



Sustainable through Digital – A Research Agenda for Digital Social Innovation

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Abstract

To address the detrimental sustainability challenges of our time, the synthesis of two currently isolated innovation research streams is promising: 1) Digital innovation leveraging digital technologies to create novel solutions, and 2) social innovation creating social value and thus accelerating sustainable development. Bringing together both research streams, this study aims to build a knowledge foundation on so-called digital social innovation (DSI). First, by identifying 135 studies in the DSI realm through a structured literature review, we analyse and synthesise their contribution via a theory-based multidimensional framework spanning digital technology, digital innovation, and social innovation. Next, to get a comprehensive overview of existing DSI research, this study provides a research agenda validated by expert scholars comprising 12 clear-cut research pathways for DSI. Our findings guide the advancement of DSI research and enable practitioners to leverage DSI in light of the current societal challenges.

Keywords Digital Social Innovation · Literature Review · Research Agenda · Sustainability

1 Introduction

Integrating the three pillars of economic, social, and ecological well-being (Elkington, 1997; Kohler & Chesbrough, 2019; Wiedmann et al., 2009), sustainability is often addressed in the form of the 17 Sustainable Development Goals (SDGs), which were adopted by the United Nations in 2015 as a universal call for action to contribute to sustainable development (United Nations, 2015; Wu et al., 2018).

Within this overarching agenda, efforts to achieve sustainability take diverse forms, ranging from initiatives that focus on individual SDGs to those that address multiple goals in an integrated manner (e.g., Kohler & Chesbrough, 2019; Mettler et al., 2017). Due to its complex and multi-faceted nature, sustainability has emerged as a central theme in many academic disciplines (Elliot, 2011; Gholami et al., 2016; Watson et al., 2010). In particular, Information Systems (IS) research holds enormous potential to accelerate sustainable development due to its interdisciplinary nature, data orientation, and broad methodological approaches (Ketter et al., 2022; Thomas et al., 2020). Thus, our IS community faces the moral responsibility to contribute to finding solutions to address societal challenges (e.g., Ketter et al., 2022; Melville, 2010; Venkatesh et al., 2019; Watson et al., 2010).

In general, IS research contributes to innovative socio-technical solutions (Thomas et al., 2020), which leverage the potential of digital technologies while paying sufficient attention to the social system they are embedded in. Such innovations are pivotal to addressing entrenched sustainability problems like climate change. Digitalisation has drastically changed innovation in the past decade, entailing an even higher potential of the resulting digital innovation (DI) to drive the achievement of sustainable development (Bähr & Fliaster, 2023; Yoo et al., 2012). Next to creating novel business value,

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integrating digital technologies within DI also poses challenges to organisations. Emerging digital technologies inhibit unique characteristics such as re-programmability, convergence, or self-inherence (Ciriello et al., 2018; Yoo et al., 2010). These characteristics require different handling than traditional innovation. For example, organisations must manage the potential of re-programmability within product roadmapping and release planning. Consequently, organisations must adapt their implementation and diffusion processes to fully exploit the value of the corresponding DIs (Jahannir & Cavadas, 2018).

There are many studies on applying DI for digital transformations in a purely economic context (e.g., Eom et al., 2022; Hodapp & Hanelt, 2022; Mendling et al., 2020). However, the urgency of sustainability challenges across the globe has forced organisations to look beyond economic success only. Today, organisations must combine economic, social, and ecological targets for regulatory, ethical, or strategic reasons. Both research and practice have only started to understand how to expand the economic focus of DI to all three sustainability pillars (Bican & Brem, 2020). If we want to make significant progress towards sustainable development, it is, however, fundamental to not only promote the value of DI for economic purposes (Henkel et al., 2017).

In contrast to DI, social innovation (SI) refers to innovation activities that comprise economically viable ideas to primarily create social value, addressing societal challenges across all the pillars of sustainability (Tracey & Stott, 2017). Originating from the perspective that profit orientation at the expense of social and ecological well-being is morally reprehensible, social innovators have proved that the potential of innovation could also drive sustainable development (Dacin et al., 2011). For example, SI includes initiatives around fostering education or developing a new strategy for facilitating the funding of charity projects (Battistella et al., 2021). SI, however, has reached its limits for some of the sustainability challenges. Therefore, new ways of addressing these issues need to be explored. The integration of digital technologies is one avenue to advance the success of SI, but it has not yet gained substantial attention. So far, both valuable research streams (i.e., DI and SI) coexist mostly separated without leveraging the synergies at their interface. However, we are convinced that the exceptional value of both streams for targeting sustainability is greatest at their intersection when expanding DI to social and ecological concerns and integrating digital technologies in SI. Thus, we aim to join forces of both research streams, advancing research on *digital social innovation* (DSI), understood as “digital solutions to social challenges” (Bria, 2015, p. 4). Digital solutions integrate the notions of digitization and digitalization, i.e., digital solutions entail the transformation of analogue information into a digital form as well as the usage of digital technologies at an individual, organisational, and societal level (Legner et al.,

2017). Therein, DSI synthesises DI and SI, where DIs create sustainability value (Bonina et al., 2021b).

DSI is a relatively new phenomenon, with most studies that mention the term having been published in the last few years (e.g., Bonina et al., 2021b; Buck et al., 2023; Gebken et al., 2021; Mehmood & Imran, 2021; Qureshi et al., 2021). Scholars have started to discuss DSI as an integrated concept recently investigating, for example, its potential for certain facets of sustainable development (e.g., Suseno and Abbott (2021) for gender equality) or topics such as participation motives in DSI (Rodrigo & Palacios, 2021). However, additional literature exists on the intersection of DI and SI with valuable insights, which is currently less present because of inconsistent terminology. Several different expressions, such as digital eco-innovation, green information and communication technologies (ICTs), or IT-enabled SI, are being used when researching topics in the domain of DSI (Butler & Hackney, 2015; Carberry et al., 2019; Gogan et al., 2020). As a result, existing DSI research is highly scattered across disciplines, outlets, and terminologies, making it difficult to grasp the richness of prior contributions. As digital technologies are a central component of DSI, IS research should know how to contribute to DSI in a meaningful way. Therefore, it is essential to understand 1) the different dimensions of DSI, 2) existing contributions, and 3) critical research pathways and their implications for DSI. Such an integrated understanding is crucial to creating a common ground on DSI for advancing future knowledge quickly (Webster & Watson, 2002). Our research question thus reads: *What are critical DSI research pathways?*

To answer the research question, we bring together the research streams of DI and SI, building upon a theory-based multidimensional framework for analysing existing DSI literature identified through a systematic literature review (Boell & Cecez-Kecmanovic, 2015; Leidner, 2018; Webster & Watson, 2002). We identify relevant dimensions of DSI to structure and capture well-researched themes and critical paths for future research to derive a research agenda. To sharpen its implications, we discuss the research agenda with 10 scholars at the intersection of digital technologies, innovation, and sustainability. Specifically, we structure contributions and research pathways along the three key dimensions of DSI: 1) the differentiation of digital technologies as a means or an end to DSI, 2) the core elements of the DI process as presented in the seminal paper by Kohli and Melville (2019), and 3), the three pillars of sustainability as incorporated in SI. We build six research clusters across the three dimensions and derive 12 critical research pathways for IS scholars. We contribute to addressing the grand challenges of our time by joining the forces of previously isolated research streams, identifying central research gaps, and deriving a research agenda. In sum, our work guides advancing DSI research and enables practitioners to tackle real-life societal challenges.

2 Conceptual Framing

In 1934, Schumpeter first defined innovation as the strategic reconfiguration of an organisation's assets and skills to achieve competitive differentiation (Schumpeter, 1934). Today, adopting new technologies further unlocks significant potential for gaining a competitive advantage. Notably, integrating digital technologies accelerates innovation at an extraordinary speed and scale, thereby facilitating DI (Kohli & Melville, 2019). In the realm of social issues, further innovation is crucial as part of SI to effectively address societal challenges (Phills & Miller, 2008). DSI emerges as a synthesis of DI, with an essential part being digital technologies, alongside the sustainability focus that characterises SI. Following Buck et al. (2023), we understand DSI as combining different characteristics of SI and DI while also having distinct characteristics. For instance, while DI is driven by using digital technologies within the innovation process or the outcome, SI is driven by tackling societal challenges. DSI not only combines these two aspects but is driven by exploring or exploiting new market opportunities for the goal of "doing good", therefore creating social and economic value (Buck et al., 2023).

Table 1 displays recent definitions of DSI in the IS domain. They include various perspectives on DSI as scholars build on and combine the concepts of digital technologies, DI,

Table 1 Definitions of DSI

Source	Definition
Bonina et al., (2021b), p. 698)	"[...] we define DSI broadly as the development of new products, services or processes, that are either embodied on IT or enabled by IT , whose goal is to meet social needs or stimulate social change. "
Buck et al., (2023, p. 4) based on Bonina et al., (2021b)	"In the context of incumbents, we define DSI as the leveraging of [digital technologies] to address societal challenges through commercially viable innovation. "
Dong and Götz (2021, p. 673)	"Open source software (OSS) is a typical digital social innovation [...] OSS is a combination of digital innovation and social innovation , or digital social innovation."
Qureshi et al., (2021, p. 647) based on Qureshi et al. (2017) and Shalini et al. (2021)	"Digital social innovation (DSI) involves the use of digital technologies in the development and implementation of innovative products, services, processes, and business models that seek to improve the well-being and agency of socially disadvantaged groups or address social problems related to marginality, inequality, and social exclusion."
Tim et al., (2021, p. 324) based on Majchrzak et al. (2016) and Pan and Zhang (2020)	"Digital social innovation (DSI)—the novel use of digital technology to address major societal challenges —has been the bedrock of sustainable development and has therefore garnered increasing attention amongst researchers and practitioners particularly in recent years."

and SI differently (Bonina et al., 2021b); Buck et al., 2023; Dong & Götz, 2021; Qureshi et al., 2021; Tim et al., 2021). These definitions focus on various concepts. Bonina et al., (2021b) draw from the concept of identity orientation developed by Brickson (2005) as well as insights from social entrepreneurship literature (e.g., Di Lorenzo & Scarlata, 2019). Buck et al. (2023) build on Bonina et al., (2015) definition and examine DSI from the perspective of established organisations drawing from DI and SI literature. Further, Dong and Götz (2021) examine a specific technology, i.e., open source software, as a DSI, drawing from DI and SI literature and building on resource dependence theory (Pfeffer & Salancik, 1978). Qureshi et al. (2021) integrate research from social entrepreneurship, ICTs for development, and SI to deepen their understanding of DSI. Finally, Tim et al. (2021) examine DSI from a practitioner's perspective, examining e-commerce as a specific form of DSI used in rural communities for poverty alleviation.

To identify and structure current research on DSI and derive a research agenda, we develop a theory-based multidimensional analysis framework consisting of the dimensions 1) *digital innovation*, 2) *digital technology*, and 3) *social innovation*. Following, we elaborate on all three dimensions as the theoretical backbone of our study.

First, regarding the *digital innovation* dimension, research on DI focuses on "the creation or adoption, and exploitation of an inherently unbounded, value-adding novelty (e.g., product, service, process, or business model) through the incorporation of digital technology" (Hund et al., 2021, p. 6). Therein, digital technology – as an enabler of entrepreneurial endeavours (Briel et al., 2021) – influences opportunity recognition through several effects (e.g., digital invasiveness, dissolving product and industry boundaries, and dissolving company and customer boundaries) (Kreuzer et al., 2022). To date, conceptualisations of DI have differed in their foci on DI outcomes, the DI process or both, constituting six primitives: input, involvement, properties, scope, implications, and creation (Hund et al., 2021). For our study, we follow Kohli and Melville's (2019) work as a well-cited literature review on DI. They comprehensively view *DI actions*, *outcomes*, and the *environment*.¹ The DI actions consist of four steps: 1) *initiating* a DI to create novel ideas and identify business opportunities, 2) *developing* a new digital solution or enhancing an existing one, 3) *implementing* the digital solution either within a company or in the market, 4), *exploiting* the digital solution to maximize its value (Baumbach et al., 2020; Kohli & Melville, 2019). The DI actions are ongoing and iterative without a clearly defined starting or ending point, pointing at the processual nature of DI (Hund et al., 2021; Kohli & Melville, 2019). In terms of outcomes, Kohli and Melville (2019)

¹ Please note that we use the term "environment" here to refer to the organisational environment.

outline new business processes, products, and/or services. On top of that, scholars also acknowledge the transformation of business models as a relevant DI outcome (Ciriello et al., 2018; Fichman et al., 2014; Hund et al., 2021). Furthermore, the DI actions are shaped by the internal organisational environment and the external competitive environment (Nasiri et al., 2023; Ye et al., 2022). The internal organisational environment refers to the organisational context, such as culture or knowledge management, while the external competitive environment refers to the organisation's competitive marketplace (Kohli & Melville, 2019). To date, the innovation ecosystem of an organisation is conceptualised beyond its competitive marketplace and includes actors that support innovation, such as end-users or innovation networks (Abrell et al., 2016; Hosseini et al., 2018; Jacobides et al., 2018; Schmitt & Muyo, 2020). For our analysis framework, we thus apply an integrated perspective following Kohli and Melville (2019) and assess the DI dimension through the characteristics of 1) actions, 2) outcome, and 3) environment.

Second, regarding the *digital technology* dimension, digital technologies comprise different loosely coupled layers, i.e., device, network, service, and content (Henfridsson et al., 2018; Yoo et al., 2010). To date, the boundaries and scope of digital technologies have not been clearly defined, and the term is often used interchangeably with the notions of IT, IS, and ICT. ICTs enable communication and collaboration such as smartphones or tablets (Dittes & Smolnik, 2019; Zuppo, 2012). Overlapping with ICTs, digital technologies are described as a combination of connectivity, information, computing, and communication technologies (Bharadwaj et al., 2013), using digital resources to acquire, create, analyse, or communicate information in specific contexts (Zuppo, 2012). Further, digital technologies are understood – more vaguely – as an umbrella term for IT within the context of digitalisation (Denner et al., 2018). Digital technologies comprise the three constitutive characteristics, re-programmability, self-referential nature, and homogenisation of data (Yoo et al., 2010). On this foundation, Benbya et al. (2020) added the complexity-inducing characteristics of embeddedness, connectedness, communicability, editability, identifiability, and associability. Digital technologies' characteristics change the nature of DI (Kohli & Melville, 2019; Yoo et al., 2010) and offer various opportunities to reach new markets and gain new sources of profit due to their high affordability and availability (Fichman et al., 2014; Walsham, 2017). Concerning DI, digital technologies can assume two different roles: 1) they can be applied during the innovation process itself (i.e., *digital technologies as a means*), and 2) they can be part of the innovation outcomes (i.e., *digital technologies as an end*) (Ciriello et al., 2018; Nambisan et al., 2017). Thus, as a means refers to digital technologies supporting the development of new

solutions (e.g., using digital platforms to connect people to co-create innovative solutions) and therefore, the outcome of the innovation process can be digital, hybrid, or non-digital (Ciriello et al., 2018; Nambisan et al., 2017). As an end refers to the digital technologies being part of the digital (or hybrid) innovation outcome (e.g., a new mobile application) (Ciriello et al., 2018; Yoo et al., 2010). To fully capture the role of digital technologies in DSI, we thus differentiate between the two characteristics: 1) digital technologies as a means of DSI or 2) digital technologies as an end to DSI.

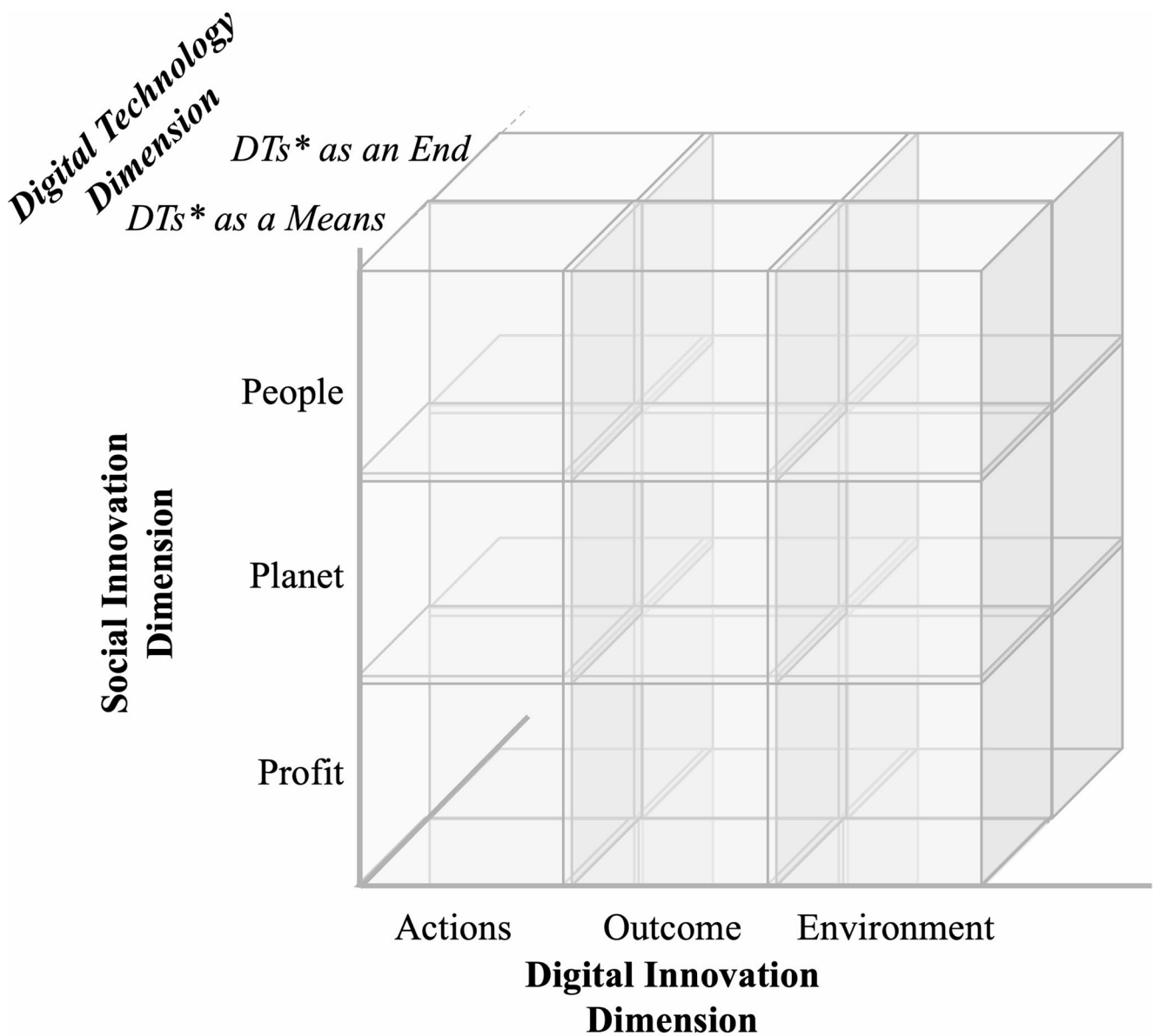
Third, regarding the *social innovation* dimension, many non-technological research streams have engaged in social topics at the intersection of innovation. Corresponding knowledge has emerged on sustainable innovation, eco-innovation, green innovation, environmental innovation, responsible innovation, frugal innovation, and SI (Albert, 2019; Alraja et al., 2022; Franceschini et al., 2016; Lubberink et al., 2017). Further, scholars have examined IS in social contexts without emphasising an explicit innovation-focus, resulting in dedicated research streams such as ICT4D, Green IS, or social tech (Arena et al., 2018; Tarik et al., 2021; Walsham, 2017; Watson et al., 2010). SI aims at creating social value, i.e., “the creation of benefits or reductions of costs for society – through efforts to address social needs and problems – in ways that go beyond the private gains and general benefits of market activity” (Phills et al., 2008, p. 39). We incorporate societal needs in SI as the third dimension of our analysis framework, including improving human and environmental well-being (Lubberink et al., 2017). An innovation is classified as a SI when its underlying rationale attains social instead of purely economic goals (Phills et al., 2008). Today, interpretations of SI are generally broad and address different societal needs. SI is often associated with attaining the SDGs (Eichler & Schwarz, 2019). The SDGs comprise 17 sub-goals spanning social (e.g., good health and well-being), ecological (e.g., life on land), and economic sustainability (e.g., decent work and economic growth) (Wu et al., 2018) or in other words people, planet and profit (Palmer & Flanagan, 2016). All three sustainability dimensions are subsumed through the concept of sustainable development and target the protection of natural resources (i.e., planet) and providing social and economic welfare (i.e., people and profit) (WCED, 1987). On this background, our analysis framework captures the three sustainability dimensions addressed by SI through the characteristics 1) people, 2) planet, and 3) profit.

The research streams of DI and SI can strongly benefit from each other (Buck et al., 2023). The integration of societal topics into DI research enables organisations to lever commercially viable innovation across actions, outcome, and environment while achieving social value (Bonina et al., 2021b; Tim et al., 2021). Simultaneously, SI strongly benefits from using the opportunities of digital technologies, such

as high scalability and availability as well as access across social classes to address societal challenges (Fichman et al., 2014; Grigore et al., 2017; Onsongo, 2019; Walsham, 2012). Digital technologies enable diverse applications within the social domain, such as using e-commerce to alleviate poverty (Tim et al., 2021) or reducing high infant mortality through digital technology intervention (Venkatesh et al., 2016). Thus, integrating the research streams of DI and SI helps to adopt a transdisciplinary perspective, which is needed to address current and future societal challenges (Walsham, 2017).

Combining the three dimensions of DI, digital technology, and SI leads to the emergence of DSI to address societal

challenges (Bonina et al., 2021b; Dong & Götz, 2021). Research on using the opportunities of digital technologies to address societal challenges is not new per se. It has been conducted through various disciplines such as Computer Sciences, Environmental Sciences, and Information Systems. However, due to the research being scattered across different disciplines, it is difficult to capture the richness of prior contributions. Thus, for our research, we integrate the three dimensions (digital technology, DI, SI) to assess prior contributions according to the core components of DSI and derive a DSI research agenda. Figure 1 depicts our resulting analysis framework.



*Notes: *DTs = digital technologies*

Fig. 1 DSI analysis framework

3 Research Method

We conducted a two-phase research approach to derive meaningful research pathways for DSI. We first used the analysis framework presented in the Conceptual Framing Section to synthesise existing DSI contributions, uncover research gaps, and derive a research agenda worth investigating (Leidner, 2018; Webster & Watson, 2002). Next, we conducted 10 expert interviews with IS scholars in the DSI domain or in one of the intersecting areas (e.g., DI) to expand, discuss, and challenge the literature-based research agenda iteratively (Myers & Newman, 2007). Figure 2 shows the overall methodological design of this study.

3.1 Phase 1: Initial Development of Research Agenda

For phase 1, based on Leidner's (2018) "polyolithic framework of research and theory development papers" (p.1), we classify our literature review as an "assessing review" with the research objective to synthesise literature and the review focus to identify gaps. Specifically, we conducted a systematic DSI literature review following Boell and Cecez-Kecmanovic (2015) alongside five-steps detailed in Fig. 3.

(1) Define Search Protocol: We selected literature bases covering IS and other fields. For IS, we focused our search on high-impact IS journals and conference publications, i.e., the *Senior Scholars' List of Premier Journals* (Association for Information Systems, 2023), the *International Conference on Information Systems*

(ICIS), the *European Conference on Information Systems* (ECIS), the *Americas Conference on Information Systems* (AMCIS), and the *Pacific Asia Conference on Information Systems* (PACIS). We acknowledge that journal rankings, including the IS Senior Scholars' List of Premier Journals, evolve over time and are periodically updated by the academic community to reflect changes in the field's landscape. However, we applied our selection criteria at the specific time point of our literature search to ensure consistency. The conferences are included to address the trade-off between the topicality of DSI and longer review cycles in top journals compared to conferences. For the other fields and to cover the whole picture of DSI in other disciplines, we additionally used the database *Web of Science*. Within Web of Science, we searched journals across disciplines with an impact factor higher than 2.5 at the time of our literature search to ensure a high-quality sample. The impact factors are dynamic and change year-on-year. Thus, we used the impact factors available at the specific time point of our search to maintain consistency in our selection criteria. This criterion aligns with Henkel and Kranz (2018) and is a popular numerical measurement method in scientific work (Garfield, 2006). While Garfield (2006), creator of the Social Science Citation Index, acknowledges that the journal impact factor is not flawless, he argues that it is well established and that a superior metric remains yet to be found. An impact factor larger than 3.0 is typically considered a suitable threshold (Sci Journal, 2020). A factor of 3.0, however, would exclude relevant sustainability-focused journals. We,

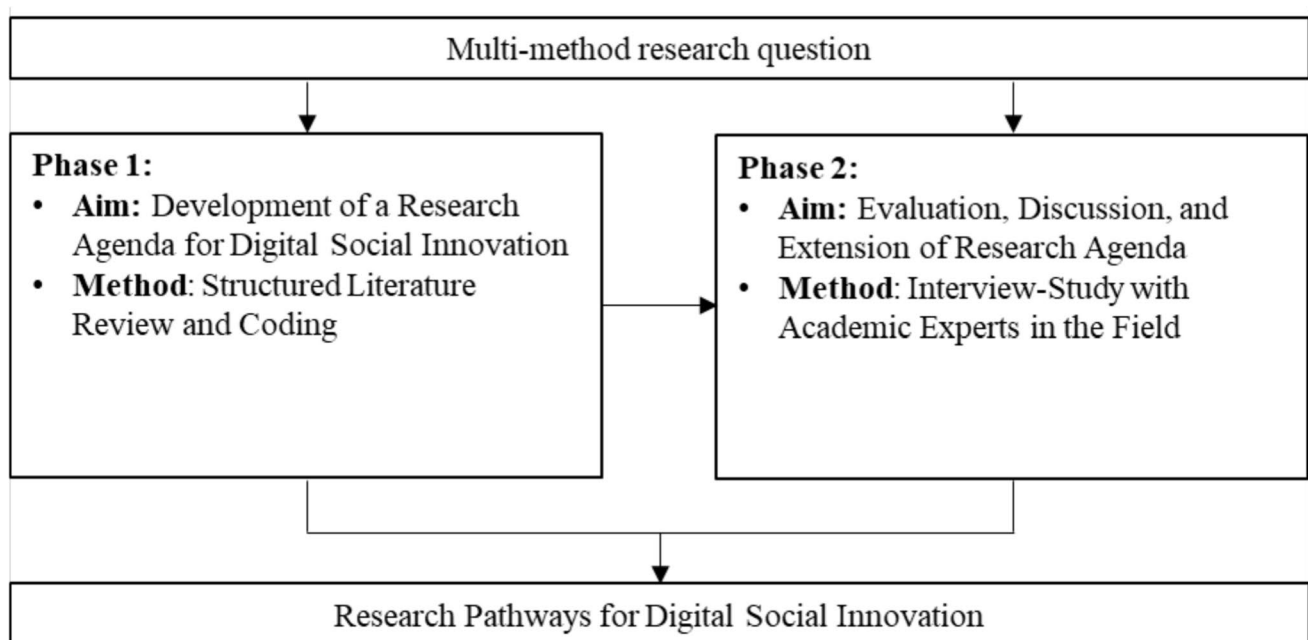


Fig. 2 Two-phase research approach

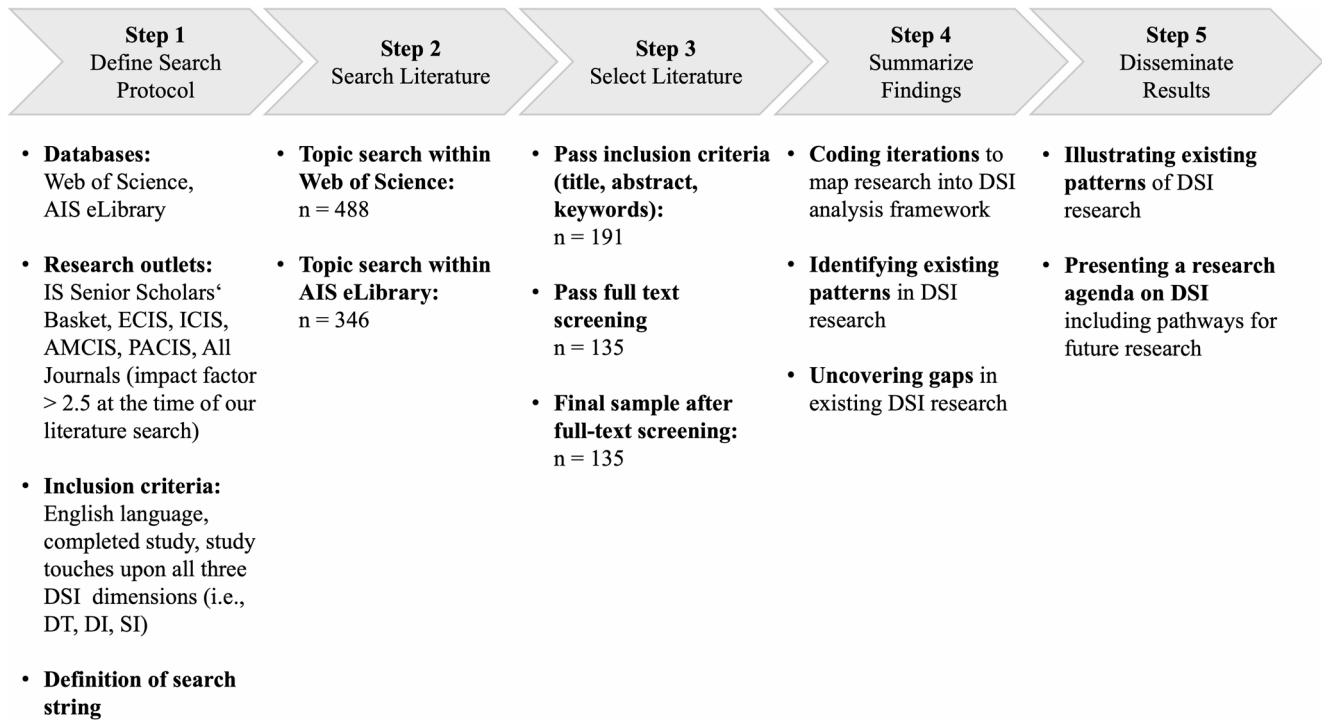


Fig. 3 Five-step approach as proposed by Boell and Cecez-Kecmanovic (2015)

Table 2 Overview of search strings

Search string #1	Search string #2	Search string #3
(ICT4D or "Green IS" or "social tech") AND innovation*	("digital* innovation*" OR "ICT innovation*" OR "information technolog* innovation*" OR "information system* innovation*") AND (social OR sustain* OR green OR environmen* OR responsib* OR eco* OR frugal)	("social innovation*" OR "sustainab* innovation*" OR "green innovation*" OR "environmen* innovation*" OR "responsib* innovation*" OR "eco-innovation*" OR "eco innovation*" OR "frugal innovation*") AND ("digital technolog*" OR ICT OR "information technolog*" OR "information system*")

therefore, reduced the threshold to 2.5 to capture valuable contributions. By selecting journals with an impact factor of 2.5 or higher, we ensured the inclusion of scholarly publications that demonstrate significant academic influence, rigorous peer-review processes, and substantial contributions to domains related to DSI. The Journal of the Association for Information Systems (JAIS), for instance, has seen its impact factor rise from 2.839 in 2019 to 7.0 in 2024. This exemplifies both the relevance of our selection criteria and the fact that the deviation from our starting point of 2.5 was already present at the outset of our search.

We defined our search string, focusing on relevant DSI contributions while yielding the largest possible set of relevant studies. Accordingly, we derived three search strings consisting of multiple terms related to the DSI dimensions, as summarised in Table 2. DSI is an emerging phenomenon in many academic disciplines and is characterised by inconsistent terminology use (e.g., SI, sustainable innovation, green innovation, frugal innovation). We reflect this diversity in our search strings, which capture the digital technology dimension (e.g., "digital technolog*" or "tech"), the DI dimension (e.g., "digital innovation" or "ICT innovation"), and the SI dimension (e.g., "green" or "sustain*"). The development of our search strings followed a three-step process. First, we identified initial keywords based on the three core dimensions of the DSI analysis framework, complemented by a comprehensive mapping of relevant synonyms for each. Second, we refined the search strings through a series of pilot searches and tested them across multiple databases to ensure consistent and relevant retrieval. Third, domain experts reviewed the terms to help identify gaps and suggest alternative or additional terminology.

(2) Search Literature: We conducted an initial literature search across Web of Science and the AIS eLibrary in October 2020. As the field continued to evolve, we expanded our search in September 2021 and November 2023 to capture more recent contributions. The search yielded 834 results (488 studies in Web of Science and 346 studies in the AIS

eLibrary), excluding duplicates and all papers from journals with an impact factor lower than 2.5.

(3) Select Literature: In a first relevance check, we screened the titles, abstracts, and keywords of the 834 studies (vom Brocke et al., 2015). Studies included (at least partly) address the outlined DSI dimensions, i.e., digital technology, DI, and SI. Further, a study has to be composed in English and be a completed research paper. Three authors screened a sample of 20 studies independently to ensure uniformity in screening. The three authors agreed in 19 cases and disagreed in one, leading to a very high agreement level of $p_0=98.41\%$. The remaining studies were split among two authors and screened independently. To dissolve potential ambiguities, all authors met in regular workshops. After the first screening, 191 studies remained for a full-text screening. We analysed the respective studies and evaluated whether they appropriately address all three defined dimensions of DSI, i.e., digital technology, DI, and SI. As a result, 135 studies remained. A list of the final set of studies and the integrated studies' domains can be found in Appendix 1.

(4) Summarise Findings: To address our research question and identify pathways for further research, we investigated the contributions of prior work and developed a research agenda from the questions left open. We coded the final 135 studies using the coding techniques of Stock et al. (1996) and Wolfswinkel et al. (2013) as an orientation. We read each study in detail during coding and assigned predefined characteristics grounded in the existing literature. These characteristics reflected the three DSI dimensions, i.e., digital technology (characteristics: *digital technologies as a means*, *digital technologies as an end*), DI (characteristics: *actions*, *outcome*, *environment*), and SI (characteristics: *people*, *planet*, *profit*). Further, we grouped the studies to form research clusters alongside the postulated analysis framework. Studies in the same cluster resembled in DSI characteristics (per dimension) and study purpose. An example of our used code book can be found in Appendix 2. While assigning the characteristics, we found meta-insights regarding the dimensions, which we summarised and further developed into pathways for further research. We refined the contents of each cluster until theoretical saturation was reached, i.e., while re-reading studies, no new insights to the clusters appeared, and we did not add new findings. Two co-authors each coded the articles independently to ensure high coding quality, and the results were discussed in regular author workshops. In terms of coding, we achieved an average agreement of $p_0=0.7857$ and a 'substantial' to 'moderate' (Landis & Koch, 1977) interrater reliability (Cohen's kappa) between 0.8128 and 0.5216 (overall average: 0.7061, median: 0.7982) per dimension (Cohen, 1960).

(5) Disseminate Results: We compiled and illustrated our results along with the outlined DSI analysis framework, which conceptualises DSI considering the digital technology, DI, and SI dimensions and establishes relations among the identified clusters. The framework depicts existing research patterns in DSI research and helps uncover relevant gaps and pathways for further research. Moreover, we built on the findings from the six DSI research clusters to derive a research agenda for DSI based on a set of twelve research pathways.

3.2 Phase 2: Evaluation of Research Agenda

Phase 1 yielded a research agenda for DSI based on the rich literature published across domains. In the second phase, we discussed, extended, and refined the initial version through expert interviews. Incorporating expert interviews within the research methodology aims to deepen the understanding of the subject matter and enrich the literature review. In the IS literature, interviews are a well-known approach to evaluating qualitative research (Myers & Newman, 2007). As our research pathways are targeted towards a theoretical contribution, we conducted 10 semi-structured interviews with IS scholars in the DSI domain or in one of the intersecting areas (e.g., DI). Thus, the expert interviews augment the literature review by providing firsthand insights, perspectives, and a nuanced understanding from individuals actively engaged in the field. The interviews aimed to complement existing scholarly knowledge, identify gaps or discrepancies in the literature, and offer valuable input for refining the research framework.

Experts were selected by a purposive sampling approach (Campbell et al., 2020), wherein individuals with extensive experience and expertise in the research domain were identified and invited to participate. The selection criteria encompassed academic credentials, research contributions, and practical experience relevant to the study's focus. Experts from various career stages, including PhD students, postdoctoral researchers, and faculty members, were included in the sample to ensure a diversity of perspectives. Scholars were selected based on their research focus and their academic position, creating a diverse set of interviewees. Appendix 3 presents a detailed overview of the experts interviewed in this study.

Each expert interview lasted approximately one hour and followed a semi-structured format (see Appendix 3 for the interview protocol) designed to facilitate in-depth exploration of key themes and topics pertinent to the research objectives (Myers & Newman, 2007). The interview protocol included open-ended questions addressing broad conceptual issues and specific research inquiries. This structure allowed for flexibility in responses while ensuring consistency across interviews. All interviews were conducted digitally using Microsoft

Teams and were accompanied and recorded by at least one co-author. After each interview, the experts' feedback was discussed within the author team. Following Gregor (2006) and Sonnenberg and vom Brocke (2012), we refer to completeness, understandability, and simplicity as criteria for evaluating the research pathways. Integrating interview insights into the research findings was guided by a triangulation process, whereby interview data were compared with existing literature. The decision to incorporate or challenge literature review findings was based on the extent to which interview insights provided additional depth, clarification, or divergence from existing knowledge and discussed by the author team. Overall, the experts confirmed that the research pathways were easy to understand and helpful for further research. They considered the research pathways relevant to address the challenges of DSI. With the help of the interviews, we gained important input for the gradual refinement of the research pathways. Appendix 4 comprises a detailed list of the interview feedback incorporated into our research agenda.

4 Research Clusters of Digital Social Innovation

To extract a research agenda for DSI, we first must understand prior contributions in a structured way. Therefore, as highlighted in the Conceptual Framing, we classified the 135 studies according to the three DSI dimensions (i.e., DI, digital technology, SI) and their respective characteristics. For further analysis, we extracted six research clusters (Fig. 4).

First, we split the dimensions according to *digital technologies as a means* and *digital technologies as an end*. Second, we differentiate between DSI *actions*, *outcome*, and *environment*. The six possible combinations of these two dimensions form the six research clusters. Third, we further differentiate between *people*, *planet*, and *profit* within each cluster. To visualise the distribution of studies across the clusters, Fig. 4 also demonstrates the numerical results. Each dot represents a study's focus (i.e., 1st order) in our sample. If a study peripherally touched upon a second characteristic (for example, the focus is on the DSI outcome, but a small part also considers the DSI environment), we plotted an “x” in the respective field. Of the 135 studies, 36 (27%) consider digital technologies as a means and 99 (73%) as an end. Further, 48 (36%) studies investigate DSI actions, 46 (34%) DSI outcomes, and 41 (30%) DSI environments. Lastly, 70 (52%) studies address people, 54 (40%) planet, and 11 (8%) profit. In the following, we discuss each cluster in detail, outlining exemplary contributions.

Research Cluster 1—Digital Technologies as a Means and Actions: The first research cluster concerns studies that deal with innovation actions using digital technologies during the innovation process. Research activities in cluster 1 centre on digital technology-enabled DSI actions. The two central themes are 1) leveraging data-based insights during DSI actions through data analytics (e.g., Kelly & Noonan, 2017) and 2) fostering broad stakeholder involvement for DSI actions through digital platforms and tools (e.g., Ketter et al., 2016).

First, information stemming from data has been recognised as a central component of creating meaningful DSI

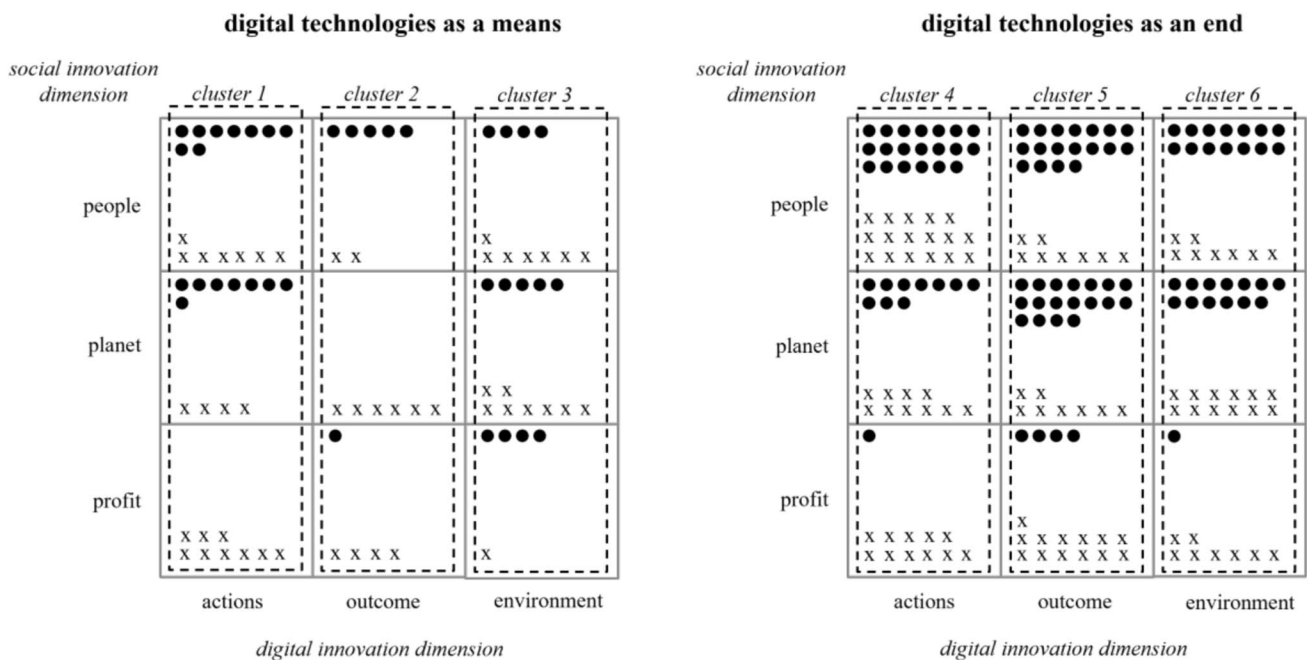


Fig. 4 DSI clustering results

initiatives (Arts et al., 2015). Therein, digital technologies such as the IoT enable information availability by systematically increasing data collection capabilities and transparency in productive environments (Yousaf et al., 2021). Associated DSI actions systematically identify, collect, and analyse data to detect DSI opportunities. Knowledge in this cluster presents the processes and actions performed to exploit the value of data. For example, Kelly and Noonan (2017) contribute to research by conceptualising the difference between systematic and edifying datafication practices. Additionally, Sanders et al. (2021) show the potential of analysing social media data to understand the public discourse surrounding a technology-centred topic (i.e., precision agriculture) to better understand user and customer preferences, doubts, and attitudes.

Second, regarding digital infrastructure, digital technologies as platforms and open-source software (e.g., Bhatt et al., 2016; Ketter et al., 2016) have proven to be a suitable tool for increasing DSI performance by fostering inclusion and (civic) participation of broader stakeholder groups (Yousaf et al., 2021). DI competitions, open-source environments, platforms, or a mash-up of different collaboration applications allow broad stakeholder groups to participate in DSI actions (Maaravi & Heller, 2021; Richardson-Ngwenya et al., 2019). The increasing communication between firms, customers, universities, or public institutions on digital platforms leads to the formation of knowledge networks (Csedő et al., 2021). Digital platforms increase crowd management capabilities, accessibility to participation, automated results aggregation in crowdsourcing and potential for time-asynchronous work (Majchrzak & Shepherd, 2021). To leverage the positive effects of platforms, the importance of equal engagement between consumers and producers or a strong focus on the core platform interactions has received attention in research (Kohler & Chesbrough, 2019).

In this realm, DSI is investigated, for example, in the context of institutional health service provision or the inclusion of marginalised groups in a community's transport planning (people) (Bhatt et al., 2016; Kelly & Noonan, 2017; Mehmood & Imran, 2021), or fostering nature conversation initiatives (planet) (Arts et al., 2015).

Research Cluster 2—Digital Technologies as a Means and Outcome: Cluster 2 comprises research that focuses on DSI outcomes that create social value leveraged by digital technologies as a means. So far, research activities in this cluster are limited, as apparent in Fig. 4. Overall, two central topics have emerged: 1) specific digital technologies addressing societal challenges (e.g., Ahuja & Chan, 2020; Ciruela-Lorenzo et al., 2020) and 2) the general role of digital technologies for creating SI (e.g., Bonina et al., 2021a).

Regarding the usage of specific digital technologies in addressing societal challenges, scholars have investigated how the usage of digital technologies can help to tackle diseases. Therefore, farmers can be integrated into collecting large-scale data through citizen science, using the knowledge to get reliable and real-time information for disease prevention. Additionally, digital platforms can be used to share expertise on the disease and easily connect stakeholders (McCampbell et al., 2018). As another example, scholars have illustrated how a digital diagnosis tool can help agri-cooperatives manage DI. Thus, the tool can be used to analyse the digitalisation process stage that the organisation has reached as well as inform politics of the digitalisation level of agri-cooperatives to have better-designed political instruments for promoting a more sustainable environment (Ciruela-Lorenzo et al., 2020).

As for the second central topic, scholars designed a framework proposing varying IT investment types and an IT investment plan for organisations based on different stages of sustainability (Abraham & Dao, 2019; Abraham & Mohan, 2015). Further scholars show how digital platforms can be used to advance sustainable development and illustrate future research avenues and the downsides of digital platforms for development (Bonina et al., 2021a).

This cluster investigates DSI through all three sustainability perspectives, i.e., using digital platforms to address a disease that dangers stable food supply and the livelihood of the banana farmers in Africa's Great Lake Region in terms of people and profit (McCampbell et al., 2018) or smart agriculture in terms of people, profit, and planet (Ciruela-Lorenzo et al., 2020).

Research Cluster 3—Digital Technologies as a Means and Environment: Research activities in cluster 3 centre on identifying contextual factors that either promote or hinder the success of DSI. The 1) internal and 2) external dynamics of DSI environments when innovating with big data, platforms, or other digital technologies are in focus.

First, and regarding the internal organisational environment, various factors were found to either promote or hinder the success of DSI. Management commitment and well-structured HR practices, an open, participative, and green corporate culture and ethics, as well as a willingness to change and adopt new technologies are among the relevant factors that positively impact the success of DSI (Arts et al., 2016; El-Kassar & Singh, 2019; Hsu et al., 2019; Yang et al., 2016, 2017). Further, specific organisational roles are crucial for DSI success: project leaders and innovation intermediaries (Dong & Götz, 2021; Munthali et al., 2018).

Second, the external environment can strongly influence the success of DSI. External partners in the DSI ecosystem, such as pro-social stakeholder views (El-Kassar

& Singh, 2019) or demographic and socio-economic characteristics such as a high level of democracy, positively impact DSI. Simultaneously, a low gross domestic product and low social expenditure negatively influence the success of DSI in international DSI projects (Huh & Kim, 2019). From a technology-perspective, open-source code and crowdsourcing communities are promising approaches to increase knowledge integration with external stakeholders to positively affect DSI projects (Gogan et al., 2020). In such communities, different user roles (e.g., collaborator, contributor, passive users) emerge, where users can support with data collection, idea generation or idea evaluation (Fuger et al., 2017; Wehn & Evers, 2015). In addition, in the context of frugal innovation (i.e., innovation focusing on minimising price, rather than maximising functionality), actively leveraging ecosystems fosters the effective use of digital technologies for producing frugal innovations (Ahuja & Chan, 2014, 2016).

The sustainability of DSI in this cluster is understood in the ecological sense (i.e., planet), for instance, by investigating projects from environmental regulators (Arts et al., 2016) or green innovation initiatives in general (Yang et al., 2017). Regarding social sustainability, studies include, for example, an assessment of agility's role in creating social value in IT firms (Gogan et al., 2020).

Research Cluster 4—Digital Technologies as an End and Actions: Research activities in cluster 4 centre on DSI actions resulting in digital technology-based outcomes. This cluster is mainly 1) reporting on existing DSI cases and 2) synthesising the learnings.

The majority of research in this cluster reports on case study findings into initiating, developing, implementing, and exploiting DSI initiatives in different contexts resulting in digital technology-based outcomes (e.g., Gerritsen et al., 2020; Hosseini et al., 2018) as well as overall findings and guidance across the different steps of DSI actions (e.g., Maffey et al., 2015; Regan & Wang, 2014). Different contexts are, for instance, the public sector, established organisations, specific industries, or society as a whole. To name examples: When *initiating* a DSI, Hosseini et al. (2018) illustrate that end-users should be included through open innovation approaches. Moreover, Gerritsen et al. (2020) investigate how different ways of initiation can lead to different ways of upscaling. As such, when a techno-experiment is initiated by research institutes, corporate actors and governmental actors, these experiments develop self-referentially. However, they tend to evolve as scattered spin-offs when initiated by engaged individuals (Gerritsen et al., 2020). Further, when *developing* DSI under time and resource constraints, it is crucial to rapidly iterate the solution with end-users, use available networks

to repurpose existing resources and integrate communities for co-creation (Vesci et al., 2021). Mashups can be used when there is a need to develop innovative solutions rapidly. As such, existing products are combined into new products to address short-term needs, as it was the case with the transaction of physical to digital education at the beginning of COVID-19 (Maaravi & Heller, 2021). For *implementing* a DSI, end-users should be integrated through co-creation and direct participation (Witteveen et al., 2017). Lastly, when *exploiting* a DSI, Furstenu et al. (2016) investigated a case of integrated care in Germany. They found that once the care provider repositioned itself as a high-quality care provider and made its competencies complementary to its organisational identity, they could scale themselves nationally and internationally. Further, Foster and Heeks (2013) describe the case of M-Pesa, differentiating five scaling phases, i.e., pilot, incremental rollout, aggressive growth, standardisation, and functional expansion.

Regarding sustainability, this cluster mainly addresses people and planet. For one, people is examined in terms of, for example, quality education (Maaravi & Heller, 2021), ethical data practices (Aitken et al., 2021), and gender equality (Harvey & Fisher, 2013; Schmitt et al., 2020). For the other, planet is examined through, for example, nature conservation (Arts et al., 2015) or smart towns (Hosseini et al., 2018).

Research Cluster 5—Digital Technologies as an End and Outcome: Research activities in cluster 5 centre on 1) numerous individual successful DSI initiatives, 2) use cases for certain technology groups or industries/sectors, and 3) digital technology-enabled social business models. This cluster incorporates DSI knowledge that focuses solely on digital or physical-digital hybrid innovation as outcomes of DSI. Rather than considering the path to developing the respective DSI outcome, this cluster considers the nature or usage of outcomes once readily developed.

First, one central theme often presented as a case study refers to specific digital tools or platforms that create a positive social impact. Therewithin, either the DSI outcome itself or effect mechanisms such as increased information availability, higher connectedness, or smarter and automated decision support are in focus (e.g., Abejirinde et al., 2018; Ahuja & Chan, 2020; de Georgio Ferrari Trecate et al., 2020). Examples of such DSI include a digital platform for money lending in the developing world and a digital education platform providing knowledge on contraceptive care (Lassar et al., 2021; Ravishankar, 2021).

Second, use cases for technology types in specific contexts or general DSI application areas in specific industries and sectors have been identified (e.g., Bonina et al., 2021a; Hanelt et al., 2017; Tarafdar et al., 2013). Regarding

technology types, research has demonstrated the diverse opportunities of IoT in smart cities for pollution control or waste management (Cvar et al., 2020) and healthcare for condition monitoring and respite care (Ghazal et al., 2021). Independent of the technology, the studies in our sample have shed light on potential use cases of DSI in smart cities, the educational sector, or public health systems (Agasisti et al., 2020; Kapoor et al., 2015; Rocha & Almeida, 2021).

Third, on a more abstract level, DSI can lead to IT-enabled business models (e.g., circular economy business models) (Cioffi et al., 2020; Han et al., 2020; Shomali & Pinkse, 2016) and can be classified through a taxonomy of DSI outcomes (Buck et al., 2020). To name just one example, digital energy service business models can positively affect the three sustainability dimensions (Hiteva & Foxon, 2021).

In terms of sustainability, this cluster covers a wide range of topics on planet (e.g., clean electricity or conservation management), people (e.g., substance abuse, recovery, maternal health), or profit (e.g., economic development at the bottom of the pyramid) (e.g., Abejirinde et al., 2018).

Research Cluster 6—Digital Technologies as an End and Environment: Research activities in cluster 6 centre on the impact of DSI environments when innovating for digital technology-based outcomes. In this realm, the focus is on two central themes: 1) internal organisational environment, for example, capabilities, team structure, culture or knowledge management, 2) external environment, for example, innovation spaces, regulations, cultural traditions or competition.

First and regarding the internal environment, the current focus is on non-human capabilities, for example, supporting IS (Hanelt et al., 2017), digital orientation capabilities of companies (Nasiri et al., 2022) as well as human capabilities, for example, capabilities of project leaders (Dong & Götz, 2021), coordinators (Arts et al., 2020) or personnel in general (Rodrigo & Palacios, 2021; Wunderlich et al., 2013). In this context, supporting IS can address sustainability on a larger scale and contribute to business success (Hanelt et al., 2017). Further, companies with a high degree of digital orientation in their operation innovate more towards sustainable development than those with a lower level of digital orientation (Nasiri et al., 2022). Moreover, a professional's network, experience, and dedication are pivotal for DSI success (Dong & Götz, 2021). A high degree of anxiety and lack of life satisfaction, in contrast, leads to a lack of commitment from professionals in DSI organisations' development (Rodrigo & Palacios, 2021).

Second regarding the external environment, the focus is on collaborations (Galán-Díaz et al., 2015; Koch et al., 2018), regulations, or the role of the public, such as social movements (Carberry et al., 2019), governments (Arts et

al., 2016; Bloom et al., 2017; Butler & Hackney, 2015), or public value co-creation (Chatfield et al., 2019) influencing DSI. Social movements are more successful when applying field-level pressure. Thus, organisations comply with legal necessities, such as the need for sustainability reporting. Organisations then innovate to develop digital technologies that can be leveraged to comply with these legal necessities (Carberry et al., 2019). Further, collaborations, for example, between organisations and academics can have positive and negative impacts. Hence, academics can support organisations in creating new ways of engaging with audiences. In contrast, negative impacts are reflected in the time and resources required to adopt new technologies or learn new skills (Galán-Díaz et al., 2015). Studies examine how regulation can influence companies' aims at innovating towards sustainable development. For example, introducing blockchain to the energy industry for issuing payments via cryptocurrency is seen as an incremental innovation that does not need regulatory adjustments, as it is up to the energy retailer to accept the means of payment. In contrast, disruptive innovations such as introducing blockchain to the energy sector that, for instance, reduces the boundaries of the natural monopoly or complementing or substituting existing platforms are likely to need regulatory adjustments (Amenta et al., 2021).

This cluster's primary sustainability focus is on planet (e.g., nature conservation (Arts et al., 2020), electricity industry (Amenta et al., 2021)) and people (e.g., health system transition (Bloom et al., 2017), telemedicine (Alaboudi et al., 2016)). Profit is mainly regarded as a by-product when considering sustainability as a whole (e.g., Hjalmarsson & Lind, 2011; Nasiri et al., 2022).

5 Research Agenda for Digital Social Innovation

Based on the 135 studies, their classification into the six research clusters, and the in-depth analysis of their contributions, we identified research pathways that translate into a DSI research agenda. These research pathways represent a variety of research questions, thus not claiming completeness, and aim at illustrating critical areas of research within DSI. We evaluated which gaps currently exist in research in each cluster. Further, we conducted 10 expert interviews with fellow IS scholars to discuss, extend, and refine the research agenda and the individual pathways' relevance based on the interviewees' feedback. We conducted expert interviews to ensure we did not overlook any relevant research pathways beyond our assessments. Thus, our goal was to identify key research pathways with significant potential for future exploration, informed by existing studies, identified

Table 3 Overview of DSI research pathways

Cluster	Research pathway	Goal
Cluster 1	RP1: What are the affordances of different digital technologies for DSI actions?	Supporting informed decision-making regarding selecting and applying digital technologies during DSI actions
	RP2: Which design principles best facilitate DSI actions in digital platform ecosystems?	Assessment of design principles for DSI ecosystems and development of recommendations for different DSI scenarios
Cluster 2	RP3: How does applying digital technologies within DSI actions change DSI outcomes?	Understanding how DSI outcomes change when integrating digital technologies in innovation processes and whether it positively affects sustainability goals in the DSI outcomes
	RP4: How can digital technologies be used to measure the impact of DSI initiatives?	Gain transparency on social impact and on how to measure DSI success
Cluster 3	RP5: Which stakeholder groups participate in DSI ecosystems, and what are their motives?	Identification of the different groups participating in DSI ecosystems, their motives, and suitable incentive strategies for each group
	RP6: How can digital technologies improve stakeholder involvement in DSI?	Analysis of the potential of different types of digital technologies for increasing stakeholder involvement in DSI initiatives across different stakeholder groups
Cluster 4	RP7: How can DSI initiatives be designed to avoid potential downsides of digital technologies?	Assessment on how to best design a DSI initiative to harness its positive impact and subsequently avoid negative consequences
	RP8: How can DSI actions ensure the DSI's technical interoperability with existing digital technology landscapes and workflows?	Assessment of how it can be assured within DSI actions that the DSI outcome is compatible with the existing digital technology landscape and the existing workflows
Cluster 5	RP9: How can DSI initiatives address the dependencies and conflicts between sustainability dimensions?	Identification of relevant positive and negative dependencies between different sustainability dimensions and assessment of the role of digital technologies in causing, increasing, or reducing these dependencies
	RP10: How do digital technologies enable the scaling of DSI initiatives?	Examination of the potential of digital technologies and associated characteristics for increasing the scaling success of DSI initiatives
Cluster 6	RP11: How can interdisciplinarity among stakeholders in DSI be leveraged?	Establishment of specific actionable requirements regarding interdisciplinarity (e.g., disciplines involved, communication formats) or understanding the role of interdisciplinarity within DSI
	RP12: How can DSI succeed in resource-limited environments?	Investigation on how to adapt to constraints within a DSI ecosystem

research gaps, and insights from IS scholars. In the following, we detail the resulting research pathways. Table 3 summarizes the 12 research pathways and their respective goals.

Cluster 1: Research has provided valuable insights into the role of digital technologies for increasing data access during innovation actions and the general role of data for innovating sustainably (e.g., Arts et al., 2015; Kelly & Noonan, 2017; Yousaf et al., 2021). For example, digital technologies can identify and assimilate knowledge to initiate innovation for societal challenges (Kohli & Melville, 2019; Majchrzak & Shepherd, 2021). Further, IoT technology, in particular, has been researched as a tool for collecting data from production processes and other operations. In turn, it can be used to identify innovation opportunities in an organisation's processes, services, and products (Da Xu et al., 2014). However, IoT is not the only promising digital technology for driving DSI, but other data-based digital technologies, such as artificial intelligence, machine learning, or virtual reality, already demonstrate a substantial potential for enabling organisations to drive sustainable solutions in traditional corporate innovation (Eom et al., 2022; Kakatkar et al., 2020). For example, artificial intelligence was more effective for routine tasks than creative activities such as ideation (Kakatkar et al., 2020). In the context of DSI, there is no assessment

of the opportunities of different digital technologies for fostering DSI actions throughout the four DSI action steps initiation, development, implementation, and exploitation. IS research has previously applied the theoretical lens of affordances as “the possibilities for goal-oriented action afforded to specified user groups by technical objects” (Markus & Silver, 2008, p. 622). Affordance theory can potentially assess the role of different digital technologies in changing and improving the four DSI action steps (Anderson & Robey, 2017). Additional approaches could consider different technological archetypes or varying technology purposes to better assess the suitability of various digital technologies within innovation actions (Baier et al., 2023). Such knowledge would be crucial for making informed decisions regarding the selection and application of digital technologies during DSI actions and it could drive the theoretical understanding of digital technology affordances in DSI. Thus, the first research pathway central to the development of DSI reads:

RP1: What are the affordances of different digital technologies for DSI actions?

Cluster 1 also highlights the potential of digital platforms as technological infrastructure to increase participation and

knowledge exchange in innovation endeavours (Ketter et al., 2016; Majchrzak & Shepherd, 2021; Richardson-Ngwenya et al., 2019). In the IS community, digital platforms as software artefacts are often not the central focus but rather the platform-based ecosystem in which they are embedded. Ecosystems are viewed as “interdependent network[s] of self-interested actors jointly creating value” (Bogers et al., 2019, p. 2), where actors in the case of DSI include firms, NGOs, the public, or policy makers. Digital platform ecosystem research focuses, for example, on managing these actors, work practices within the ecosystem, selected technologies and the overall goal of innovating and competing (Costabile et al., 2022). Platform ecosystems enhance the efficiency and inclusiveness of DSI actions. For instance, they enable people to connect virtually to co-create solutions for societal challenges faster and on a larger scale (Bria, 2015; Majchrzak & Shepherd, 2021). The concept of crowdsourcing on innovation platform ecosystems is not new within DSI but has long been present in purely commercial contexts (Adamczyk et al., 2012; Gimpel et al., 2023). IT-enabled idea crowdsourcing and online innovation contests are two concepts that leverage digital platforms to drive innovation (Adamczyk et al., 2012). The success of platform ecosystems is highly dependent on the right interaction with users and their motivation to participate appropriately. Hence, designing the ecosystem (e.g., governance, user interface, data protection mechanisms) to best incentivise people to contribute to DSI is crucial (Gimpel et al., 2023). Design science research has conceptualized this type of knowledge as design principles (Gregor & Hevner, 2013; Gregor et al., 2020; Yassae et al., 2019) – i.e., the “design decisions and design knowledge that are intended to be manifested or encapsulated in an artefact, method, process or system” (Gregor, 2002, p. 17). Thus, we ask:

RP2: Which design principles best facilitate DSI actions in digital platform ecosystems?

Cluster 2: Research investigates the social value creation mechanisms and DSI outcomes when innovating with digital technologies during the DSI actions (i.e., digital technologies as a means). When developing innovation for societal challenges, digital technologies enhance the efficiency and inclusiveness of the development process. This is mirrored in the respective logics of business process management (i.e., process logic, infrastructure logic, agential logic) (Baiyere et al., 2020). Logics, in general, can be defined as “the dominant way of thinking, which is reflected in terms of the assumptions, practices and values underlying the conception and associated actions in a specific context.” (Baiyere et al., 2020, p. 7). Within the infrastructure logic of business process management, the dominant view is that the (digital) infrastructure should be in sync with the business process

objectives. Thus, applying digital technologies within DSI actions should be used to avoid inefficiencies and facilitate connected departments, business units, and stakeholders (Baiyere et al., 2020). For instance, platforms can be used to connect people virtually (Fichman, 2004) to co-create solutions for societal challenges faster and on larger scale (Bria, 2015). Despite the opportunities of digital technologies for DSI actions, there is no comprehensive knowledge of how the application of digital technologies within innovation changes DSI outcomes and whether it positively affects sustainability goals in the DSI outcomes. We, therefore, propose the following research pathway:

RP 3: How does applying digital technologies within DSI actions change DSI outcomes?

Part of the outcome dimension in cluster 2 concerns DSI solutions' value creation and measurement. A DSI initiative (usually) simultaneously creates social value and economic value (Bonina et al., 2021b). Quantifying economic value is usually straightforward since it can be expressed through financial indicators like revenue or profit margins. In contrast, assessing social value is more complex because it is shaped by personal perspectives, often intangible, and not immediately visible (Geobey et al., 2012; Popov et al., 2016). This makes it difficult to determine what constitutes success in DSI and how that success should be measured (Buck et al., 2025). Also, DSI initiative prioritisation is much harder to execute as the value of different initiatives cannot be compared easily. While this is also an issue for traditional SI initiatives, digital technologies can be important in measuring DSI success. For example, energy monitors can be used to track how much energy is saved by using a more energy-efficient solution (Rommetveit et al., 2021) or smart garbage can be used to track how much waste was collected (Mohd Yusof et al., 2017). As transparency on social impact is a key requirement for tackling sustainability challenges and thus measuring DSI success and its corresponding impact, we propose the following research pathway:

RP4: How can digital technologies be used to measure the impact of DSI initiatives?

Cluster 3: The impact of the internal and external organisational environment when innovating with digital technologies has not yet received substantial attention. However, given the often low motivation of users to participate in initiatives in DI ecosystems, factors of the internal and external environment have emerged as central motivational drivers, making this research cluster central to DSI success (Renqiang & Wende, 2022). In the set of studies on digital technologies as a means, DI ecosystems (e.g., on platforms) are central. However, not just the technological design

is decisive for their expected impact (RP2), but also the people, or groups of people, cooperating in the ecosystem (Ahuja & Chan, 2016; Fuger et al., 2017). Depending on the context, stakeholder groups contributing could include employees, corporate leadership, consultants, customers, technology users, policy makers, lobby groups, and others (Bonina et al., 2021a; Ketter et al., 2016). Each group and individual within such groups might have different intrinsic and extrinsic motivations for participating in DSI initiatives. For ecosystems to be effective, a deep understanding of the various stakeholder groups and differences in motivations is thus critical to selecting the right communication, interaction, and incentivisation strategies (Füller et al., 2014). While this topic has been thoroughly researched in commercial contexts, participation motives in sustainability initiatives are less known. In this context, first studies have demonstrated that participation motives differ substantially in initiatives related to sustainable development (Say et al., 2021). Possible approaches to building knowledge in this area could build on the insights of studies such as Fuger et al. (2017), who use social network analytics to identify different user types based on their participation behaviour in crowdsourcing. The first pathway in this cluster thus reads:

RP5: Which stakeholder groups participate in DSI ecosystems, and what are their motives?

Research in cluster 3 widely agrees that the involvement of diverse stakeholder groups is needed when tackling sustainability issues (Wamsler, 2017). As discussed above, DSI has paid special attention to digital platform ecosystems as a tool for fostering stakeholder involvement in various contexts (Ahuja & Chan, 2014, 2016). The particular value of digital platform ecosystems stems from their ability to bridge temporal and geographic distance between stakeholders. However, digital platforms are not the only possibility for stakeholders to contribute to DSI. For example, Arts et al. (2020) and Wehn and Evers (2015) expand on the role of individuals as data collectors to improve the data availability needed for opportunity identification in DSI. In that context, self-tracking devices and wearables could also be valuable tools (Ghosh et al., 2022; Seshadri et al., 2020). While the research stream on digital platform ecosystems and the platform economy is relatively mature, the potential of other digital technologies for improving stakeholder involvement is less known. Expanding on these research pathways could provide practitioners with more possibilities for external knowledge integration and help research to generalise knowledge on digital technology-enabled stakeholder integration beyond DSI contexts. Therefore, we propose:

RP6: How can digital technologies improve stakeholder involvement in DSI?

Cluster 4: Research within cluster 4 focuses on DSI actions, with the outcome being digital, i.e., digital (or hybrid) products, services, processes, or business models. Although digital technologies offer many opportunities to address societal challenges, which we mainly highlighted in this paper, there are also downsides to consider. For example, access to digital technologies may differ depending on the generation (Kim & Feng, 2021) or geographical background (i.e., Global North and Global South), limiting the social impact of a DSI solution. Further, when focusing on specific digital technologies, artificial intelligence, for instance, has many opportunities to address societal challenges (cf. Artificial Intelligence for Social Good (Tomašev et al., 2020)). However, it is also often criticized regarding race, gender, or religion bias (Srinivasan & Chander, 2021). Furthermore, concepts, especially regarding ecological sustainability, often discuss the rebound effect. Generally, using technology is supposed to improve efficiency, leading to decreased resource use. However, an increase in efficiency through technology use often does not lead to the same decrease in resource use, and it leads to more resources being used due to behavioural changes and a subsequent increase in economic activities (Binswanger, 2001). This, in return, leads to adverse ecological consequences. To avoid these issues, there needs to be a focus on how to best design a DSI initiative to harness its positive impact and subsequently avoid negative consequences. Against this backdrop, we ask:

RP7: How can DSI initiatives be designed to avoid potential downsides of digital technologies?

An organisation implementing a DSI often already has numerous other (digital) products, services, processes, or business models. Furthermore, DSI solutions are usually integrated into existing workflows. Thus, DSI initiatives need to be designed to make them interoperable and easily integrated with other systems (Hodapp & Hanelt, 2022) as well as with existing workflows. Current DSI findings, however, neglect the challenge of selecting a digital technology that is suitable for the DSI initiative while ensuring data availability and quality, data protection, and interoperability with existing digital technologies (Cichosz et al., 2020; Kayser et al., 2018). There is also little understanding of how the intended users can seamlessly work with digital technologies within DSI. For the latter, insights from the research field of human–computer interactions, which focuses on the interaction between computers and their intended users, and the subsequent design of user interfaces could further advance the DSI field (Brey & Søraker, 2009). Thus, an important research pathway is assessing how DSIs' compatibility with the existing digital technology landscape

and workflows can be ensured during development. We, therefore, propose the following research pathway:

RP8: How can DSI actions ensure the DSI's technical interoperability with existing digital technology landscapes and workflows?

Cluster 5: The many individual use cases of DSI initiatives that constitute this cluster, complemented by studies on technology groups, DSI in specific industries, or DSI business models, all show some positive sustainability impact. Positive advancements in one area of sustainability sometimes automatically trigger improvements in another area (e.g., better nutrition levels leading to improved health) (Biglari et al., 2022). However, there are also cases where negative conflicts between sustainability dimensions can arise. To name two examples: Higher resource efficiency caused by digitalisation potentially leads to lower demand for the workforce and increases unemployment in specific sectors (Hilpert, 2021). In addition, implementing an app to save water and benefit the environment could discriminate against older people who do not have access to mobile phones. Research as well as projects such as the Agenda 2020 Compass—a collaboration between the *Stockholm Environment Institute*, the *MIT Center for Collective Intelligence*, and industry—have investigated these positive and negative synergies between all dimensions of sustainability (Biglari et al., 2022; Hallding & Blixt, 2020; Parthiban et al., 2020). To reach sustainable development in the long run, it is indispensable to understand how DSI causes, affects, or solves the synergies, conflicts, and relationships between sustainability dimensions early on. Otherwise, well-intentioned DSI initiatives could cause more damage than good. While this is most prominent in cluster 5, this topic is also relevant to cluster 2 and the corresponding innovation with digital technologies as a means for sustainability. Research should holistically address:

RP9: How can DSI initiatives address the dependencies and conflicts between sustainability dimensions?

The richness of contributions in this cluster is promising for the potential of digital technologies in DSI. However, looking at the achievement status of many SDGs, much remains to be done (Sachs et al., 2023). Consequently, it is safe to say that the theoretical potential of DSI has not yet translated into positive sustainability effects to a full extent. To fully exploit the value of DSI initiatives, there is a need to understand how DSI initiatives can be successfully maintained and scaled after the initial prototypical implementation (Rodrigo & Palacios, 2021). Scaling (digital) social innovations has proven to be tedious and often

unsuccessful (Voltan & Fuentes, 2016). Digital technologies have the potential to play a significant role in scaling DSI outcomes by making the DSI available across time and place more quickly than with purely analogue approaches. This is possible due to digital technology's characteristics, such as their convergence, inexpensiveness, and availability across social classes, which enables reaching large parts of the population (Fichman et al., 2014; Foster & Heeks, 2013; Walsham, 2017; Yoo et al., 2012). Therefore, a further research pathway would be to investigate the specific possibilities of digital technologies and their characteristics for scaling a DSI initiative. Thus, we propose the following research pathway:

RP10: How do digital technologies enable the scaling of DSI initiatives?

Cluster 6: Research in this cluster focuses on the DSI environment, encompassing components such as knowledge management (Kohli & Melville, 2019) or innovation ecosystems and networks (Abrell et al., 2016; Hosseini et al., 2018; Jacobides et al., 2018; Schmitt & Muyoya, 2020). To master DSI endeavours, there is a need for knowledge both on 1) the underlying societal challenges as well as 2) the applied digital technologies. The societal challenges (e.g., climate change, poverty, poor education) that are addressed through DSI initiatives are often complex, ill-structured and highly uncertain (Weber & Khademan, 2008), making it difficult to develop solutions (Chalmers, 2013). On a technological side, developing DSI initiatives demands knowledge regarding digital technologies and their unique characteristics, possibilities, purposes, and risks (Baier et al., 2023; Kohli & Melville, 2019). Given the different knowledge streams required in DSI, there is a need for diverse stakeholder groups in terms of departments (e.g., IT department, innovation department) and in terms of societal backgrounds (i.e., diversity in age, gender, race) to interact, share their knowledge and bring in their different standpoints when developing DSI initiatives. This will increase the efficiency of the DSI initiative and help address societal challenges in the best way possible (Charalabidis et al., 2014; Guinan et al., 2019). However, not only practice needs to consider an interdisciplinary perspective but also research. Hence, the IS discipline calls for adopting transdisciplinary perspectives in engaging with other disciplines to address today's societal challenges (Kar et al., 2019; Pappas et al., 2023; Walsham, 2012, 2017). IS research should be "co-contributors with everyone else, since all people worldwide have views about 'development' in their particular context" (Walsham, 2017, p. 37). While there is consensus about the general need for transdisciplinary perspectives, specific, actionable requirements regarding interdisciplinarity (e.g.,

disciplines involved, communication formats) or the role of interdisciplinarity within DSI are less established. Thus, we ask:

RP11: How can interdisciplinarity among stakeholders in DSI be leveraged?

When studying environments in which DSI starts to develop as the topic in cluster 6, there are different context factors to consider. For instance, DSI initiatives may differ when being created in the Global North or Global South due to differences in organisations’ resource bases, governmental regulations, or context factors such as varying climate conditions (Qureshi et al., 2021). Thus, when considering rural or remote regions, the starting point for developing DSI initiatives can be completely different than in highly industrialised regions. There are first studies that focus on developing DSI initiatives in rural areas. For instance, Tim et al. (2021) investigate in their practitioner’s paper how grassroots communities in remote areas used e-commerce to “leapfrog” out of poverty. Leapfrogging means that a

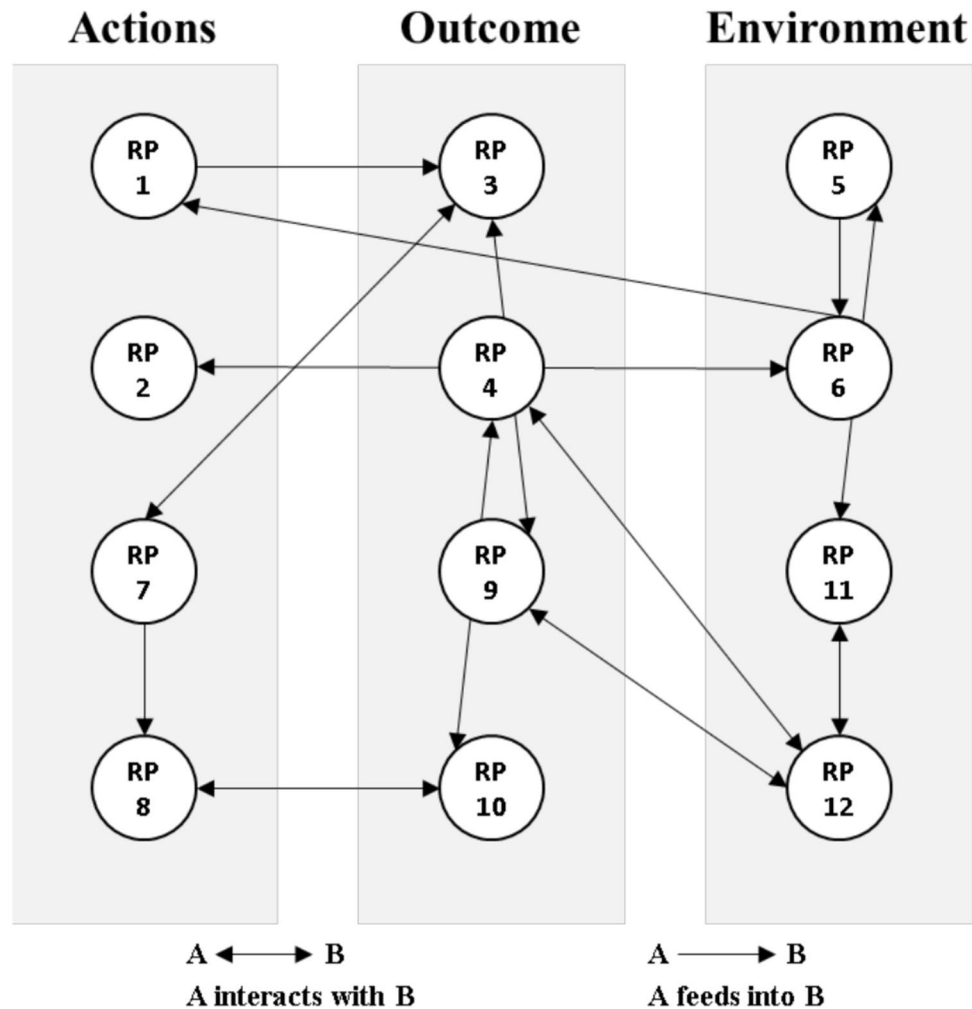
technology is adopted while the previous version of that technology has not been adopted (Tim et al., 2021). As another example, studies investigate frugal innovation, i.e., innovation focusing on minimising price rather than maximising functionality (Ahuja & Chan, 2014, 2016) and thus, minimising resource use, such as water, energy, or fuel (Albert, 2019). Therefore, first studies investigate how to adapt to constraints within a DSI ecosystem. Advancing this research, we propose the following pathway:

RP12: How can DSI succeed in resource-limited environments?

6 Discussion

Reflecting upon the research pathways and the literature sample studied during our review, it becomes apparent that there are overlaps and interdependencies between the research pathways. Figure 5 presents the most evident of those relationships.

Fig. 5 Exemplary interrelationships between research pathways



While there is no claim for completeness regarding the relationships, the figure demonstrates sustainability issues' complex, intertwined nature. The following brief example illustrates these relationships. RP2 feeds into RP6. RP2 centres on design principles that foster DSI actions in digital ecosystems. RP6 is concerned with improving stakeholder involvement in DSI. One facet of the respective design principles in RP2 could be related to the topic of stakeholder involvement opportunities, thus providing parts of the solution to RP6. For research, these interdependencies imply the need to carefully assess the impact of one's research endeavours on surrounding domains as well as certain limitations to the parallelization of all research pathways.

Apart from interrelationships on RP level, there are also overarching themes emerging from the combination of multiple pathways. These central topics are as follows: 1) the role of DSI ecosystems, 2) the role of DSIs for potential conflicts and synergies between sustainability dimensions, 3) the integration of DSI into different contexts and environments, 4) the role of data, and 5) the assessment of DSI success. These topics span various research pathways and have already produced relevant insights for them. Figure 6 depicts how the five topics emerge from the general understanding of DSI. The following paragraphs discuss each of the five topics and its implications for DSI.

6.1 DSI Ecosystems

The impact of digital technologies and ecosystems on DSI represents a significant area of research that requires deeper investigation. Ecosystems are generally understood as multiple actors working together, sharing a common destiny (Catala et al., 2023). Ecosystems hold many opportunities in the digital as well as the social domain. In the social domain, ecosystems can help enhance SI through human capital, access to resources, connection between organisations, institutional strength, political will, and demand for goods and services (Biggeri et al., 2017). In the digital domain, ecosystems can help organisations stay competitive in light of digital disruption and create new business opportunities (Weill & Woerner, 2015).

Given their potential to overcome financial, temporal, and geographic barriers, ecosystems are especially relevant for DSI. Since DSI is a multifaceted phenomenon, different skills and knowledge are needed to develop DSI initiatives. Ecosystems hold the opportunity to connect stakeholders so that they can share resources and capabilities (Bhatt et al., 2021). Beyond human interaction in ecosystems, DSI can also leverage human–computer interactions to create social value (Obayi et al., 2025). Furthermore, societal challenges are complex, and oftentimes, multiple stakeholders are needed to tackle these challenges.

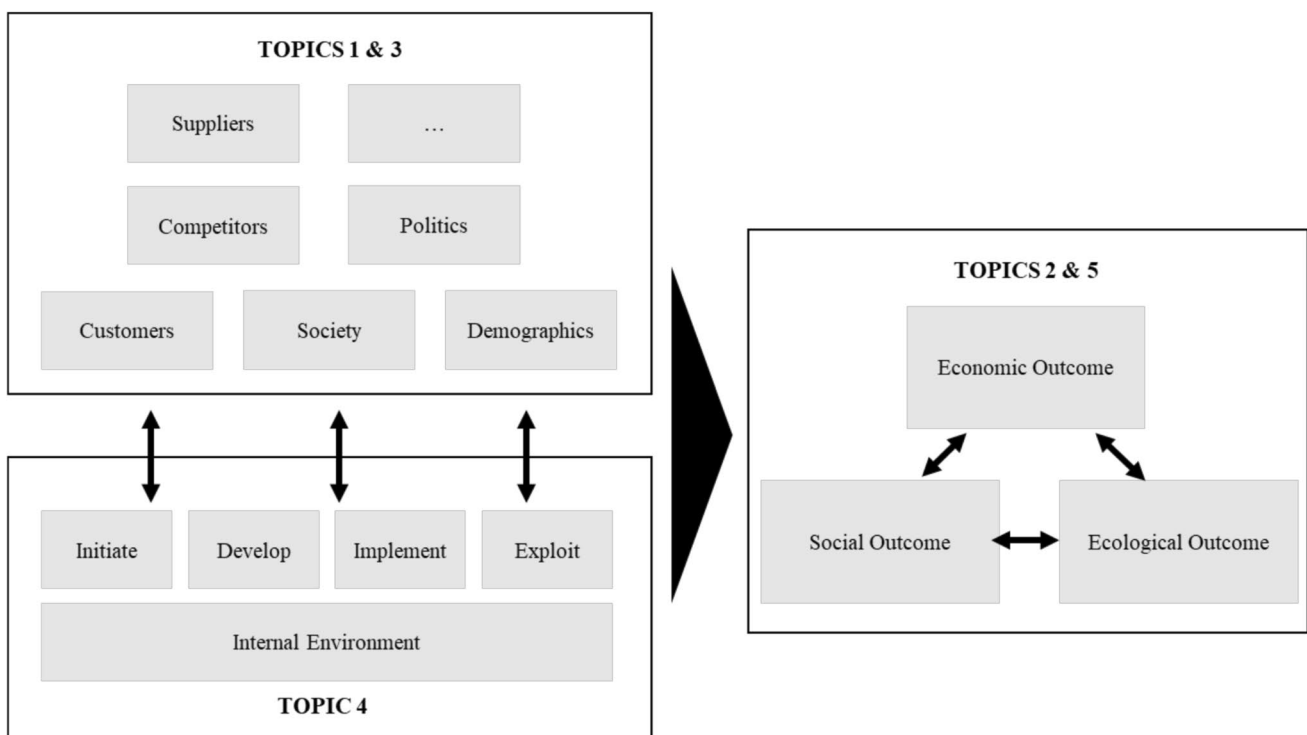


Fig. 6 Central topics driving DSI research

Ecosystems can help to create synergies between DSI initiatives from different organisations. This, in turn, helps to scale the DSI initiatives much faster and unfold even more significant social value instead of addressing these challenges individually (Bhatt et al., 2021; Qureshi et al., 2021). IS researchers delve into these ecosystems to analyse how DSI initiatives are developed, shared, and utilised within ecosystems (Bogers et al., 2019; Costabile et al., 2022; Jacobides et al., 2018).

Within our study, different dimensions of ecosystem research appear relevant, such as its technical design, the selection and incentivisation of participants, or their integration into other digital technologies. In detail, the topic of ecosystems is especially mirrored in our research pathways on understanding the role of interdisciplinarity in DSI research, how digital technologies can help to scale DSI initiatives, understanding which stakeholder groups participate in DSI ecosystems and their corresponding motives as well as how digital technologies can improve stakeholder involvement within DSI.

6.2 DSIs for Potential Conflicts and Synergies between Sustainability Dimensions

Sustainability is a massively interconnected, complex challenge (Hallding & Blixt, 2020), where solution quality (e.g., social impact) is often difficult or impossible to measure. This is partly due to existing conflicts and synergies between and within the three pillars of sustainability (Reyers & Selig, 2020). Sometimes, achievements in one area of sustainability drive sustainability in another. For example, reduced poverty (SDG 1) almost always automatically leads to a reduction in hunger (SDG 2) (Shetty & Shetty, 2014). In other cases, achievements in one area inhibit or worsen the situation in another area. A prominent example is the positive correlation between a country's wealth (SDG 1) and the negative climate impact it produces (SDG 13) (Lægread & Povitkina, 2018). However, to develop solutions to sustainability challenges more effectively, knowledge of interdependencies between sustainability dimensions and the impact of individual initiatives (or portfolios thereof) is indispensable.

For DSI, this topic is highly relevant for two reasons. First, innovators often start their innovation endeavour focusing on a specific sustainability challenge to be solved (e.g., reducing the carbon emissions of a production step). Throughout the innovation process, finding the best possible solution for that particular problem is the primary goal. However, knowing the interdependencies between sustainability dimensions allows for finding a solution that is optimal not only for the specific individual problem but also for sustainable development overall.

Therein, reflecting on the direct and indirect impacts of DSI outcomes on the different areas of sustainability is crucial and adds to the topic of multi-criteria decision analysis (Cinelli et al., 2014). Second, DSIs have an additional role in terms of synergies and conflict, as they have the potential to reduce existing sustainability conflicts. For example, increased production efficiency and automatization (an increase in economic and environmental sustainability) can lead to unemployment (a decrease in social sustainability) (Nakamura & Zeira, 2023). However, DSI solutions such as digital education and training tools can ease the transfer to new job positions and thus have a positive impact on the existing conflict (Witteveen et al., 2017).

The topic of interactions between sustainability areas is reflected within two research pathways in this study. Both the assessment of potential downsides of DSI and the active management of synergies and conflicts lead to a more holistic perspective of sustainability within DSI.

6.3 DSI's Integration into Different Contexts and Environments

In the contemporary digital landscape, understanding the integration of DSI into diverse contexts and environments emerges as a critical area of inquiry. Broadly defined, contexts encompass the multifaceted socio-cultural economic within which DSI operates. These contexts are characterised by varying resources, policies, cultural norms, and organisational structures, shaping the landscape in which DSI initiatives unfold (Hilpert, 2021; Nasiri et al., 2022). In the digital age, the significance of exploring DSI's integration into different environments lies in its potential to inform the design of adaptable and context-aware IS solutions. Such solutions must account for the nuances of societal norms, cultural dynamics, and regulatory frameworks across diverse settings (Hong et al., 2014).

For DSI, this discourse holds particular relevance for several reasons. First, DSI includes an inherent emphasis on leveraging digital technologies to address societal challenges while fostering inclusivity in a diverse set of environments. Integrating DSI into various contexts becomes pivotal for achieving meaningful social impact (Foster & Heeks, 2013; Tarafdar et al., 2013). By understanding how DSI initiatives interact with and adapt to different environments, scholars and practitioners can elucidate strategies for optimising their effectiveness and scalability. We can leverage its full value only when understanding what impacts DSI implementation and adoption success (Nasr et al., 2025). Second, it is evident that the adaptability of DSI initiatives is crucial to meet the diverse requirements and resources of different contexts. For instance, innovators of

DSI initiatives in resource-constrained environments find innovative ways to achieve their goals by leveraging local resources and community networks (Foster & Heeks, 2013). Third, our findings have underscored that scaling DSI initiatives with digital technologies presents a complex challenge that requires thoroughly considering local conditions (Foster & Heeks, 2013; Voltan & Fuentes, 2016). Successful DSI strategies often rely on context-specific partnerships and collaboration models, enabling DSIs to adapt to the needs of their respective environments. Furthermore, we found that context-specific factors heavily influence the composition and dynamics of actor groups in DSI ecosystems. For example, the cultural heterogeneity of a community can affect stakeholder collaboration, which in turn impacts the implementation and success of DSI initiatives. By considering these contextual factors, we can better understand how DSI operates in different environments and how effectiveness-enhancing measures can be developed tailored to the specific needs and challenges on the ground.

The integration of DSI into diverse contexts intersects with the research pathways posed within this study. This refers to the participation of different stakeholder groups and their motives, the usage of digital technologies to scale DSI initiatives, and the success of DSI in resource-limited environments.

6.4 Role of Data within DSI

The strategic utilisation of data constitutes a crucial aspect of advancing DSI. Data, in its broadest sense, encompasses information availability, quality, and ethical use, serving as a cornerstone for steering DSI initiatives toward meaningful impact (Arts et al., 2016). Data plays a multifaceted role within DSI from informed decision-making processes to facilitating collaboration among diverse stakeholders (Aitken et al., 2021). However, navigating the ethical considerations and potential conflicts associated with data use in DSI initiatives presents a complex challenge (El-Kassar & Singh, 2019).

By leveraging data-driven insights, DSI initiatives can tailor their interventions to better meet the needs of communities, optimise resource allocation, and monitor progress towards desired outcomes (Filelis-Papadopoulos et al., 2024). Moreover, data catalyses innovation, enabling the development of novel solutions and the identification of emerging trends and opportunities. Within DSI, several aspects regarding data emerge from our analysis. Firstly, the quality and accessibility of data significantly influence the outcomes of DSI initiatives, highlighting the importance of robust data governance frameworks and digitally accessible infrastructure (Kelly & Noonan, 2017). Secondly, ethical

considerations surrounding data use are necessary to ensure secure, transparent, and participatory approaches to data collection, analysis, and sharing (Arts et al., 2016). Furthermore, the interplay between data-driven decision-making and the social dimensions of DSI underscores the need for holistic approaches that prioritise both technological innovation and social equity. The transformative potential of data within DSI emphasises the need for comprehensive frameworks that balance technological advancements with ethical and social considerations. By elucidating the role of data within DSI, further research should contribute to advancing knowledge on effective strategies for harnessing data-driven approaches to address complex societal challenges.

The integration of data within DSI intersects with the research pathways posed within this study on the affordances of different digital technologies for DSI actions, the measurement of DSI success, and the design of DSI initiatives to avoid potential downsides of digital technologies.

6.5 The Assessment of DSI Success

Evaluating the success of DSI initiatives constitutes an important aspect. Success is challenging to define since it usually needs to be put into the different contexts that are examined. In research, one way of understanding success is often investigated through success factors, i.e., “those characteristics, conditions, or variables that, when properly sustained, maintained, or managed, can have a significant impact on the success of a firm competing in a particular industry” (Leidecker & Bruno, 1984, p. 24). Therefore, success factors indicate what is needed for an initiative to be successful. Moreover, measuring the success of initiatives varies between concepts. For instance, while the success of DI initiatives and the associated created economic value is easy to measure due to economic key figures, the success of SI initiatives and the associated social value is hard to measure due to its subjectivity and implicitness (Geobey et al., 2012; Popov et al., 2016).

DSI initiatives create social and economic value (Bonina et al., 2021b). Thus, the success of DSI is not only multifaceted but also deeply intertwined with the socio-economic and environmental challenges it seeks to address. Therefore, traditional success metrics may not fully capture the nuanced and often intangible outcomes of DSI initiatives (Regan & Wang, 2014). Hence, developing comprehensive, multi-criteria assessment frameworks that account for the interconnectedness of success dimensions is needed (Abdel-Basset et al., 2024). This involves not only measuring the direct impact of DSI but also understanding the broader implications and potential conflicts that may arise (Cichosz et al., 2020).

The assessment of DSI success is mirrored within our research pathway that focuses on how digital technologies can be used to measure DSI's success. Therefore, by delving into the complexities of success measurement and utilising the opportunities of digital technologies to measure success more easily, researchers can contribute to refining evaluation methods tailored to the unique DSI initiatives.

7 Contribution and Implications

7.1 Contribution

DSI is emerging as a significant area of research investigating how digital technologies can be used to create innovative solutions to societal challenges (Bonina et al., 2021b). Currently, DSI research is highly scattered across disciplines, terminologies, and outlets. By answering the call of Buck et al., (2023, p. 13) for “further research in the DSI area to harness [digital technologies]’ potentials to do good and to shape and develop the DSI field in the future”, we aimed to reflect on existing contributions as well as critical research pathways for DSI by providing 1) research clusters and 2) a research agenda for DSI.

First, our research clusters structure current DSI findings, drawing knowledge from different research streams, thus harmonising a diverse range of research. Traditionally, DSI research has been dispersed across various academic disciplines, lacking a cohesive, integrated view that brings together all relevant facets. With the six research clusters and a summary of the insights generated within each, we provide a shared knowledge base of the themes researched in the domain of DSI. Therefore, our six research clusters provide an aggregated understanding of the different characteristics of DSI based on DI, digital technologies, and SI, helping to structure and categorise current DSI findings.

Second, building on the six distinct research clusters, we outline current research gaps and identify future research opportunities through 12 research pathways. In line with Gregor's (2006) theory types, our research agenda can be understood as a first step towards a theory for analysing (i.e., Type I) that describes the phenomenon of interest and commonalities found in discrete observation, laying the foundation for higher-order theories (i.e., theories for explaining, predicting, and design and action) (Gregor, 2006). Accordingly, our work contributes to the descriptive knowledge of DSI, which is needed when little is known about a phenomenon under consideration, i.e., in our case DSI (Gregor, 2006; Kohli & Melville, 2019).

In summary, our work represents a significant synthesis and expansion of DSI research, elucidating previously uncharted research pathways by offering a comprehensive

overview of DSI research clusters and their associated research pathways. Thus, our research agenda serves as the cornerstone for future theoretical developments within DSI.

7.2 Theoretical Implications

While our research agenda addresses the IS discipline's call to better characterise and understand DSI (Buck et al., 2023), it not only builds upon the foundational contributions of scholars like Bonina et al., (2021b) and Qureshi et al. (2021) but also complements their work by offering a nuanced and holistic perspective on DSI. For instance, Qureshi et al. (2021) have opened up the opportunity space on research pathways that are of interest in DSI. Based on our systematic literature review and structure along the different research clusters, we narrow down this opportunity space by determining what has already been done. We have extracted valuable knowledge from Qureshi et al.'s (2021) research framework and built upon it within the pathways of our research agenda. Following their contributions, our research agenda seeks to extend the discourse initiated by Walsham's (2012) imperative—'are we making a better world with ICTs?'. We envision that the synergy between the DSI research framework and our proposed pathways will catalyse further interest and inquiry, fostering socially relevant and impactful research in the dynamic landscape of DSI.

For theory, the five topics presented in Section 6 offer theoretical angles relevant to future DSI research. In addition, developing a DSI research agenda represents a shift toward a more structured and mature approach to this multidisciplinary field. With the development of the DSI field, the research community needs to complement individual, explorative case studies on DSI examples to directed, well-defined research endeavours to continue creating meaningful and impactful research output. The multidisciplinary nature of DSI implies that future DSI research will likely require theories and concepts from different fields (e.g., computer science, information theory, statistics, and other fields) to be co-created to build a comprehensive understanding of the evolving landscape. The research agenda synthesises theories from prior studies and thus forms a first step towards a theory for analysing (Gregor, 2006). Our results, therefore, can serve as a springboard for future sense-making and design-led research into DSI (Gregor & Hevner, 2013; Jones & Gregor, 2007; van Aken, 2004).

Looking at the distribution of studies across the six clusters portrayed in Fig. 4, it also becomes apparent that not all clusters have received equal attention. Interestingly, research on digital technologies as an end is much more present than digital technologies as a means. This implies that the shift of the IS community's perspective from

viewing digital technologies as a mere infrastructure tool towards more recognition of its fundamental transformative effects as an enabler for new products, services, processes, and even business models has also been successfully integrated into DSI research (Vial, 2019; Wessel et al., 2021). While generally positive, this implication nevertheless calls for a balanced view regarding both roles of digital technologies in DSI (Nambisan et al., 2017) so as not to neglect the potential of digital technologies as a means of future research.

7.3 Managerial Implications

Although the nature of research agendas implies a strong focus on implications for research rather than practice, our work still provides practical value (Moeini et al., 2019). From a practical perspective, our work supports practitioners in understanding the relevance of DSI, providing a basis for observing, measuring, analysing, and managing relevant aspects of DSI. First, the research agenda can serve as a roadmap for organisations to find inspiration for their DSI initiatives. Organisations can ensure that their efforts to leverage digital technologies are synergetic with IS research. Second, the research agenda can also facilitate collaboration and partnerships among organisations. Organisations can pool and allocate their resources effectively to achieve greater social and environmental impact through collaboration in the research areas identified in the agenda. Third, the research agenda can inform organisations, governments, and regulatory environments on the persisting challenges of DSI. This might potentially enhance the success of DSI in the long-term.

8 Limitations & Further Research

In conclusion, our research agenda proposes 12 research pathways that can guide future research efforts in DSI. By exploring these areas, we can gain a deeper understanding of the potential of digital technologies to address some of the key societal challenges. Like any research, our work has limitations, which, in turn, provide stimuli for future research.

First, our research agenda varies in its specificity level to the DSI phenomenon. While parts of the pathways (e.g., RP9) are DSI-specific, others (e.g., RP5) are also transferrable to related phenomena within the IS research community (e.g., DI in commercial settings). While we purposefully included both types of questions to comprehensively present the existing challenges in DSI, future research could leverage these differences in specificity for a broader view

of IS research agendas. For example, scholars could explore conducting a meta-analysis on research agendas to unveil overarching themes in IS research.

Second, the scope of our study was to synthesise existing research and provide relevant pathways for future research. Our research agenda, however, does not provide a prioritisation of the pathways or a precise formulation of dependencies between them. This might lead to difficulties for practitioners in prioritising where to allocate their efforts effectively. Future research could prioritise these pathways to address this limitation. This prioritisation could be based on various criteria, such as the urgency of the issues addressed, the potential impact of the research, or the level of interdependence between pathways. Introducing a temporal dimension could also play a role in prioritisation, recognising that specific pathways may have greater relevance at different times.

Third, we interviewed 10 IS scholars to discuss and evaluate the research agenda. Future research can engage in assessing the research agenda with more researchers and practitioners or hybrid groups. Such discussion could help translate the research agenda into actions for practitioners to continue driving DSI for sustainable development.

Looking forward, our results may stimulate further theoretical developments. We hope this paper serves as a vigorous call to action, reminding us that, as IS discipline, we can illuminate the path forward by integrating the missing socio-technical lenses to provide theoretically and practically relevant solutions.

Appendix 1: Full List of DSI Studies and Coding of the DSI Dimensions

Table 4 provides an overview of the 135 studies from our systematic literature review. Each study is presented with its classification to at least one characteristic of each of the three digital social innovation (DSI) dimensions, i.e., digital technology, digital innovation (DI), and social innovation (SI). Each dot represents a study's main classification (i.e., 1st order) in our sample. If a study peripherally touched upon a second characteristic of a dimension (for example, the focus of the contribution is on DSI outcome, but a small part of the study also refers to DSI environments), we plotted an "x" (i.e., 2nd order). Accordingly, the dots show characteristics central to the studies, and the "x" show rather peripherally addressed characteristics.

Further, Table 5 illustrates the different domains of the journals or conferences from which we extracted the studies and the number of studies per domain.

Table 4 Full list of DSI studies and coding of the DSI dimensions

Study	Digital technology dimension		Digital innovation dimension			Social innovation dimension		
	Characteristics		actions	outcome	environment	profit	planet	people
	digital technologies as a means	digital technologies as an end						
Abejirinde et al., 2018		•	x	•				•
Abraham & Dao, 2017	•			•		•	x	x
Abraham & Dao, 2019	x	•		•		x	•	x
Abraham & Mohan, 2015	x	•		•		x	•	x
Adaba & Ayoung, 2017		•			•	•		
Agasisti et al., 2020		•	x	•				•
Ahuja & Chan, 2014	•				•	•	x	x
Ahuja & Chan, 2016		•			•	•	x	x
Ahuja & Chan, 2020	•	x		•		•	x	x
Aitken et al., 2021		•	•					•
Alaboudi et al., 2016		•	•	x	x			•
Amenta et al., 2021		•			•		•	
Andrade-Rojas & Lin, 2019		•			•		•	
Antonioli et al., 2018	•		•				•	
Arena et al., 2018		•			•	x	x	•
Arts et al., 2015	•	x	•				•	
Arts et al., 2016	•	x			•		•	
Arts et al., 2020		•		•	x		•	
Barberan-Garcia et al., 2021		•		•				•
Bengtsson & Ågerfalk, 2011	x	•			•	x	•	x
Bhatt et al., 2016	x	•	•			x		•
Bloom et al., 2017		•			•			•
Bonina et al., 2021a	•	x		•	x	x	x	•
Bonina et al., 2021b		•		•		x	x	•
Broadbent & Cara, 2018		•		•			•	
Buck et al., 2020		•		•		x	x	•
Butler & Hackney, 2015		•	•		x		•	
Buttol et al., 2012	•		•				•	
Carberry et al., 2019		•			•		•	
Cecere et al., 2014		•	•	x	x		•	
Chatfield et al., 2019		•			•	x	x	•
Cioffi et al., 2020		•		•			•	
Ciruela-Lorenzo et al., 2020		•	•			x	x	•
Cosimato & Vona, 2021		•		•		x	•	x
Csedó et al., 2021	•		•		x		•	
Cvar et al., 2020		•		•		x	•	x
Daum et al., 2021		•		•		•		
Dong & Götz, 2021	x	•			•			•
Dreyer et al., 2017		•	•			x	x	•
El-Kassar & Singh, 2019	•				•		•	
Emilsson et al., 2020		•	•					•
Essén & Conrick, 2008		•	•					•
Falk & Ryan, 2007		•		•			•	
Foster & Heeks, 2013		•	x			x		•
Fuger et al., 2017	•		x		•			•
Furstenau et al., 2016		•	•					•
Galán-Díaz et al., 2015		•	x		•		•	
Garske et al., 2021		•		•	x		•	
Gavrilović & Maksimović, 2018		•	•			x	•	x
Gebken et al., 2021		•	x		•			•
Ghazal et al., 2021		•		•				•
George et al., 2021		•		•	x		•	

Table 4 (continued)

Study	Digital technology dimension		Digital innovation dimension			Social innovation dimension		
	Characteristics		actions	outcome	environment	profit	planet	people
	digital technologies as a means	digital technologies as an end						
de Georgio Ferrari Trecate et al., 2020		•		•		x	x	•
Gerritsen et al., 2020	x	•	•				•	x
Ghobakhloo et al., 2021	•	x	•			X	•	x
Gogan et al., 2020	•	x	x		•			•
Guyader et al., 2021		•	x		•		•	x
Han et al., 2020		•		•			•	
Hanelt et al., 2017		•		•	x		•	
Harvey & Fisher, 2013		•	x		•			•
Hiteva & Foxon, 2021		•		•		x	•	x
Hird et al., 2016	•	x	•					•
Hjalmarsson & Lind, 2011		•	•		x	x	•	x
Hosseini et al., 2018		•	•			x	•	x
Howell et al., 2018		•		•		•		
Hsu et al., 2019	•				•	x	x	•
Huh & Kim, 2019	•				•			•
Husar & Ondrejicka, 2019		•		•			•	x
Iuorio et al., 2019	•			•	x	x	x	•
Kapoor et al., 2015		•		•			x	•
Keijzer-Broers & de Reuver, 2016		•	•					•
Kelly & Noonan, 2017	•		•					•
Ketter et al., 2016	•	x	•	x			•	
Koch et al., 2018		•	x		•			•
Kohler & Chesbrough, 2019	•		•			x	x	•
Lajoie-O'Malley et al., 2020		•		•			x	•
Lassar et al., 2021		•		•				•
Maaravi & Heller, 2021	•	x	•			x		•
Madianou, 2019	x	•			•			•
Maffey et al., 2015		•	•				•	
Majchrzak & Shepherd, 2021	•	x	•					•
McCampbell et al., 2018	•		x	•		x		•
McLoughlin et al., 2019		•		•				•
Mehmood & Imran, 2021	•		•			x	x	•
Melville, 2010		•	x	•	x	x	•	
Mettler et al., 2017		•	•					•
Michard et al., 2017		•		•				•
Misuraca & Pasi, 2019		•	x	•		•		
Moss et al., 2020		•		•				•
Munthali et al., 2018	•		x		•	•		
Nasiri et al., 2022		•			•	x	•	x
Nikiforova, 2021	•			•				•
Nittas et al., 2019		•		•				•
Oborn et al., 2021		•	x		•			•
Park et al., 2021		•			•		•	
Parthiban et al., 2020		•	•		x			•
Rachmawati et al., 2021		•		•		x	x	•
Ravishankar, 2021		•		•		x		•
Regan & Wang, 2014		•	•		x			•
Rey-Garcia et al., 2021		•			•	x		•
Richardson-Ngwenya et al., 2019	•		•					•
Robaeyst et al., 2021		•	x		•			•
Rocha & Almeida, 2021		•		•				•
Rodrigo & Palacios, 2021		•			•	x	x	•

Table 4 (continued)

Study	Digital technology dimension		Digital innovation dimension			Social innovation dimension		
	Characteristics		actions	outcome	environment	profit	planet	people
	digital technologies as a means	digital technologies as an end						
Rommetveit et al., 2021	•				•		•	
Röpke, 2012		•		•			•	
Sahay & Walsham, 2014		•	x	•			•	
Sahay et al., 2018		•	•				•	
Sandeep & Ravishankar, 2015	•		•			x	•	
Sanders et al., 2021	•	x	•		x	x	• x	
Sasaki, 2018		•			•		•	
Schmitt & Muyoya, 2020		•			•	x	x •	
Schmitt et al., 2020		•	•		x		•	
Senshaw & Twinomurizi, 2022	•		x		•		•	
Shomali & Pinkse, 2016		•	•	x			•	
Soni et al., 2021		•		•		x	x •	
Suseno & Abbott, 2021		•	•				•	
Tarafdar et al., 2013		•		•		•		
Tim et al., 2021		•	•			x	•	
Vahtera, 2008		•			•		•	
van Osch & Avital, 2010		•	•			x	• x	
Vesci et al., 2021		•	•				•	
Vrain & Wilson, 2021		•		•			•	
Watanabe et al., 2019		•	•				•	
Wehn & Evers, 2015	•				•		•	
Witteveen et al., 2017		•	•				•	
Wu et al., 2020		•	•				•	
Wunderlich et al., 2013		•			•		•	
Xiao et al., 2013	x	•	•	x		•		
Yang et al., 2016	•				•		•	
Yang et al., 2017	•				•		•	
Yang et al., 2019		•			•		•	
Yang et al., 2020		•		•			•	
Yousaf et al., 2021	•	x	•		x	x	• x	
Zhang & Liang, 2012		•			•	x	•	

• ≙ main focus of the study; x ≙ peripheral focus of the study

Table 5 Domains of integrated journals and conferences

Domain	Number of studies
Business	20
Communication	4
Computer Sciences	4
Development Studies	8
Economics	2
Environmental Sciences	35
Information Systems (journal)	20
Information Systems (conference)	28
Medical Sciences	11
Natural Sciences	1
Public Sector	2

Appendix 2: Exemplary Code Book

The code book presents illustrative examples of open codes with corresponding citations, axial codes, and their associated selective codes, which reflect the characteristics of the dimensions DI, SI, and digital technologies. For each selective code, additional studies are listed—either as directly focusing on the selective codes (i.e., 1st order) or as addressing the selective codes peripherally (i.e., 2nd order).

The codebook can be found under the following link:

https://figshare.com/articles/dataset/Supplementary_Material_A_-_Code_Book_Excerpt/30939545?file=60577100
(<https://doi.org/10.6084/m9.figshare.30939545>).

Appendix 3: Interviewees and interview protocol

We conducted 10 expert interviews with Information Systems (IS) scholars to refine the initial research agenda. The research focus of the IS scholars is either DSI directly or one of the intersecting areas such as DI or Green IS. Table 6 presents a description of the 10 IS scholars, including

their current academic position, research focus, and years of experience in research.

The interview protocol (see Table 7) is structured to gather information and insights from the scholars on various DSI aspects. It comprises a series of questions covering the DSI research agenda. The questionnaire is divided into sections to ensure comprehensive coverage of relevant areas. These sections include:

- **General DSI Research Agenda Section:** Exploring the scholars' perceptions, experiences, and perspectives on DSI and the research agenda.
- **DSI Research Section:** Seeking the scholars' opinions, suggestions, and recommendations regarding potential strategies and future directions related to DSI.
- **Debriefing and Demographic Information:** Gathering basic demographic details such as age, gender, educational background, and professional experience.

Table 6 Information on interviewed scholars

ID	Current position	Research focus	Years of experience in research
R1	PhD Candidate	Digital Innovation	6
R2	PhD Candidate	Digital Technologies for Sustainable Business Models	4
R3	PhD Candidate	Digitalisation of the Energy Sector	3
R4	PhD Candidate	Machine Learning for Healthcare	3
R5	PhD Candidate	Digital Social Innovation	5
R6	Post-Doc	Digital Opportunities for Sustainability	14
R7	Associate Professor	Digital Technologies for Sustainability	20
R8	Professor	Digital Social Innovation	8
R9	Professor	Sustainable Mobility	10
R10	Professor	Customer Processes and Sustainability	13

Table 7 Interview protocol

Time	Questions/Information
General DSI Research Agenda Section	
2 min	<i>Explanation of the background of the interviews and reference to data processing clarification</i> <ul style="list-style-type: none"> • Possibility to record Teams meeting/audio recording? • Note on anonymisation of information and further processing of interview content
3 min	<ul style="list-style-type: none"> • Can you briefly introduce your professional background? • What research topics are central to you?
5 min	<ul style="list-style-type: none"> • How would you define DSI? <i>Detailed presentation of DSI, the study, and the research questions</i>
25 min	<ul style="list-style-type: none"> • Comments, feedback on the existing research questions
DSI Research Section	
10 min	<ul style="list-style-type: none"> • The current portfolio of research questions in the Research Agenda is based on an extensive literature review of adjacent domains • Do you see a need for expansion or other highly relevant research questions in the field of DSI that must not be missing from this research agenda? • Do you see a need for prioritisation among the different questions?
10 min	<ul style="list-style-type: none"> • In the IS community, the contribution of IS to sustainable development is still considered relatively small. However, the potential of digital technologies is immense. DSI also represents a central lever for achieving the UN SDGs • What do you consider to be the central challenges in DSI research? What needs to happen, what is missing, to make research in this area even more pioneering? <i>OR</i>: What do you consider to be the central challenges in your research area to make research even more pioneering for sustainable development? Which of these challenges are also central for DSI?
10 min	<ul style="list-style-type: none"> • While the field of DSI is relatively new, it has evolved from longer-standing research streams such as DI, SI, or Green IS/IT. Therefore, for the advancement of the field, it is crucial not to reinvent the wheel everywhere but to also draw on existing theories and insights from adjacent areas where possible • What perspectives, theories, and insights from your research domain do you see as relevant for DSI research?
Debriefing & Demographic Information	
2 min	<ul style="list-style-type: none"> • Age, Gender • Years of experience in research • Current role

Appendix 4: Interview feedback

During the interviews, we extracted feedback that was either included in the research agenda, the research clusters, the discussion, or the conclusion. Table 8 presents the central feedback points incorporated during the refinement loops and details the respective section. For conciseness, we do not include feedback points on changing the wording of research pathways.

Table 8 Included feedback from the interviews

ID	Feedback	Included in
R1	• Include trade-off between the different sustainability dimensions	Research Agenda
R2	• Include a table to subsume the research pathways and their goals • Include ecosystems research stream in the research agenda • Include a call for action on the role of the IS discipline to bring together digitalisation, the economy, and sustainability	Research Agenda Research Agenda Conclusion
R5	• Delineate questions to Qureshi et al. (2021) • Integrate research pathways for each cluster	Discussion Research Agenda
R6	• Expand platform focus with insights from digital ecosystems research • Sharpen argumentation on why the research pathways address actions, outcome, or the environment, respectively • Integrate the rebound effect • Integrate the downsides of digital technologies	Research Agenda Research Agenda Research Agenda Research Agenda
R7	• Differentiate the characteristic “social” from the dimension “social innovation” • Change to people, planet, profit • Discuss that the research pathways are representative for a variety of research questions and are not meant to claim completeness	Research Clusters Research Agenda
R8	• Differentiate the characteristic “social” from the dimension “social innovation” • Integrate at least one research pathway for each cluster • Include the structure of the clusters in the research agenda	Research Cluster Research Agenda
R9	• Discuss which research pathways are DSI specific and which are not	Conclusion
R10	• Include a time perspective in the research pathways • Discuss dependencies between research pathways • Include limitation that the research pathways are not brought into a chronological order	Conclusion Conclusion

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Declarations

Ethics Approval and Consent to Participate The study did not involve procedures that required formal approval from an ethics committee. All interview participants were informed about the purpose of the study and gave their written consent to participate and to have their anonymized data used for this journal article.

Consent for Publication All authors have read and approved the final version of the manuscript. We give our full consent for the publication of this manuscript in Information Systems Frontiers, including tables, figures, and other related content.

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