

Abstract

It needs to be clarified how digital, innovation, and sustainable concepts are interdependent and what dimensions they encompass from an organizational perspective. This article aims to fill these gaps. 12,249 articles are analyzed, of which 776 are minimum C ranked, and 457 pass the quality filters. Only 48 publications deal with all three concepts, and 24 offer definitions. This results from an eight-step systematic literature review. Three dimensions for 'digital' (data, technologies, and networks), three dimensions for 'sustainable' (environmental, social, and economic), and four dimensions for 'innovation' (product, service, business model, and process) are elaborated in a framework. Based on this, an integrated definition is derived using a content analysis. The DIS-definition can be used for strategic decision-making processes and bridges the disciplines of technology, innovation, and sustainability management. Finally, a canvas that clarifies the concepts and their connections is proposed for interdisciplinary management discussions.

Keywords: Digital, Innovation, Sustainability, Systematic Literature Review, Content Analysis.

Graphical abstract

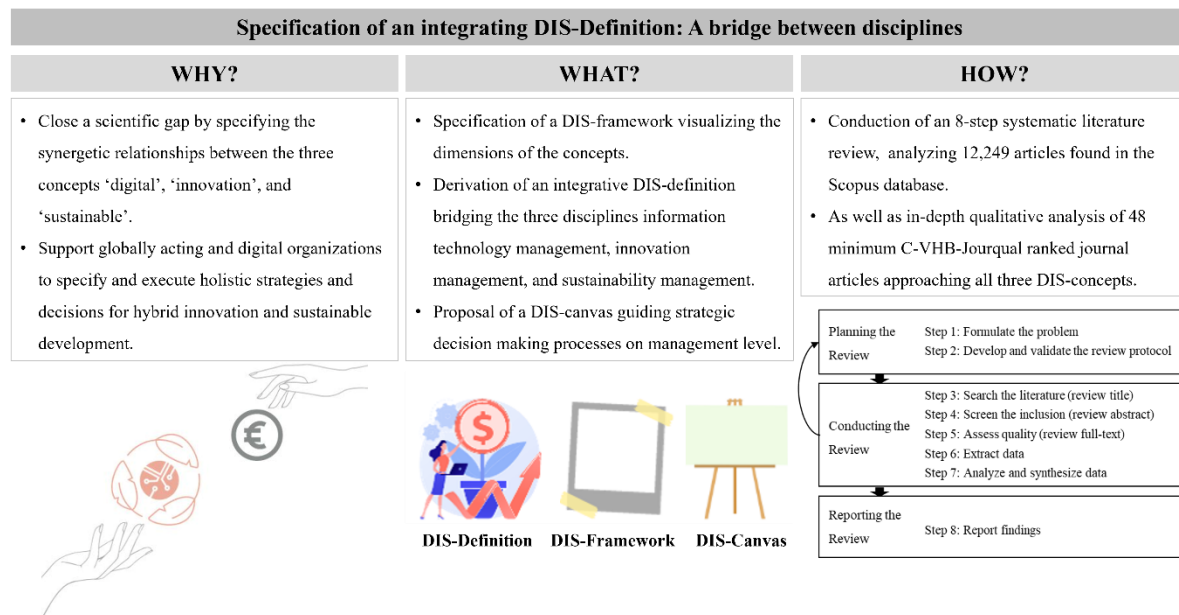


Figure 1: Graphical Abstract (Source: own representation).

Highlights

- Description of the mutual influence of digital, innovation, and sustainable concepts.
- Development of a framework that identifies the dimensions of the three DIS-concepts.
- Derivation of an integrative DIS-definition for the three disciplines: technology, innovation, and sustainability management.
- Proposal of a DIS-canvas for holistic strategic decision-making processes.

1. Introduction

The objective of this publication is to establish an integrative definition for the three concepts of Sustainable (S), Digital (D), and Innovation (I). In the following, the definition will be referred to as the DIS-definition. The definition bridges the three disciplines of technology management, innovation management, and sustainability management, as shown in *Fig. 2*.

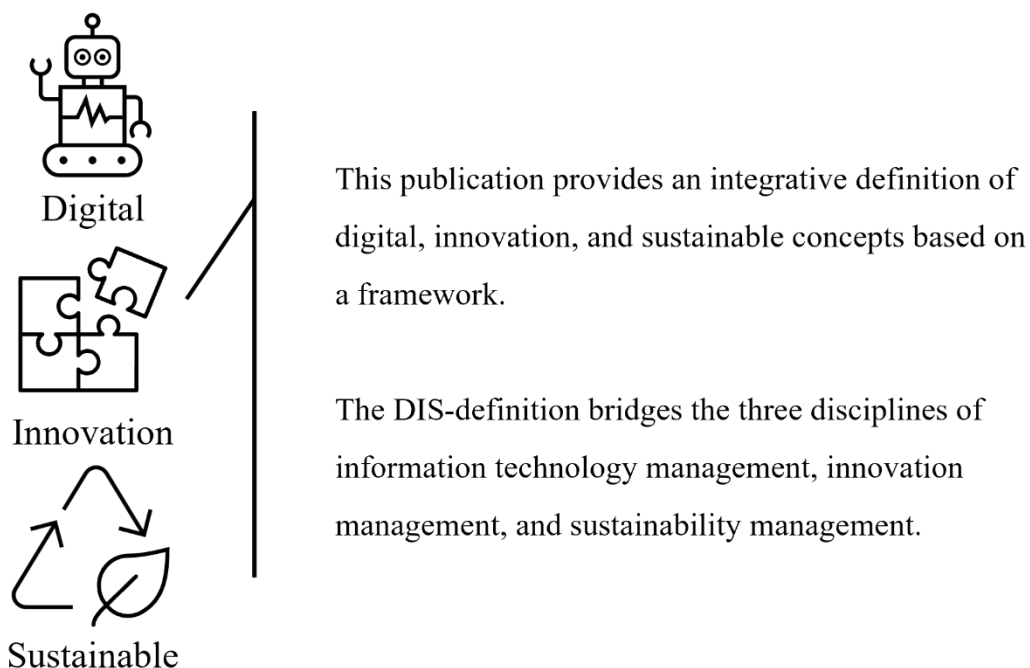


Figure 2: This Publication derives a DIS-Definition (Source: own representation).

The derivation of an integrative DIS-definition is intended to fill a scientific gap. In addition, the definition is intended to help innovation managers and other decision-makers in digital organizations to generate holistic strategies for sustainable development. The target audiences of this paper are research and management.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

In *Chapter 2*, the authors explore organizations' economic context and behavior. *Chapter 3* involves conducting a systematic literature review (SLR). *Chapter 4* qualitatively analyzes the condensate from the SLR to formulate a DIS-framework and an integrative definition.

Chapter 5 delves into the practical application of the framework and definition in organizational strategy. *Chapter 6* summarizes insights for academia, organizations, and management. Lastly, *Chapter 7* addresses research limitations and prospects.

2. Literature Review¹

2.1 The Digital, Circular, and Innovation Economy

2.1.1 Digital Economy (DE)

Digital technologies have an undeniable impact on the global economy. The European Union has developed an index system encompassing network connectivity, human resources, network applications, digital technology integration, and digital public services to measure the digital economy's (DE) influence (cf. Xu and Li, 2022, p.3). Scholars agree that the DE significantly enhances innovation efficiency (cf. Xu and Li, 2022, p.5).

The rapid pace of digital disruption is transforming the innovation landscape. Analog information's conversion into digital formats facilitates automation and seamless data transfer across various media. Adherence to defined standards further promotes the integration of diverse technologies (cf. Teece, 2018, p.3).

At the macro level, the DE is reshaping the national economy, compelling interdisciplinary collaboration, and strategic reevaluation among organizations. It also increases financial support for green innovation and transparency in environmental decision-making. On the micro level, digital transformation in enterprises continually utilizes digital technologies to optimize decision-making, streamline operations, and upgrade business models, ultimately improving efficiency and effectiveness (cf. Chen, 2023, p.1664).

While concerns persist about potential carbon emissions associated with the DE, the shift to green technology (GT) offers prospects for enhanced energy efficiency. GT comprises innovative processes, technologies, systems, and products to mitigate environmental hazards (cf. Yin and Li, 2022, p.2 cited from Rennings, 2000). Despite potential cost challenges, GT's

¹ While preparing the theoretical work, the author(s) used ChatGBT and BARD to shorten text passages. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication (ScienceDirect, 2023).

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines role in reducing carbon emissions makes it a crucial driver of sustainable global economic growth (e.g., Song et al., 2023; Tang et al., 2023).

Remarkably, information and communication technology (ICT), while contributing to global emissions and e-waste, also provides innovative tools for energy conservation. “The Global e-Sustainability Initiative projects a potential 20% reduction in greenhouse gas emissions by 2030 through smarter energy use by companies and consumers.” (Sedlmeier et al., 2020, p.3)

2.1.2 Circular Economy (CE)

In 2021, the G20 nations, including major emitters like China, the United Nations (UN), and the EU, were responsible for 81% of global CO₂ emissions (cf. Destatis Statistisches Bundesamt, 2020). Global warming, driven by greenhouse gas emissions, emphasizes the need for a low-carbon economy (cf. Ali et al., 2021, p.1-2).

By 2050, Europe aims for climate neutrality (cf. EU, 2023). This is to be achieved, among other things, with the help of circularity. The concept aims to reduce CO₂ emissions by replacing the linear 'cradle-to-grave' model with a circular 'cradle-to-cradle' framework. Its primary objective is to reduce resource input and mitigate environmental impacts by optimizing production, distribution, and consumption processes, extending product lifespans, and reintegrating waste materials into supply chains (cf. Zeiss et al., 2021, p.149).

The circular economy can be understood as an archetype or subcategory of sustainability. It follows the sustainability goals of stakeholder engagement and a long-term perspective and focuses on resource cycles. In addition to circularity, there are other measures to drive sustainable development (Geissdoerfer et al., 2018, p.403).

The 2030 Agenda for Sustainable Development (SD), adopted by all UN Member States in 2015, comprises 17 Sustainable Development Goals (SDGs), collectively addressing poverty, economic growth, clean energy, and climate change mitigation (cf. UN, 2022). SD, defined by the UN Brundtland Commission in 1987, seeks to meet present needs without compromising future generations' ability to meet their needs (cf. UN, 1987). Corporate Social Responsibility (CSR) and eco-innovation are pivotal in advancing global SD (cf. Chen, 2023, p.1664).

Sustainability, emerging as a guiding principle since the 1992 UN Conference on Environment and Development in Rio de Janeiro, is framed by the 'three-pillar model' introduced by the German Federal Parliament's Enquete Commission on the Protection of People and the Environment in 1995. These three pillars - economic, environmental, and

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines social dimensions - underpin the pursuit of sustainability. The economic dimension emphasizes responsible resource utilization to meet current consumption levels without jeopardizing future needs. The environmental dimension focuses on ecosystem integrity and sustainable resource use, while the social dimension focuses on human-beings, their social well-being and mental health (e.g., Bartol and Herkommer, 2014; Filho et al., 2020).

Sustainability operates at both macro and micro levels. At the macro level, it involves the SD of economies, as exemplified by the CE (cf. Ali et al., 2021, p.2). On the micro level, it entails the sustainable transformation of organizations, fostering sustainable corporate practices.

Haney (2017, p.261) identifies two ethical mechanisms that positively mediate the relationship between threat interpretation of management and innovation: an enlarged concept of responsibility to society and moral legitimacy. The author highlights the importance of ethics in linking managerial interpretation to innovation, particularly in global environmental and social challenges.

2.1.3 Innovation Economy (IE)

Innovation's capacity and its effective integration into the market exert significant influence as pivotal drivers of global competitiveness. Estimates underscore that innovation and the generation of new knowledge contribute substantially, accounting for a noteworthy 50% to 80% of economic growth. Notably, this dynamic is reciprocal, with economic activity acting as a catalyst, propelling further innovation efforts. Within the scholarly landscape, the IE commands attention through two primary channels. Firstly, one stream focuses on industrial innovation and technological evolution, where market expansion pivots on groundbreaking technological advancements, giving rise to innovative products, services, and business models. Secondly, the other stream delves into organizations' competitive and collaborative strategies, particularly emphasizing the pivotal role of research collaboration. An intriguing aspect to highlight is the role of CSR as a potent catalyst for enhancing the innovation capacity of capitalist organizations. CSR fosters stakeholder dialogue and cooperation, thus driving innovation (e.g., Bonina et al., 2021; Yang and Yan, 2019).

Fig. 3 aggregates the core insights for organizations engaging in the digital, innovation, and sustainable economy. Europe's vision is to push sustainable development for climate neutrality with the help of the digital and sustainable transformation of organizations. Both transformations drive innovations aiming for progress and profits.

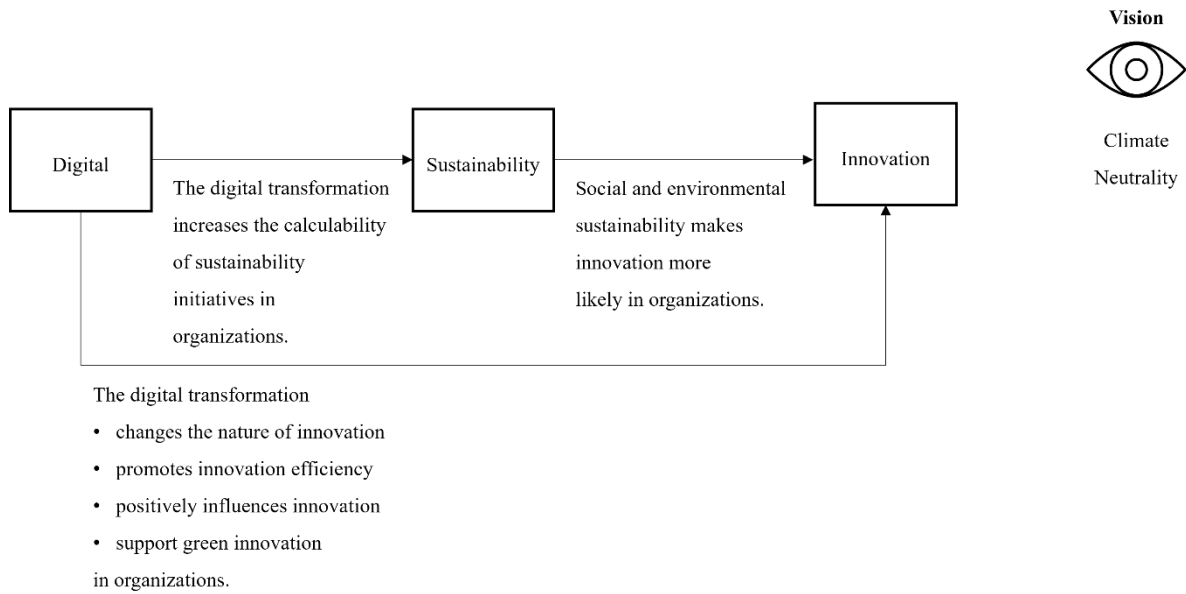


Figure 3: Mutual Influence of the Digital, Innovation, and Sustainable Concepts (Source: own representation).

2.2 Organizations acting within diverse Economies

Organizations currently operate between three different and mutually dependent economies. From a DE perspective, organizations want to use data, networks, and digital technologies to optimize decision-making and operations. This is to achieve efficiency and effectiveness (cf. Xu and Li, 2022, p.5). From a CE perspective, organizations strive for a sustainable transformation (cf. Ali et al., 2021, p.2), leading to a reduction of carbon emissions (cf. Chen, 2023, p.1665) that can be enabled, for example, by green technologies (e.g., Song et al., 2023; Tang et al., 2023). The vision is to achieve climate neutrality in Europe by 2050 (e.g., EU, 2023). From an IE perspective, CSR and digitalization positively influence an organization's innovativeness, providing progress and profits (e.g., Chen, 2023; Xu and Li, 2022). Whether the growth model will continue to be suitable for an economy is increasingly being doubted. Pueyo (2018, p.1) proposes a degrowth model in which the self-interest of elites is overcome, and superintelligences are used to ensure social and ecological justice. These key insights are visually represented in *Fig. 4*.

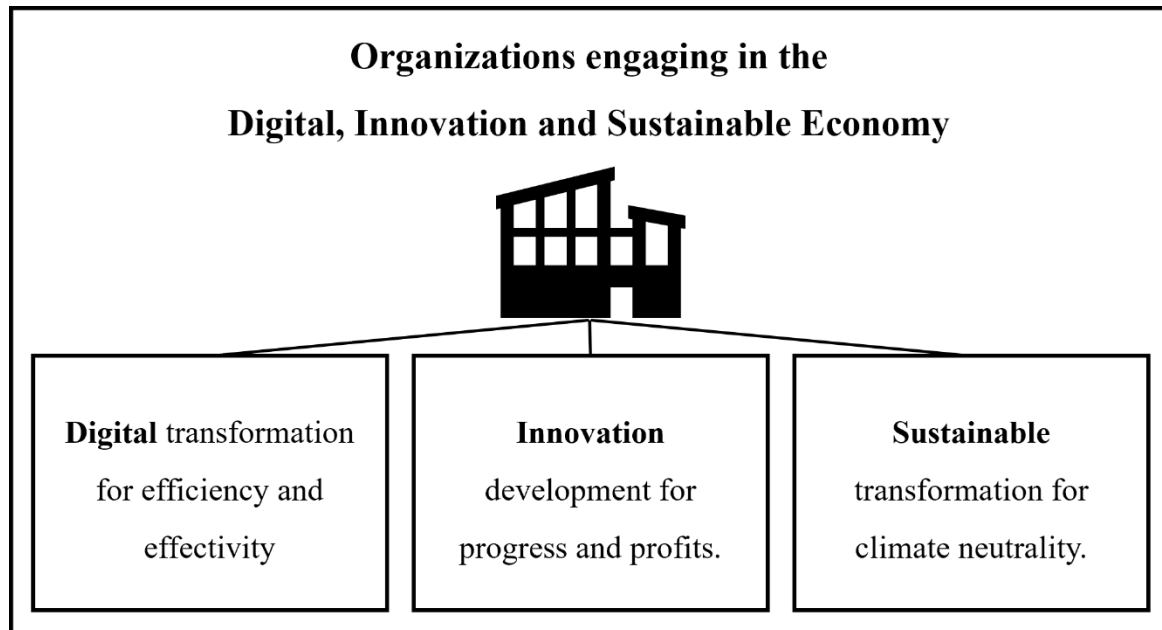


Figure 4: Digital, Innovation, and Sustainable gains from an Organizational Perspective (Source: own representation).

To this end, a systematic literature analysis (SLR) will be conducted on the three DIS-concepts, and the essences will be elaborated with the help of a summarizing qualitative content analysis (CA).

3. Material and Methods

To perform the SLR, the authors adopt the 8-step approach of Xiao and Watson (2019, p.103), as shown in *Fig. 5*.

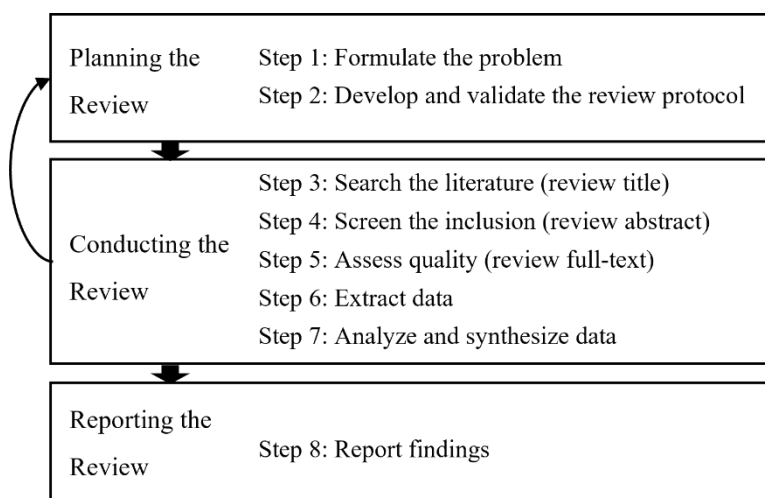


Figure 5: SLR-Procedure (Source: in accordance with Xiao and Watson, 2019, p.103).

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Step 1: Problem Formulation. In this paper, a DIS-framework, a DIS-definition, and a DIS-canvas are developed. The overall goal is to enable organizations to fully exploit the opportunities of ‘digital’, ‘innovation’, and ‘sustainable’ for progress with regards to sustainable development in a structured and strategic way.

Step 2: Review Protocol Development. *Tab. 1* presents the review protocol, presented in *Appendix A.1*.

Table 1: Review Protocol (Source: own representation).

No.	Author	Year	Title	Top Category	Sub-category	Source Title	VHB-Ranking	Cited by	Abstract	Method

In the top category column, the concepts and their combinations are recorded (Digital, Innovation, Sustainable, Digital AND Innovation, Digital AND Sustainable, Innovation AND Sustainable, Digital AND Innovation AND Sustainable), which are in the title or the summary of the peer-reviewed article. These are deductively formed codes applied to the material as in a structured CA. The column subcategory concretizes the top category. The subcategories result from the titles and are thus inductively derived (e.g., Green Technology Innovation). They are summarizing CA’s form inductive codes. In this contribution, deductive-inductive category formation occurs (e.g., Mayring, 2022; Mayring, 2012; Mayring, 1994).

Step 3: Literature Review. First, the VHB-Jourqual total list with 887 journals is reduced to at least C-ranked. This step leaves 590 relevant journals. Second, the subratings TIE (Technology, Innovation and Entrepreneurship; N=55), WI (Business Informatics; N=120), and NAMA (Sustainability Management; N=42) are filtered out and duplicates removed². The three subratings are assumed to have the most excellent correspondence with the DIS-concepts as well as with the technology management, the innovation management, and the sustainability management disciplines. Journals are excluded if they are written in German, dedicated to a sector (e.g., Energy, Consumer, Industry, Trade), or purely related to teaching or conferences. The detailed exclusion procedure is given in *Appendix A.2*. A total of 98 journals remains in which the concepts ‘Sustainable AND Digital AND Innovation’ are

² Since a journal is assigned to several subratings, this leads to duplicates.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines searched across all fields in Scopus³. Filtering is done on publications from 2010 to 2023, English publications, and review articles⁴.

Step 4: Inclusion Criteria Screening. Included in the title check of the contribution are those contributions that are useful in the specification of at least one core term in the technology environment (IT⁵, ICT⁶) of an organization or that contribute to the understanding of the organizational context of the DIS-concepts⁷. *Tab. 2* shows the filter and inclusion criteria.

Table 2: SLR-Inclusion and Exclusion Criteria (Source: own representation).

Filter	Criteria	Number
1 Journal Search	<ul style="list-style-type: none"> • VHB Total List • TIE, WI and/or NAMA subratings • At least C-ranked • Not in German • No sector or country focus • No conference or teaching contribution 	98
2 Keyword Search	<ul style="list-style-type: none"> • Sustainable AND Digital AND Innovation • Search in all fields • Publication year 2010-2023 • Publication type Review article • Publication language English 	12.249
3 Title Selection	<ul style="list-style-type: none"> • Specification of minimum one keyword (Sustainable, Digital, Innovation) • IT/ICT focus • Organizational focus 	776 6% of 2
4 Abstract Selection	<ul style="list-style-type: none"> • Specification of at least Digital in combination with Innovation and/or Sustainable • AND/OR Specification of the circular or digital economy 	457 59% of 3
5 Meta-Definition Selection	<ul style="list-style-type: none"> • Articles focusing on the combination of Sustainable, Digital, and Innovation • Quantitative, Qualitative, or Mixed Methodology 	48 11% of 4

Step 5: Quality Assurance. The quality of the journals is assured via a VHB-Jourqual⁸ ranking of at least C. The quality of the peer-reviewed articles is determined via their

³ Scopus allows forward and backward searches due to its index database, and the publications can be output as CSV files. In addition, the database is not limited to a few journals and allows one to view all publications, not just a few (such as Google Scholar or ScienceDirect).

⁴ In the Scopus database, the category ‘Review Article’ refers to an article overviews a specific research area or question. Review articles are usually written by experts in the field and summarize the current state of research. They may also summarize and evaluate new research and findings. Review articles are essential for scientists to learn about new developments in their field. They can also identify research gaps and pose new research questions.

⁵ Information Technology.

⁶ Information and Communication Technology.

⁷ Excluded are those contributions that refer to a sector other than IT/ICT, a country, the sharing economy, knowledge management, or digital technologies such as 3D printing or VR/AR. Included in the review of the short summaries of the contributions are those helpful in specifying at least one core term in the technology environment (IT, ICT) of a small, medium, or large organization or describing its environment in terms of the concepts. Contributions that do not refer to IT/ICT and merely describe technology in the digital environment without referencing innovation or sustainability are excluded. Also excluded are contributions that refer purely to industry 4.0 (supply chains, production), marketing, education, or the development of rural areas and ecosystems.

⁸ VHB-Jourqual is a journal ranking of the ‘Verband der Hochschullehrer für Betriebswirtschaft e.V. (VHB)’, the umbrella organization of German university professors in business administration.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines contribution to formulating a DIS-definition. A focused reading of the concepts ensures the quality of the text.

Step 6: Data Extraction. The titles and abstracts of the peer-reviewed journals passing filter 1 and filter 2 are extracted in Scopus as a CSV⁹-file and aggregated into an excel that follows the structure from *Tab. 1*. The 776 papers relate to any DIS-concepts. The 48 publications that pass the title and abstract selection filter 3 and four are aggregated into the coding guide shown in *Tab. 3* and provided in *Appendix A.3* relates to all DIS-concepts.

Table 3: Coding Guide (Source: own representation).

Unit of Analysis	Paraphrase the text passage	Summary based on level of abstraction	Reduction by selection	Reduction by bundling	Category System	Back Checking

The 48 DIS-papers specify all three DIS-concepts and are aggregated in *Tab. 4* for transparency. The concepts mentioned are highlighted with different forms of underlining (Digital, Innovation, Sustainable).

Table 4: SLR Peer Review Paper Extract (Source: own representation).

Author	Year	Title	Source Title	VHB-Ranking	Cited by
Ahmed et al.	2022	Nexus between Cyclical <u>Innovation</u> in <u>Green Technologies</u> and <u>CO2-Emissions</u> in Nordic Countries: Consent toward Environmental Sustainability	Sustainability	C	6
Ahuja et al.	2023	<u>Responsible innovation</u> with <u>digital platforms</u> : Cases in India and Canada	Information Systems Journal	A	6
Akter et al.	2023	Addressing the grand challenges of <u>poverty</u> with <u>data-driven</u> creative service offerings (<u>social innovation</u>)	Journal of Product Innovation Management	A	0
Ali et al.	2021	A <u>clean technological innovation</u> and <u>eco-efficiency enhancement</u> : A multi-index assessment of <u>sustainable economic and environmental management</u>	Technological Forecasting and Social Change	B	33
Alkhatib	2023	Fostering <u>green innovation</u> : the roles of <u>big data analytics</u> capabilities and green supply chain integration	European Journal of Innovation Management	C	0
Ardito	2023	The influence of firm <u>digitalization</u> on <u>sustainable innovation</u> performance and the moderating role of corporate Sustainability practices: An empirical investigation	Business Strategy and the Environment	B	1
Bhatt et al.	2016	<u>Social innovation</u> with <u>open source software</u> : User engagement and development challenges in India	Technovation	C	37
Bonina et al.	2021	Social, commercial, or both? An exploratory study of the identity orientation of <u>digital social innovations</u>	Information Systems Journal	A	13

⁹ Comma-separated values.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Author	Year	Title	Source Title	VHB-Ranking	Cited by
Buhmann and Fieseler	2023	<u>Deep Learning</u> Meets Deep Democracy: Deliberative Governance and <u>Responsible Innovation in Artificial Intelligence</u>	Business Ethics Quarterly	B	19
Carlsson et al.	2022	Long-Lived <u>Sustainable</u> Products through <u>Digital Innovation</u>	Sustainability	C	1
Chen and Chen	2023	A Metaorganizations Perspective on <u>Digital Innovation</u> and Corporate <u>Social Responsibility</u> : Evidence from China	Sustainability	C	0
Chen	2023	<u>Digital</u> economy development, corporate social responsibility and <u>low-carbon innovation</u>	Corporate Social Responsibility and Environmental Management	C	5
Du et al.	2016	<u>Sustainability</u> , <u>Social Media</u> Driven Open <u>Innovation</u> , and New Product Development Performance*	Journal of Product Innovation Management	A	109
Fan et al.	2023	The Driving Factors of <u>Green Technology Innovation</u> Efficiency—A Study Based on the Dynamic QCA Method	Sustainability	C	0
Fauchoux and Nicolaï	2011	<u>IT for green</u> and green IT: A proposed typology of <u>eco-innovation</u>	Ecological Economics	B	112
Gao et al.	2023	A Study on the Impact Mechanism of <u>Digitalization on Corporate Green Innovation</u>	Sustainability	C	2
Guo et al.	2022	How does green <u>digitalization</u> affect <u>environmental innovation</u> ? The moderating role of institutional forces	Business Strategy and the Environment	B	7
Hanelt et al.	2017	Driving business transformation toward <u>Sustainability</u> : exploring the impact of supporting <u>IS</u> on the performance contribution of <u>eco-innovations</u>	Information Systems Journal	A	53
Jung et al.	2023	Investigating the Interaction Effect between <u>IT</u> -enabled <u>innovation</u> and <u>Corporate Social Responsibility</u> on Firm Performance	Information Systems Management	C	2
Khan et al.	2021	<u>Green</u> process <u>innovation</u> : Where we are and where we are going (clean <u>technologies</u>)	Business Strategy and the Environment	B	56
Lee et al.	2023	How does <u>information technology</u> capabilities affect business <u>sustainability</u> ? The roles of ambidextrous <u>innovation</u> and data-driven culture	R and D Management	B	0
Li and Shen	2021	Can corporate <u>digitalization</u> promote <u>green innovation</u> ? The moderating roles of internal control and institutional ownership	Sustainability	C	30
Lichten-thaler	2017	<u>Shared value innovation</u> : Linking competitiveness and societal goals in the context of <u>digital</u> transformation	International Journal of Innovation and Technology Management	C	34
Liu et al.	2023	Optimization of carbon performance evaluation and its application to strategy decision for investment of <u>Green Technology Innovation</u>	Journal of Environmental Management	B/C	3
Lutfi et al.	2023	<u>Green Environmental Management System</u> to Support Environmental Performance: What Factors Influence SMEs to Adopt Green <u>Innovations</u> ?	Sustainability	C	1
Ma et al.	2023	<u>Digital</u> Transformation and <u>Corporate Environmental</u> Green <u>Innovation</u> Nexus: An Approach towards Green Innovation Improvement	Sustainability	C	1
Makhloufi et al.	2023	Understanding the Impact of <u>Big Data Analytics</u> and Knowledge Management on <u>Green Innovation</u> Practices and Organizational Performance: The Moderating Effect of Government Support	Sustainability	C	3
Park and Hong	2022	A Research Framework for <u>Sustainable Digital Innovation</u> : Case Studies of Japanese Firms	Sustainability	C	5

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Author	Year	Title	Source Title	VHB-Ranking	Cited by
Pasqualino et al.	2021	<u>Digital</u> transformation and <u>sustainable</u> oriented <u>innovation</u> : A system transition model for socio-economic scenario analysis	Sustainability	C	19
Pueyo	2018	Growth, <u>degrowth</u> , and the challenge of <u>artificial superintelligence</u> (technological <u>innovation</u>)	Journal of Cleaner Production	B	27
Qureshi et al.	2021	<u>Digital social innovation</u> : An overview and research framework	Information Systems Journal	A	30
Rodrigo et al.	2022	Organisational commitment in the <u>digital social innovation</u> context: does qualitative comparative analysis add information to linear regression?	Technological Forecasting and Social Change	B	0
Fan et al.	2023	The Driving Factors of <u>Green Technology Innovation</u> Efficiency—A Study Based on the Dynamic QCA Method	Sustainability	C	0
Sahoo et al.	2023a	How do green knowledge management and <u>Green Technology Innovation</u> impact corporate environmental performance? Understanding the role of green knowledge acquisition	Business Strategy and the Environment	B	57
Sahoo et al.	2023b	<u>Circular economy</u> practices and environmental performance: Analysing the role of <u>big data analytics</u> capability and responsible research and <u>innovation</u>	Business Strategy and the Environment	B	0
Schmitt and Muyoya	2020	Influence in <u>technological</u> innovation spaces: A network science approach to understand <u>innovation for sustainability</u> in the global south	Sustainability	C	2
Shirazi and Hajli	2021	IT-enabled <u>sustainable innovation</u> and the global <u>digital divides</u>	Sustainability	C	10
Song et al.	2023	Incentivizing <u>green technology</u> innovation to confront sustainable development	Technovation	C	0
Tang et al.	2023	The Effect of Enterprise <u>Digital</u> Transformation on <u>Green Technology Innovation</u> : A Quantitative Study on Chinese Listed Companies	Sustainability	C	0
Turkina et al.	2021	The impact of co-inventor networks on <u>smart cleantech Innovation</u> : The case of montreal agglomeration	Sustainability	C	7
Wang et al.	2023a	Fiscal Decentralization, Enterprise <u>Digital</u> Transformation and Enterprise <u>Green Innovation</u> —The Case of 11 Years A-Share Listed Companies in China	Sustainability	C	1
Wang et al.	2023b	<u>Big Data</u> capability and <u>sustainability</u> oriented <u>innovation</u> : The mediating role of intellectual capital	Business Strategy and the Environment	B	1
Wang et al.	2021	Is <u>technological innovation</u> making world " <u>Greener</u> "? An evidence from changing growth story of China	Technological Forecasting and Social Change	B	154
Yin J. and Li C.	2022	Data governance and <u>green technological innovation</u> performance: A curvilinear relationship	Journal of Cleaner Production	B	3
Yousaf et al.	2021	Towards <u>sustainable digital innovation</u> of SMEs from the developing countries in the context of the Digital economy and frugal environment	Sustainability	C	47
Zhang H. and Xu X.	2023	<u>Innovative Technology</u> Method Based on Evolutionary Game Model of Enterprise <u>Sustainable Development</u> and CNN-GRU	Sustainability	C	0
Zhang et al.	2023	Study on the Coupled and Coordinated Development and Evolution of <u>Digital</u> Economy and <u>Green Technology Innovation</u>	Sustainability	C	0
Zhu et al.	2022	Driving Path and System Simulation of <u>Green Innovation</u> Capability of Science and <u>Technology</u> Enterprises in Yangtze River Delta	Sustainability	C	2

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

4. Results

Step 7: Data Analysis. First, the 776 selected titles and the 48 DIS-papers are discussed descriptively. Second, an in-depth analysis of the 48 DIS-papers with a CA is executed. Third, a DIS-framework and a DIS-definition for scientists and economists are derived.

4.1 Descriptive discussion of the DIS-Papers

The 48 DIS-papers account for 6% of the 776 titles selected and 0,4% of the 12,249 Scopus database output. Among the contributions that passed the title filter, the DIS-papers are the fewest. Most publications exist on the two concepts, digital and sustainable, as stated in *Tab. 5*.

Table 5: Number of Title-Fit-Publications per Top Category (Source: own representation).

Top Category	Number of Publications	Percentage
Digital	125	16%
Innovation	68	9%
Sustainable	100	13%
Digital, Innovation	102	13%
Digital, Sustainable	219	28%
Innovation, Sustainable	112	15%
Digital, Innovation, Sustainable	48	6%

The 776 DIS-papers come from 16 journals listed in *Tab. 6*. The sub-ratings the journals are coming from are highlighted (Digital, Innovation, Sustainable).

Table 6: Overview of the DIS-Papers Journal Sources (Source: own representation).

No.	Journal	VHB-Ranking	Subrating	Articles
1	Business and Information Systems Engineering	B	<u>WI</u>	1
2	Business Ethics Quarterly	B	RECH, <u>NAMA</u> , WEW	1
3	Business Strategy and the Environment	B	<u>NAMA</u> , SM	5
4	Corporate Social Responsibility and Environmental Management	C	<u>NAMA</u>	1
5	Ecological Economics	B	<u>NAMA</u>	1
6	European Journal of Innovation Management	C	<u>TIE</u>	1
7	Information Systems Journal	A	<u>WI</u>	4
8	Information Systems Management	C	<u>WI</u>	1
9	International Journal of Innovation and Technology Management	C	<u>TIE</u> , Entrepreneurship	1
10	Journal of Cleaner Production	B	<u>NAMA</u>	2
11	Journal of Environmental Management	B/C	<u>NAMA</u>	1
12	Journal of Product Innovation Management	A	MARK, <u>TIE</u>	2
13	R and D Management	B	<u>TIE</u>	2
14	Sustainability	C	<u>NAMA</u>	20
15	Technological Forecasting and Social Change	B	PROD, <u>TIE</u>	3
16	Technovation	C	<u>TIE</u> , Entrepreneurship	2

Most of the journals in *Tab. 6* are B-ranked (N=7), coming from the NAMA subrating (N=7), and are published in the Swiss C-ranked journal ‘Sustainability’ (N=20).

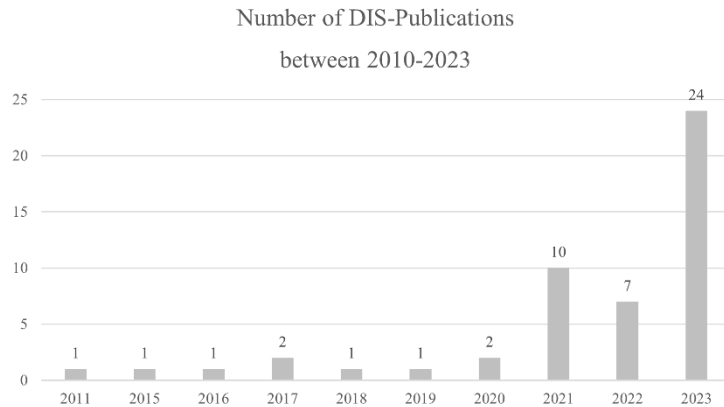


Figure 6: Historical Perspective on DIS-Publications (Source: own representation).

Sorted by year, *Fig. 6* shows that most DIS-papers were published in 2023, and the first increase in publications was in 2021.

As an interim result of the DIS-papers descriptive analysis, the following can be stated:

- Only 6% of the titles that fit the filtering criteria talk about all three DIS-concepts.
- Most title-fit-publications deal with digital and sustainable in combination (28%).
- Most DIS-papers are B-ranked and spring from the NAMA subrating.
- Most of the DIS-papers are from the Swiss C-ranked journal ‘Sustainability’.
- Most of the DIS-Papers were published in 2023, and an increase in the publishing of DIS-papers started in 2021.

4.2 CA of the 48 DIS-papers

Of the 48 DIS-papers, thirteen definition pairs are identified in the review protocol, which are now analyzed. *Tab. 7* shows the deductively formed top categories grounded in the publication text, their sources, and the subcategories derived from the source titles. The publications not discussing a concrete definition of the term pairs are crossed out in *Tab. 7* (N=24).

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Table 7: Alternative Terms for each DIS-Concept (Source: own representation).

No.	Top Category	Subcategory	No.	Publication Source
1	CTI	Clean Technology Innovation (N=2), Smart Cleantech Innovation	3	9, 12, 41
2	DaSI	Digitalization and Sustainable Innovation, Social Innovation with Open-Source Software, Big Data and Sustainability Innovation	3	29, 30, 60
3	DGI	Big Data Green Innovation, Digital Low-Carbon Innovation, Digitalization for Green Innovation, Digital Environmental Innovation (N=2), IS for Eco-Innovation, Digital Green Innovation (N=4)	10	4, 28, 37, 38, 39, 43, 46, 47, 48, 58
4	DIS	Digital Innovation for Social Responsibility, Social Media Driven Innovation for Sustainability, IT for Sustainability via Innovation	3	33, 34, 42
5	DRI	Responsible Innovation with Digital Platforms, Responsible Innovation with Deep Learning, Responsible Big Data Innovation for CE	3	26, 31, 55
6	DSI	Data-driven Social Innovation, Digital Social Innovation (N=3), Shared value Innovation for Digital	5	19, 27, 44, 51, 52
7	GTI	Innovation in Green Technology, Green Technology Innovation (N=8), Green Technological Innovativeness, Green Innovation in the Technology Enterprise	11	5, 8, 25, 35, 45, 53, 54, 57, 59, 61, 63
8	IEI	IT for Eco-Innovation, IT-enabled Innovation for CSR	2	36, 40
9	ITfS	Innovative Tech for Sustainable Development	1	62
10	SDI	Sustainable Digital Innovation, IoT-enabled Sustainable Digital Innovation	2	6, 49
11	SfDI	Sustainable Products through Digital Innovation	1	32
12	SIB	Sustainable oriented innovation business	1	50
13	TIfS	Tech Innovation for Degrowth, Tech Innovation for Sustainability	2	21, 56

The article review leads to few and/or unconcreted definitions for the term pairs DIS (Digital Innovation for Sustainability), DRI (Digital Responsible Innovation), IEI (IT enabled Eco-Innovation), and SDI (Sustainable Digital Innovation). These are listed now:

- DIS: "Digital Innovation (DI) is a vital source of dynamism and innovation for many *technologies, products, and services* in the global economy. Due to the connectivity and *integration of digital technology* [1], DI accelerates the value interaction across organizational boundaries, improving firms' efficiency through joint innovation and fostering an amicable collective exchange relationship [2,3]. Precisely because of this, to *establish effectiveness*, firms and stakeholders are required to disclose parts of their knowledge and resources to other actors in the DI process [4,5]. This underscores the *social and public nature of DI* and fosters more sustainable, open, but complex relationships between organizations and stakeholders [6,7]. Thus, firms in the DI process are under continuous pressure to adapt their strategic initiatives in line with digital coordination and co-creation principles. In this context, *corporate social responsibility (CSR)*, a key strategy for maximizing shared value during collaborative processes, is theorized to be the *basic task and common goal for organizations initiating a digital movement*. This movement aims toward a more sustainable, democratic, and inclusive

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

economy [8,9]. Consequently, our research aims to explore the interconnections between DI and CSR." (Chen and Chen, 2023, p.1)

- DRI: "Biddle (2017) suggests that technology might be considered an example of *RI if it addresses a societal challenge* that is locally defined if the technological research behind it is conducted in local contexts, and *if the technology is accessible* to those who need it most." (Ahuja et al., 2023, p.108)
- IEI: "*Green applications of IT or IT for green* defined as the *impact of IT on other sectors' environmental productivity*, particularly in terms of energy efficiency and carbon footprint." (Faucheux and Nicolai, 2011, p.3)
- SDI: "We define SDI as a *long-term organizational change process* to achieve the *firm's longevity needs and the livelihood of its ecosystem*. Naturally, SDI contributes to *creating value for the societal and the business goals* through internal and supply chain network processes." (Park and Hong, 2022, p.1-2)

What becomes transparent is that the DSI-definition strives to connect the conceptual pairs of digital innovation and CSR. The DRI-definition addresses accessible technology addressing societal challenges. The IEI-definition emphasizes the environmental nature and effects of IT. The SDI-definition strives for business longevity and ecosystem livelihood by aligning value creation with societal and business goals through continuously aligning supply chains in the network.

Fig. 7.1 to Fig. 7.3 show the findings on the remaining pairs of terms DaSI and DGI, DSI, and GTI resulting from 19 publications. The three figures are entitled 'DIS-Insight-Map'. They aggregate the aspects of the term definition and its effects. If stated in the dedicated contribution, it also says something about the effect of connections or measurement.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Figure 7.1 to 7.3: DIS-Insight-Map (Source: own representation).

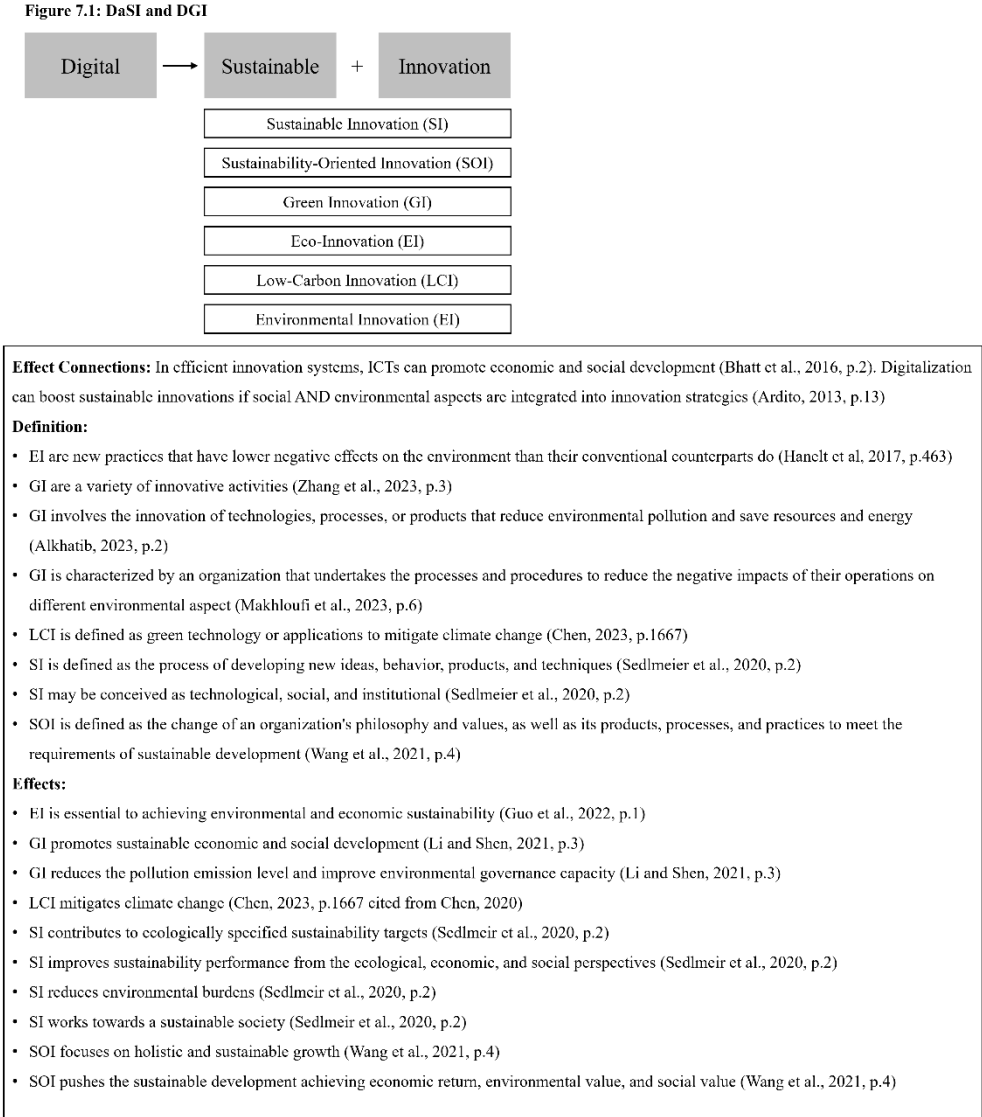
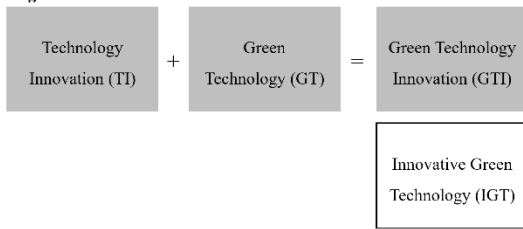


Figure 7.2: GTI



Definition:

- GT are new processes, technologies, systems and products (Wang et al., 2023, p.2)
- GTI is a composite concept that combines technological innovation and green technology concepts (Fan et al., 2023, p.3)
- GTI consists of eco-labelling, recycling, cleaner operations, and environmental products and services (Sahoo, 2023, p.7)
- GTI is characterized by a firm's capacity to apply novel ideas in service of developing new functional processes and products and enhancing current processes or products via a greener orientation (Alkhatib, 2023, p.554)
- GTI is innovative products and processes that reduce negative environmental impacts (Qureshi et al., 2021, p.1)
- IGT is typically defined as any innovation (Ahmed et al., 2022, p.4)

Effects:

- GTI are aiming to attain the synergetic progress of the economy, environment, and resources (Fan et al., 2023, p.3)
- GTI avoid or reduce environmental hazards (Wang et al., 2023, p.2)
- GTI contribute to energy conservation, emissions reduction, eco-product creation, and overall sustainable development (Alkhatib, 2023, p.554)
- GTI lead to a greener orientation (Alkhatib, 2023, p.554)
- GTI reduce negative environmental impacts (Wang et al., 2023, p.2)
- IGT contribute to the Sustainable Development Goals (Ahmed et al., 2022, p.4)

Measurement: GTI is commonly measured by the number of patents and the R&D expenditure in an environmental field (Song et al., 2023, p.8)

Figure 7.3: DSI



Definition:

- DSI is the development of new products, services or processes, that are either embodied on IT or enabled by IT (Bonina et al., 2021, p.698)
- DSI involves the use of digital technologies in the development and implementation of innovative products, services, processes and business models (Qureshi et al., 2021, p.1)
- DSI is "an effective organisational network model leveraged by information and communication technological systems (ICTs) whose ends and means are social" (Rodrigo et al., 2022, p.647)
- DSIs are new, hybrid products/services that innovatively combine "activities, practices, processes, and meanings" from diverging sectors, i.e., the commercial and social ones (Bonina et al., 2021, p.698)

Effects:

- DSI's goal is to meet social needs or stimulate social change (Bonina et al., 2021, p.698)
- DSI's seek to improve the well-being and agency of socially disadvantaged groups or address social problems related to marginality, inequality and social exclusion (Qureshi et al., 2021, p.1)

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

As an interim result, the following can be stated regarding the CA of the DIS-papers:

- Most research findings revolve around DaSI, DGI, GTI, and DSI.
- DaSI and DGI have diverse and distinct definitions, making precise characterization challenging. Key findings include:
 - SI benefits from digitization and digitalization, such as the integration of ICT in organizations when both social and environmental aspects are integral to the innovation strategy. This insight matches the organizational perspective in the introduction, where ‘digital’ positively influenced ‘sustainable’ and ‘innovation’.
 - Efficient innovation systems are crucial for ICT to drive economic and social development.
 - SI encompasses eco-friendly processes, spanning technologies, practices, and products with technological, social, and institutional dimensions.
 - SI combats climate change through resource conservation and reduced pollution, reshaping an organization's values.
 - SI fosters environmental and economic sustainability, social development, and holistic growth.
- The most specific definitions pertain to GTI and DSI.
- The GTI definition can be summarized as follows:
 - Green technologies encompass novel processes, systems, and products, incorporating technological innovations (e.g., touch screens, OLEDs).
 - The goal is to enhance an organization's environmental friendliness and achieve SD by conserving energy, reducing emissions, and greening production, promoting synergy between the economy, environment, and resources.
- The DSI-definition includes developing new products, services, or processes enabled by IT and utilizing digital technologies to innovate products, services, processes, and business models within an organizational network. DSI seeks to address social needs, such as marginality and inequality, driving social change.

Tab. 8 shows the DIS-framework that emerged from examining the diverse publications from different perspectives. The framework is intended to map the different dimensions of DIS-concepts.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Table 8: DIS-Framework (Source: own representation).

Digital	Innovation	Sustainable
<input type="checkbox"/> Data	<input type="checkbox"/> Business Model	<input type="checkbox"/> Environmental (Green, Ecological)
<input type="checkbox"/> Technology	<input type="checkbox"/> Process	<input type="checkbox"/> Economic (Business Goals, Commercial, Performance, Profit)
<input type="checkbox"/> System	<input type="checkbox"/> Product	<input type="checkbox"/> Social (CSR, SDG, SD)
	<input type="checkbox"/> Service	

The DIS-framework is now applied to the two most concretely elaborated definitions, GTI and DSI, to better understand its use.

DSI is defined by Quershi (42, p.647) as "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." Transferred to the DIS-framework, digital technologies, products, processes, services, and business models whose design positively impacts the social dimension are mentioned. *Tab. 8a* presents this finding. Dimensions that are mentioned in the DSI-definition are marked with a checkmark.

Table 8a: DIS-Framework using the **DSI**-Definition (Source: own representation).

Digital	Innovation	Sustainable
<input type="checkbox"/> Data	<input checked="" type="checkbox"/> Business Model	<input type="checkbox"/> Environmental (Green, Ecological)
<input type="checkbox"/> System	<input checked="" type="checkbox"/> Process	<input type="checkbox"/> Economic (Business Goals, Commercial, Performance, Profit)
<input checked="" type="checkbox"/> Technology	<input checked="" type="checkbox"/> Product	<input checked="" type="checkbox"/> Social (CSR, SDG, SD)
	<input checked="" type="checkbox"/> Service	

Yin and Li (61, p.2) define **GTI** as follows: "The definition of green technological innovation is innovative *products and processes* that reduce negative *environmental impacts* (Fussler and James, 1996), and Rennings (2000) specifies that green technologies are new processes, *technologies, systems, and products* that avoid or reduce environmental hazards." Reference is made in *Tab. 8b* to systems, products, processes and technologies, and environmental sustainability.

Table 8b: DIS-Framework using the **GTI**-Definition (Source: own representation).

Digital	Innovation	Sustainable
<input type="checkbox"/> Data	<input type="checkbox"/> Business Model	<input checked="" type="checkbox"/> Environmental (Green, Ecological)
<input checked="" type="checkbox"/> System	<input checked="" type="checkbox"/> Process	<input type="checkbox"/> Economic (Business Goals, Commercial, Performance, Profit)
<input checked="" type="checkbox"/> Technology	<input checked="" type="checkbox"/> Product	<input type="checkbox"/> Social (CSR, SDG, SD)
	<input type="checkbox"/> Service	

The exercise just performed in *Tab. 8a* and *8b* were given to the second and third authors. The Cohen Kappa, calculated with the formula $k = \frac{p0 - pc}{1 - pc}$, is 1. **p0** is the measured agreement

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines value of the two estimators, and pc is the random expected agreement. When raters agree on all judgments, $k = 1$. An interrater reliability of at least 0.61 is said to be substantial (Landis and Koch, 1977, p.163, 166).

4.3 Derivation of a DIS-definition

From the existing DIS-framework, a new DIS-definition is now being formed aiming for sustainable development, considering all three dimensions of sustainability and technology. The goal is to create a holistic understanding of the DIS-concepts, resolve misunderstandings worldwide, and guide strategic decision-making processes in organizations. First, the authors specify the three DIS-concepts:

- **Digital:** Digitization and digitalization reshape innovation and foster economic and social development within efficient systems. Digitization relies on digital data, while digitalization involves integrating ICT and other technology systems into organizational networks.
- **Innovation:** Organizations endeavor to ensure long-term viability by introducing innovations in organizational products, processes, services, and business models, driving progress and profitability.
- **Sustainable:** Sustainability encompasses environmental, social, and economic actions at individual, organizational, and systemic levels. It underscores the interconnectedness of society, economy, and the environment, highlighting their mutual dependence.

Coming from the single DIS-concepts, the integrated definition is now formed. DIS stands for Digital Transformation and Organizational Innovation Dynamics from a Sustainability Perspective and is defined as “The ongoing process of digital transformation, driven by digitization (utilizing digital data) and digitalization (integrating ICT systems into organizational networks), is redefining innovation, facilitating economic and social development within efficient systems. In pursuing long-term viability, organizations introduce innovations spanning organizational structures, products, processes, services, and business models, ultimately fueling progress and profitability. These endeavors are viewed from a sustainability perspective, emphasizing the holistic nature of sustainability, encompassing environmental, social, and economic actions at individual, organizational, and systemic levels. This perspective underscores the interconnectedness of society, economy, and the environment, highlighting their interdependent relationship.”

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

From an economic perspective, economic transformation happens through the interrelation of digitization, digitalization, innovation, and sustainability.

5. Discussion

The DIS-definition and DIS-framework could be used to add value in technology-driven or digital organizations as follows: Diverse organizational units engaging in strategic work (e.g., organizational development, process management, technology management, sustainability management, innovation management, human resources management, R&D) are invited to a strategic decision-making workshop. The interdisciplinary group aims to sharpen the future development of value-adding activities to ensure organizational competitiveness and sustainable development. The DIS-definition text and the DIS-framework visual could serve as a starting point to discuss the DIS-concepts and their facets in a moderated manner. Once all participants have worked out a common understanding of the DIS-concepts and their interrelations, the specification of a DIS-strategy starts. Therefore, the questions of the DIS-canvas presented in *Fig. 8*¹⁰ serve as an orientation.

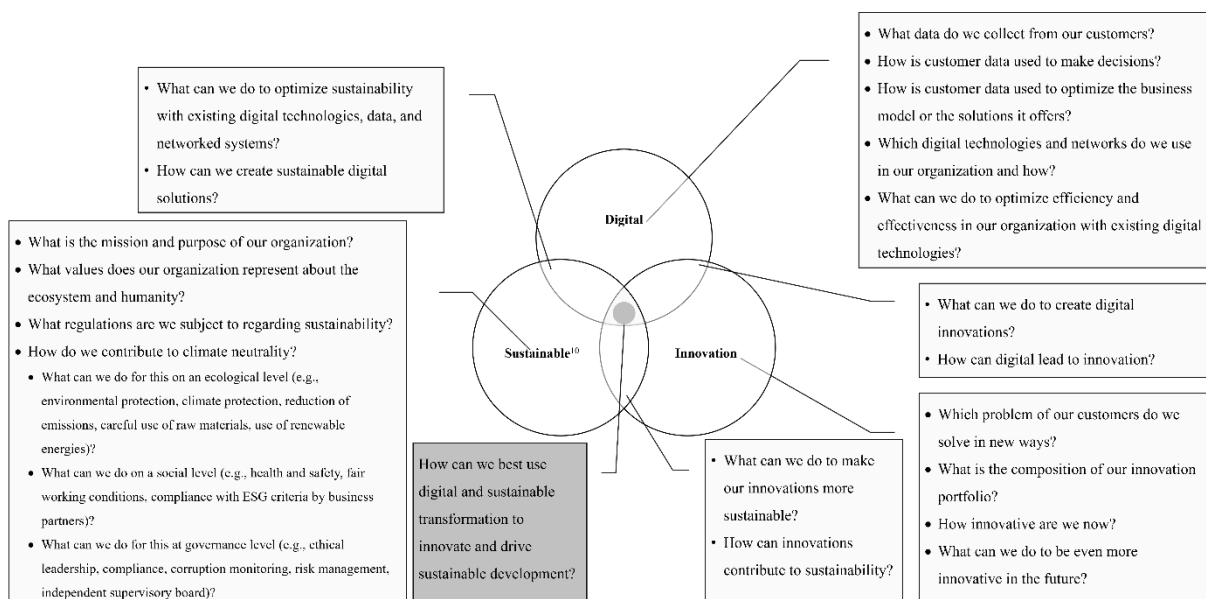


Figure 8: DIS-Canvas (Source: own representation).

Once the questions have been answered sufficiently, a DSI-strategy can be specified and documented from the condensate, and objectives can be derived to guide the engagement of organizational actors from FUZZY to CLEAR or EGO to ECO.

¹⁰ The economic goal is to use resources responsibly to satisfy present consumption levels without compromising future needs. The environmental goal is to create ecosystem integrity. The social goal is to create social well-being for everyone.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

6. Conclusion

Step 8: Findings Report. The following summarizes the core findings for science and management.

6.1 Core Insights for the Scientific Community

How often does each of the DIS-concepts occur in the data set?

From 12,249 journal articles extracted from 98 at least C-VHB-Jourqual ranked journals, 48 (0,4%) were identified that specified the three DIS-concepts in the title and abstract. Twenty of the 48 (42%) publications were from the journal ‘Sustainability’, which is assigned to the VHB-Jourqual-subrating ‘sustainability management’. The first publication on the three concepts was in 2011, then there was a pause until 2016, and since 2021, the publications have been increasing significantly. Thus, this is still a very young research field. Green Technology Innovation and Digital Social Innovation were identified as stable definitions related to the three concepts. Elementary facets of the core term combinations were elaborated, from which a definition and a standardized framework were derived.

What does this mean for the DIS-definition?

The DIS-definition can be specified as an intermediate state, supplemented with new research. An interdisciplinary approach from the subratings of sustainability management, business informatics, technology, innovation, and entrepreneurship is still advisable. An extension to the broader social sciences, management, and economics literature would be conceivable.

How do the results relate to the existing state of research?

The definitions listed so far refer to existing literature and solutions used in practice. There has yet to be an empirical survey on the definition itself.

6.2 Core Insights for Management

What can be concluded from the DIS connections?

Digital transformation can support organizations in their transformation to greater sustainability. Even though technologies such as Blockchain or Artificial Intelligence consume much energy during development and operation, the potential energy savings from these technologies are estimated to be many times higher. Technologies themselves can be socially or environmentally sustainable in that they use society to participate in decision-making processes or use renewable energy and energy-saving techniques.

That is why digitization, digitalization, and sustainability funding are recommended. Digital transformation positively influences innovation, in particular sustainable innovation. Socially and ecologically beneficial innovations receive a great deal of attention. How both can be achieved simultaneously in the form of innovations still needs to be answered. Sustainable innovation is important for companies to ensure their survival, competitiveness, or profitability while supporting social and environmental development. Digitalization can lead to innovations that serve one or more dimensions of sustainability.

What can be concluded for management the management of organizations in particular?

For an organization to be sustainably oriented and for innovations to emerge from digital and sustainable transformation, it needs management that acts ethically and responsibly. Decisions must be made based on information and knowledge. Unstable environments require intelligence and wisdom to focus on the most promising solutions. Technologies are seen to an end and are intended to support the transformation toward a sustainable society. Finally, actions at all levels in private and professional contexts must be changed. This requires role models and translators who can do so. Management is, therefore, particularly in demand in the mutually positive interrelationship of sustainability, digitization, and innovation.

What has been insufficiently penetrated so far?

The existing DIS-definitions mainly refer to the solutions (i.e., services, products) and organizations' processes and business models. Rarely are all three digital (data, technology, networks) and sustainable (environmental, economic, and social) dimensions addressed.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

Also, the questions from the DIS-canvas have yet to be addressed strategically and discussed across the organization concerning the solution portfolio, the processes, and the business model including the value chain.

The importance of technologies will continue to increase in the development of innovations to mitigate climate change. However, it is essential to note that technology alone cannot completely control the behavior of rising populations. For this reason, the importance of management is increasing.

How can the results be used?

The DIS-framework can be used to situate existing and emerging definitions further. It is also possible to extend this with further facets. The integrative DIS-definition can be used as a starting point for strategic decision-making processes across disciplines (i.e., technology, innovation, change, and sustainability management) and can be extended to include the DIS-canvas in greater depth.

6.3 Limitations and Outlook

The SLR is based on the analysis of 98 at least C-VHB-Jourqual-ranked journals originating from one of the three subratings NAMA, WI, TIE. Thus, this paper must be understood as an excerpt of the status quo.

In future SLR, the abbreviation ‘sustainab’ could also be used as a keyword or substitute for the word ‘sustainable’.

The definitions listed here for the three concepts and their location in the DIS-framework were reviewed by two individuals. Expanding the DIS-framework would become necessary as new definitions from A+-to-C-ranked Journals are added and clarified.

In perspective, the DIS-definition, the DIS-framework, and the DIS-canvas should be tested for their existence in an empirical study with technology-driven organizations. This way, the DIS-canvas from *Fig. 8* will be enriched with methods such as the Objectives and Key Results framework, the three Horizons framework, and Porter’s value chain. In the future, the findings on DIS will be embedded in existing management and organizational research. Expanding the canvas with levels such as strategy, culture, leadership, information and technology management, structure, and processes is also conceivable.

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Footnotes

1. While preparing the theoretical work, the author(s) used ChatGBT and BARD to shorten text passages. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication (ScienceDirect, 2023).
2. Since a journal is assigned to several subratings, this leads to duplicates.
3. Scopus allows forward and backward searches due to its index database, and the publications can be output as CSV files. In addition, the database is not limited to a few journals and allows one to view all publications, not just a few (such as Google Scholar or ScienceDirect).
4. In the Scopus database, the category 'Review Article' refers to an article overviewing a specific research area or question. Review articles are usually written by experts in the field and summarize the current state of research. They may also summarize and evaluate new research and findings. Review articles are essential for scientists to learn about new developments in their field. They can also identify research gaps and pose new research questions.
5. Information Technology.
6. Information and Communication Technology.
7. Excluded are those contributions that refer to an sector other than IT/ICT, a country, the sharing economy, knowledge management, or digital technologies such as 3D printing or VR/AR. Included in the review of the short summaries of the contributions are those helpful in specifying at least one core term in the technology environment (IT, ICT) of a small, medium, or large organization or describing its environment in terms of the concepts. Contributions that do not refer to IT/ICT and merely describe technology in the digital environment without referencing innovation or sustainability are excluded. Also excluded are contributions that refer purely to industry 4.0 (supply chains, production), marketing, education, or the development of rural areas and ecosystems.
8. VHB-Jourqual is a journal ranking of the 'Verband der Hochschullehrer für Betriebswirtschaft e.V. (VHB)', the umbrella organization of German university professors in business administration.
9. Comma-separated values.

An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

10. The economic goal is to use resources responsibly to satisfy present consumption levels without compromising future needs. The environmental goal is to create ecosystem integrity. The social goal is to create social well-being for everyone.

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An integrative definition of digital, innovation, and sustainable: A bridge between disciplines

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Appendices

A.1

№	Authors	Year	Title	Top Category	Subcategory	Source title	Web-Link	Cited	Abstr.	Method
723	Xiong W., Guo X.	2023	Green standard and green development: Theory and empirical evidence	Sustainable	Green standard	Journal of Cleaner Production	B	6	This sto	Qualitative
724	Hu J., Lu W.	2022	The Impact of the Digital Economy on Innovation: New Evidence from Panel Threshold Model	Digital Innovation	DE on Innovation	Sustainability (Switzerland)	C	6	The digit	Quantitative
725	Hu J., Zhang Y., Liu	2023	Labour Protection, Enterprise Innovation, and Sustainable Development	Digital Innovation	Sustai Enterprise Inno	Sustainability (Switzerland)	C	6	As an in	Quantitative
726	Hu Z., Qi Z., Wang	2023	A Look at the Focus on Big Data for Information Technology and Decision Making during 1994 to 2020	Digital	Big data for infor	International Journal of Information Technology and C	0	0	Big data	Qualitative
727	Yang S., Zhuo H.	2023	The Impact of Digital Enterprise Agglomeration on Carbon Intensity: A Study Based on the Entangled Spatial STPPAT Model	Digital, Sustainable	Digital Enterprise, Sustainability	(Switzerland)	C	6	The digit	Quantitative
728	Yang T., K., Yan M.	2019	Exploiting the enablers of strategic orientation for technology-driven business innovation ecosystems	Innovation	IE	Sustainability (Switzerland)	C	10	The prest	Qualitative
729	Yang Y., Ma Q., He	2021	Can green innovation subsidies reduce the systemic risk of green innovative enterprises? A simulation study	Innovation, Sustai	Green Innovation, Technology Analysis and Strategic Management	(Switzerland)	B	2	Purpose	Quantitative
730	Yang Y., Guo L., Z	2018	Selection of technological innovation for creative-oriented enterprises	Digital Innovation	Tech Innovation	Sustainability (Switzerland)	C	13	Technol	Quantitative
731	Yates D., Islam M.	2022	Data Mining on Smartphones: An Introduction and Survey	Digital	Data Mining sckl	ACM Computing Surveys	B	5	Data mi	Quantitative
732	Ye D., Liu M., Lu	2022	How to Achieve Swift Resilience: The Role of Digital Innovation Enabled Mediators	Digital Innovation	DI for swift resili	Information Systems Frontiers	B	5	Contrib	Quantitative
733	Ye X., Ma L., Feng	2018	Impact of technology habitat domains on ambidextrous innovation: Case study of a Chinese high-tech enterprise	Digital Innovation	High tech enterp	Sustainability (Switzerland)	C	9	To obtai	Qualitative
734	Yeh S. C., Wu A.	2021	Public perception of artificial intelligence and its connections to the sustainable development goals	Digital, Sustainable	AI SDGs	Sustainability (Switzerland)	C	11	Artificia	Quantitative
735	Yigithanil T.	2021	Governing the artificial intelligence for a sustainable planet: An editorial commentary	Digital, Sustainable	Green AI	Sustainability (Switzerland)	C	6	Artificia	Qualitative
736	Yin B. A., Paner	2021	Systemic formalisation of Cyber-Physical-Social Systems (CPSS): A systematic literature review	Digital	Cyber-Physical-S	Computers in Industry	C	37	The notl	Qualitative
737	Yin C. Y., Chang H.	2022	What is the Link between Strategic Innovation and Organizational Sustainability? Historical Review and Bibliometric Analysis	Innovation, Sustai	Strategic Innoval	Sustainability (Switzerland)	C	4	The ac	Quantitative
738	Yin J., Li C.	2022	Data governance and green technological innovation performance: A curvilinear relationship	Digital Innovation	Green technology	Journal of Cleaner Production	B	3	The digit	Quantitative
739	Young A. G.	2018	Using ICT for social good: Cultural identity restoration through emancipatory pedagogy	Digital	ICT Tools	Information Systems Journal	A	43	This res	Mixed
740	Yousaf Z., Panahi	2022	Value Creation through Digital Innovation, Innovation Capability and Knowledge Sharing in a Cloud Economy	Innovation	Innovation Capa	Sustainability (Switzerland)	C	6	This sto	Quantitative
741	Yousaf Z., Panahi	2021	Towards sustainable digital innovation of firms from the developing countries in the context of the digital economy and digital innovation	Digital Innovation	Sustainable Digit	Sustainability (Switzerland)	C	47	This sto	Quantitative
742	Yu F., Du H., Li X.	2023	Enterprise digitalization, business strategy and subsidy allocation: Evidence of the signaling effect	Digital	Enterprise digital	Technological Forecasting and Social Change	B	2	Govern	Quantitative
743	Van J. J., Jung K.	2018	Open innovation of James Watt and Steve Jobs: Insights for sustainability of economic growth	Innovation	Open Innovation	Sustainability (Switzerland)	C	13	This pag	Qualitative
744	Zacharewicz G., Di	2017	Model-based approaches for interoperability of next generation enterprise information systems: state of the art and future challenges	Digital	Enterprise Incom	Information Systems and e-Business Management	C	48	Enterpre	Qualitative
745	Zamani M., Yaloz	2022	Developing metrics for emerging technologies: identification and assessment	Digital, Sustainable	Emerging technol	Technological Forecasting and Social Change	B	9	Use anal	Quantitative
746	Zameer H., Yang	2021	Exploring a pathway to carbon neutrality via reinforcing environmental performance through green process innovation, environmental orientation and green competitive advantage	Innovation, Sustai	Green process in	Journal of Environmental Management	BIC	57	In the sig	Quantitative
747	Zartha Soesha, Jhc	2021	Determinants of a sustainable innovation system	Innovation, Sustai	Sustainable inno	Business Strategy and the Environment	B	11	This sto	Qualitative
748	Zeng R., Imamer	2021	Mobilizing information systems scholarship for a circular economy: Review, synthesis, and directions for future research	Digital, Sustainable	IT for a CE	Information Systems Journal	A	24	One of t	Qualitative
749	Zeng F., Lee S. H. A.	2020	The role of information systems in the sustainable development of enterprises: A systematic literature network analysis	Digital, Sustainable	Information syste	Sustainability (Switzerland)	C	20	Informa	Qualitative
750	Zhan Y., Tan K. H.	2017	A big data framework for facilitating product innovation processes	Digital Innovation	Big data to facil	Business Process Management Journal	C	100	Purpose	Quantitative
751	Zhang Q., Pan S. L.	2022	Overestimating big data analytics capability for sustainability: A study of air pollution management in China	Digital	Big data	Information and Management	B	29	Under a	Qualitative
752	Zhang H., Song M.	2020	Achieving the success of sustainability development projects through big data analytics and artificial intelligence capability	Digital, Sustainable	AI SDG	Sustainability (Switzerland)	C	22	There ho	Quantitative
753	Zhang H., Sun X.	2023	Innovative Technology Method Based on Evolutionary Game Model of Enterprise Sustainable Development and CHN-GRU	Digital Innovation	Innovative Tech	Sustainability (Switzerland)	C	6	Realtio	Quantitative
754	Zhang H., Yuan S.	2023	How and When Does Big Data Analytics Capability Boost Innovation Performance?	Digital Innovation	Big Data, Inno	Sustainability (Switzerland)	C	1	The digit	Quantitative
755	Zhang H., Zhang X.	2021	Deploying AI for New Product Development Success: By embracing and incorporating AI in all stages of NPD, companies can increase their success rate of NPD projects.	Digital Innovation	AI for innovation	Research Technology Management	C	2	Overcom	Qualitative
756	Zhang H., Yin S.	2023	Can China's Digital Economy and Green Economy Achieve Coordinated Development?	Digital, Sustainable	DE GE	Sustainability (Switzerland)	C	1	In the cool	Quantitative
757	Zhang M., Sun C.	2023	Catching Up of Latecomer Economies in ICT for Sustainable Development: An Analysis Based on Technology Life Cycle Using Patent Data	Digital, Sustainable	ICT, Sustainable I	Sustainability (Switzerland)	C	6	In the dig	Quantitative
758	Zhang S. X., Chen	2023	Responsible Innovation: The Development and Validation of a Scale	Innovation	Responsible Inno	Technovation	C	6	The burg	Quantitative
759	Zhang X., Antsoval	2023	Where business model innovation comes from and where it goes: A bibliometric review	Innovation	BM	Creativity and Innovation Management	C	6	Busines	Qualitative
760	Zhang X., Guo X.	2022	Sensitization for the Environment? The Impact of Data-Centric Product-Service Models	Digital	Data-centric tech	Journal of Management Information Systems	A	3	Recent	Quantitative
761	Zhang X., Chong Y.	2023	Does the Development of Digital Economy Affect Environmental Pollution?	Digital, Sustainable	Digital Economy	Sustainability (Switzerland)	C	6	The dev	Quantitative
762	Zhang X., Hong X.	2023	Study on the Coupled and Coordinated Development and Evolution of Digital Economy and Green Technology Innovation	Digital Innovation	Green Tech Inno	Sustainability (Switzerland)	C	6	Green te	Qualitative
763	Zhang Y., Liu J., Wu	2023	Can HPUS Promote Digital Innovation? Learning as Mediator and Supportive Organizational Culture as Moderator	Digital Innovation	High performance	Sustainability (Switzerland)	C	6	Nonsada	Quantitative
764	Zhang Y., Sun J.	2020	Critical success factors of green innovation: Technology, organization and environment readiness	Innovation, Sustai	Green Innovation	Journal of Cleaner Production	B	195	Many or	Mixed
765	Zhang Z., Shang Y.	2022	Big Data Capability and Sustainable Competitive Advantage: The Mediating Role of Ambidextrous Innovation Strategy	Digital Innovation	Big Data, Ambi	Sustainability (Switzerland)	C	5	Aftre the	Quantitative
766	Zhao H., Zhao Q.	2018	Sustainability and digitalization of corporate management based on asymmetric virtual reality tool usage: China and other world IT companies' experience	Digital, Sustainable	Digitalization, Sus	Sustainability (Switzerland)	C	28	The artic	Quantitative
767	Zhao Y., Wang Z.	2022	Organizational learning and inclusive innovation: The moderating role of green control ambidexterity	Innovation, Sustai	Inclusive innova	Sustainable Development	C	4	Inclusiv	Quantitative
768	Zheng L., Dong Y.	2022	Impact of Crisis on Sustainable Business Model Innovation—The Role of Technology Innovation	Digital Innovation	SEMI, Tech Inno	Sustainability (Switzerland)	C	2	The tran	Quantitative
769	Zheng J., Ning	2021	Product innovation in entrepreneurial firms: How business model design influences disruptive and adoptive innovation	Digital Innovation	Block-chain-base	Technological Forecasting and Social Change	B	23	Block-ch	Quantitative
770	Zhou C., Song Y.	2021	Digitalization as a way forward: A bibliometric analysis of 20 years of servitization research	Digital	Digital PSS and e	Journal of Cleaner Production	B	17	This pag	Qualitative
771	Zhu Q., Lok S. V.	2019	Applications of distributed ledger technologies to the internet of things: A survey	Digital	IoT-based applic	ACM Computing Surveys	B	126	Distrib	Quantitative
772	Zhu Y., He B., Bao	2022	Driving Path and System Simulation of Green Innovation Capability of Science and Technology Enterprises in Yangtze River Delta	Digital Innovation	Technology Emer	Sustainability (Switzerland)	C	2	Green in	Quantitative
773	Zhao C., Chen J.	2023	Can digital transformation overcome the enterprise innovation dilemma: Effect, mechanism and effective boundary	Digital Innovation	Digital transfor	Technological Forecasting and Social Change	B	10	This sto	Qualitative
774	Zwemba E.	2021	The Contribution of ICT Adoption by Local Businesses to Sustainability—Empirical Evidence from Poland	Digital, Sustainable	ICT for Sustainable	Information Systems Management	C	13	The most	Quantitative
775	Zwolnick J. C., Bluh	2018	Fit not (fit) about efficiency: Powering and organizing technology from a deep-work perspective	Digital, Sustainable	Technology for a	Journal of Cleaner Production	B	10	Transpo	Qualitative
776	Zuo L., Li H., Guo	2022	The Sustainable Efficiency Improvement of Internet Companies under the Back ground of Digital Transformation	Digital	Digital Transform	Sustainability (Switzerland)	C	2	The digit	Mixed

Figure A.1: Extract of the Review Protocol (Source: own representation).

A.2

Table A.2: Exclusion Criteria for the VHB-Journals

Filter	Number
VHB-ranked	887
Minimum C VHB-ranked	590
NAMA excluding - Energy - German - Consumer - Macromarketing - Industry - Corporate Citizenship	22
TIE excluding - Energy - German - Consumer - Macromarketing - Industry - Corporate Citizenshi	31
WI excluding - Engineering - Telecommunications - Electronics - German - Insurance - BA-FI - Country specific - MARK - DL-Handel - PROD - Conferences - Mathematics - Lecture Notes - LOG - Media	49
Subtotal	102
- excluding duplicates	98

A.3

Number	Unit of analysis	Page	1. Paraphrase of text passage	2. Summary based on level of abstraction	3. Reduction by selection	4. Reduction by bundling	5. Category system incl. 6. Back checking
1	Ahmed et al. 2022_C	2	... technical innovation has had a significant impact on economic growth by facilitating sustainable development and green innovation	Technical innovation facilitates sustainable development Technical innovation facilitates green innovation Technical innovation impacts economic growth	Technical innovation facilitates sustainable development	Tech innovation for sustainability	TI->DI->hoIS
1	Ahmed et al. 2022_C	2	sustainable green technologies may contribute to green manufacturing and energy efficiency	sustainable green technologies contribute to energy efficiency	Energy efficiency through sustainable green tech	Sustainable green tech for energy efficiency	SGT->DS->EnS
1	Ahmed et al. 2022_C	3	green technology innovation is a subset of technological innovation, which is the umbrella term for managerial and technical innovation geared toward environmental protection	Technical innovation geared toward environmental protection are green technology innovations	Green tech innovation protects the environment	Green tech innovation for the environment	GTI->EnS
1	Ahmed et al. 2022_C	3	Green technology is defined as technology that adheres to the ecological principle and the law of ecological economy, takes into account the conservation of resources and energy during the process of innovation, prevents, eliminates, or significantly reduces the pollution and damages caused to the ecological environment during the process of innovation, and ensures that technological innovation has the smallest possible negative impact on the environment.	Green tech for pollution reduction during the process of innovation	Innovating with green tech reduces pollution	IGT for pollution reduction	IGT->EnS
1	Ahmed et al. 2022_C	3-4	The goals of green technology innovation (GTI) are to: accomplish long-term sustainable development, provide economic, environmental, and social advantages; conserve resources and energy; and eliminate or significantly decrease environmental pollution and deterioration	GTI for sustainable development GTI for economic, environmental, and social advantages	GTI for sustainability	GTI for sustainability	GTI->hoIS
1	Ahmed et al. 2022_C	4	Innovation in green technologies (IGT) enhances performance, reputation in the market, economic efficiency, and competitive advantage.	IGT for competitive advantage IGT for performance enhancement IGT for economic efficiency	IGT for business profits	IGT for corporate performance	IGT->C,Perf
1	Ahmed et al. 2022_C	4	IGT is typically defined as any innovation that contributes to the SDGs by reducing the adverse effects of production techniques on the environment, strengthening natural resilience to environmental issues, or developing more dependable and effective methods for using natural resources.	IGT are innovations contributing to the SDGs	GTI for SDG resolutevment	GTI for SDGs	GTI->hoIS (SDGs)

Figure A.3: Coding Guide (Source: own representation).