Information Systems and e-Business Management
https://doi.org/10.1007/s10257-024-00677-z

ORIGINAL ARTICLE

Back to a resilient future: Digital technologies for a sustainable supply chain

Stephanie Winkelmann[1,2] · **Rajae Guennoun**[1,3] · **Frederik Möller**[2,4] · **Thorsten Schoormann**[2,4] · **Hendrik van der Valk**[1]

Received: 28 June 2023 / Revised: 5 March 2024 / Accepted: 11 March 2024

Abstract
Economic, political, and societal pressure forces companies to act more sustainably. New legislation and regulation such as the Supply Chain Act, mandates companies to take responsibility for their actions as well as those of their supply chain collaborators. Meeting these requirements demands transparency. Digital technologies along the supply chain have the potential to collect diverse types of data and raise awareness for sustainability purposes. For example, data obtained from multiple supply chain participants can be used to estimate CO_2 emissions or optimize resource utilization. Following guidelines for systematically reviewing a body of literature, this paper therefore investigates the distribution of digital technologies in supply chains for sustainability. Based on a collected corpus of 70 articles, we identify seven key digital technologies and indicate how they can be employed to contribute to economic, environmental, and social sustainability. The results show that (1) blockchain is the most used technology for sustainability within the supply chain and (2) the majority of articles on digital technologies in our corpus address the social dimension of sustainability. Our findings advance the understanding of how digitalization can transform supply chains into more sustainable entities and help practitioners decide which technology fits a certain sustainability dimension.

Keywords Sustainability · Technology · Supply chain · Logistics

1 Introduction

In 2015, the United Nations (2015) presented the 2030 Agenda, proposing a set of 17 Sustainable Development Goals (SDGs) to create a better world. While this has emphasized the issue of *sustainable development* in society and organizations, the term has been defined far earlier as the "development that meets the needs of the present without compromising the ability of future generations to meet their own

Extended author information available on the last page of the article

needs" (Brundtland et al. 1987, p. 41). The idea of sustainability pressures individuals and institutions considering how to materialize and implement sustainable action. An example is the *German Supply Chain Act* starting on the 1st of January 2024. It mandates Germany-based companies with 1.000 employees or more to implement monitoring mechanisms to prevent environmental damage and human rights violations in supply chains (Federal Government Germany 2021). Companies under German jurisdiction must act and enforce sustainable behavior because they are responsible for all actions along the supply chain (e.g., preventing working with suppliers using child labor), meaning their suppliers and service providers. In a recent article for the German newspaper *Tagesspiegel*, the car manufacturer BMW came under pressure for arguably sourcing valuable resources from a Morrocan mine that supposedly poses health risks for the workers and damages the environment (Blum et al. 2023). This notion of extended accountability throughout the supply chain requires adequate (digital) tools to monitor and ensure compliance with sustainable goals and laws. As an illustration of this, the industry-driven research consortium *Catena-X Automotive Network* aims to establish a global circular economy by generating holistic data for participants and beyond the borders of local data availability through implementing a novel digital technology called *data space* (Catena-X Automotive Network 2023). The data continuity between service providers, suppliers, and OEMs can build accurate representations of goods, and, for instance, their CO_2 emissions. This can be used to achieve sustainability, such as the optimal use of resources or the reduction of bottlenecks (Catena-X Automotive Network 2023).

Sustainable supply chain management (SSCM) is an approach addressing the issues of achieving economic, environmental, and social goals in coordinating interorganizational processes within the supply chain to improve long-term performance (Carter and Rogers 2008). Reaching these goals requires integrating digital technologies throughout supply chains to collect and share diverse data sets with the aim of optimizing processes, such as coordination (Jussen et al. 2024; Sachs et al. 2019). Integrating and enabling these technologies for *good* could catalyze the pursuit of reaching the SDGs more efficiently (Holzinger et al. 2021; Nishant et al. 2020; Schoormann et al. 2023; Wu et al. 2018). Consider, for instance, the digital technology *blockchain*, which can impact the sustainability of supply chains by generating immutable data to address social conditions, including preventing corruption and fraud (Saberi et al. 2019). Similarly, Yew et al. (2020) show the potential for blockchain in food supply chains by enhancing traceability, trust, and responsibility. On the other hand, digital technologies not only have advantages but also have a *dark side*. For example, some of them, such as the blockchain, require extreme amounts of energy (Moorthy et al. 2022; Veit and Thatcher 2023). Despite this balancing act, Watson et al. (2021) identified technology as a proven tool for sustainable development.

The impact of digital technologies on SSCM has been broadly discussed in academia and practice, mainly focusing on the application and analysis of a single technology. We aim to contribute to the body of research by collecting a comprehensive literature corpus demonstrating the use of digital technologies in supply chains for sustainability purposes. Doing this is necessary to assess the current state of research in this emerging and quickly changing area as well as find blind spots and dominant technologies for future research. Given the potential of digital technologies and calls for the Information Systems (IS) domain to focus on sustainability (Gholami et al. 2016), we pursue the following two research questions:

> What digital technologies are investigated in research on sustainable supply chains (RQ1), and which sustainability dimensions are addressed (RQ2)?

To answer these questions, we conducted an exploratory analysis of the SSCM area in the form of a systematic literature review. By extracting technologies for sustainability in supply chains, we make several contributions: **(1)** a numeric overview of digital technologies used for SSCM and their potential for sustainability, **(2)** dominant digital technologies and white spots, as well as **(3)** opportunities for future research. Exploring and streamlining academic discourse can be fertile soil for future investigation of practical cases complementing our work.

We structured our paper as follows: First, we start by introducing the fundamental concepts of sustainable supply chains and briefly summarizing related literature on the role of digital technologies (Sect. 2). Following the research method of literature reviews (Sect. 3), we present our main outcomes, namely the positive sustainability effects of technologies on SSCM (Sect. 4). Lastly, we analyze and discuss the implications for the theory and practice of our work (Sect. 5) as well as conclude (Sect. 6).

2 Sustainable supply chain management

The growing interest in becoming more responsible and sustainable increases the pressure on companies and their supply chains. Various factors, including changes in customer expectations and new government legislation, lead to new challenges concerning the implementation and management of those chains. In addition to the economic obligations, SSCM builds upon the *Triple Bottom Line principle* (Elkington 1998) and seeks to consider environmental and social goals. Due to its importance, prior research has already investigated various areas of SSCM and their underpinning technologies (see Table 1). In the following, we summarize the discourse on SSCM at the intersection of digital technologies.

Tronnebati and Jawab (2020) identify similarities and differences between green supply chain management (GSCM) and SSCM. Their analysis illustrates that GSCM concentrates on environmental, flow, and stakeholder factors. SSCM goes beyond this and considers economic and social issues as well, and they argue that SSCM is an extension of GSCM. They conclude that future studies should analyze sustainable development in supply chain management. Similarly, Samah et al. (2022) examine various definitions and practices of SSCM and argue that research primarily accounts for the two dimensions, "economic" and "environmental". As a result, they call for engaging the social dimension of SSCM with more intensity and point to the lack of insights concerning the impact of SSCM on sustainable performance. Soni and Yadav (2022) concentrate on megatrends,

Table 1 Illustrative related studies

Keywords/streams	Examples
"Digital technology" and "sustainability" and "supply chain"	Maha and Akram (2022) investigate available literature focusing on the adaption of digital technologies in the supply chain by analyzing different aspects, for example, the distribution of papers by countries or journals Peng et al. (2021) analyze the current literature and present a framework with technology's capabilities supporting sustainability development Müller (2022) proposes an overview of supply chain trends and present technological transformation processes
"Digital technology" and "supply chain"	Albrecht et al. (2023) analyze available literature and develop a catalog of ten digital technology affordances in logistics Kabra et al. (2023) identify five main barriers with several sub-barriers that occur when implementing information or digital technologies in humanitarian supply chain management
"Digital technology" and "sustainability"	Böttcher et al. (2023) identify archetypes of digital sustainable business models that use digital technologies Holzmann and Gregori (2023) investigate the role of business models for merging sustainability and digital technologies as such actors Sharma et al. (2022) introduce a framework that contains digital technologies and their roles in enabling the achievement of the European Green Deal policies as well as barriers to their implementation
"Sustainability" and "supply chain"	Tirkolaee and Aydin (2022) introduce a decision support system to optimize a sustainable Supply Chain (SC) for perishable products Ângelo et al. (2020) investigate home health care and propose an approach to identify potential patients and collect their samples by using routing systems and the Internet of Things

challenges, and limitations in SSCM. They underline the value of implementing SSCM in business to enable themselves to comprehend the social, environmental, and economic impact on their suppliers and customers.

To implement and manage SSCM, digital technologies such as visualization techniques or Artificial Intelligence (AI) have gained importance because of their abilities and great potential for economic and societal goals (e.g., Schoormann et al. 2023). They correspond to digitized techniques, instruments, and systems that enable people to store, process, and circulate data and promote digital innovation (Baier et al. 2023; Yoo et al. 2012). Yoo et al. (2010, p. 4) specify three unique characteristics: "(1) the re-programmability, (2) the homogenization of data, and (3) the self-referential nature of digital technology." They state that digital technologies, unlike analog ones, are reprogrammable to perform different functions. Data homogenization is created by mapping each analog signal into a series of binary numbers. Not only can all digital content be stored on the same digital devices, but it can also be combined with other digital data. The homogenization of data and the emergence of new media thus separate the content from the medium. Last, self-reference means that digital innovation requires the use of digital technology.

Müller (2022) provides an overview of recent and future trends in supply chain design, giving four examples of technological transformation processes that drive a new form of supply chain management: (1) Advanced manufacturing technologies, (2) data-driven technologies in logistics and supply chain management, (3) the electrification of vehicles, and (4) microchip and semiconductor manufacturing. Peng et al. (2021) address IT-enabled sustainability-oriented innovation by conducting a literature review. They propose a conceptual framework that illustrates the capabilities of technology to enable the development of sustainability-oriented innovation. They argue that organizations should view technologies as a capability to enable sustainability in their business. Based on this paper, Peng et al. (2022) report on a case study to explore the capabilities within organizations. Their results show that technology affordances are influenced by organizational capability as well as sustainability orientation. Thus, analyzing digital technologies' capabilities and implementing them sustainably is essential. Maha and Akram (2022) investigate the adoption of digital technologies in the supply chain. They have reviewed the current literature and argue that there is a lack of research concerning the adaption of digital technologies to enhance sustainable supply chains. Within the study, they analyzed the distribution of papers by countries, journals, type of digital technology, industrial area of research, and methodology. They identify seven technologies used for a sustainable supply chain, such as blockchain, the Internet of Things, and information and communication technologies. They highlight the adoption of digital technologies as a significant aspect missing in the analyzed paper. Their results show that most articles are limited through a restricted scope of study and the relation to a specific domain.

The related studies highlight the relevance of research at the intersection of digital technologies, sustainability, and SSCM. Combining digital technologies and supply chain management is crucial to achieving sustainability throughout the supply chain (Müller 2022; Soni and Yadav 2022). Digital technologies can drive such a new form of supply chain management. Although much work has been done, many articles call for investigating the adoption of digital technologies without focusing on a specific domain. A systematic literature review improves our understanding of how digital technologies can be used in SSCM.

3 Research design

To identify suitable literature on digital technologies for SSCM, we conducted a systematic literature review based on vom Brocke et al. (2015) and Webster and Watson (2002) (see Fig. 1). As the first step, we defined a search string according to the objectives of our paper's goals. In our search, we combined the term *sustainability* with keywords to specify our field of investigation: *logistics*, *supply chain, technology*, *digitalization,* and *digitization*.

The resulting search strings (i.e., combinations of the keywords) were used in three databases (Schoormann, Behrens, et al., 2021). *AISeL,* as the leading IS

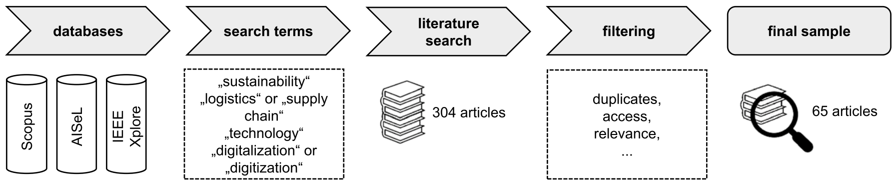

Fig. 1 Visualization of the literature search process

literature database, indexes well-accepted journals (e.g., JAIS or CAIS) and conference proceedings (e.g., ECIS or ICIS) from the field. Considering IS literature is especially important since the field, per its *modus operandi*, investigates the use of novel digital technologies emerging in digitalization in a socio-technical context in organizations to support and guide management and IS practice (Legner et al. 2017). *IEEE Xplore* covers more ground, especially in the engineering discipline, and considers the interface of digital technologies and supply chain literature not explicitly published in IS research. Lastly, we used *Scopus* to extract additional papers from high-ranking IS journals that are not listed in AISeL. To identify high-quality IS literature, we applied ranking filters in Scopus for A+, A, and B-ranking articles (e.g., MISQ, Electronic Markets, BISE) according to the VHB ranking.[1] By triangulating the results of these three databases and the filtering criteria, we ensured we had a solid foundation with high-quality articles (Levy and Ellis 2006). We built the literature corpus independent of the publishing year to account for an inclusive search strategy. The literature review was performed in September 2022. To filter the literature corpus and condense it only to the most relevant papers, we applied inclusion criteria (vom Brocke et al. 2015). As a result, we only included peer-reviewed papers for deeper analysis, providing a sound description of their results and research process. The entire database search, including forward and backward searches, yielded an initial literature base of 304 articles. Fifteen articles in our corpus were unavailable and/or inaccessible. Moreover, we observed that some articles addressed digital technologies but did not list specific ones. Others used the term "sustainability" in the abstract but did not address the use of digital technology to achieve sustainability in supply chains; rather, they used it to highlight the importance of technologies. We did not consider those in the further analysis. After applying the exclusion criteria, our final sample consists of 65 articles.

We created and employed a coding scheme to analyze the literature corpus. Table 2 provides selected examples to explain our coding and illustrative indications for excluding articles that did not meet our relevance criteria. For each article, we collected the industry, the digital technology used to achieve sustainability, the specific use case, and the mentioned technology's abilities. To ensure transparency and the validity of our qualitative analysis, we **(1)** divided the articles among the authors and **(2)** discussed the results afterward. In case of uncertainty, another author coded the article to reach a consensus. In a follow-up step, we evaluated our findings (e.g.,

[1] https://vhbonline.org/vhb4you/vhb-jourqual/vhb-jourqual-3/gesamtliste

Table 2 Examples of our coding procedure

Article (References)	Relevance	Industry	Digital technology	Use case	Advantages
Sims and Key (2011)	No	Farming	–	–	–
Pinna et al. (2021)	Yes	Food	blockchain integrated IoT	Traceability system (BOSE) for the food supply chain	Increased transparency Storages data Reduces inequalities Access to information Reduces the supply-chain carbon footprint
Munoz et al. (2021)	Yes	Wood	blockchain	Tracking system (LogLog) for the wood supply chain and enforcing FSC certification standards	Increases traceability Increases audibility Access to information

the classification of the benefits in the dimensions) with two external sustainability experts.

Sims and Key (2011) report on the "Velella project [that aims] to test the feasibility of drifting mariculture operation entrained in regional ocean-current eddies in the lee of the Big Island of Hawaii" (Sims and Key 2011, p. 1). Since the paper does not explicitly refer to supply chains but only uses the keyword “logistics” to explain costs in the context of sustainable fishing, we did not include the paper in our sample. Pinna et al. (2021) present an agile methodology for developing blockchain-oriented systems incorporating sustainability practices. They apply this to the example of a supply chain and install IoT in the warehouse as a supporting digital technology to record relevant data. Subsequently, they combine two technologies. We cannot always differentiate which advantages are generated by which digital technology and attribute the advantages to both digital technologies. Munoz et al. (2021) propose LogLog, an entirely blockchain-based on-chain system tracking wood volumes throughout a supply chain. It enforces Forest Sustainability Council certification standards and meets the base requirements for a forestry supply chain. They summarize their findings and give further advantages of Loglog. It increases availability, traceability, and data integrity.

Our analysis procedure is inspired by the *grounded theorizing* paradigm, which is especially useful when aggregating finely detailed constructs to more abstract categories through iteratively clustering data to higher categorical levels (Gioia et al. 2013). The foundation is our initial coding of the literature excerpts (e.g., Saldaña, 2015). Subsequently, several 1st-order concepts are combined into aggregated terms. In this case, the conceptual lens aiding our categorization is the triple bottom line (i.e., *economy*, *environment*, and *social*). Figure 2 illustrates the data structure.

4 Findings: digital technologies for sustainable supply chains

4.1 Descriptive analysis of sample

Overall, we observe a growing interest from the IS community to investigate the use of digital technologies along a sustainable supply chain based on our sample. The number of articles increased since 2018, with a significant increase in the literature’s focus on digital technologies in 2019 (see Fig. 3). Please note that the number of articles in 2022 decreased because we performed the literature search in 2022.

Our final sample comprises 65 articles covering different technologies and industries. In terms of the industry (i.e., field of application), we found that around half of the articles (43%) are somewhat industry agnostic and the other 57% address diverse areas, including *food* (15%), *agriculture* (14%), *fashion* (3%), *agri-food* (9%), *construction* (5%), *energy* (3%), *sea* (3%), *healthcare* (3%), and *electronics* (2%).

Our analysis of digital technologies shows that 51% of articles employed *blockchain* to support SSCM. Other technologies are the *Internet of Things* (26%), *platforms* (12%), *radio-frequency identification (RFID)* (11%), *big data* (9%), and *Artificial Intelligence* (9%). The category *other* (14%) subsumes technologies that rarely occur in the sample, including *cloud computing*, *simulation*, or *digital training*

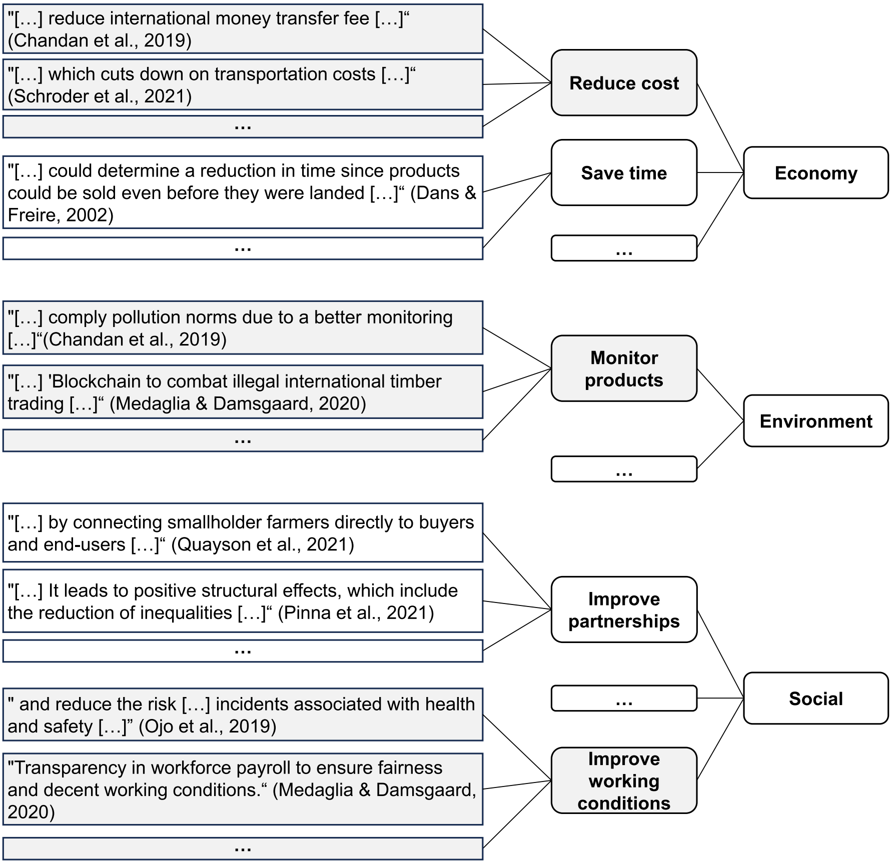

Fig. 2 Illustrative data structure reflecting our theorizing process

systems. Table 3 gives an overview of each digital technology, a brief description, and indicates the percentage of how often it occurred in the literature sample. Some articles reported on more than one technology, exceeding 100% (see Fig. 4). While in some cases, the technology used has a direct impact on the supply chain (e.g., increasing its ecological performance), other cases report that technologies have an indirect effect on sustainability. Among the examples is Batulan et al. (2021), who found that platforms "can take on a more significant role in creating value for businesses and their supply chain, specifically in alignment with sustainability targets." On the other hand, blockchain directly impacts sustainability by creating transparency and trust in the supply chain (Jahanbin et al. 2019).

4.2 Overview of sustainability advantages

We identified twelve sustainability advantages and assigned them to the triple bottom line. While we are aware that some advantages can have additional sub-effects

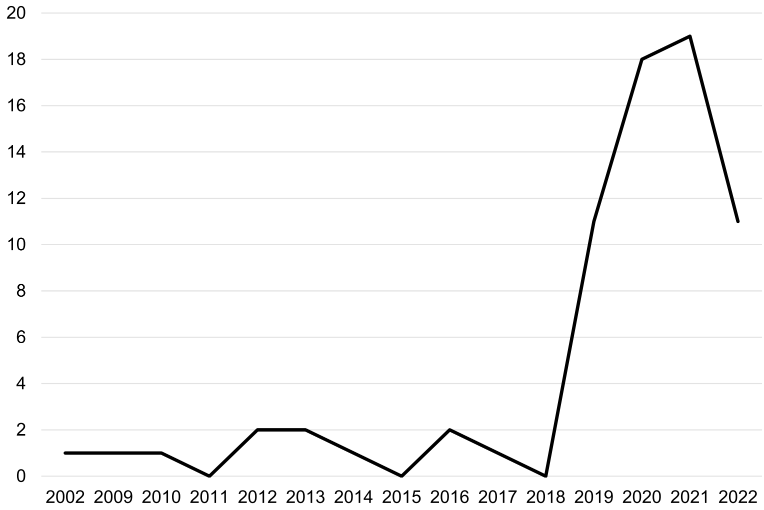

Fig. 3 Yearly distribution of SSCM articles

and thus might relate to more than one sustainability dimension (e.g., reduced environmental emissions will also lead to better social situations), we seek to identify and report the primary impact of the specific digital technology (Table 4).

Our sample contains four main advantages concerning the economic dimension. Digital technologies have the power to reduce *costs* (Bansal et al. 2022; Della Corte et al. 2021; Padalkar et al. 2020). Several cost reduction opportunities were identified, including eliminating time-consuming, manual, or error-prone processes through automation or reducing transportation through better planning. Cost reduction is an economic advantage because it relates to the company's financial resources. *Increasing profit* describes measures to improve revenues or reduce expenses of a company. The following aspects were considered in our analysis: Increasing efficiency in different company areas, diversity of revenue sources, or optimization of cash flow management (Guo et al. 2020; Menon and Shah 2020; Vogel et al. 2019). Increasing profit is an economic advantage as it improves the difference between a company's turnover and costs. *Time savings* can be generated by optimizing tasks and processes using digital technologies. For example, by automating, streamlining, simplifying, and optimizing processes, savings in transport and production times can be achieved (Metzger et al. 2012; Nasir et al. 2022; Omar et al. 2022). Such savings also indirectly influence the environment as less transportation or production might lead to fewer emissions. However, the analyzed articles do not mention the environmental benefits. Instead, they refer to (1) faster product selling (Dans and Freire 2002), (2) lower transportation costs (Schroder et al. 2021), (3) increasing profit through higher customer satisfaction (Ojo et al. 2019), or (4) increased efficiency (Metzger et al. 2012). Accordingly, we position time-saving as an economic advantage. Lastly, our sample highlights the ability of technologies to *share information* along the supply chain, for instance, to improve decision-making based on a comprehensive set of sustainability data (Chandan et al. 2019; Omar

Table 3 Digital technologies for sustainability in supply chains

Technology	Description and potential	Occurrence (%)
Blockchain	The blockchain is a distributed database that stores data in blocks linked together and allows transactions to be verified and recorded. It is a non-modifiable, appendage-linked list of different elements that have an overall sequence and thereby has the potential to improve trust and traceability in supply chains (Ballandies et al. 2022; Bodkhe et al. 2020; Nakamoto 2008)	51
Internet of Things	The Internet of Things (IoT) refers to the connectivity between a network of physical objects through which data can flow. By embedding technologies, such as wireless sensor networks, things become 'smart'. This transformation enables smart things to communicate ubiquously and universally (Atzori et al. 2010; Meyer et al. 2009; Tran-Dang et al. 2020)	26
Platform	Platforms are digital infrastructures that enable the interaction between user groups in supply and demand (e.g., actors in supply chains) and allow them to negotiate (Bonina et al. 2021; Gawer 2009)	12
RFID	RFID supports identification, data collection, and information transfer. It is applied, among other fields of usage, in the tracking of goods in the supply chain (Dukovska-Popovska et al. 2010)	11
Big data	Big Data technology enables the analysis of large amounts of data and creates opportunities to process many different data formats or data at much higher speeds (Pappas et al. 2018)	9
Artificial intelligence	Artificial Intelligence integrates computational resources to facilitate or even mimic human-like tasks, such as decision-making and prediction of sustainable impacts (Dwivedi et al. 2021; Vinuesa et al. 2020)	9

Digital Technologies	Economy: Reduce cost	Economy: Increase profit	Economy: Save time	Economy: Share information	Environment: Monitor products	Environment: Reduce emissions	Environment: Reduce waste	Social: Improve partnerships	Social: Contribute to the welfare	Social: Increase fairness	Social: Promote trust	Social: Improve working conditions
blockchain	15	4	9	12	7	5	7	22	3	7	18	4
Internet of Things	5	3	3	8	0	2	7	12	1	3	2	5
platform	5	3	3	4	0	1	3	7	1	4	1	2
RFID	3	0	2	5	1	3	6	4	0	0	0	1
big data technologies	2	0	1	4	1	0	2	2	0	1	0	2
Artificial Intelligence	0	0	1	2	0	0	2	2	0	0	1	0
Other	3	1	0	4	0	2	3	1	0	1	0	3

None	article
1 - 4	articles
5 - 9	articles
≥ 10	articles

Fig. 4 Heat map of digital technologies in the realm of sustainable supply chains

et al. 2022; Singh et al. 2021). Decisions include the selection of suppliers in compliance with sustainability standards. Other articles did not specify which decisions were addressed, such as Chandan et al. (2019), who point to the fact that buyers have access to product data through information sharing. As another illustration, Vogel et al. (2019) highlight that blockchain ensures easy access to product history for every stakeholder. Using blockchain in the supply chain makes the vendor selection process much more accessible (Ribeiro and Brito 2022). Although these three examples do not focus on a specific sustainability dimension, we decided to assign this to the economic dimension. In line with the expert interviews, the reasons for our decision are as follows: (1) Information about suppliers as well as the measurement of energy efficiency per raw material usage, could be considered in the overall rating of the supplier and when making purchase decisions (Dukovska-Popovska et al. 2010); (2) inefficiencies can be reduced (Omar et al. 2022); (3) greater control over internal processes and cost-effective (Almadani and Mostafa 2021).

The environmental dimension captures advantages concerning ecologic protection or resource conservation. Digital technologies were used to *monitor products*, such as those of illegal trade, to avoid prohibited sales. This protects, for example, animals or plants (Chandan et al. 2019; Medaglia and Damsgaard 2020). Only two articles report on benefits, such as the monitoring of all transactions (Fakkhong et al. 2022) or the real-time monitoring of logistics activities to improve supply chain traceability (Ribeiro and Brito 2022), rather than economic issues. We mapped monitoring to the environmental dimension as it (1) ensures the quality and credibility of organic products (Vogel et al. 2019), (2) increases compliance with pollution norms (Chandan et al. 2019; Ribeiro and Brito 2022), and (3) supports the fight against the illegal international timber trade (Medaglia and Damsgaard 2020). If the trading companies selling organic products are regularly inspected, they can avoid contamination or mixing up with conventional products or unauthorized substances. This protects the environment from harmful influences. Other environmental advantages extracted from our sample are the *reduction of emissions*, including carbon (Dumitrache et al. 2017; Guo et al. 2020) as well as *waste reduction* to minimize

Table 4 Concept matrix presenting advantages of digital technologies for SSCM

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Hatzivasilis et al. (2019)	Artificial Intelligence							●	●				
Tan et al. (2022)	Artificial Intelligence			●				●					
Bansal et al. (2022)	Blockchain	●							●			●	
Chandan et al. (2019)	Blockchain	●			●	●	●	●		●	●		
Della Corte et al. (2021)	Blockchain	●		●								●	
Fahim et al. (2021)	Blockchain	●		●	●	●			●				●
Fakkhong et al. (2022)	Blockchain					●			●				
Munoz et al. (2021)	Blockchain				●				●				
Guo et al. (2020)	Blockchain	●	●				●		●	●			
Jahanbin et al. (2019)	Blockchain	●				●			●			●	
Medaglia and Damsgaard (2020)	Blockchain					●	●	●		●		●	

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Menon and Shah (2020)	Blockchain	●	●	●					●				●
Nasir et al. (2022)	Blockchain	●		●								●	
Omar et al. (2022)	Blockchain			●	●				●			●	
Padalkar et al. (2020)	Blockchain	●										●	
Rana et al. (2021)	Blockchain								●			●	
Ribeiro and Brito (2022)	Blockchain			●	●	●		●	●			●	
Runzel et al. (2021)	Blockchain		●						●			●	
Song et al. (2020)	Blockchain	●		●					●		●		
Tagiltseva et al. (2021)	Blockchain	●			●				●			●	
Tang et al. (2022)	Blockchain	●										●	

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Tsoukas et al. (2021)	Blockchain			●	●							●	
Viskovic et al. (2021)	Blockchain								●				
Vogel et al. (2019)	Blockchain		●		●	●			●			●	
Singh et al. (2021)	Big data technologies				●				●				●
Su and Fan(2020)	Big data technologies				●	●							
Ying (2021)	Big data technologies	●			●								
Almadani and Mostafa (2021)	Internet of Things	●	●		●			●	●				●
Almalki et al. (2021)	Internet of Things				●				●				
Dumitrache et al. (2017)	Internet of Things				●		●	●	●				
Kim (2022)	Internet of Things				●				●				
Metzger et al. (2012)	Internet of Things			●	●				●				

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Roy and Roy (2019)	Internet of Things	●	●		●				●				●
Villagomez-Aranda and Saenz-de la (2021)	Internet of Things							●		●	●		
Zhang et al. (2020)	Internet of Things			●									
Batulan et al. (2021)	Platform	●							●				
Dans and Freire (2002)	Platform		●	●									
Gangwar et al. (2020)	Platform	●			●				●				●
Kurnia et al. (2012)	Platform	●	●		●				●			●	
Lo Bello et al. (2019)	Platform				●				●				
Schroder et al. (2021)	Platform	●	●	●				●	●	●	●		
Yau et al. (2020)	Platform	●		●	●		●	●	●				●

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Dukovska-Popovska et al. (2010)	RFID			●	●		●	●					
Felice and Petrillo (2013)	RFID					●	●	●					
Gandino et al. (2009)	RFID	●		●	●			●	●				
Williams et al. (2019)	RFID	●			●			●	●				
Baena et al. (2020)	Other: Simulation							●					
Karnouskos et al. (2020)	Other: Industrial agents	●	●		●								
Lopez-Martin et al. (2016)	Other: Cloud computing				●				●				
Ngassam and Raborife (2013)	Other: Virtual buying cooperative	●											
Ovaitt et al. (2021)	Other: Photovoltaic specif. software						●	●					

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Tagiltseva et al. (2021)	Other: Transportation system	●			●		●						●
Articles with more than one digital technology													
Arena et al. (2019)	Blockchain integ. IoT								●			●	
Choo et al. (2020)	Blockchain	●			●								
	Internet of Things											●	
Cortes-Murcia et al. (2022)	Artificial Intelligence				●								
	Blockchain										●		
	Internet of Things								●				
Liao and Pan (2021)	Artificial Intelligence				●								
	Blockchain											●	
Moorthy et al. (2022)	Artificial Intelligence								●			●	
	Blockchain			●					●			●	

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Ojo et al. (2019)	Big data technologies							●					
	Internet of Things		●	●				●					
	RFID						●	●	●				
	Robotics							●					●
Ouafae and Jalila (2020)	Big data technologies			●				●					
	Blockchain				●		●	●					
	Internet of Things							●					●
Pinna et al. (2021)	Blockchain integ. IoT						●	●	●				
Tentzeris et al. (2014)	Internet of Things	●							●				
	RFID				●								
Quayson et al. (2020)	Blockchain								●				
	Digital training system				●								●

Table 4 (continued)

Article	Digital technology	Advantages											
		Economic				Environ-mental			Social				
		Reduce cost	Increase profit	Save time	Share information	Monitor products	Reduce emissions	Reduce waste	Improve partnerships	Contribute to welfare	Increase fairness	Promote trust	Improve working con
Quayson et al. (2021)	Blockchain with IoT and big data technologies	●			●				●		●		●
Whitaker and Pawar (2020)	Blockchain							●	●			●	
	Platform							●	●				
Absolute number of advantages		29	11	19	35	9	12	27	44	5	13	21	13
Relative number in % (100% ≙ 65 articles)		45	17	29	54	14	18	42	68	8	20	32	20

*Direct advantages are not exclusive. They can also have additional effects on other dimensions the amount of waste that is generated during the product lifecycle, such as waste residues during production or food waste (Tan et al. 2022; Villagomez-Aranda and Saenz-de la 2021).

The most frequently occurring advantages in our sample refer to the social dimension. A supply chain generally contains different actors, such as suppliers, manufacturers, distributors, retailers, or customers (e.g., Mentzer et al. 2001). They are all involved in the process of bringing a product or service to the end customer. The connection or exchange between the actors ensures the efficiency and effectiveness of the process. Our analysis shows that technologies are used to reduce inequalities by creating transparency along the supply chain, supporting communication, and *improving partnerships* (Guo et al. 2020; Hatzivasilis et al. 2019; Vogel et al. 2019). This benefit can also have an indirect impact on the other two dimensions. For instance, the creation or improvement of partnerships can reduce inefficiencies and thus influence the actor's economy (Chandan et al. 2019). Partnering with universities, trade, and industry, as well as association and innovation, can address several aspects of sustainability by using new findings to achieve positive effects in the financial, environmental, or social areas (Medaglia and Damsgaard 2020). Although there are some indirect benefits of partnerships, the primary benefit in our sample is the reduction of inequalities between small and large actors, where we assigned this to the social dimension. The use of digital technology to improve the well-being and quality of life of individuals or communities are clustered as *contributing to welfare* (Chandan et al. 2019; Villagomez-Aranda and Saenz-de la 2021). It is a social one as it enhances people's quality of life and equality of opportunity. Another advantage is called *increased fairness*. Fairness in this context usually refers to the equity of companies and individuals within the supply chain. One example is ensuring equal access to resources and opportunities within the supply chain (Song et al. 2020; Villagomez-Aranda and Saenz-de la 2021). Increasing fairness is a social benefit because it promotes trust, cooperation, and satisfaction between people. When people feel they are treated fairly, they are more willing to participate in common goals. Other social benefits are the *promotion of trust* in supply chains (Bansal et al. 2022; Omar et al. 2022), which facilitates cooperation, as well as the *improvement of working conditions*, such as physical, social, and organizational factors that support employee safety (Almadani and Mostafa 2021; Menon and Shah 2020; Singh et al. 2021).

4.3 Digital technologies for a sustainable supply chain: economic advantages

Our results stress that digital technologies are mainly used within the economic dimension to reduce costs, increase profit, save time, and share information for data-driven decision-making. We found that the majority of articles report on using *platforms* along the supply chain to reduce costs (45%). For example, Kurnia et al. (2012) justify the cost reduction with a better analysis of the return on investment, the profit margin, and the cash flow, and Schroder et al. (2021) point to minimizing transportation costs. The cost reduction potential of *blockchain* occurred often in our sample. Through the blockchain, transactions between participants take place without intermediating entities, such as banks or notaries, which enables a secure, traceable, and auditable way of doing transactions (Bansal et al. 2022; Quayson et al. 2021; Rana et al. 2021; Vogel et al. 2019). It reduces costs because fees for international money transfers are minimized or even eliminated (Chandan et al. 2019; Padalkar et al. 2020). Moreover, (1) blockchain's proof of ownership of capital (Medaglia and Damsgaard 2020) for lending or partner selection, and (2) increased transparency contributes to efficient inventory management (Padalkar et al. 2020; Suhardi et al. 2017). In contrast to the bright side, Moorthy et al. (2022) emphasize that there may be higher costs for using the blockchain network than for traditional processes, which need to be weighed up.

Among the frequently used technologies to increase profit (17%) are *platforms* that allow efficient pricing (Dans and Freire 2002) and create revenues due to a share in the sale of the products sold (Schroder et al. 2021). Sales can be positively influenced via the platform by gaining regular customers, achieving customer satisfaction, creating a competitive advantage, spreading quality knowledge (Kurnia et al. 2012), and identifying time savings (Dans and Freire 2002). Our analysis has also shown the great potential of the *Internet of Things* to, for instance, bridge communication between supply chain participants. Through transparent tracking of products, just-in-time and just-in-sequence processes can be performed (Ojo et al. 2019; Vogel et al. 2019), which leads to increased customer satisfaction and loyalty, as well as improved sales. Another economic advantage of the Internet of Things is its power to craft novel products. Ojo et al. (2019) pointed out that customer feedback or product usage can be captured and incorporated into new product development. Besides, our sample mentioned that the *blockchain* contributes to profit (Dukovska-Popovska et al. 2010; Song et al. 2020; Tagiltseva et al. 2021). Creating transparency paves the ground to improve product histories (Arena et al. 2019; Guo et al. 2020; Tsoukas et al. 2021) and monitor sustainability criteria (Chandan et al. 2019). *RFID* can link the product to its virtual identity on the blockchain (Fakkhong et al. 2022), which creates additional sustainability value. With the help of big *data technologies*, companies can predict demand and supply (Ojo et al. 2019) and thus increase their economic responsiveness (Ouafae & Jalila 2020).

As another important advantage, digital technologies ensure access to and share of information (54%) across the entire supply chain. This allows for making informed decisions, including ethical aspects (Chandan et al. 2019; Ouafae and Jalila 2020). Sharing data accelerates business processes, improves collaboration, and enables efficient decision-making. Especially in terms of the Supply Chain Act, it is important to choose a suitable supplier. From a technology viewpoint, the *blockchain* can support this through transparency (Ribeiro and Brito 2022). Data can be collected via *RFID*, which enables analysis to, for example, improve supplier evaluation (Dukovska-Popovska et al. 2010). Digital platforms enable real-time information sharing between companies, leading to more efficient resource utilization and enhanced collaboration (Schroder et al. 2021). For instance, they can prevent overstocking by providing better data access or fostering joint innovation efforts.

4.4 Digital technologies for a sustainable supply chain: environmental advantages

During our analysis, we obtained three environmental effects. Monitor products—occurred less frequently in our sample (14%)—covers activities for monitoring all processes along the supply chain and the control of being compliant with regulations, such as the Supply Chain Act. Therefore, *blockchain's* potential to increase transparency is important (Guo et al. 2020). It allows illegal trade to be controlled (Chandan et al. 2019), as well as pollutant norms, certifications, and standards to be checked (Chandan et al. 2019; Fakkhong et al. 2022; Ribeiro and Brito 2022). Besides, it enhances planning, such as in storage and transport (Chandan et al. 2019).

Among the effects of monitoring, there are various forms of how waste can be reduced (42%) in a supply chain, including food contamination (Ouafae and Jalila 2020). Because all documents are stored digitally in a *blockchain*, less paper is needed to accompany the delivery (Ribeiro and Brito 2022). The use of the *Internet of Things* supports waste reduction by the detection of defective batches or by ensuring product safety, for example, the cold chain in the food industry (Ojo et al. 2019; Ouafae and Jalila 2020). Sensors allow temperature fluctuations to be perceived and measures taken more quickly to respond to such issues. Monitoring prevents food, in particular, from being damaged during transport and subsequently disposed of due to quality defects. In addition to temperature, the sensors can be used to determine other influences that occur during storage or transport. These include vibrations, which can lead to a reduction in product quality. The evaluations of the sensor data might be taken into account in the development of packaging or route planning (Zhang et al. 2020). The data can be analyzed and evaluated as part of *big data technologies*. Through better production planning, advanced product flows, predicting the life of the products, and specifying recovery options in the supply chain, waste is minimized (Ojo et al. 2019; Ouafae and Jalila 2020). Also, general *analytics* aids in optimizing packaging, shipping, distribution, and returns (Zhang et al. 2020). By supporting the remanufacturing of used material through analyzing sensor data, *RFID* contributes to less waste too. Furthermore, the data allows to avoid unnecessary product movements (Dukovska-Popovska et al. 2010; Ojo et al. 2019) as well as support the return of products (Cai & Choi 2021).

Overall, this leads to a reduction of the carbon footprint (18%). Teaching the basics of chain mapping via *blockchain* to more, possibly weaker members of the supply chain can lead to a reduction in emissions during transportation (Ouafae and Jalila 2020). Better planning leads to fewer transportation trips, which in turn decreases the footprint (Pinna et al. 2021). Blockchain is even used for the automatic calculation of emissions. Schroder et al. (2021) differentiate *platforms* into two categories: Alterations that shorten the supply chain so consumers can buy fresh produce directly from farms, which positively impacts the environment (e.g., by reducing storage and transportation) as well as redistributors that reduce food waste (Schroder et al. 2021). One example is the TooGoodToGo platform. It acts as a platform where sellers or producers can provide surplus products that other participants can pick up offline. The surplus products are products that would otherwise be thrown away.

4.5 Digital technologies for a sustainable supply chain: social advantages

In addition to the economic and environmental advantages, we identified five social advantages. The improvement of partnerships (68%) across supply chains occurred frequently in our sample. *Platforms* support this by bringing suppliers together with customers or with other suppliers. From an economic viewpoint, a platform helps to contribute to the welfare (8%) of all stakeholders and thus also to the welfare of individual small farmers (Schroder et al. 2021). *Blockchain* connects numerous actors from different geographical areas (Bansal et al. 2022; Soedarno et al. 2020) and improves their partnerships.

Concerning fairness (20%), the ability of *blockchain* is highlighted in particular. Blockchain stores and executes documents and transactions in a tamper-proof manner and creates a type of fairness along the supply chain (Medaglia and Damsgaard 2020; Rana et al. 2021). For example, wages cannot be manipulated. Corruption can be prevented (Chandan et al. 2019). In line with aspects of fairness, inequalities in access to quality information (e.g., food information) can be decreased (Pinna et al. 2021). This, in turn, can improve the economy of the local community (Chandan et al. 2019). Because in today's world, where sustainability is emphasized, customers are buying more locally from individual farms. In addition, farmers are protected from overreaching (Quayson et al. 2021). Every action within the supply chain is traceable (Ribeiro & Brito 2022). This builds trust in the supply chain (e.g., Medaglia and Damsgaard (2020), Vogel et al. (2019), Dukovska-Popovska et al. (2010)), eliminating the need for internal or external inspections (Guo et al. 2020). In addition, buyers have the opportunity to obtain information about the smallholder (Quayson et al. 2020), which in turn improves customer trust (Ouafae & Jalila 2020). Collected data with *RFID* is a valid basis for generating trust within the supply chain (Gandino et al. 2009). Trust is mentioned frequently across all relevant articles.

Lastly, digital technologies can serve as a foundation for employee education and improve working conditions (20%). With the help of historical data generated by *RFID* and stored within the *blockchain*, employees (e.g., farmers) can be trained and prepared for situations (Quayson et al. 2021). The *Internet of Things* has the potential to assist employees in product detection. This facilitates the work of employees and minimizes the frequency of errors. *Big data technologies* of various processes can optimize them and not only improve working conditions for employees but also increase customer satisfaction (Ouafae and Jalila 2020).

5 Discussion

5.1 Observations and implications

As socio-technical IS research on sustainability and technologies recognizes their transformative potential, we explore the use of digital technologies for SSCM. Our synthesis of the findings highlight the technology's economic, environmental, and social advantages (Fig. 4). Based on our analysis, we elaborate on four major observations that emerged and reflect in accordance to the corresponding literature, namely (1) the focus on social advantages, (2) the trust-building technology blockchain, (3) the scarce references to Artificial Intelligence, and (4) industry-specific use of digital technologies.

First, a rather unexpected result is the frequency of social advantages mentioned in our sample, as several authors stressed that they have been less studied in previous literature (Samah et al. 2022; Schoormann and Kutzner 2020). Our findings however align with existing results in a supply chain context. For example, Holzmann and Gregori (2023) explore the literature with a focus on digital technologies for sustainable entrepreneurship. They argue that the focus mainly lies on social aspects when discussing digital technologies as enablers of sustainability. While they stressed that digital technologies have the potential to increase the quality of life and reduce poverty, our sample provides no or limited examples for this; improving welfare and working conditions are the least mentioned social advantages. To support working conditions, industry 5.0 deals with the harmonious working of technological and social systems. Bednar and Welch (2020) analyze this development from the perspective of individual understandings of work roles and sustainability. They found that collaboration between employees and digital technologies can assist workers in finding greater meaning in their work roles. Unnecessary and monotonous activities can be replaced by automated systems. Digital technologies can help to optimize conditions. However, they also point out that it is important to achieve a balance between social and economic interests. A potential avenue for further research is an in depth investigation of the peculiarities of digital technologies and their integration into the workforce.

Second, blockchain is one of the few digital technologies whose advantage is to build trust across numerous actors. This observation is supported by other literature. Völter et al. (2023) analyze factors that enhance user's trust in blockchain by experimenting with different participants. Centobelli et al. (2022) highlight the significance of trust, traceability, and transparency within supply chains, especially in circular ones. The authors propose a circular blockchain platform and argue that blockchain has a relevant role in improving control of the movement of wastes and product return management activities. Happy et al. (2023) investigate antecedents, applications, and consequences of adopting blockchain in supply chains and thereby disclose its positive consequences. For example, blockchain can be used to reduce risk, secure data, or reduce costs. It influences sustainable supply chains by enabling responsible approaches to carbon emissions, supporting economic viability, and sustaining waste reduction, reuse, and recycling. da Silva et al. (2023) motivate their research by underlining the relevance of data sharing among the supply chain to support a circular economy to promote sustainability. They report on a case study from an electric vehicle supply chain in which blockchain technology helps achieve circularity due to its transparency and traceability. In contrast to the power of blockchain, there are still challenges and barriers that need to be considered. Monrat et al. (2019), for instance, present a study of blockchain's challenges, including scalability, regulatory issues, and energy consumption. In terms of sustainability, the blockchain's propensity for high energy consumption is an issue. In accordance with this, Bada et al. (2021) explore the need for a sustainable blockchain, and Alofi et al. (2022) present a model that reduces consumption. They point to the fact that environmental sustainability can be enhanced. Even if some literature addresses this topic, more research is required since blockchain technology is maturing continuously in different fields of application, and mitigating the positive with potential negative effects (e.g., energy consumption) is critical. The advantages and disadvantages might lead to tensions, not only in the context of blockchain implementation but also more generally in data sharing. An example of a potential tension is the trade-off between knowledge gain and competitive loss. Future research might want to shed a particular light on these tensions and incentives.

Third, we observe that the use of Artificial Intelligence for sustainability in the context of supply chains is less discussed, although it is becoming a game-changer in almost every industry (Wanner et al. 2020). This lack might be attributed to the fact that the term is extensive and is implemented within a lot of different areas. As a consequence, Artificial Intelligence can be an essential part of other technologies, such as platforms and machine learning algorithms that can be applied to big data technologies. The relevance of this technology is supported by research and practice. For instance, Schoormann et al. (2021) reviewed a range of literature to identify the main genres of IS research at the intersection of AI and sustainability, as well as to figure out blind spots. They found that research focuses on health and education in the social dimension, farming, energy management, and animal protection in the environmental dimension, and working conditions, smart infrastructure, and innovation in the economic dimension. Accordingly, there is still room for additional research on exploring the contribution of AI to sustainable supply chains while mitigating increasing security issues.

Fourth, we analyzed the different industries addressed by the articles in our sample (see Sect. 4.1). 43% of the 65 articles do not relate to a specific industry. The other 57% of articles address diverse fields, including the following ten industries: *food* (15%), *agriculture* (14%), *fashion* (3), *agri-food* (9%), *construction* (5%), *energy* (3%), *sea* (3%), *healthcare* (3%), and *electronics* (2%). The food industry, which is also closely linked to agriculture, is an important, global, and challenging sector. It must satisfy the growing demand for food and, at the same time, meet consumers' high expectations in terms of quality, safety, and sustainability. As aforementioned, digital technologies can contribute to this by optimizing production, increasing resource efficiency, and improving the traceability of products. Other industries are affected by digitalization, such as the fashion industry, which is heavily dependent on changing trends and customer preferences and requires a high degree of flexibility. The healthcare industry has to deal with ethical and regulatory aspects before using technologies like AI. Our results, however, do not show that the other industries are less interesting but that researchers focus on the food and agriculture sectors, in particular when investigating digital technologies.

Besides, while our work discloses the positive effects of using digital technologies to make supply chains more sustainable (i.e., the bright side), there are, of course, negative aspects and rather unintended ones that need to be taken into account. From a dark-side perspective, scholars point to risks across the sustainability dimensions. Examples include challenges of artificial intelligence-based technologies that raise social issues concerning discrimination (Beretta et al. 2021) and gaps in transparency, safety, and ethics (Berente et al. 2021; Vinuesa et al. 2020). Also, environmental concerns might occur due to the increased energy consumption (e.g., see ongoing discourses on the blockchain, Sedlmeir et al. (2020), for which reason academia and practice have started to investigate the environmental-friendly design of technologies and data processing techniques (Schneider et al. 2023). Based on our findings, future research can compare and position negative effects.

In our study, we conducted a literature review to identify digital technologies and their benefits discussed in academia. We respond to the call by Müller (2022), who considers the significance of analyzing the use of digital technologies to identify changes in the structure of the supply chain. While Maha and Akram (2022) report, in their literature review, on the distribution of articles by country, journal, type of digital technology, and methodology, we address the explicit benefits of such technologies and categorize them into the three sustainability dimensions. In this way, we provide practitioners with a basis for deciding which technology suits the application objective. Another way in which our work differs from existing research is that we do not focus on a specific area. Complementing existing research, our work is not limited to a specific domain or limited to a single technology (Haleem et al. 2024; Rohde et al. 2024; Schoormann et al. 2023; Upadhyay et al. 2021). We examine all identified technologies to provide a broad overview of their possible applications.

5.2 Limitations

Although we have provided a comprehensive review of the existing IS literature on the use of digital technology for SSCM, our results are not free of limitations. First, we have followed the socio-technical perspective of the IS discipline. However, the deployment of digital technology can also be analyzed from other perspectives. Second, we focused on the advantages and provided a broad sense of how technologies can help improve sustainability. Doing this, we did not discuss negative consequences, which can be the subject of future research on the dark side, such as environmental issues from blockchain. Third, from a methodical perspective, the literature review results are based on several subjective factors. These include the choice of databases, the derivation of search terms, the classification of criteria, and the interpretation of results. The keywords are based on our decisions derived from exemplary sustainability and digital technologies articles. The classification of advantages is based on the terminology of the paper and the frequency of individual aspects; for example, we combined transportation and storage costs into one single dimension. The results are interpreted based on our own experiences and discussions within the author team. Other authors may come to different conclusions at different times and with different background knowledge (e.g., mapping of a benefit to another sustainability dimension).

6 Conclusion

Digital technologies support companies in their initiatives to achieve sustainability. Against this backdrop, we have created an overview of digital technologies and their sustainability advantages through a literature review using the guidelines by Webster and Watson (2002) and vom Brocke et al. (2015). We examined and summarized the results of a sample of 65 articles in a concept matrix to answer our two research questions. Referring to *RQ1*, we identified six digital technologies that are currently being used to achieve sustainability. These include blockchain, the Internet of Things, RFID, platforms, big data technologies, and Artificial Intelligence. We found that blockchain is the most used digital technology within a supply chain to create sustainability. In a further step, we classified the advantages of technology use and assigned them to the Triple Bottom Line-principle (economy, environment, and social) to answer *RQ2*. In doing so, we respond to the call to bring digital technologies and sustainability together (Nishant et al. 2020) and aim to pave the way for further research. Overall, our analysis revealed six advantages for social sustainability and three advantages each for economic and environmental sustainability. The results show that research on digital technologies preferentially addresses social issues.

Our findings can be used as reference points to promote sustainability along the supply chain. As the existing literature on economic, environmental, and social is scattered, we argue that a systematic assessment is valuable to understand the current research landscape and promote the use of digital technologies for sustainability. The proposed research opportunities can be used by academics, for example, to derive new research questions (e.g., negative aspects of digital technologies) and to explore the use of digital technologies in other industries to create sustainability. It is possible to extend our research with an interview study with practitioners to identify barriers to implementing digital technologies and to propose recommendations. For practical purposes, we primarily provide an overview of the advantages of technologies for a sustainable supply chain. Based on our analysis, companies can derive conclusions or initial inspiration for implementing technology in their own company.

Acknowledgements This research and development project is funded by the German Federal Ministry of Education and Research (BMBF) within the *Digital Ecosystem for a Sustainable Circular Economy in the Automotive Industry – DIONA* funding action (02J21E200). The author is responsible for the content of this publication.

Funding Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest The authors declare that they have no financial interests that are directly or indirectly related to the work.

References

Albrecht T, Baier M-S, Gimpel H, Meierhöfer S, Röglinger M, Schlüchtermann J, Will L (2023) Leveraging digital technologies in logistics 4.0: insights on affordances from intralogistics processes. Inf Syst Front. https://doi.org/10.1007/s10796-023-10394-6

Almadani B, Mostafa SM (2021) IIoT based multimodal communication model for agriculture and agro-industries. IEEE Access 9:10070–10088. https://doi.org/10.1109/ACCESS.2021.3050391

Almalki KJ, Mohzary M, Choi B-Y, Song S, Chen Y (2021) Crowd safety sensing (CroSS) for the post pandemic era. In: IEEE globecom workshops, Madrid, Spain

Alofi A, Bokhari MA, Bahsoon R, Hendley R (2022) Optimizing the energy consumption of blockchain-based systems using evolutionary algorithms: a new problem formulation. IEEE Trans Sustain Comput 7(4):910–922. https://doi.org/10.1109/TSUSC.2022.3160491

Ângelo A, Barata J, Paula A, Santos M (2020) Projecting the community pharmacy into home health care: an IS perspective. In: International conference on electronic business 2020 proceedings, pp 265–274

Arena A, Bianchini A, Perazzo P, Vallati C, Dini G (2019) BRUSCHETTA: an IoT blockchain-based framework for certifying extra virgin olive oil supply chain. In: IEEE international conference on smart computing, Washington, DC, USA

Atzori L, Iera A, Morabito G (2010) The internet of things: a survey. Comput Netw 54(15):2787–2805. https://doi.org/10.1016/j.comnet.2010.05.010

Bada AO, Damianou A, Angelopoulos CM, Katos V (2021) Towards a green blockchain: a review of consensus mechanisms and their energy consumption. In: Proceedings of the 17th international conference on distributed computing in sensor systems, Pafos, Cyprus

Baena B, Cobian C, Larios VM, Orizaga JA, Maciel R, Cisneros MP, Beltran-Ramirez JR (2020) Adapting food supply chains in Smart Cities to address the impacts of COVID19 a case study from Guadalajara metropolitan area. In: Proceedings of the international smart cities conference, Piscataway, NJ, USA

Baier M-S, Berger S, Kreuzer T, Oberländer AM, Röglinger M (2023) What makes digital technology? A categorization based on purpose. Commun Assoc Inf Syst 52:332–384. https://doi.org/10.17705/1CAIS.05215

Ballandies MC, Dapp MM, Pournaras E (2022) Decrypting distributed ledger design-taxonomy, classification and blockchain community evaluation. Clust Comput 25(3):1817–1838. https://doi.org/10.1007/s10586-021-03256-w

Bansal L, Chaurasia S, Sabharwal M, Vij M (2022) Blockchain integration with end-to-end traceability in the food supply chain. In: Proceedings of the 2nd international conference on advance computing and innovative technologies in engineering, Greater Noida, India

Batulan C, Tan F, Chan C (2021) Bridging the sustainability leadership chasm: a case study of the sustainability advantage program of the NSW Government, Australia. In: Proceedings of the 54th Hawaii international conference on system sciences, Kauai, Hawaii, USA

Bednar PM, Welch C (2020) Socio-technical perspectives on smart working: creating meaningful and sustainable systems. Inf Syst Front 22(2):281–298. https://doi.org/10.1007/s10796-019-09921-1

Berente N, Gu B, Recker J, Santhanam R (2021) Managing artificial intelligence. MIS Q 45(3):1433–1450. https://doi.org/10.25300/MISQ/2021/16274

Beretta E, Vetrò A, Lepri B, de Martin JC (2021) Detecting discriminatory risk through data annotation based on Bayesian inferences. In: Proceedings of the 2021 ACM conference on fairness, accountability, and transparency (pp 794–804). ACM. https://doi.org/10.1145/3442188.3445940

Blum P, Felke C, von Ondarza V, Pittelkow S, Strunz B (2023) Testfall für das deutsche Lieferkettengesetz. https://www.tagesschau.de/wirtschaft/unternehmen/bmw-zulieferer-kritik-reaktionen-100.html

Bodkhe U, Tanwar S, Parekh K, Khanpara P, Tyagi S, Kumar N, Alazab M (2020) Blockchain for industry 4.0: a comprehensive review. IEEE Access 8:79764–79800. https://doi.org/10.1109/ACCESS.2020.2988579

Bonina C, Koskinen K, Eaton B, Gawer A (2021) Digital platforms for development: foundations and research agenda. Inf Syst J 31(6):869–902. https://doi.org/10.1111/isj.12326

Böttcher TP, Empelmann S, Weking J, Hein A, Krcmar H (2023) Digital sustainable business models: using digital technology to integrate ecological sustainability into the core of business models. Inf Syst J, 1–26. https://doi.org/10.1111/isj.12436

Brundtland G, Khalid M, Agnelli S, Al-Athel S, Chidzero B, Fadika L, Hauff V, Lang I, Shijun M, Morino de Botero M, Singh M, Okita S, Others A (1987) Our common future ('Brundtland Report'). Oxford University Press, USA

Cai Y-J, Choi T-M (2021) Extended producer responsibility: a systematic review and innovative proposals for improving sustainability. IEEE Trans Eng Manage 68(1):272–288. https://doi.org/10.1109/TEM.2019.2914341

Carter CR, Rogers DS (2008) A framework of sustainable supply chain management: moving toward new theory. Int J Phys Distrib Logist Manag 38(5):360–387. https://doi.org/10.1108/09600030810882816

Catena-X Automotive Network (2023) Catena-X circular economy use case. https://catena-x.net/en/mehrwerte/circular-economy

Centobelli P, Cerchione R, Del Vecchio P, Oropallo E, Secundo G (2022) Blockchain technology for bridging trust, traceability and transparency in circular supply chain. Inf Manag 59(7):103508. https://doi.org/10.1016/j.im.2021.103508

Chandan A, Potdar V, Rosano M (2019) How blockchain can help in supply chain sustainability. In: Proceedings of the 30th Australasian conference on information systems, Fremantle, Australia

Choo K-KR, Ozcan S, Dehghantanha A, Parizi RM (2020) Editorial: Blockchain ecosystem—technological and management opportunities and challenges. IEEE Trans Eng Manage 67(4):982–987. https://doi.org/10.1109/TEM.2020.3023225

Cortes-Murcia DL, Guerrero WJ, Montoya-Torres JR (2022) Supply chain management, game-changing technologies, and physical internet: a systematic meta-review of literature. IEEE Access 10:61721–61743. https://doi.org/10.1109/ACCESS.2022.3181154

da Silva ER, Lohmer J, Rohla M, Angelis J (2023) Unleashing the circular economy in the electric vehicle battery supply chain: a case study on data sharing and blockchain potential. Resour Conserv Recycl 193:106969. https://doi.org/10.1016/j.resconrec.2023.106969

Dans E, Freire J (2002) IT as an agent of social change: lonxanet and the case of the Galician Artisanal Fisheries. In: Proceedings of the 23rd international conference on information systems, Barcelona, Spain

Della Corte G, Ricci F, Modaffari G, Scafarto V (2021) Blockchain as a strategic enabler of agri-food sustainability. In: Proceedings of the IEEE international conference on technology management, operations and decisions, Marrakech, Morocco

Dukovska-Popovska I, Lim MK, Steger-Jensen K, Hvolby H-H (2010) RFID technology to support environmentally sustainable supply chain management. In: IEEE international conference on RFID-technology and applications, Guangzhou, China

Dumitrache I, Caramihai SI, Sacala IS, Moisescu MA (2017) A cyber physical systems approach for agricultural enterprise and sustainable agriculture. In: Proceedings of the 21st international conference on control systems and computer science, Bucharest, Romania

Dwivedi YK, Hughes L, Ismagilova E, Aarts G, Coombs C, Crick T, Duan Y, Dwivedi R, Edwards J, Eirug A, Galanos V, Ilavarasan PV, Janssen M, Jones P, Kar AK, Kizgin H, Kronemann B, Lal B, Lucini B, Williams MD (2021) Artificial intelligence (AI): multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. Int J Inf Manage 57:101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Elkington J (1998) Accounting for the tripple bottom line. Meas Bus Excell 2(3):18–22. https://doi.org/10.1108/eb025539

Fahim P, Rezaei J, Jayaraman R, Poulin M, Montreuil B, Tavasszy L (2021) The physical internet and maritime ports: ready for the future? IEEE Eng Manag Rev 49(4):136–149. https://doi.org/10.1109/EMR.2021.3113932

Fakkhong K, Rangsaritvorakarn N, Tantitecha C (2022) Using blockchain technology for a sustainable agri-food supply chain in Thailand. In: Proceedings of the international conference on decision aid sciences and applications, Chiangrai, Thailand

Federal Government Germany (2021) Greater protection for people and the environment in the global economy. https://www.bundesregierung.de/breg-en/service/archive/supply-chain-act-1872076
de Felice F, Petrillo A (2013) RFID in green supply chain: proposal of a multicriteria decision model based on AHP. In: Proceedings of the 10th international conference on e-business engineering, Coventry, UK
Gandino F, Montrucchio B, Rebaudengo M, Sanchez ER (2009) On improving automation by integrating RFID in the traceability management of the agri-food sector. IEEE Trans Ind Electron 56(7):2357–2365. https://doi.org/10.1109/TIE.2009.2019569
Gangwar DS, Tyagi S, Soni SK (2020) Connecting farmers to knowledge, networks and institutions for agroecological sustainability. In: International conference on electrical and electronics engineering, Gorakhpur, India
Gawer A (2009) Platforms, markets and innovation. Edward Elgar Publishing. https://doi.org/10.4337/9781849803311
Gholami R, Watson RT, Hasan H, Molla A, Bjorn-Andersen N (2016) Information systems solutions for environmental sustainability: how can we domore? J Assoc Inf Syst 17(8):521–536. https://doi.org/10.17705/1jais.00435
Gioia DA, Corley KG, Hamilton AL (2013) Seeking qualitative rigor in inductive research. Organ Res Methods 16(1):15–31. https://doi.org/10.1177/1094428112452151
Guo S, Sun X, Lam HKS (2020) Applications of blockchain technology in sustainable fashion supply chains: operational transparency and environmental efforts. IEEE Trans Eng Manag 1–17. https://doi.org/10.1109/TEM.2020.3034216
Haleem A, Javaid M, Khan IH, Mohan S (2024) Significant applications of artificial intelligence towards attaining sustainability. J Ind Integr Manag 1–32. https://doi.org/10.1142/S2424862223500331
Happy A, Chowdhury MMH, Scerri M, Hossain MA, Barua Z (2023) Antecedents and consequences of blockchain adoption in supply chains: a systematic literature review. J Enterp Inf Manag 36(2):629–654. https://doi.org/10.1108/JEIM-03-2022-0071
Hatzivasilis G, Christodoulakis N, Tzagkarakis C, Ioannidis S, Demetriou G, Fysarakis K, Panayiotou M (2019) The CE-IoT framework for green ICT organizations: the interplay of CE-IoT as an enabler for green innovation and e-waste management in ICT. In: Proceedings of the 15th international conference on distributed computing in sensor systems, Santorini Island, Greece
Holzinger A, Weippl E, Tjoa AM, Kieseberg P (2021) Digital transformation for sustainable development goals (SDGs)—a security, safety and privacy perspective on AI. In: Lecture notes in computer science, machine learning and knowledge extraction. Springer, pp 1–20. https://doi.org/10.1007/978-3-030-84060-0_1
Holzmann P, Gregori P (2023) The promise of digital technologies for sustainable entrepreneurship: a systematic literature review and research agenda. Int J Inf Manage 68:102593. https://doi.org/10.1016/j.ijinfomgt.2022.102593
Jahanbin P, Wingreen S, Sharma R (2019) A blockchain traceability information system for trust improvement in agricultural supply chain. In: Proceedings of the 27th European conference on information systems, Stockholm and Uppsala, Sweden
Jussen I, Möller F, Schweihoff J, Gieß A, Giussani G, Otto B (2024) Issues in inter-organizational data sharing: findings from practice and research challenges. Data Knowl Eng 150:102280. https://doi.org/10.1016/j.datak.2024.102280
Kabra G, Ramesh A, Jain V, Akhtar P (2023) Barriers to information and digital technology adoption in humanitarian supply chain management: a fuzzy AHP approach. J Enterp Inf Manag 36(2):505–527. https://doi.org/10.1108/JEIM-10-2021-0456
Karnouskos S, Leitao P, Ribeiro L, Colombo AW (2020) Industrial agents as a key enabler for realizing industrial cyber-physical systems: multiagent systems entering industry 4.0. IEEE Ind Electron Mag 14(3):18–32. https://doi.org/10.1109/MIE.2019.2962225
Kim T-H (2022) Editorial special issue on AI innovations in intelligent transportation systems. IEEE Trans Intell Transport Syst 23(3):2279–2283. https://doi.org/10.1109/TITS.2022.3152067
Kurnia S, Mahbubur RM, Gloet M (2012) Understanding the roles of Is/It in sustainable supply chain management. In: Proceedings of the 16th Pacific Asia conference on information systems, Ho Chi Minh City, Vietnam
Legner C, Eymann T, Hess T, Matt C, Böhmann T, Drews P, Mädche A, Urbach N, Ahlemann F (2017) Digitalization: opportunity and challenge for the business and information systems engineering community. Bus Inf Syst Eng 59(4):301–308. https://doi.org/10.1007/s12599-017-0484-2

Levy Y, Ellis TJ (2006). A systems approach to conduct an effective literature review in support of information systems research. Inform Sci: Int J Emerg Transdiscip 9:181–212. https://doi.org/10.28945/479

Liao H-T, Pan C-L (2021) The role of resilience and human rights in the green and digital transformation of supply chain. In: Proceedings of the 2nd international conference on technology, engineering, management for societal impact using marketing, entrepreneurship and talent (TEMSMET), Pune, India

Lo Bello L, Mubeen S, Saponara S, Mariani R, Bordoloi UD (2019) Guest editorial embedded and networked systems for intelligent vehicles and robots. IEEE Trans Ind Inf 15(2):1035–1037. https://doi.org/10.1109/TII.2018.2886529

Lopez-Martin A, Carvajal RG, Cortes P (2016) Smart ecosystem for a sustainable, safe and integrated freight transport. In: Proceedings of the international conference on emerging technologies and innovative business practices for the transformation of societies (EmergiTech), Mauritius

Maha EG, Akram EK (2022) Adoption of digital technologies for sustainable supply chain_ a systematic literature review. In: Proceedings of the 3rd international conference on electronics, control, optimization and computer science, Fez, Morocco

Medaglia R, Damsgaard J (2020) Blockchain and the United Nations Sustainable Development Goals: towards an Agenda for IS research. In: Proceedings of the 24th Pacific Asia conference on information systems, Dubai, United Arab Emirates

Menon S, Shah S (2020) Are SMEs ready for industry 4.0 technologies: an exploratory study of i 4.0 technological impacts. In: 2020 International conference on computation, automation and knowledge management (ICCAKM), Dubai, United Arab Emirates

Mentzer JT, DeWitt W, Keebler JS, Min S, Nix NW, Smith CD, Zacharia ZG (2001) Defining supply chain management. J Bus Logist 22(2):1–25

Metzger A, Franklin R, Engel Y (2012) Predictive monitoring of heterogeneous service-oriented business networks: the transport and logistics case. In: 2012 Annual SRII global conference, San Jose, CA, USA

Meyer GG, Främling K, Holmström J (2009) Intelligent products: a survey. Comput Ind 60(3):137–148. https://doi.org/10.1016/j.compind.2008.12.005

Monrat AA, Schelen O, Andersson K (2019) A survey of blockchain from the perspectives of applications, challenges, and opportunities. IEEE Access 7:117134–117151. https://doi.org/10.1109/ACCESS.2019.2936094

Moorthy S, Balakrishanan S, Nithish K, Rohith CMR (2022) Blockchain and artificial intelligence feasibility, implementation and sustainability in supply chain. In: IEEE (ed) Proceedings of the 8th international conference on advanced computing and communication systems (pp 2112–2116). IEEE. https://doi.org/10.1109/ICACCS54159.2022.9785273

Müller JM (2022) The impact of data-driven technologies on supply chain design. In: Proceedings of the 43rd international conference on information systems, Copenhagen, Denmark

Munoz MF, Zhang K, Shahzad A, Ouhimmou M (2021) LogLog: a blockchain solution for tracking and certifying wood volumes. In: Proceedings of the IEEE international conference on blockchain and cryptocurrency, Sydney, Australia

Nakamoto S (2008) Bitcoin: a peer-to-peer electronic cash system. https://bitcoin.org/bitcoin.pdf

Nasir NM, Hassan S, Zaini KM, Nordin N (2022) Blockchain trust impact in agribusiness supply chain: a survey, challenges, and directions. In: Region 10 symposium, Mumbai, India

Ngassam E, Raborife M (2013) Virtual buying cooperative: a procurement model for improving the sustainability of very small retailers in emerging economies. In: 2013 IST-Africa conference and exhibition: Nairobi, Kenya, 29–31 May 2013 (pp 1–9)

Nishant R, Kennedy M, Corbett J (2020) Artificial intelligence for sustainability: challenges, opportunities, and a research Agenda. Int J Inf Manag (53):102104

Ojo OO, Zigan S, Orchard J, Shah S (2019) Advanced technology integration in food manufacturing supply chain environment: pathway to sustainability and companies' prosperity. In: IEEE technology and engineering management conference, Atlanta, GA, USA

Omar IA, Jayaraman R, Debe MS, Hasan HR, Salah K, Omar M (2022) Supply chain inventory sharing using ethereum blockchain and smart contracts. IEEE Access 10:2345–2356. https://doi.org/10.1109/ACCESS.2021.3139829

Ouafae PZO, Jalila B (2020) Impact of digitalization on the performance of a sustainable supply chain: the case of the agro-fisheries sector. In: Proceedings of the 13th international colloquium of logistics and supply chain management, Fez, Morocco

Ovaitt S, Mirletz HM, Hegedus A, Gaulding A, Barnes T (2021) PV evolution in the light of circular economy. In: IEEE 48th photovoltaic specialists conference, Fort Lauderdale, FL, USA
Padalkar NR, Sheikh-Zadeh A, Song J (2020) Business value of smart contract: case of inventory information discrepancies. In: Proceedings of the 26th Americas conference on information systems, Salt Lake City, USA
Pappas IO, Mikalef P, Giannakos MN, Krogstie J, Lekakos G (2018) Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies. IseB 16(3):479–491. https://doi.org/10.1007/s10257-018-0377-z
Peng X, Kurnia S, Samson D, Cui T (2021) Exploring IT-enabled sustainability-oriented innovation: a functional affordances perspective. In: Proceedings of the 5th Australasian conference on information systems, Sydney, Australia
Peng X, Kurnia S, Samson D, Cui T (2022) Exploring IT-enabled sustainability-oriented innovation: a case study. In: Proceedings of the 26th Pacific Asia conference on information systems, Virtual Event/Taipei, Taiwan/Sydney, Australia
Pinna A, Baralla G, Marchesi M, Tonelli R (2021) Raising sustainability awareness in agile blockchain-oriented software engineering. In: IEEE international conference on software analysis, evolution and reengineering, Honolulu, HI, USA
Quayson M, Bai C, Osei V (2020) Digital inclusion for resilient post-COVID-19 supply chains: smallholder farmer perspectives. IEEE Eng Manage Rev 48(3):104–110. https://doi.org/10.1109/EMR.2020.3006259
Quayson M, Bai C, Sarkis J (2021) Technology for social good foundations: a perspective from the smallholder farmer in sustainable supply chains. IEEE Trans Eng Manage 68(3):894–898. https://doi.org/10.1109/TEM.2020.2996003
Rana RL, Tricase C, de Cesare L (2021) Blockchain technology for a sustainable agri-food supply chain. British Food Journal 123(11):3471–3485. https://doi.org/10.1108/BFJ-09-2020-0832
Ribeiro FA, Brito MA (2022) Blockchain technology applications: enhancing fashion supply chain sustainability. In: Proceedings of the 17th Iberian conference on information systems and technologies (CISTI), Madrid, Spain
Rohde F, Wagner J, Meyer A, Reinhard P, Voss M, Petschow U, Mollen A (2024) Broadening the perspective for sustainable artificial intelligence: sustainability criteria and indicators for Artificial Intelligence systems. Curr Opin Environ Sustain 66:101411. https://doi.org/10.1016/j.cosust.2023.101411
Roy M, Roy A (2019) Nexus of Internet of Things (IoT) and big data: roadmap for smart management systems (SMgS). IEEE Eng Manage Rev 47(2):53–65. https://doi.org/10.1109/EMR.2019.2915961
Runzel MAS, Hassler EE, Rogers REL, Formato G, Cazier JA (2021) Designing a smart honey supply chain for sustainable development. IEEE Consumer Electron Mag 10(4):69–78. https://doi.org/10.1109/MCE.2021.3059955
Saberi S, Kouhizadeh M, Sarkis J, Shen L (2019) Blockchain technology and its relationships to sustainable supply chain management. Int J Prod Res 57(7):2117–2135. https://doi.org/10.1080/00207543.2018.1533261
Sachs JD, Schmidt-Traub G, Mazzucato M, Messner D, Nakicenovic N, Rockström J (2019) Six transformations to achieve the sustainable development goals. Nature Sustain 2(9):805–814. https://doi.org/10.1038/s41893-019-0352-9
Saldaña J (2015) The coding manual for qualitative researchers (2nd edition). Sage
Samah M, Salah O, El Farouk Imane I (2022) A literature review on sustainable supply chain management and its impact on sustainable performance. In: Proceedings of the 14th international colloquium of logistics and supply chain management, El Jadida, Morocco
Schneider J, Seidel S, Basalla M, vom Brocke J (2023) Reuse, reduce, support: design principles for green data mining. Bus Inf Syst Eng 65(1):65–83. https://doi.org/10.1007/s12599-022-00780-w
Schoormann T, Behrens D, Fellmann M, Knackstedt R (2021) On your mark, ready, search: a framework for structuring literature search strategies in information systems. In: Ahlemann F, Schütte R, Stieglitz S (eds) Lecture notes in information systems and organisation. Innovation Through Information Systems (vol. 46, pp. 558–575). Springer. https://doi.org/10.1007/978-3-030-86790-4_38
Schoormann T, Kutzner K (2020) Towards understanding social sustainability: an information systems research-perspective. In: Proceedings of the 41st international conference on information systems, Hyderabad, India

Schoormann T, Strobel G, Möller F, Petrik D (2021) Achieving sustainability with artificial intelligence: a survey of information systems research. In: Proceedings of the 42nd international conference on information systems, Austin, Texas, USA
Schoormann T, Strobel G, Möller F, Petrik D, Zschech P (2023) Artificial intelligence for sustainability: a systematic review of information systems literature. Commun Assoc Inf Syst 52:199–237. https://doi.org/10.17705/1CAIS.05209
Schroder A, Prockl G, Constantiou I (2021) How digital platforms with a social purpose trigger change towards sustainable supply chains. In: Proceedings of the 54th Hawaii international conference on system sciences, Kauai, Hawaii, USA
Sedlmeir J, Buhl HU, Fridgen G, Keller R (2020) The energy consumption of blockchain technology: beyond myth. Bus Inf Syst Eng 62(6):599–608. https://doi.org/10.1007/s12599-020-00656-x
Sharma R, Kamble S, Mani V, Belhadi A (2022) An empirical investigation of the influence of industry 4.0 technology capabilities on agriculture supply chain integration and sustainable performance. IEEE Trans Eng Manag 1–21. https://doi.org/10.1109/TEM.2022.3192537
Sims NA, Key G (2011) Fish without footprints. In: OCEANS'11 MTS/IEEE KONA, Waikoloa, HI
Singh GK, Dadhich M, Chouhan V, Sharma A (2021) Impact of big data analytics and capabilities on supply chain management (SCM)—an analysis of Indian Cement Industry. In: 3rd International conference on advances in computing, communication control and networking, Greater Noida, India
Soedarno D, Ranti B, Nugroho WS (2020) Use of physical internet system to increase effectiveness of sea toll logistics operations in Indonesia. In: Proceedings of the 6th international conference on interactive digital media, Bandung, Indonesia
Song L, Wang X, Merveille N (2020) Research on blockchain for sustainable E-agriculture. In: Proceedings of the IEEE technology and engineering management conference, Novi, MI, USA
Soni S, Yadav U (2022) Sustainable supply chain management: research review and its future. In: Proceedings of the international conference on computing, communication, and intelligent systems (ICCCIS), Greater Noida, India
Su Y, Fan Q-M (2020) The green vehicle routing problem from a smart logistics perspective. IEEE Access 8:839–846. https://doi.org/10.1109/ACCESS.2019.2961701
Adellina AR, Wulandari M, Sembiring J, Hasugian LP (2017) Service innovation for a sustainable fuel supply using cyber physical social system technology. In: Proceedings of the 6th international conference on electrical engineering and informatics, Langkawi
Tagiltseva JA, Kuzina EL, Drozdov NA, Vasilenko MA, Barashyan VY, Churilov AI (2021) The intelligent transportation system in multimodal freight transportation. In: International conference on quality management, transport and information security, information technologies, Yaroslavl, Russian Federation
Tagiltseva JA, Kuzina EL, Drozdov NA, Vasilenko MA, Kuzina MA, Korenyakina NN (2021) The international Cargo transportations in South Russian transport and logistics system. In: International conference on quality management, transport and information security, information technologies, Yaroslavl, Russian Federation
Tan X, Gao K, Zhou M, Zhang L (2022) An exploratory study of deep learning supply chain. In: Dwyer MB, Damian D, Zeller A (Chairs) Proceedings of the 44th international conference on software engineering, Pittsburgh Pennsylvania
Tang S, Wang Z, Ge S, Ma Y, Tan G (2022) Research and implementation of resource recovery supply chain financial platform based on blockchain technology. In: International conference on computer engineering and artificial intelligence, Shijiazhuang, China
Tentzeris MM, Georgiadis A, Roselli L (2014) Energy harvesting and scavenging. Proc IEEE 102(11):1644–1648. https://doi.org/10.1109/JPROC.2014.2361599
Tirkolaee EB, Aydin NS (2022) Integrated design of sustainable supply chain and transportation network using a fuzzy bi-level decision support system for perishable products. Expert Syst Appl 195:116628. https://doi.org/10.1016/j.eswa.2022.116628
Tran-Dang H, Krommenacker N, Charpentier P, Kim D-S (2020) Toward the Internet of Things for physical internet: perspectives and challenges. IEEE Internet Things J 7(6):4711–4736. https://doi.org/10.1109/JIOT.2020.2971736
Tronnebati I, Jawab F (2020) The similarities and differences between the green and sustainable supply chain management definitions and factors: a literature review. In: Proceedings of the 13th international colloquium of logistics and supply chain management, Fez, Morocco

Tsoukas V, Gkogkidis A, Kampa A, Spathoulas G, Kakarountas A (2021) Blockchain technology in food supply chain: a state of the art. In: 6th South-East Europe design automation, computer engineering, computer networks and social media conference (SEEDA-CECNSM), Preveza, Greece

United Nations (2015) The 17 goals. https://sdgs.un.org/goals

Upadhyay A, Mukhuty S, Kumar V, Kazancoglu Y (2021) Blockchain technology and the circular economy: implications for sustainability and social responsibility. J Clean Prod 293:126130. https://doi.org/10.1016/j.jclepro.2021.126130

Veit DJ, Thatcher JB (2023) Digitalization as a problem or solution? Charting the path for research on sustainable information systems. J Bus Econ. Advance online publication. https://doi.org/10.1007/s11573-023-01143-x

Villagomez-Aranda A, Saenz-de la OD (2021) Agriculture and COVID-19 : impacts, perceptions and alternatives to become stronger. In: XVII international engineering congress, Queretaro, Mexico

Vinuesa R, Azizpour H, Leite I, Balaam M, Dignum V, Domisch S, Felländer A, Langhans SD, Tegmark M, Fuso Nerini F (2020) The role of artificial intelligence in achieving the Sustainable Development Goals. Nat Commun 11(1):233. https://doi.org/10.1038/s41467-019-14108-y

Viskovic A, Franki V, Damiano A (2021) Integrated strategic action for facilitating the electrification process. In: 44th International convention on information, communication and electronic technology (MIPRO), Opatija, Croatia

Vogel J, Hagen S, Thomas O (2019) Discovering blockchain for sustainable product-service systems to enhance the circular economy. In: 14th International conference on Wirtschaftsinformatik, Siegen, Germany

Völter F, Urbach N, Padget J (2023) Trusting the trust machine: evaluating trust signals of blockchain applications. Int J Inf Manage 68:102429. https://doi.org/10.1016/j.ijinfomgt.2021.102429

vom Brocke J, Simons A, Riemer K, Niehaves B, Plattfaut R, Cleven A (2015) Standing on the shoulders of giants: challenges and recommendations of literature search in information systems research. Commun Assoc Inf Syst 37(1):205–224. https://doi.org/10.17705/1CAIS.03709

Wanner J, Heinrich K, Janiesch C, Zschech P (2020) How much AI do you require? Decision factors for adopting AI technology. In: Proceedings of the 41st international conference on information systems, Hyderabad, India

Watson RT, Elliot S, Corbett J, Farkas D, Feizabadi A, Gupta A, Iyer L, Sen S, Sharda R, Shin N, Thapa D, Webster J (2021) How the AIS can improve its contributions to the UN's sustainability development goals: towards a framework for scaling collaborations and evaluating impact. Commun Assoc Inf Syst 48(1):476–502. https://doi.org/10.17705/1CAIS.04841

Webster J, Watson RT (2002) Analyzing the past to prepare for the future: writing a literature review. MIS Q 26(2):xiii–xxiii.

Whitaker M, Pawar P (2020) Commodity ecology: a virtual community platform for promoting responsible consumption and production to achieve SDG #12. In: IEEE green technologies conference, Oklahoma City, OK, USA

Williams JM, Khanna R, Rumbel L, Qian Y, Liu H (2019) Farm-to-fork computing: sensor networks in agriculture's coldchain. In: IEEE global humanitarian technology conference, Seattle, WA, USA

Wu J, Guo S, Huang H, Liu W, Xiang Y (2018) Information and communications technologies for sustainable development goals: state-of-the-art, needs and perspectives. IEEE Commun Surv Tutor 20(3):2389–2406. https://doi.org/10.1109/COMST.2018.2812301

Yau K-LA, Peng S, Qadir J, Low Y-C, Ling MH (2020) Towards smart port infrastructures: enhancing port activities using information and communications technology. IEEE Access 8:83387–83404. https://doi.org/10.1109/ACCESS.2020.2990961

Yew MH, Kurnia S, Molla A, Ali M, Ramayah T, Rahim M (2020). Exploring blockchain for sustainability in the food supply chain: an affordance approach. In: Proceedings of the 24th Pacific asia conference on information systems, Dubai, United Arab Emirates

Ying S (2021) Research on big data and new smart city construction. In: International conference on education, information management and service science, Xi'an, China

Yoo Y, Boland RJ, Lyytinen K, Majchrzak A (2012) Organizing for innovation in the digitized world. Organ Sci 23(5):1398–1408. https://doi.org/10.1287/orsc.1120.0771

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

Zhang M, Sun M, Bi D, Liu T (2020) Green logistics development decision-making: factor identification and hierarchical framework construction. IEEE Access 8:127897–127912. https://doi.org/10.1109/ACCESS.2020.3008443

Authors and Affiliations

Stephanie Winkelmann[1,2] · Rajae Guennoun[1,3] · Frederik Möller[2,4] · Thorsten Schoormann[2,4] · Hendrik van der Valk[1]

✉ Stephanie Winkelmann
stephanie.winkelmann@tu-dortmund.de

Rajae Guennoun
rajae.guennoun@tu-dortmund.de

Frederik Möller
frederik.moeller@tu-braunschweig.de

Thorsten Schoormann
thorsten.schoormann@tu-braunschweig.de

Hendrik van der Valk
hendrik.van-der-valk@tu-dortmund.de

1 TU Dortmund University, Joseph-Von-Fraunhofer Str. 2-4, 44227 Dortmund, Germany

2 TU Braunschweig, Brunswick, Germany

3 DB Schenker AG, Essen, Germany

4 Fraunhofer Institute for Software and Systems Engineering, Dortmund, Germany