli et al., 2018; Nobre and Tavares, 2017; Pagoropoulos et al., 2017). This is important for theoretical and practical reasons. SBMs represent a promising theoretical framework to discern how companies conceive and implement innovations that lead to further sustainability performance. Understanding the increasingly influential role of digitalization in this framework is vital. While some theoretical studies mention using digitalization to enhance sustainability (Xu et al., 2017; Song and Moon, 2017; Wu et al., 2016), they remain too fragmented and broad. While insightful, these studies do not explore the link between digitalization and SBMs. For instance, Geissdoerfer et al. (2018), in their review of innovation in SBMs, mention technological innovation as one of the possible challenges; however, they do not make it the center of their analysis. Evans et al. (2017), when developing a theory on the creation of SBMs, did not emphasize the role of digitalization. Therefore, our theoretical focus on digitalization and SBMs is well-established.

Furthermore, other studies have focused on specific aspects of digitalization and sustainability without presenting a comprehensive view. For instance, Di Vaio et al. (2020) focused on artificial intelligence and its relationship with one of the sustainable development goals. Conversely, Khan et al. (2021) explored the link between e-government and corruption. Pizzi et al. (2021) studied the role of fintech (a particular set of digital technologies applied to finance) in developing circular economy (CE) business models. Another recent study on the relationship between CE and digitalization was conducted by Chauhan et al. (2022). CE presents "a systems solution framework" that aims to "eliminate waste and pollution, circulate products and materials…, and regenerate nature" (Ellen MacArthur Foundation, 2022). CE solutions comprise one of the possible configurations of SBM, the latter being a wider and more encompassing concept (Pizzi et al., 2021; Geissdoerfer et al., 2017).

Consequently, this exploration of the link between digitalization (considering a broad range of technologies instead of a particular one) and SBMs (broadly considered) has not yet been conducted. This is surprising, given that digitalization may be significant in addressing opportunities, increasing capabilities, and supporting the transformation of business models toward sustainability (Jelinek and Bergey, 2013). Furthermore, modern managers must grasp and address both digitalization and sustainability. Our study may help managers by identifying the main impacts of digitalization, providing insights on the potential benefits of digitalized SBMs, and providing guidance on the implementation of digital tools toward an SBM. Therefore, we contend that the focus of this literature review is relevant to both practice and academia.

This study aims to accomplish two goals. First, we explore whether digitalization contributes to an organization's transformation toward SBMs. Digitalization is a complex process of transformation of the entire company (Comuzzi and Pattel, 2016; Ross et al., 2017), whose path is not always linear or straightforward. Some studies (e.g., IBM, 2016) demonstrate that digitalization does not necessarily translate into increased value, which is a condition for implementing a successful SBM. Consequently, our first research question is as follows:

RQ1: Does digitalization contribute to the implementation of sustainable business models?

Our second goal explores the relationship between digital transformation and SBM implementation, including the different environmental, social, and economic aspects of sustainability, type of digital tools analyzed, and building blocks concerned (Osterwalder and Pigneur, 2010). Therefore, our second research question is as follows.

RQ2: How does digitalization relate to SBM?

The remainder of this paper is organized as follows. The next section explains the design of the systematic literature review and provides search criteria and descriptive characteristics of the selected papers. Section 3 presents the findings of the literature review, where systematization is provided, also answering the two research questions formulated. Section 4 presents a discussion and new insights are underlined. Finally, we present conclusions and future agendas.

2. Review design

We conducted a systematic literature review in this field. To ensure research replicability, we followed the recommendations of Creswell and Creswell (2017), Easterby-Smith et al. (2015), and Tranfield et al. (2003). Our procedure is based on three stages: planning, execution, and reporting. We first defined the goals of this study and identified key sources, selecting only published articles (Podsakoff et al., 2003) and, thus, excluding conference proceedings. However, as this is an emerging topic, we also considered non-peer-reviewed articles and those published by practitioners. Second, we (a) identified the search criteria, (b) set search queries, and (c) eliminated duplicate and loosely focused papers (Mauro et al., 2017). Finally, we report the main features and insights of the analyzed papers.

After identifying search criteria and formulating queries described in the following paragraph, we performed article selection based on abstracts. Based on the introduction, findings, and conclusions of each paper, we then selected a second paper. Finally, we eliminated duplicates and identified relevant cross-references. Following Geissdoerfer et al. (2018), a snowball process was executed. We identified a relevant set of studies, analyzed their titles and abstracts, and then reviewed their content, particularly in the Findings and Conclusion, study limitations, and future work/directions sections. This content analysis allowed us to exclude highly generic articles (Fig. 1).

Finally, to obtain the final papers' list for analysis, the authors independently examined the contributions to guarantee the validity of the papers' choices.

2.1. Search criteria, search queries, and elimination of duplicates

After defining the goal of this research (i.e., digitalization's impact on sustainable business models), we identified a set of *keywords*: digitalization, digital tools, impact, sustainability, and sustainable business models. We then combined them with Boolean logic and searched using different databases (e.g., Google Scholar, Business Source Complete, and Web of Science). Table 1 lists the parameters used in this study.

Using Boolean logic and identified keywords, we designed six search queries to create the literature dataset shown in Table 2.

Fig. 2 describes the scope of our review at the crossroads of sustainability, business model innovation, and digitization. Some innovations in business models relate to sustainability and can also be connected with digitalization. However, not all innovations in BMs relate to sustainability and digitalization, which is the focus of our study.

At this stage, controlling for duplicate articles remain necessary, which helped reduce the list to 76 papers. Consequently, each co-author read the papers separately, eliminating those that did not specifically address the role of digitalization in implementing an SBM. The final list included 29 articles (please see papers with * in the References section for the full list). The final number of articles that were consistent with the novelty of the topic, emerging from this analysis was limited. This novelty also explains our choice to not have based our paper inclusion process on citation statistics.

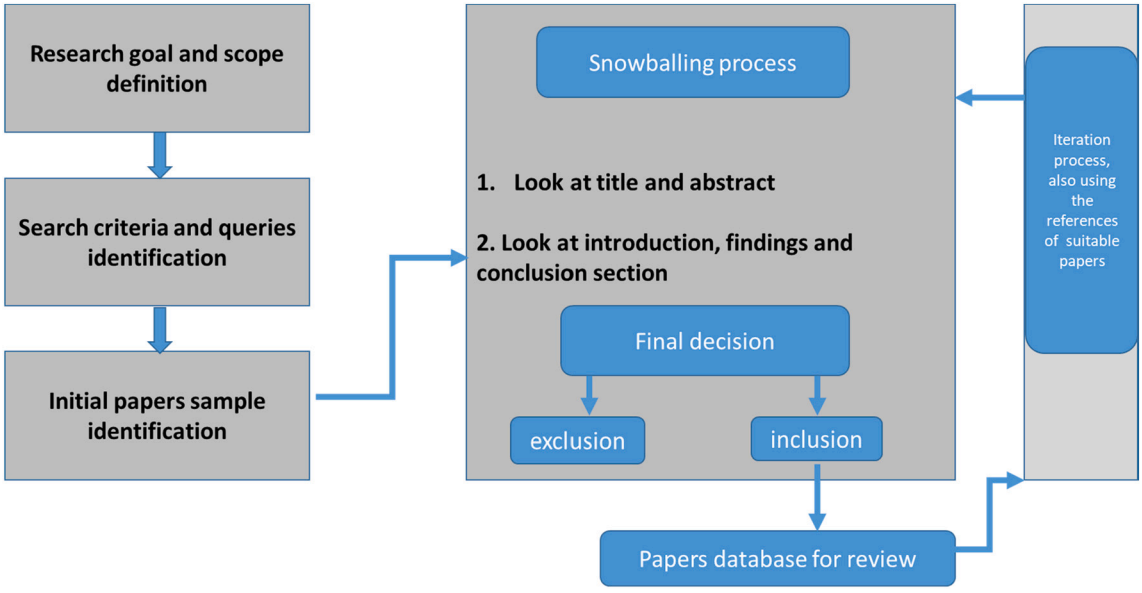

Fig. 1. The literature review process.
Source: adaptation based on Geissdoerfer et al. (2017).

Table 1
Literature review parameters.

Parameter	Description
Language	English only
Time horizon	2010–2021
Source	Only published articles (both academics and practitioners), no conference proceedings.
Inclusion/exclusion criteria	Only articles that deal with digitalization and SBM. Papers that address Business Model Innovation in a general way were excluded. Furthermore, papers considering circular economy were included only when linked to SBMs (see Fig. 2)
Keywords	Digitalization, digital tools, impact, sustainability and sustainable business model

Source: authors' elaboration.

Table 2
Database – search queries.

Search queries	Number of articles
Q1. Digitalization and sustainability	44
Q2. Digitalization and sustainable business model	28
Q3. Digitalization and impact and sustainability	25
Q4. Digitalization and impact and sustainable business model	17
Q5. Digital tool and impact and sustainability	30
Q6. Digital tool and impact and sustainability	17
Total	161

Source: authors' elaboration.

2.2. A first papers overview: data analysis

2.2.1. Year of publication and country of study

As expected, digitalization and sustainability topics appear in our selection only from 2014. Conversely, the largest number of articles (52 %) was published in 2020, indicating a growing interest in recent years. Publication numbers for 2021 are not definitive, as some journals release "ahead of print" articles before assigning them an official publication date. In all cases, a clear positive trend was observed. Additionally, some interesting articles were published in 2022, which we could not include in our list as we included articles published only till the end of 2021. Nevertheless, we cited the following new articles in this study (Fig. 3).

On data origin, the most represented countries in our selection include Europe and the UK (41 %), while nearly the same proportion of studies is based worldwide (38 %). Moreover, one study considered both Asia and North America.

2.2.2. Type of authors and research method used

In almost all cases (96.55 %), the selected authors had academic affiliation. Only one paper has been authored by a practitioner. In the methodology used, almost half of the articles in our selection were case studies (44.83 %), while 13.80 % were surveys. More than half of the studies are empirical in nature and are usually restricted to a particular geographical area, as indicated in Fig. 4. Additionally, the low percentage of conceptualization papers (10.34 %), which are consistent with the novelty of this field, suggests that currently, the priority depends on empirical and exploratory studies. Furthermore, we found nine literature reviews with scopes differing from those of our study. Nevertheless, as they were still dealing with similar issues, we retained them in our selection process (Table 3).

2.2.3. Journal of publication

Studies were published in journals from several academic domains (Fig. 5), ranging from technology to management and sustainability, thus indicating interest among scholars in different fields. One can also see a concentration of articles in four academic journals, whereas the other 12 journals published only one paper each. Appendix B provides a complete list of articles and journals.

2.2.4. Citations per article

From our collection of 29 articles, only eight concentrated on more than 100 citations (Fig. 6). The complete list of articles and their citations are included at the end of this article in Appendix C.

3. Findings

In this section, we present what we found in the review, and we elaborate in the Discussion section.

3.1. Digitalization and the sustainable business model

To answer our first research question, "*Does digitalization contribute to*

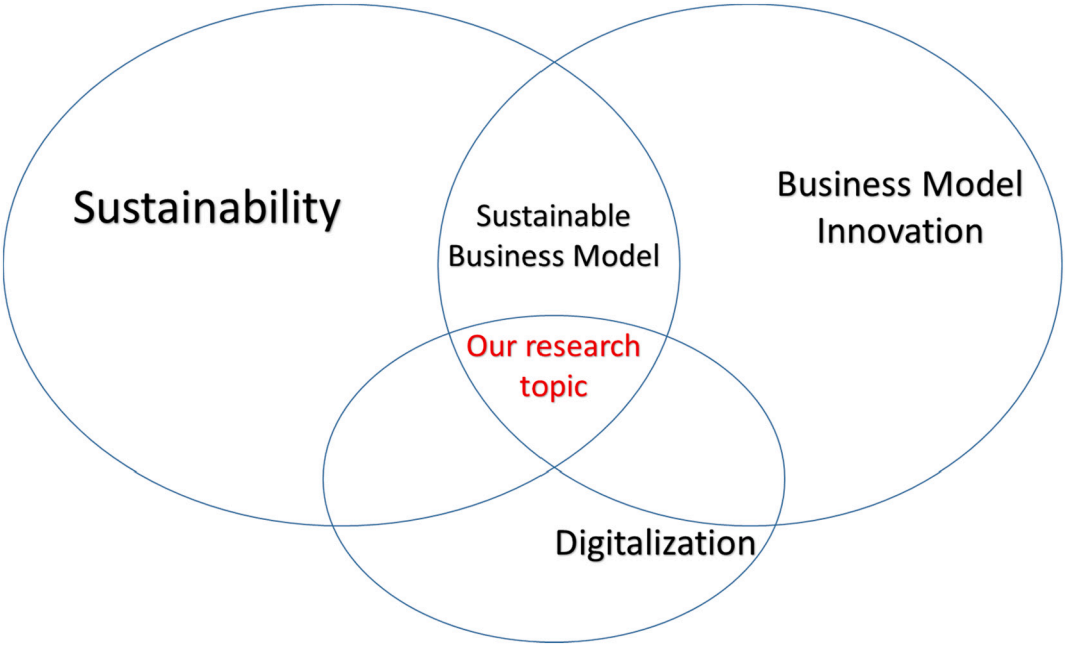

Fig. 2. The boundaries of our review.
Source: adaptation from Çetin et al. (2021).

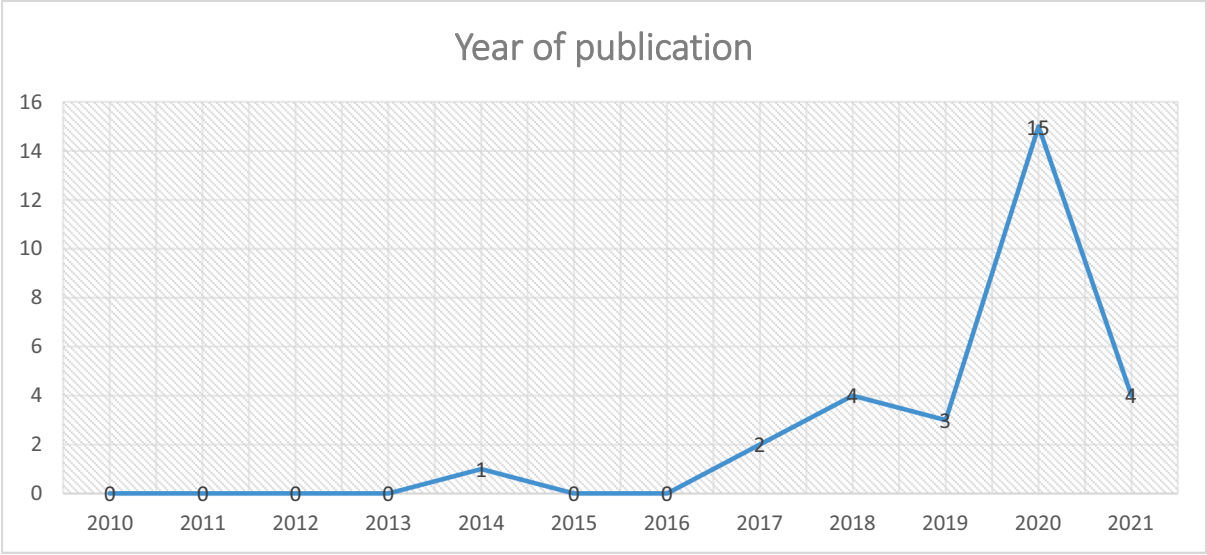

Fig. 3. A recent topic, appearing only in 2014.

the implementation of sustainable business models?", we found that the selected articles unanimously support the notion of digital tools as a helpful factor toward implementing SBMs. We find a distinction between the majority of papers claiming that digital tools enable the creation of SBMs (i.e., SBMs would not have appeared without digital tools) and papers that merely identify a favorable effect (i.e., digital tools contribute to the SBM while not being a central element for their implementation). Most studies presented these enabling effects (89.66 %), compared to a mere 10.34 % of papers that identified a favorable effect. Examples of favorable effects include Evans et al. (2017), who mention the role of simulations as a way of experimenting with SBMs, and Geissdoerfer et al. (2018), who evoke integration of technological innovation. In both articles, digital tools may contribute to SBMs; however, they are not at their core.

Moreover, this positive effect is documented for more traditional industries, as exemplified by Bohnsack et al. (2014) in their study on car manufacturing. They explore how the surge of electric vehicles is changing the business models (BMs) of major players in that industry, comparing the strategies of incumbents and newcomers. While the main technological innovation in this industry involves electrical motorization, digital tools convey new channels (i.e., online sales and car-sharing schemes). Additionally, Del Giudice et al.'s (2021) study—which focused on the ship–port industry—highlights how digitalization can increase long-term productivity. Digital tools are also implicit in Geissdoerfer et al.'s (2018) review of SBMs. After identifying different strategies for business model innovation, they mentioned possible strategies to achieve sustainability in these new BMs. For example, providing functionality or results to clients (instead of giving ownership to them), remanufacturing, and recycling. Even if authors do not evoke digital tools, these tools are implicit in their analysis, particularly when they

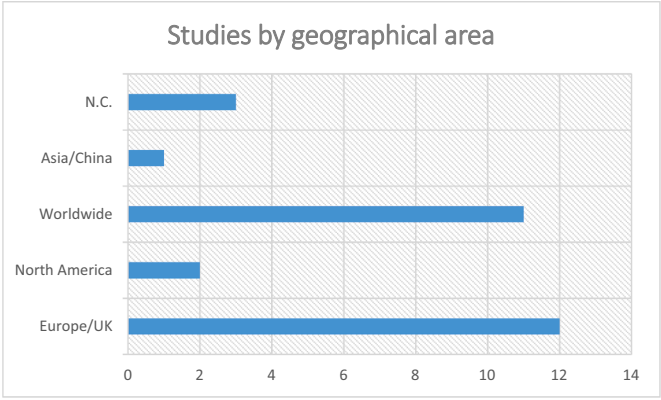

Fig. 4. Study concentrated in Europe/UK.

Table 3
Methodology used.

Methodology	Number of papers	Percentage
Case study	13	44.83 %
Literature review	9	31.03 %
Conceptualization	3	10.34 %
Survey	4	13.80 %
Total	29	100 %

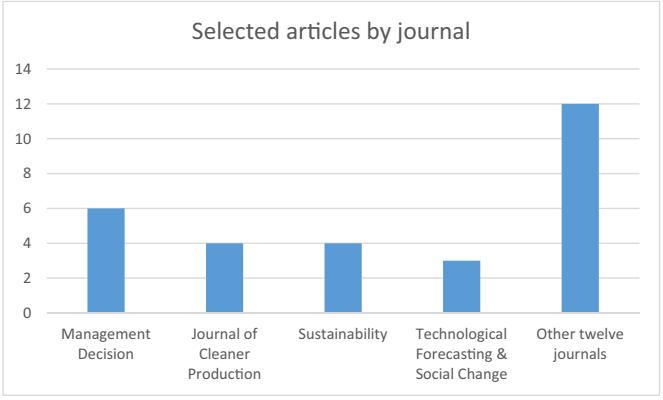

Fig. 5. Most articles concentrated in four journals.

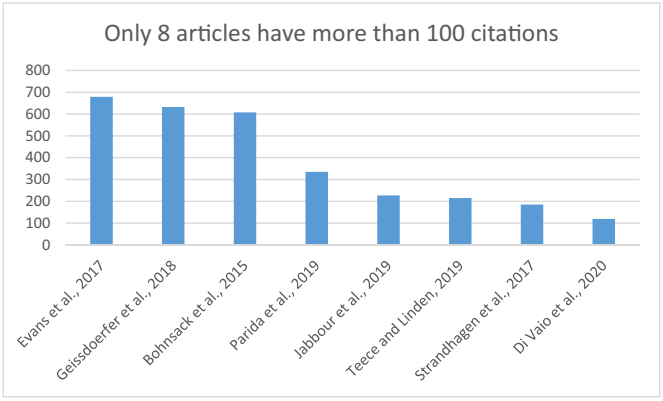

Fig. 6. Citations per paper.

mention a "design-implementation gap" (a challenge in implementing sustainability strategies) and the need to find tools to address these gaps.

Some studies have focused on the digital transformation in manufacturing. Strandhagen et al. (2017) explore the fourth industrial revolution (dubbed Industry 4.0) and its promise of higher efficiency owing to the use of digital technologies for both manufacturing and logistics. Similarly, Parida et al. (2019) claim that some industries embrace change, particularly by creating service business models enabled by digital tools and usually in collaboration with clients. This notion was further developed by Schiavone et al. (2022), who presented digital servitization and its impact on sustainable manufacturing. Lardo et al. (2020) assume a complementary approach by focusing on a service company that provides Internet-of-Things solutions to the industry, leading to "smart and sustainable business models." Li et al. (2020) present a case study of an industrial firm that uses "digital twins," a new technology that creates a virtual replica of an industrial process. Moreover, they explained how the company uses this technology to develop its SBM. Evans et al. (2017) emphasized the importance of this type of simulation for low-cost, low-risk testing, and improvement of SBMs. Moreover, they highlight the importance of a broader perspective, well beyond the boundaries of a single firm. Consequently, they advocate that these simulations include a larger network of stakeholders.

Some studies (Paiola et al., 2022; Strandhagen et al., 2017; Lardo et al., 2020; Li et al., 2020) are industry specific. Despite their focus, they are interesting, as they describe and illustrate digital tools in SBM in greater detail. Watanabe et al. (2018) studied the impact of digital technologies in the paper industry, focusing on Finland, one of the world's largest paper producers. On one hand, demand for printing paper has been diminishing in recent years, resulting in the decline of printed books and the replacement of letters by emails, among other factors. On the other hand, digital tools allow the optimization of operations, better logistics, and a closer relationship to industrial clients. The authors emphasize that the impact of digital technologies in that industry is not straightforward. While volumes may decrease, higher efficiency (thus, increased margin) may eventually compensate for lower volumes.

Fiorentino et al. (2020) presented an interesting case study on the use of digital tools to improve the operations of ENAV, the provider of air traffic systems in Italy. With these digital tools, ENAV could define more efficient routes, thus reducing fuel consumption and carbon dioxide emissions. This study presents how improvement in sustainability results may occur with the deployment and use of digital technologies without significant changes in tangible assets (i.e., aviation technology did not change). Annosi et al. (2020) elaborate on the relationship between digital technologies and SBMs in the agricultural sector, while Jocevski (2020) studies the interaction between digital and physical spaces in retailing. Two studies remain in the realm of energy efficiency. Loock (2020) explains how digital tools can address inefficiencies in the energy sector in Europe, while Hiteva and Foxon (2021) study how digital tools can contribute to creating social and environmental value in the UK energy sectors.

Some of these studies have focused on specific digital technologies, such as blockchain technology. Dal Mas et al. (2020a) favorably view blockchain, claiming that it enables SBMs by providing social proof among stakeholders, thus increasing their engagement and diminishing transaction costs. These authors describe the case of a start-up in the insurance sector using "smart contracts" based on blockchain technology to develop SBM. Another use of blockchain, in this case for the agri-food sector, was presented by Tiscini et al. (2020). In this case, the winery uses blockchain to improve traceability, improve customer management, and improve supply chain efficiency. In their study on fintech, Pizzi et al. (2021) also designate blockchain technology as an enabler tool, particularly for SMEs. Other studies, while not directly related to SBMs, have explored blockchain's promise in different supply chain contexts. For instance, Kamble et al. (2021) studied automotive

supply chains in India, Paul et al. (2021) studied tea supply chains in India, Bai et al. (2022) studied cocoa supply chains in Africa, and Kshetri (2021) studied developing countries. Furthermore, Saberi et al. (2019) analyzed barriers to adopting blockchain in the supply chain, and Friedman and Ormiston (2022) elaborated on the contributions of blockchain to sustainability in international food supply chains. Furthermore, some studies are related to the growing field of CE. Jabbour et al. (2019) used the ReSOLVE framework created by Ellen MacArthur Foundation (2015), which proposes several strategies, including digital technology support. For instance, "virtualize" replaces a physical product with a virtual equivalent. Simultaneously, the "loop" implies using digital tools for collaboration and coordination among stakeholders willing to reuse, remanufacture, or recycle. Similarly, Schwanholz and Leipold (2020) analyzed the BMs and practices of digital sharing platforms in German-speaking countries, identifying environmental and social interaction goals.

Similarly, Ranta et al. (2021), in their multi-case study of four companies in different industrial sectors, developed a typology of different BM types according to the degree of resource efficiency and value creation. Finally, Boons and Bocken (2018) focus on sharing practices, either uncompensated (e.g., Wikipedia) or compensated (e.g., Spotify). Authors suggest that these BMs can improve environmental performance as assets are used more efficiently than conventional ownership-based BMs (e.g., going to a launderette instead of a clothes washer or dryer).

Therefore, articles analyzed globally support the idea that digital technology contributes to SBM development, thereby, achieving profits while having a positive impact on both the planet and society. The aforementioned studies span various sectors, including manufacturing, agriculture, and services. All selected papers share comparable insights with diverse emphases and perspectives and draw from different contexts. Gregori and Holzmann (2020) provide one of the most encompassing perspectives on the relationship between digital tools and SBMs. The authors claim that digital technologies have an enabling role as their "unique properties…create digital affordances." That is, digital technologies would allow entrepreneurs to explore, test, and implement new BM models that promise higher environmental, social, and economic performance. Consequently, our first research question (*Does digitalization contribute to the implementation of sustainable business models?*) can be affirmatively answered. Furthermore, we identified areas that require further academic exploration, which can form the basis for future research. We describe these issues in this section and we provide a synthesis of them at the end of this paper (i.e., "future work/directions").

The selected papers explored a variety of research sites and industries; however, one can observe a bias toward trendy industries (e.g., digital platforms). There is comparatively less interest in traditional firms, with the exception of Watanabe et al. (2018). As the economy, and not only some industries, has to achieve sustainability, academic interest in conventional firms is warranted. Besides, such an exploration would be particularly interesting, as those traditional firms, compared to digital ones, face the dual challenge of digitalizing while they look for sustainability. Similarly, we also observe a bias toward large firms, as few studies focus on SMEs. This is problematic because the collective impact of SMEs on sustainability can be as important or even more important than that of larger firms.

The selected papers tended to have a generally positive view on digitalization, without considering trade-offs or problems created by digital tools. For instance, in our selection, three articles presented the benefits of blockchain, while overlooking its energy consumption, an issue addressed by a recent paper by Biswas et al. (2023). A nuanced, more balanced view on the promises of digitalization for sustainability is needed, as done in a few papers that do not explicitly use the SBM model. For instance, De Giovanni (2021) explored the promise of smart applications and artificial intelligence in supply chains, identifying tensions between customer orientation and environmental performance. He consequently develops the notion of "Responsible Digitalization," defined as "the firms' capability to achieve their CSR (Corporate Social Responsibility) goals by adopting digital technologies" (Cardinali and De Giovanni, 2022; p. 984). Hence, digital technologies can certainly improve economic performance; however, they should also aim to achieve social and environmental performance. Similarly, Noussan and Tagliapietra (2020), in their study of passenger transport in Europe, elaborated the possibility of "responsible" versus "selfish" digitalization, depending on whom digitalization benefits. Furthermore, in their study on the deployment of digital tools in Italy's airport industry, Di Vaio and Varriale (2020) highlighted that sustainability performance is not straightforward. These recent studies have the merit of proposing challenges in the path to digitalization for sustainability.

Some articles have highlighted challenges or difficulties in implementing new digital tools. For instance, Geissdoerfer et al. (2018) highlight the "design-implementation gap." Conversely, Gregori and Holzmann (2020) illustrate the tensions between global scalability (favored by digital tools) and the regional focus of some initiatives (i.e., local farming). Furthermore, Evans et al. (2017) claim that SBMs must consider the broader context of the firm, thus going beyond the boundaries of the company, a point shared by Boons and Bocken (2018). These articles are very useful as they highlight problems that must be addressed when implementing a digitalized SBM. Thus, we should welcome future studies that surpass triumphal descriptions of success stories on digitalized SBMs.

3.2. How digitalization impacts SBM implementation

We can now address the second question: *How does digital transformation relate to the SBM?* For this purpose, we analyzed the following: i) type of digital tools mobilized, ii) impacts of digitalization on different blocks of the SBM, and iii) different sustainability dimensions.

Focusing on the type of digitalization tool, we follow Felser et al. (2019) in distinguishing between information technology (IT) and operational technology (OT). IT is a set of tools with agility and flexibility features shaping data processing systems (e.g., IT, big data, cloud computing). Conversely, OT is a tool efficiently arranging information to support automation processing (e.g., robotics, 3D, augmented reality). In the selected articles, we observed a predominance of IT tools in SBM implementation (Table 4), particularly the use of tools, such as big data, platforms, and cloud computing. We may hypothesize that this reduced focus on OT tools relates to the incipient deployment of those technologies.

Furthermore, we explore which new opportunities originate from the digitalization of SBMs. For this review, we follow Osterwalder and Pigneur (2010), who identify nine blocks to illustrate, examine, and design business models: (1) customer segments, (2) value proposition, (3) channels, (4) customer relationships, (5) revenue streams, (6) key resources, (7) key activities, (8) key partnerships, and (9) cost structure. Following this classification, we identify new opportunities that, according to the literature, digitalization can bring to each SBM block (Table 5).

Table 4
Percentage of IT tools referenced in the sample papers.

	IT - Information technologies (Iot, big data, cloud computing)	OT - Operation technologies (robotics, 3D augmented reality, and virtual reality)	IT and OT	Not classifiable	Total
Number of papers	18	5	5	1	29
%	62.07 %	17.24 %	17.24 %	3.45 %	100 %

Table 5
Digitalization and the SBM blocks – main insights from selected papers.

Key partners	Key activities	Key resource	Cost structure	Value proposition	Customers segments	Customers relationship	Channels	Revenues flow
New online partners More opportunities to share among partners Ecosystem for creation improved Stakeholder engagement facilitated New investors Entrepreneurship democratized (lower barriers for entrepreneurs) Involvement by local authorities and prosumers facilitated	More efficient logistics Remanufacturing facilitated Reusing facilitated Recycling facilitated More automatized processes More efficient transactions	Use of in-store technology Resources easier to share Use of renewable resources and raw materials More efficient use of resources and capabilities Time reduction	Improved cost structure due more efficiency More R&D investments Lower costs per unit	Customized products and service Servitization Virtual and dematerialized products Sustainable and smart products New value propositions More information to customers Opportunities of value co-creation with consumers Potentially cheaper products Circular economy increase	New customer segments (for sustainable/ smart products) Surge of prosumers	Closer relationship Longer run relationship Opportunities for co-creation More legitimacy vis-à-vis consumers Asset sharing among clients Better grasp of customers' needs Relations based on social proof Higher social trust Fostering of good behaviors Relationship facilitated via platforms/apps Community building	Online sales Lower transaction costs Vertical integration facilitated More use of digital sales platforms Omni Channels strategies Shared infrastructure	New revenue streams due to servitization More stable revenues due to servitization More licensing

When analyzing the selected papers, we found that some blocks are mainly involved in the digital transformation process, leading to the integration of sustainability in the BMs. These blocks include key partnerships, activities, resources, channels, and customer relationships. We note that digitalization tools, particularly in the "key partners" block, allow for reaching new investors, thus opening the door to the creation of ecosystems and circular economy initiatives. Moreover, the involvement of local authorities and the surge in prosumers are two essential elements in integrating sustainability into BMs. In the "key activities" block, the importance of reusing, remanufacturing, and recycling, all of which are supported by the "key resources" used, is evident. Particularly, digitalization facilitates the use of renewable resources, raw materials, and saves time. Consequently, there is a change in cost structures, with increased operational efficiency and a need to invest more in R&D (Research & Development).

Additionally, when observing two blocks related to the process of value creation and value capture (i.e., "value proposition" and "customers' segments"), we find two new customer segments: i) customers requiring sustainable products, and ii) prosumers, both of which are sensitive to the new value propositions supported by the SBMs. Moreover, there is also an increase in long-run and closer business relationships, leading to resource sharing and co-creating processes, all of which are facilitated by digital platforms. Furthermore, these digital platforms have become unavoidable channels, useful in community building, sharing, communicating, and (re) creating a relationship between the firm and its customers. Digital platforms can be channels that relate to a changing revenue stream enriched by new flows that correspond to additional services.

All the papers analyzed, while using different approaches and investigating different contexts, acknowledge that digitalization helps i) share resources, ii) improve relationships and collaboration, iii) reuse, and iv) recycle. All these actions have a positive impact on the cost structure, efficiency, and the creation of new revenue flows, thus allowing for the integration of sustainability in the business model.

Finally, we analyzed specific opportunities arising from digitalization according to the three dimensions of sustainability (i.e., economic, environmental, and social dimensions) (Kleine and Von Hauff, 2009), as they were consistently mentioned in the selected papers.

The selected papers described opportunities for creating new SBMs or improving the performance of existing SBMs. Table 6 presents the particular opportunities identified for each dimension, namely, the economic, environmental, and social dimensions. In *environmental* dimensions, we identified classical elements of the circular economy (i.e., reuse, recycling, and remanufacturing). While these activities are not new and not necessarily digitally led, the selected papers emphasize the enabling or at least the favorable role of digital tools in the surge of the circular economy by facilitating exchanges among different stakeholders, thus making "circularity" easier to achieve.

Table 6
Digitalization and new opportunities for the SBM.

Environmental dimension	Social dimension	Economic dimension
Reuse	Stakeholder participation made easier	Cost reductions, as digital tools allow for sharing resources, reusing, and recycling
Recycling	Relation with local authorities facilitated	
Remanufacturing	Faster, more efficient collection of information, allows for more awareness of employees and client needs	Successful SBMs favor further investments in R&D
Shared assets	Democratization of entrepreneurship (lower barriers)	New revenue flows due to digital platforms and servitization
More efficient use of resources	Community building	

Considering the *social* dimension of sustainability, digital tools make involving stakeholders easier, thus committing them to the SBM improvement. For instance, digital tools favor community building, greater involvement from local authorities, the possibility of better understanding of employees' needs, and the democratization of entrepreneurship.

Digital transformation has also substantially changed the *economic* dimensions of SBM. Not only are there cost reductions owing to shared resources, reuse, and recycling, but there are also new or increased cash flows coming from new value propositions. Simultaneously, more investments in digitalization are frequently a condition for achieving these SBMs. Therefore, identifying a virtuous circle wherein investments in digitalization allow for cost reductions and increased cash flows is

possible, which would support further reinvestments in digital tools with time.

As with our first research question, we now identify some areas for future exploration; conversely, an integrated synthesis is presented at the end of this paper.

We found that the economic aspects of SBMs, compared to social and environmental issues, remain relatively less explored. This is notable because any business model must be economically sound. Considering the selected articles, we identified some economic elements for each SBM block (Table 5), together with opportunities in the economic dimension of the SBM (Table 6). However, the economic aspects of digitalized SBMs deserve further academic attention. In this paper, we attempt to move a step in that direction with our "closing the circle" (Fig. 7).

Some of the selected papers explore emerging practices, such as the circular and sharing economy. These practices have become more feasible through digital tools (Schwanholz and Leipold, 2020); however, these models may have existed without digital tools (Boons and Bocken, 2018). Thus, coordination among stakeholders in an SBM does not always need to be mediated by technology. One can see the increasing role of numerous stakeholders and their participation in these innovative practices. Consequently, the role of stakeholders in the deployment of digitalized SBMs constitutes a future area of exploration. A few of the selected studies explored stakeholders' viewpoints. This is also the case in Teece and Linden (2017) and Hiteva and Foxon (2021).

The selected papers aimed to consider digital tools as a whole, rarely focusing on specific tools and their impacts, with the exception of papers focusing on blockchain. Additionally, Table 4 presents relatively less involvement with operational technologies (OT), despite their promise for sustainable manufacturing. Thus, future studies should focus on the role of particular digital tools in SBMs, considering, the use of OT among others.

4. Discussion

Our first conclusion is that digitalization supports SBM implementation, thus creating positive effects for our society and planet. Additionally, from an economic viewpoint, digitalization tends to favor or enable operation optimization, especially in the supply chain, increasing efficiency in industrial processes, and even compensating for eventual volume decreases, as is the case for forest-based firms presented by Watanabe et al. (2018). Additionally, digital transformation can decrease transaction costs, as Dal Mas et al. (2020a) illustrated in the case of an insurance company based on blockchain technology. As digital tools are deployed, stakeholders' collaboration tend to be facilitated, sharing practices become more common, and the "re" policy (i.e., reuse, remanufacture, and recycle) becomes expected behavior in a community empowered by digital tools.

These positive effects have been identified in all selected papers for various industries. As expected, this positive relationship between digitalization and SBMs has been identified in sophisticated, technologically advanced contexts, such as Internet of Things services (Lardo et al., 2020), Industry 4.0 (Strandhagen et al., 2017), and "digital twins" for industrial innovation (Li et al., 2020). Perhaps, in a less expected way, a positive relationship has also been identified in more traditional activities, such as car manufacturing (Bohnsack et al., 2014), brick-and-mortar store sales (Jocevski, 2020), and wine production (Tiscini et al., 2020).

Our second set of conclusions refers to how digitalization relates to SBMs. After identifying the digital tools mobilized in the selected articles (Table 4), we explored the impact of these digital tools in the SBM. For this purpose, we referred to the nine building blocks proposed by Osterwalder and Pigneur (2010). This allows us to present a list of impacts, classified according to their respective building blocks (Table 5), thus providing a comprehensive perspective on the importance and promise of digital tools for SBMs. Furthermore, in Table 6, we identify opportunities that digitalization can bring to SBMs and present those opportunities according to their dimensions (i.e., environmental, social, or economic).

Furthermore, our results explain how digital tools support the transformation to sustainability, while impacting several blocks of SBM. Digitalization may enable improvements in the production process, facilitating cost savings (e.g., through end-to-end supply chain visibility, improved delivery accuracy, stock level optimization, and alignment with demand planning), as illustrated by Watanabe et al. (2018), in their study of forest-based firms. Boons and Bocken (2018), in their

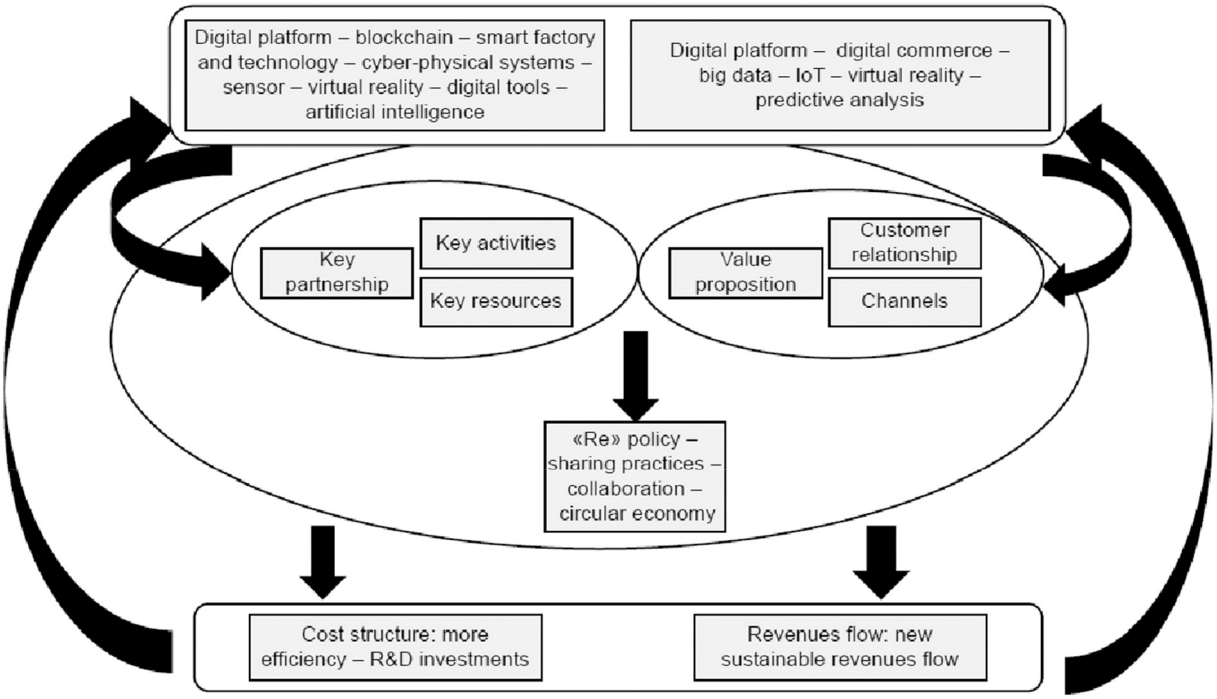

Fig. 7. Digital tools transform a conventional BM into an SBM: closing the circle.

exploration of the sharing economy, highlight the potential of these tools for better coordination among key partners. Additionally, surge in e-commerce has diminished the distance between the upstream and downstream parts of the supply chain. For instance, in their research on Logistics 4.0, Strandhagen et al. (2017) emphasized the possibility of becoming more transparent to customers, the opportunity to reduce waste in the supply chain, and facilitation of recycling, reuse, and remanufacturing. Concerning essential resources, Schwanholz and Leipold (2020), in their study on German-language online sharing platforms, illustrated how renewable resources are better used while time saving is achieved. Furthermore, digitalization supports organizations in disrupting incumbent value propositions by opening up new possibilities (e.g., co-creation, circular processes, and asset sharing), allowing collaborative business ecosystems (Brenner, 2018), and enriching key partnerships.

Our study proposes a conceptual framework that presents the richness and complexity of the relationship between digitalization and SBMs. Thus, our study differs from literature reviews in other fields. Geissdoerfer et al. (2018) studied SBM innovation but did not focus on the role of digital tools. Boons and Bocken (2018) explored innovation in sharing economy models, a subset of SBMs. While studying digital tools, they acknowledge that sharing economy models are not necessarily technology-driven. Parida et al. (2019) focused on industrial activities, leaving aside other sectors. Conversely, Annosi et al. (2020) concentrated on the agri-food industry. Di Vaio et al. (2020) do not focus on the SBM concept but instead focus on a specific SDG (sustainable development goal). While acknowledging the value of the above studies, our study develops a generalist perspective, considering all industrial sectors and the ensemble of digital tools.

Our research is original, as it explains how digitalization contributes to the integration of sustainability by i) highlighting the main digital tools impacting BM, ii) identifying the main blocks influenced by digitalization, iii) underlining resulting sustainability effects, and iv) highlighting the economic effects and related virtuous cycle that could be generated by systematic projects in digitalization aligned to the business strategy. Consequently, this study elaborates the role of digital tools and digitalization in converting *business models to sustainable business models*.

5. Theoretical and practical implications

Based on our study results, we propose an integrative model (Fig. 7), where we attempt to capture the complexity and recurrence of interactions between digitalization and SBM implementation. This figure illustrates the theoretical and practical implications of the study.

From a *theoretical perspective*, three points are worth mentioning.

Fig. 7 explains how digital tools influence BM blocks. Two sets of digital tools can then be distinguished. The upper left part of the figure includes tools that are more inside-oriented, pointing to the efficiency of internal processes in numerous cases. Numerous tools correspond to categories of information technology (IT) and operation technologies (OT) as shown in Table 4 (following Felser et al., 2019). These tools particularly influence the key partnerships, activities, and resource blocks of the SBM. Additionally, the upper-right part of the figure includes tools considered more client-oriented and several are classified as IT in Table 4, following Felser et al. (2019). These other tools directly influence value proposition, customer relationships, and channel blocks of SBM. While some overlap exists between both types of digital tools (i.e., those on the upper left- and upper-right parts of the figure), this typology distinguishes the different impacts of these tools, which mobilize different blocks of the SBM.

All these impacts lead to different innovative practices (Fig. 7): "Re" policies (reusing, remanufacturing, recycling), sharing, collaboration, and a circular economy. These practices create obvious positive environmental and societal impacts and consolidate the gradual implementation of solid SBMs. Finally, at the bottom of Fig. 7, one can see the economic translation to a changed cost structure (i.e., R&D investments and more efficiency) and a surge of revenues related to sustainability. This model highlights profound changes that the implementation of an SBM can have in both revenue flow and cost structure. There is an opportunity for a reinforcing, virtuous circle: investments in digitalization lead to an evolution toward an SBM, which consequently implies changes in revenue flows, thus allowing for further reinvestments and improvements.

Moreover, this study contributes to the small but rapidly growing body of work exploring the connection between digitalization and sustainability (Dubey et al., 2019; Bressanelli et al., 2018; Nobre and Tavares, 2017; Pagoropoulos et al., 2017). Our research focuses on key digitalization elements impacting the implementation of SBMs, aiming to further highlight the complex relationship between digitalization and sustainability. Moreover, the model proposed in Fig. 7 contributes to i) clarifying the potential virtuous cycle generated by digitalization, also highlighting the elements that play a relevant role in that process and ii) the required alignment of digital tools and key business factors to gain value for companies.

Hence, from a *managerial perspective*, four points are worth mentioning.

Our results suggest that merely investing in digitalization is not a magic bullet for achieving successful SBM. Fig. 7 demonstrates that digital transformation should be a rational and planned process, aiming to score consistently in all three dimensions of Table 6. Indeed, without a planned and balanced digitization project, in line with the main factors of a company's SBM, digitalization investments can be wasted without achieving improvements in economic, social, and environmental performance.

This virtuous circle is neither automatic nor straightforward, as firms may struggle to find appropriate technological solutions (Chesbrough, 2010) or overlook digitalization's human or social challenges (Nelson and Nelson, 2002). Indeed, as Teece and Linden (2017) remind us, a BM is successful not when it creates value but when at least a good part of it is captured. That is, sustainability is not only social and environmental but also economical.

Additionally, our study identifies the main potential impacts of digitalization for each block of SBM in Table 5. Conversely, Table 6 presents a list of the potential benefits that SBMs can bring in economic, social, and environmental impacts. Both tables provide valuable information to managers when they intend to implement SBMs using digital tools.

Fig. 7 presents the virtuous circle that may originate from the digitalization–sustainability iteration, thus raising awareness about the impact of digitalization investments on sustainability. This notion of a virtuous circle for investments can be relevant for companies hesitant to change their current business models, perhaps because of the necessary technological investments (Amit and Zott, 2001; Christensen and Raynor, 2003). That is, investments are not necessarily made in a one-shot effort. This idea of iterations between digitalization and impacts on sustainability is also consistent with the design thinking notion of advancing in small steps, thus learning-by-doing and experimenting with lower risk (Liedtka et al., 2017).

6. Conclusion, study limitations, and future work/directions

This literature review explored a collection of recent studies across different industries with diverse methodological approaches and concludes with two complementary findings. First, digitalization benefits the implementation of SBMs, with most papers proposing an enabling effect (i.e., digital transformation making SBMs possible). Thus, our review helps us answer the first research question: "*Does digital transformation contribute to the implementation of SBMs?*" in the affirmative.

Second, this review explores the specific ways wherein digital transformation relates to SBMs (the second research question). Our analysis of the selected articles allowed us to identify the most important impacts of digital tools on each building block of the SBM (Table 5).

Moreover, this analysis is complemented by a typology of opportunities that digitalization brings to SBMs (Table 6). Furthermore, we propose a comprehensive perspective on how digital tools transform a conventional business model into an SBM (Fig. 7). The key concept in this figure is the reinforcing effect that investments in digitalization may have on revenue flows, thus supporting further reinvestments in the future.

As is the case in any literature review, this study contains some limitations. Our search criteria may have excluded some relevant studies. For instance, studies have been published in languages other than English and in conference proceedings (i.e., unpublished papers). As our search criteria included papers published until 2021, relevant papers in 2022 have not been included. Nevertheless, we found some interesting papers dated to 2022, which were cited. Furthermore, our research focuses on crossroads between digitalization and SBMs (Fig. 2). This focus can exclude some interesting papers on digitalization and sustainability without a specific focus on the SBM concept. To partially address this limitation, we cited some of these studies.

For *future research*, our study identified areas for further exploration. We enumerate these here in the hope of helping fellow scholars:

Based on our selection of articles, we understand that academic discussion on the impact of digitalization on SBMs remains at an early stage and that more empirical data are needed before attempting major theoretical evolutions in the area. Moreover, further empirical studies in different industrial sectors, contexts, and locations are necessary.

Furthermore, empirical research tends to focus on Western European settings and, to a lesser extent, in North America, leaving the rest of the world relatively unexplored (Fig. 4). More research is required to explore how developing economies associate digitalization with sustainability.

Related to the aforementioned point, these studies have concentrated on developed countries with market economies. However, other institutional environments remain unexplored, as scholars of "varieties of capitalism" (Hall and Soskice, 2001) remind us. Otherwise, a liberal market economy has different institutional conditions compared to other economy types. Those less-explored economies, with other institutional conditions, may have other ways of implementing digitalization of SBMs. Thus, to engage with less explored institutional environments, such as state capitalism (Musacchio and Lazzarini, 2014), and Latin America's "hierarchical capitalism" (Schneider, 2013), future studies are necessary. For instance, Uzunca et al. (2018) compare the deployment of sharing economy firms in contrasting institutional environments (i.e., developed and emerging economies), explaining why the same firms perform differently in different institutional environments.

Extant studies still focus on "fashionable" industrial sectors or activities (e.g., fintech companies, electric vehicles, digital platforms). While the enthusiasm for these industries remains understandable, all industrial sectors must address the challenges of sustainability. Thus, studies on more conventional and traditional sectors for the paper industry, such as Watanabe et al. (2018), remain both necessary and welcome.

Few of the selected studies have focused on SMEs. Some of those exceptions were Pizzi et al. (2021), who studied how fintech firms can help SMEs adopt SBMs, and Dal Mas et al. (2020a), who studied a startup in the insurance sector. This scarce focus on SMEs could be related to selection bias toward large firms (Collinson and Rugman, 2010). This is problematic, as collective impact of SMEs on both social and environmental issues can be relevant. Thus, future studies should prioritize digitalization and SBMs in the SMEs context.

We only found success stories, that is, papers emphasizing the positive effects of digitalization on the implementation of SBMs. This lack of attention to cases of failure or partial success may suggest a publication bias that should be addressed in future studies. Otherwise, one learns from the failures.

There is little discussion on trade-offs, limitations, and problems related to digitalization in SBMs, that is, the "dark side" of digitalization (Trittin-Ulbrich et al., 2021). Instead, we perceive an optimistic, unwarranted hope that SBMs will simultaneously (perhaps effortlessly as well) develop satisfactory results in the three areas (i.e., economic, social, and environmental). An exception is Biswas et al.'s (2023) study on the use of blockchain in global supply chains, where they elaborate the tension between the positive outcomes of using that technology and its environmental impact (i.e., energy consumption). Another exception is Grigore et al. (2021), who highlight the shortcomings and limitations of digitalization in CSR practice, and Kaur et al. (2021), who highlight the risks of cyberstalking, reminding us that digitalization does not always have positive impacts. Thus, we believe that potentially negative impacts, trade-offs, and tensions should be further explored to moderate an optimistic extant perspective on digitalization and SBMs.

The impact of digitalization on the economic aspects of SBMs has been relatively less studied. As SBMs must be financially sound to be viable, higher focus on these economic aspects seems well advised. Our study attempts a step in this direction by considering cost structure and revenue flow of digitalization investments (Fig. 7). We hope that future studies will further highlight the economic dimensions of digitalization and SBMs (some of which are identified in Table 6).

While SBMs need to create value, to whom that value is distributed is also critical. This important issue of economic value distribution has rarely been addressed. An exception is Hiteva and Foxon (2021), who explore innovations in digital energy services and focus on the creation and distribution of economic value. As inequality remains an issue in most countries, further scholarly attention on how digitized SBMs distribute value seems justified.

Except for papers dealing with blockchain, papers in our selection considered digital tools collectively instead of analyzing specific tools in isolation, looking for their particular impact on SBM implementation. Therefore, learning more about how each digital tool affects specific SBM blocks would be useful.

Some studies acknowledge the role of several stakeholders in the digitalization of SBMs (e.g., Boons and Bocken (2018) in the sharing economy). However, most research tends to focus on a company and its managers, while the agency of stakeholders has rarely been explored. We contend that this is a promising area of research, as exemplified by recent discussion on the role of stakeholders and their foundational role in the firm (Alvarez and Sachs, 2022; Brown and Bylund, 2022), which we believe can be extended to the digitalization of the SBM.

Finally, all selected papers focus on the relationship between digitalization and sustainability. That is, digitalization leads to the implementation or improvement of SBM. For instance, Dal Mas et al. (2020a) presented the case of an insurance firm using blockchain to improve the sustainability of its business model. Future studies may explore a possible reciprocal relationship, that is, the possibility that sustainable business models reinforce digital transformation, a point we suggest in Fig. 7, as additional revenue from SBMs would support new investments in digitalization.

CRediT authorship contribution statement

Laura Broccardo: Conceptualization, Methodology, Writing – original draft. **Adrián Zicari:** Writing – review & editing, Visualization. **Fauzia Jabeen:** Validation, Writing – review & editing. **Zeeshan A. Bhatti:** Validation, Writing – review & editing.

Data availability

Data will be made available on request.

Appendix A. How each of the papers explains the impact of digitalization on SBMs

N	Authors	Digital tools	SBM blocks involved	Sustainability dimensions involved (environmental, social, or economic)
1	Bohnsack et al. (2014)	Internet (digital commerce)	Value proposition (sell or lease batteries separately) Revenue stream (lease cars instead of selling them)	Environmental and economic
2	Strandhagen et al. (2017)	Industry 4.0, including smart factory, cyber-physical systems, IoT	Key activities (more efficient logistics due to better/more timely information) Value proposition (servitization, customized products) Customer relation (closer and for a longer run) Cost structure (more resources shared) Revenue stream more stable, due to servitization	Environmental and economic
3	Evans et al. (2017)	Simulations for testing new SBMs	Customer proposition (servitization) Cost structure (life cycle)	Environmental, social and economic
4	Geissdoerfer et al. (2018)	Generic, no mention of specific digital tools. technological innovation as a challenge for BM innovation, Table 7, p. 408	Customer proposition (servitization) Key resources (renewables) Key activities (remanufacturing, reusing)	Environmental, social and economic
5	Watanabe et al. (2018)	Digital maps, GPS, online wood trade, drone helicopters, virtual reality	Key partners (online retailers) Key resources (better use of forests) Channels (online sales) Cost structure improved due to higher efficiency Customer proposition (new wood-based products)	Environmental, social and economic
6	Boons and Bocken (2018)	Digital tools in general	Key partners (users who share) Key resources, now shared. Different cost structure and revenue stream	Environmental, social and economic
7	Brenner (2018)	A broad set of tools: sensors, big data, AI, machine learning, digital platforms, mobility and cloud technology, decentralized manufacturing	New customer propositions Different customer relation (co-creation, asset sharing, servitization) Revenue streams related to service Key resources used more efficiently	Environmental, social and economic
8	Parida et al. (2019)	Industry 4.0, IoT, intensive data exchange and predictive analytics	Customer proposition (new offers) Customer relation (co-creation, better understanding of customers' expectations) Key activities (new capabilities) Channels (reduction of transaction costs) Resources shared Cost structure (higher efficiency) New or increased revenue streams	Environmental, social and economic
9	Teece and Linden (2017)	Internet	Key partners (ecosystem) Revenue stream, cost structure and customer relation (servitization) Resources (better use of current capabilities versus development of new ones) Revenue Streams (licensing) Channels (boundaries of the firm/vertical integration), selling via digital platforms	Only economic
10	Jabbour et al. (2019)	Big data	Circular economy Key partners: suppliers, customers and producers Activities: regenerate, share, optimize, loop. Resources are shared, reutilised, recycled New value propositions, e.g. virtualize/ dematerialize Customer relation on a longer run Different cost structure and revenue streams	Environmental, social and economic
11	Dal Mas et al. (2020b)	Blockchain	Key partners: stakeholder engagement Customer relation now based on social proof Channels (less transaction cost) Less unused resources Shared resources allow for democratization of entrepreneurship	Environmental, social and economic
12	Jocevski (2020)	E-commerce, mobile devices, in-store technology	Revised value proposition Revised key activities Channels (omnichannel strategies, brick and mortar) Resources, use of in-store technology Customer relation changed, as both digital and store channels are used	Only economic
13	Fiorentino et al. (2020)	Smart technologies for air traffic control	More efficient activities Better use of resources Customer proposition (more efficient flights)	Environmental and economic

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(*continued*)

N	Authors	Digital tools	SBM blocks involved	Sustainability dimensions involved (environmental, social, or economic)
14	Bican and Brem (2020)	Digital tools in general	Key activities are digitized Channels (conventional versus digital)	Environmental and economic
15	Biloslavo et al. (2020)	IIT, big data, AI, blockchain	Value proposition (a more sustainable product) Key partners (waste collectors) New key activities (recycle) Customer relation (legitimacy) Customer segment (clients buying sustainable products) Cost structure (need to invest in R&D)	Environmental and economic
16	Dal Mas et al. (2020a)	Blockchain	Customer relation (higher social trust, fostering of good behavior) Cost structure reduced Customer proposition (cheaper product, affordable for more people) Channel (less transaction costs)	Social and economic, no environmental impacts considered
17	Di Vaio et al. (2020)	Artificial intelligence	Better resource use Automatized activities Cost structure improved (higher efficiency)	Environmental, social and economic
18	Loock (2020)	Digital platform technologies, in electricity markets	Key partners (prosumers, new investors) New value proposition (prosumption) Resources (decentralized energy production) New customer relation, new Customer segment (prosumers) Channels (shared infrastructure and digital platform for coordination) Different cost structure and revenue stream	Environmental, social and economic
19	Schwanholz and Leipold (2020)	Digital sharing platforms	Key partners: peers who share Key resources, which are reused New value proposition New customer relation, mediated via the platform Different cost structure and revenue stream	Environmental, social and economic
20	Tiscini et al. (2020)	Blockchain, for ensuring traceability in agri-food supply chains	Key activities more efficient Value proposition (client informed about food traceability) Customer relation more efficient Channel (lower transaction costs, easier disintermediation) Higher cost structure, potentially higher revenue streams	Environmental and economic
21	Gregori and Holzmann (2020)	Digital tools in general	Value proposition (co-creation of value) Customer relation (community building) Resources (higher efficiency)	Environmental, social and economic
22	Tohanean et al. (2020)	Digital tools in general	Cost structure (investments in digital tools) Revenue streams (risk management)	Environmental, social and economic
23	Li et al. (2020)	Digital twin platforms	Value proposition (a more sustainable product, more customized) Customer relation (mass customization) Key resources (more efficiency) Reduce time consumed in design and production, meet customization needs, and help manage life cycle	Environmental, social and economic
24	Annosi et al. (2020)	Digital tools in general, as used in the agrifood industry (smart agriculture)	Resources (higher efficiency)	Environmental, social and economic
25	Lardo et al. (2020)	"Capabilities": smart technologies that support specific processes. These capabilities are sold as a service to industrial firms	Improved resource use Key activities (support reuse/remanufacturing) Cost structure (less front investment as "capabilities" bought as a service)	Environmental, social and economic
26	Ranta et al. (2021)	Digital tools in general, in the context of Industry 4.0	Key resources (easier use of renewable raw materials, higher efficiency) Cost structure and revenue stream improved, due to remanufactured products	Environmental and economic
27	Hiteva and Foxon (2021)	Peer-to-peer digital platforms, in the context of energy markets	Key actors: local authorities, prosumers Key resource: platform that supports a decentralized energy market Value proposition (greener energy) Customer relations: prosumers in a decentralized market Revenue stream and cost structure are different	Environmental, social and economic
28	Del Giudice et al. (2021)	Digitalization and new technologies for sustainable business models at the ship–port interface: a bibliometric analysis	Key resource: digitalization allows the use of clean energy and emission reduction	Environmental
29	Pizzi et al. (2021)	Fintech and SMEs sustainable business models: reflections and considerations for a circular economy	Key activities more efficient, specifically the blockchain	Environmental

Appendix B. List of journals, number of papers published and percentage to total

Journal	Papers number	Percentage
Management Decision	6	20,69 %
Journal of Cleaner Production	4	13,79 %
Sustainability	4	13,79 %
Technological Forecasting & Social Change	3	10,34 %
Research Policy	1	3,45 %
Advances in Manufacturing	1	3,45 %
Business Strategy and the Environment	1	3,45 %
Technology in Society	1	3,45 %
Maritime Policy & Management	1	3,45 %
Journal of Organizational design	1	3,45 %
Journal of Business Models	1	3,45 %
California Management Review	1	3,45 %
Journal of Business Research	1	3,45 %
Energy Research & Social Science	1	3,45 %
Amfiteatru Economic	1	3,45 %
Resources, Conservation & Recycling	1	3,45 %
Total	29	100 %

Appendix C. List of articles and number of citations for each article

Ranking	Article number	Year	Authors	Title	Number of citations (as of February 9, 2022)
1	3	2017	Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E.A. and Barlow, C.	Business Model Innovation for Sustainability: Toward a Unified Perspective for Creation of Sustainable Business Models.	679
2	4	2018	Geissdoerfer, M.Vladimirova, D. and Evans, S.	Sustainable business model innovation: a review	632
3	1	2014	Bohnsack, R., Pinkse, J. and Kolk, A.	Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles	608
4	8	2019	Parida,V., Sjodin, D. and Reim, W.	Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises	335
5	10	2019	Jabbour, C., de Sousa Jabbour, A., Sarkis, J. and Filho, M.	Unlocking the circular economy through new business models based on large-scale data: an integrative framework and research agenda	227
6	9	2019	Teece, D. and Linden, G.	Business models, value capture, and the digital enterprise	215
7	2	2017	Strandhagen, J. O., Vallandigham, L., Fragapane, G., Strahdhagen, J. W., Stangeland, A. and Sharma, N.	Logistics 4.0 and emerging sustainable business models	185
8	17	2020	Di Vaio, A., Palladino, R., Hassan, R. and Escobar, O.	Artificial intelligence and business models in the sustainable development goals perspective: a systematic business review	119
9	14	2020	Bican, P. and Brem, A.	Digital business model, digital transformation, digital entrepreneurship: is there a sustainable digital?	80
10	6	2018	Boons, F. and Bocken, N.	Toward a sharing economy - Innovating ecologies of business models	68
11	26	2021	Ranta, V., Aarikka-Stenroos, L. and Vaisanen, J.	Digital technologies catalyzing business model innovation for circular economy-Multiple case study	60
12	7	2018	Brenner, B.	Transformative sustainable business models in the light of the digital imperative — A global business economics perspective.	41
13	5	2018	Watanabe, C., Naveed, N. and Neittaanmäki, P.	Digital solutions transform the forest-based bioeconomy into a digital platform industry - A suggestion for a disruptive business model in the digital economy	37
14	21	2020	Gregori, P. and Holzmann, P.	Digital sustainable entrepreneurship: A business model perspective on embedding digital technologies for social and environmental value creation	34
15	29	2021	Pizzi, S., Corbo, L. and Caputo, A.	Fintech and SMEs sustainable business models: reflections and considerations for a circular economy	33
16	12	2020	Jocevski, M.	Blurring the lines between physical and digital spaces	28
17	23	2020	Li, X., Cao, J., Liu, Z. and Luo, X.	Sustainable Business Model Based on Digital Twin Platform Network: The Inspiration from Haier's Case Study in China.	27
18	20	2020	Tiscini, R., Testarmata, S., Ciaburri, M. and Ferrati, E.	The blockchain as a sustainable business model innovation	23
19	19	2020	Schwanholz, J. and Leipold, S.	Sharing for a circular economy? an analysis of digital sharing platforms' principles and business models	21
20	15	2020	Biloslavo, R., Bagnoli, C., Massaro, M. and Cosentino, A.	Business model transformation toward sustainability: the impact of legitimation	18
21	28	2021	Del Giudice, M., Di Vaio, A., Hassan, R., and Palladino, R.		17
21	16	2020	Dal Mas, F., Dicuonzo, G., Massaro, M. and Dell'Atti, V.	Smart contracts to enable sustainable business models. A case study	17
22	18	2020	Loock, M.	Unlocking the value of digitalization for the European energy transition: a typology of innovative business models	16
23	22	2020	Tohanean, D., Buzatu, A., Baba, C. and Georgescu, B.	Business model innovation through the use of digital technologies: managing risks and creating sustainability	15

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Ranking	Article number	Year	Authors	Title	Number of citations (as of February 9, 2022)
23	24	2020	Annosi, M., Brunetta, F., Capo, F. and Heideveld, L.	Digitalization in the agri-food industry: the relationship between technology and sustainable development.	15
24	13	2020	Fiorentino, R., Grimaldi, F., Lamboglia, R. and Merendino, A.	How smart technologies can support sustainable business models	13
24	25	2020	Lardo, A., Mancini, D., Paoloni, N. and Russo, G.	The perspective of capability providers in creating a sustainable I4.0 environment. Management Decision.	13
25	27	2021	Hiteva, R. and Foxon, T.	Beware the value gap: creating value for users and for the system through innovation in digital energy services business models	9
26	11	2020	Dal Mas, F., Massaro, M., Verde, J. and Cobianchi, L.	Can the blockchain lead to new sustainable business models?	8

Appendix D. Glossary of acronyms used in this paper

BM Business model
CE Circular economy
CSR Corporate Social Responsibility
ENAV Ente Nazionale Assistenza al Volo. Italian company.
IT Information technology
OT Operational technology
R&D Research & Development
ReSOLVE Regenerate, Share, Optimise, Loop, Virtualise, Exchange. Framework proposed by the Ellen MacArthur Foundation.
SBM Sustainable business model
SDG Sustainable development goals

References[2]

Alvarez, S., Sachs, S., 2022. Where do stakeholders come from? Acad. Manag. Rev. https://doi.org/10.5465/amr.2019.0077 (In print).

Amit, R., Zott, C., 2001. Value creation in e-business. Strateg. Manag. J. 22 (6–7), 493–520.

Amit, R., Zott, C., 2012. Creating value through business model innovation. Sloan Manag. Rev. 53 (2), 41–49.

*Annosi, M., Brunetta, F., Capo, F., Heideveld, L., 2020. Digitalization in the agri-food industry: the relationship between technology and sustainable development. Manag. Decis. 58 (8), 1737–1757.

Bai, C., Quayson, M., Sarkis, J., 2022. Analysis of Blockchain's enablers for improving sustainable supply chain transparency in Africa cocoa industry. J. Clean. Prod. 358, 131896.

*Bican, P., Brem, A., 2020. Digital business models, digital transformation, digital entrepreneurship: is there a sustainable "digital"? Sustainability. 12 (13), 5239.

*Biloslavo, R., Bagnoli, C., Massaro, M., Cosentino, A., 2020. Business model transformation toward sustainability: the impact of legitimation. Manag. Decis. 58 (8), 1643–1662.

Biswas, D., Jalali, H., Ansaripoor, A., De Giovanni, P., 2023. Traceability vs. sustainability in supply chains: the implications of blockchain. Eur. J. Oper. Res. 305 (1), 128–147.

Bocken, N., Short, S., Rana, P., Evans, S., 2013. A value mapping tool for sustainable business modelling. Corp. Gov. Int. J. Bus. Soc. 13 (5), 482–497.

Bocken, N., Short, S., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. J. Clean. Prod. 65, 42–56.

*Bohnsack, R., Pinkse, J., Kolk, A., 2014. Business models for sustainable technologies: exploring business model evolution in the case of electric vehicles. Res. Policy 43 (2), 284–300.

*Boons, F., Bocken, N., 2018. Towards a sharing economy - innovating ecologies of business models. Technol. Forecast. Soc. Change 137, 40–54.

*Brenner, B., 2018. Transformative sustainable business models in the light of the digital imperative - a global business economics perspective. Sustainability. 10 (12), 4428.

Bressanelli, G., Adrodegari, F., Perona, M., Saccani, N., 2018. Exploring how usage-focused business models enable circular economy through digital technologies. Sustainability. 10 (3), 639.

Broccardo, L., Zicari, A., 2020. Sustainability as a driver for value creation: a business model analysis of small and medium entreprises in the Italian wine sector. J. Clean. Prod. 259, 120852.

Brown, L., Bylund, P., 2022. Entrepreneurial choice as the genesis of stakeholder emergence. Acad. Manag. Rev. https://doi.org/10.5465/amr.2021.0503 (In print).

Cardinali, G., De Giovanni, P., 2022. Responsible digitalization through digital technologies and green practices. In: Corporate Social Responsibility and Environmental Management, pp. 1–12. https://doi.org/10.1002/csr.2249.

Cavélius, F., Endenich, C., Zicari, A., 2020. Back to basics or ready for take-off? The tensions on the role of management controllers in the digital age. Comptabilité-Contrôle-Audit. 26 (2), 87–121.

Çetin, S., De Wolf, C., Bocken, N., 2021. Circular digital built environment: an emerging framework. Sustainability. 13 (11), 6348.

Chauhan, C., Parida, V., Dhir, A., 2022. Linking circular economy and digitalisation technologies: a systematic literature review of past achievements and future promises. Technol. Forecast. Soc. Change 177, 12508.

Chesbrough, H., 2010. Business model innovation: opportunities and barriers. Long Range Plan. 43 (2–3), 354–363.

Christensen, C., Raynor, M., 2003. Why hard-nosed executives should care about management theory. Harv. Bus. Rev. 81 (9), 66–75.

Collinson, S., Rugman, A., 2010. Case implication biases in management research: the implications for international business studies. Eur. J. Int. Manag. 4 (5), 441–463.

Comuzzi, M., Pattel, A., 2016. How organisations leverage Big Data: a maturity model. Ind. Manag. Data Syst. 116 (8), 1468–1492.

Creswell, J., Creswell, J., 2017. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage, Newbury Park.

*Dal Mas, F., Dicuonzo, G., Massaro, M., Dell'Atti, V., 2020a. Smart contracts to enable sustainable business models. A case study. Manag. Decis. 58 (8), 1601–1619.

*Dal Mas, F., Massaro, M., Verde, J., Cobianchi, L., 2020b. Can the blockchain lead to new sustainable business models? J. Bus. Models 8 (2), 31–38.

De Giovanni, P., 2021. Smart supply chains with vendor managed inventory, coordination, and environmental performance. Eur. J. Oper. Res. 292, 515–531.

*Del Giudice, M., Di Vaio, A., Hassan, R., Palladino, R., 2021. Digitalization and new technologies for sustainable business models at the ship–port interface: a bibliometric analysis. Marit. Policy Manag. https://doi.org/10.1080/03088839.2021.1903600.

*Di Vaio, A., Varriale, L., 2020. Blockchain technology in supply chain management for sustainable performance: evidence from the airport industry. Int. J. Inf. Manag. 52, 102014.

Di Vaio, A., Palladino, R., Hassan, R., Escobar, O., 2020. Artificial intelligence and business models in the sustainable development goals perspective: a systematic literature review. J. Bus. Res. 121, 283–314.

Dubey, R., Gunasekaran, A., Childe, S., Papadopoulos, T., Luo, Z., Wamba, S., Roubaud, D., 2019. Can big data and predictive analytics improve social and environmental sustainability? Technol. Forecast. Soc. Chang. 144, 534–545.

Easterby-Smith, M., Thorpe, R., Jackson, P., 2015. Management and Business Research, 5th ed. Sage, London.

Ellen MacArthur Foundation, 2015. Delivering the circular economy a toolkit for policymakers. available at. https://ellenmacarthurfoundation.org/a-toolkit-for-policymakers. (Accessed 25 October 2021).

Ellen MacArthur Foundation, 2022. Glossary. Available at. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/glossary. (Accessed 16 February 2022).

[2] (*) Papers included in the present literature review.

*Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E., Barlow, C., 2017. Business model innovation for sustainability: towards a unified perspective for creation of sustainable business models. Bus. Strateg. Environ. 26, 597–608.
Felser, M., Rentschler, M., Kleineberg, O., 2019. Coexistence standardization of operation technology and information technology. Proc. IEEE 107 (6), 962–976. https://doi.org/10.1109/JPROC.2019.2901314.
*Fiorentino, R., Grimaldi, F., Lamboglia, R., Merendino, A., 2020. How smart technologies can support sustainable business models: insights from an air navigation service provider. Manag. Decis. 58 (8), 1715–1736.
Friedman, N., Ormiston, J., 2022. Blockchain as a sustainability-oriented innovation? Opportunities for and resistance to Bolckchain technology as a driver of sustainability in global food supply chains. Technol. Forecast. Soc. Change 175, 121403.
Geissdoerfer, M., Savaget, P., Bocken, N., Hultink, E., 2017. The Circular Economy – a new sustainability paradigm? J. Clean. Prod. 143, 757–768.
*Geissdoerfer, M., Vladimirova, D., Evans, S., 2018. Sustainable business model innovation: a review. J. Clean. Prod. 198, 401–416.
*Gregori, P., Holzmann, P., 2020. Digital sustainable entrepreneurship: a business model perspective on embedding digital technologies for social and environmental value creation. J. Clean. Prod. 272, 122817.
Grigore, G., Molesworth, M., Miles, C., Glozer, S., 2021. (Un)resolving digital technology paradoxes through the rhetoric of balance. Organization. 28 (1), 186–207.
Hall, P., Soskice, D., 2001. Varieties of Capitalism. Oxford University Press, Oxford.
*Hiteva, R., Foxon, T., 2021. Beware the value gap: creating value for users and for the system through innovation in digital energy services business models. Technol. Forecast. Soc. Change 166, 120525.
IBM, 2016. Extracting business value from the 4 V's of big data. available at. https://www.ibmbigdatahub.com. (Accessed 17 April 2019).
*Jabbour, C., de Sousa Jabbour, A., Sarkis, J., Filho, M., 2019. Unlocking the circular economy through new business models base on large-scale data: an integrative framework and research agenda. Technol. Forecast. Soc. Chang. 144, 546–552.
Jelinek, M., Bergey, P., 2013. Innovation as the strategic driver of sustainability: big data knowledge for profit and survival. IEEE Eng. Manag. Rev. 41 (2), 14–22.
*Jocevski, M., 2020. Blurring the lines between physical and digital spaces: business model innovation in retailing. Calif. Manag. Rev. 63 (1), 99–117.
Kamble, S., Gunasekaran, A., Subramanian, N., Ghadge, A., Belhadi, A., Venkatesh, M., 2021. Blockchain technology's impact on supply chain integration and sustainable supply chain performance: evidence from the automotive industry. Ann. Oper. Res. https://doi.org/10.1007/s10479-021-04129-6.
Kaur, P., Dhir, A., Tandon, A., Alzeiby, E., Abohassan, A., 2021. A systematic literature review on cyberstalking. An analysis of past achievements and future promises. Technol. Forecast. Soc. Change 163, 120426.
Khan, A., Krishnan, S., Dhir, A., 2021. Electronic government and corruption: systematic literature review, framework, and agenda for future research. Technol. Forecast. Soc. Change 167, 120737.
Kleine, A., Von Hauff, M., 2009. Sustainability-driven implementation of corporate social responsibility: application of the integrative sustainability triangle. J. Bus. Ethics 85 (3), 517–533.
Kramer, M., Porter, M., 2011. Creating shared value. Harv. Bus. Rev. 89 (1–2), 62–77.
Kshetri, N., 2021. Blockchain and sustainable supply chain management in developing countries. Int. J. Inf. Manag. 60, 102376.
*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.
*Li, X., Cao, J., Liu, Z., Luo, X., 2020. Sustainable business model based on digital twin platform network: the inspiration from Haier's case study in China. Sustainability. 12 (3), 936.
Liedtka, J., Salzman, R., Azer, D., 2017. Design Thinking for the Greater Good. Columbia Business School Publishing, New York.
*Loock, M., 2020. Unlocking the value of digitalization for the European energy transition: a typology of innovative business models. Energy Res. Soc. Sci. 69, 101740.
Lüdeke-Freund, F., Dembek, K., 2017. Sustainable business model research and practice: emerging field or passing fancy? J. Clean. Prod. 168, 1668–1678.
Mauro, S., Cinquini, L., Grossi, G., 2017. Insights into performance-based budgeting in the public sector: a literature review and a research agenda. Public Manag. Rev. 19 (7), 911–931.
Musacchio, A., Lazzarini, S.G., 2014. Reinventing State Capitalism. Harvard University Press, Boston.
Nelson, R., Nelson, K., 2002. Technology, institutions, and innovation systems. Res. Policy 31 (2), 265–272.
Nidumolu, R., Prahalad, C., Rangaswami, M., 2009. Why sustainability is now the key driver of innovation. Harv. Bus. Rev. 87 (9), 56–64.
Nobre, G., Tavares, E., 2017. Scientific literature analysis on big data and internet of things applications on circular economy: a bibliometric study. Scientometrics. 111 (1), 463–492.
Noussan, M., Tagliapietra, S., 2020. The effect of digitalization in the energy consumption of passenger transport: an analysis of future scenarios for Europe. J. Clean. Prod. 258, 120926.
Osterwalder, A., Pigneur, Y., 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons, Hoboken.
Pagoropoulos, A., Pigosso, D., McAloone, T., 2017. The emergent role of digital technologies in the Circular Economy: a review. Proc. CIRP 64, 19–24.
Paiola, M., Khvatova, T., Schiavone, F., Jabeen, F., 2022. Paths toward advanced service-oriented business models: a configurational analysis of small- and medium-sized incumbent manufacturers. Technol. Forecast. Soc. Chang. https://doi.org/10.1016/j.techfore.2022.121774.
*Parida, V., Sjodin, D., Reim, W., 2019. Reviewing literature on digitalization, business model innovation, and sustainable industry: past achievements and future promises. Sustainability. 11 (2), 391.
Paul, T., Mondal, S., Islam, N., Rakshit, S., 2021. The impact of blockchain technology on the tea supply chain and its sustainable performance. Technol. Forecast. Soc. Change 173, 121163.
*Pizzi, S., Corbo, L., Caputo, A., 2021. Fintech and SMEs sustainable business models: reflections and considerations for a circular economy. J. Clean. Prod. 281, 125217.
Podsakoff, P., MacKenzie, S., Lee, J., Podsakoff, N., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88 (5), 879–903.
*Ranta, V., Aarikka-Stenroos, L., Vaisanen, J., 2021. Digital technologies catalyzing business model innovation for circular economy - multiple case study. Resour. Conserv. Recycl. 164, 105155.
Rashid, A., Asif, F., Krajnik, P., Nicolescu, C., 2013. Resource conservative manufacturing: an essential change in business and technology paradigm for sustainable manufacturing. J. Clean. Prod. 57, 166–177.
Ross, J., Beath, C., Sebastian, I., 2017. Digitized and digital. MIT CISR Res. Brief. 18 (10), 1–3.
Saberi, S., Kouhizadeh, M., Sarkis, J., Shen, L., 2019. Blockchain technology and its relationship to sustainable supply chain management. Int. J. Prod. Res. 57 (7), 2117–2135.
Schaltegger, S., Hansen, E., Lüdeke-Freund, F., 2016. Business models for sustainability: origins, present research, and future avenues. Organ. Environ. 29 (1), 3–10.
Schiavone, F., Leone, D., Caporuschio, A., Lan, S., 2022. Digital servitization and new sustainable configurations of manufacturing systems. Technol. Forecast. Soc. Change 176, 121441.
Schneider, B.R., 2013. Hierarchical Capitalism in Latin America. Cambridge University Press, Cambridge.
*Schwanholz, J., Leipold, S., 2020. Sharing for a circular economy? an analysis of digital sharing platforms principles and business models. J. Clean. Prod. 269, 122327.
Sommer, A., 2012. Managing Green Business Model Transformations. Springer Science & Business Media, Berlin.
Song, Z., Moon, Y., 2017. Assessing sustainability benefits of cyber manufacturing systems. Int. J. Adv. Manuf. Technol. 90 (5–8), 1365–1382.
*Strandhagen, J., Vallandigham, L., Fragapane, G., Strahdhagen, J., Stangeland, A., Sharma, N., 2017. Logistics 4.0 and emerging sustainable business models. Adv. Manuf. 5, 359–369.
Stubbs, W., Cocklin, C., 2008. Conceptualizing a "sustainability business model". Organ. Environ. 21 (2), 103–127.
*Teece, D., Linden, G., 2017. Business models, value capture, and the digital enterprise. J. Org. Des. 6 (8) https://doi.org/10.1186/s41469-017-0018-x.
*Tiscini, R., Testarmata, S., Ciaburri, M., Ferrati, E., 2020. The blockchain as a sustainable business model innovation. Manag. Decis. 58 (8), 1621–1642.
*Tohanean, D., Buzatu, A., Baba, C., Georgescu, B., 2020. Business model innovation through the use of digital technologies: managing risks and creating sustainability. Amfiteatru Econ. 22 (55), 758–774.
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.
Trittin-Ulbrich, H., Scherer, A., Munro, I., Whelan, G., 2021. Exploring the dark and the unexpected sides of digitalization: towards a critical agenda. Organization. 28 (1), 8–25.
Uzunca, B., Rigtering, C., Ozcan, P., 2018. Sharing and shaping: a cross-country comparison of how sharing economy firms shape their institutional environment to gain legitimacy. Acad. Manag. Discov. 4 (3) https://doi.org/10.5465/amd.2016.0153.
*Watanabe, C., Naveed, N., Neittaanmäki, P., 2018. Digital solutions transform the forest-based bioeconomy into a digital platform industry - a suggestion for a disruptive business model in the digital economy. Technol. Soc. 54, 168–188.
Wells, P., 2013. Business Models for Sustainability. Edward Elgar Publishing, Cheltenham.
Wu, Y., Schuster, M., Chen, Z., Le, Q., Norouzi, M., Macherey, W., Krikun, M., Cao, Y., Gao, Q., Macherey, K., Klingner, J., 2016. Google's neural machine translation system: bridging the gap between human and machine translation. arXiv preprint. https://doi.org/10.48550/arXiv.1609.08144 (arXiv:1609.08144).
Xu, R., Zhang, L., Zhao, H., Peng, Y., 2017. Design of network media's digital rights management scheme based on blockchain technology. In: 2017 IEEE 13th International Symposium on Autonomous Decentralized Systems (ISADS), pp. 128–133.

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