Digital Social Innovation:
Leveraging Digital Technologies for a Sustainable Future

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"You cannot get through a day without having an impact on the world around you. What you do makes a difference, and you have to decide what kind of difference you want to make."

Jane Goodall

Back in 2014, when I had just started as a student assistant, I attended a PhD defense celebration. As I listened to the heartfelt acknowledgements, I thought to myself: "One day, I might also stand there, proud of completing my own PhD." Now, over a decade later, I am beyond excited to submit my dissertation.

The journey to this point was not always linear - it came with highs and lows - but the meaningful moments far outweighed the challenges. Looking back, I can genuinely say I never once regretted the decision to pursue a PhD. For this, I owe my deepest thanks to Prof. Dr. Maximilian Röglinger, Prof. Dr. Anna Maria Oberländer, and Prof. Dr. Christoph Buck.

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To my family (Monika, Christian, Michi, Sarah, Fukano, and Dexter) and friends (especially my two best friends Sassy and Vanessa): thank you for your endless patience, love, and support. I know the past few years have not always been easy, and I am so grateful for your understanding when I had to cancel plans to "work on a paper." I appreciate each of you more than words can express - and I love you with all my heart.

Finally, a special thank you to my incredible parents, Monika and Christian, who supported me not only for the past years, but my whole life. I owe everything to you, and I would not be the person I am today if it wasn't for you.

Copyright Statement

The following sections are partly comprised of content from the research papers included in this thesis. To improve the readability of the text, I omit the standard labeling of these citations.

Abstract

Digital social innovation (DSI) appears as a ray of hope in addressing today's societal challenges and contributing to sustainable development. DSI uses the possibilities offered by digital technologies to create social and economic value. It draws knowledge from digital innovation, with a key part being digital technologies, and social innovation.

DSI is experiencing growing practical relevance and adoption. Nevertheless, academic research on the topic remains in its early stages. DSI research can be categorized across three core dimensions: outcomes, actions, and environment. These dimensions intersect with the broader sustainability pillars: people, planet, and profit. Within this, research is currently highly scattered across different disciplines and terminologies, making it hard to grasp the richness of prior research and failing to understand DSI's *structural foundations*. Furthermore, research currently lacks an understanding of how organizations can successfully develop and implement DSI over the long term due to many barriers arising along the *overall DSI process*. Moreover, there is a lack of research on how to systematically and reproducibly develop successful DSI initiatives and thus foster *DSI actions*. As for *DSI outcomes*, research lacks a unified understanding regarding DSI's characteristics and implementation possibilities. Lastly, within *DSI environments* there is a knowledge gap regarding the broader systemic contexts in which societal challenges, and thus DSI efforts, are embedded.

To address the identified research gaps, the dissertation contributes to the field of DSI by pursuing two primary research objectives: (1) exploring the structural foundations of DSI, and (2) examining the processual foundations of DSI in general and along its actions, outcome, and environment. First, the dissertation touches upon the *overall structure of DSI* with Research Paper #1. The research paper outlines an understanding of the overall DSI concept and investigates the current state of DSI research followed by offering further research opportunities. Second, the dissertation touches upon the *process of DSI* with six research papers. These papers contribute to the understanding of the foundations of the DSI process and to the DSI actions, DSI outcomes, and the DSI environment intersecting with the broader sustainability pillars of people, planet, and profit. Research Paper #2 focuses on the foundations of the overall DSI process by proposing a comprehensive framework that maps out the DSI process and highlights 28 barriers encountered throughout. Research Paper #3 and Research Paper #4 investigate DSI success factors along DSI actions. While Research Paper #3 focuses on organizations, Research Paper #4 addresses success factors for a specific facet of DSI, i.e., citizen-centric digital public services. Research Paper #5 outlines resource-centric DSI patterns,

that enable the utilization of incumbent firm's existing resource portfolio through digital technologies to address societal challenges. Furthermore, Research Paper #6 contributes research to the DSI outcome by outlining DSI characteristics and implementation possibilities within the context of incumbent firms. Lastly Research Paper #7 focuses on the DSI environment by investigating the influence of a specific digital technology (i.e., artificial intelligence) on the system of a specific societal challenge (i.e., the system of deforestation).

This dissertation contributes substantially to the emerging field of DSI by offering descriptive and explanatory knowledge. As for descriptive knowledge, the dissertation's Research Paper #1 through Research Paper #6 contribute to or represent a theory for analyzing through analyzing and describing the phenomenon of DSI and what it constitutes in terms of its characteristics, resource-centric patterns, success factors, and barriers. As for explanatory knowledge, the dissertation's Research Paper #7 represents a theory for explaining through explaining how and why specific phenomena occur, i.e., how a specific digital technology affects a specific societal challenge, analyzing the respective causal relationships. Overall, the findings of this dissertation provide a foundation for future sense-making and design-led research on the DSI phenomenon.

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Acronyms

AI	artificial intelligence
BMZ	Federal Ministry for Economic Cooperation and Development
CCDPS	citizen-centric digital public services
CLDs	causal loop diagrams
DBF	Digital Social Innovation Barrier Framework
DSF	digital social innovation success framework
DSI	digital social innovation
FAO	Food and Agriculture Organization
ICTs	information and communication technologies
IS	Information Systems
IT	Information Technology
UN	United Nations
UNDP	UN Development Programme
UNEP	UN Environmental Program
UNFF	UN Forum on Forests
UN-REDD+	UN Reducing Emissions from Deforestation and Forest Degradation
RPs	research pathways
SDGs	Sustainable Development Goals

I. Introduction

1 Motivation

Today's society faces a multitude of societal challenges ranging from poverty, poor education and insufficient health to gender inequality, climate change, and biodiversity loss. For example, in 2024, over 8.5% of the global population lived in extreme poverty, translating to approximately 692 million worldwide surviving on less than $2.15 per person per day (World Bank, 2024). Moreover, climate change is accelerating at an unprecedented pace, triggering cascading effects across the globe and giving rise to increasingly frequent and extreme weather events, such as the devastating wildfires that swept through Los Angeles in 2025, resulting in at least 29 fatalities, numerous injuries, the destruction of over 50,000 acres of land, and the evacuation of thousands of residents (Semancik, 2025). To counteract these challenges and work towards sustainable development, the United Nations defined the 17 Sustainable Development Goals (SDGs) in 2015 as a universal call of action to contribute to sustainable development (United Nations, 2015). However, recent reports indicate that only 17% of the defined SDG targets are on track. Additionally, only half of the goals show minimal to moderate progress, while over one-third experienced stalled or regressed progress (United Nations, 2024). Thus, further change needs to happen, and individuals, research institutions, the public and private sector alike must contribute to sustainable development.

In response to these pressing challenges, digital social innovation (DSI) appears as a ray of hope to advance sustainable development. DSI leverages digital technologies to effectively address societal challenges (Bonina et al., 2021; Dong and Götz, 2021; Tim et al., 2021). It integrates insights from digital innovation, with an integral part being digital technologies and social innovation (Bonina et al., 2021; Dong and Götz, 2021).

Digital innovation leverages the transformative effect of digital technologies to reshape products, services, processes, and business models (Ciriello et al., 2018; Nambisan et al., 2017; Vega and Chiasson, 2019). Conceptualizations of digital innovation vary regarding the use of digital technologies during the digital innovation process and/or the digital innovation outcome (Fichman et al., 2014; Nambisan et al., 2017; Vega and Chiasson, 2019) constituting the six primitives input, involvement, properties, scope, implications, and creation (Hund et al., 2021). As a well-cited literature review, Kohli and Melville (2019) conceptualize digital innovation as consisting of digital innovation actions, environment, and outcomes. Digital innovation actions include initiating (i.e., opportunity recognition), developing (i.e., designing and adopting),

implementing (i.e., installing and maintaining), and exploiting (i.e., leveraging) a digital innovation. These actions do not follow a sequential order and are, therefore, ongoing and iterative without a clear starting or ending point (Kohli and Melville, 2019). The different digital innovation actions are influenced by an organization's internal environment and its external competitive environment. The internal organizational environment encompasses factors such as organizational culture and strategy, whereas the external competitive environment pertains to the broader market context in which the organization operates and competes (Kohli and Melville, 2019). Today, an organization's external environment extends beyond its competitive market, encompassing actors that contribute to digital innovation, such as end-users and innovation networks (e.g., Abrell et al., 2016; Hosseini et al., 2018; Jacobides et al., 2018; Schmitt and Muyoya, 2020). The digital innovation actions result in the digital innovation outcomes, including new products, services, processes, or business models (Ciriello et al., 2018; Hund et al., 2021; Kohli and Melville, 2019).

An essential element of digital innovation is digital technologies that are characterized by their re-programmability, homogenization of data, self-referential nature, embeddedness, connectedness, communicability, editability, identifiability, and associability (Benbya et al., 2020; Yoo et al., 2010). Digital technologies consist of four loosely coupled layers: device, service, network, and content (Yoo et al., 2010). The device layer encompasses the fundamental components of digital technologies, including software and hardware resources. The network layer consists of the resources required for digital transmission. The service layer features functional software-based resources like weather services and smart lighting. Lastly, the content layer provides relevant information (e.g., maps and news) (Henfridsson et al., 2018; Yoo et al., 2010). Digital technologies are usually used as part of the development of digital innovation (i.e., digital technologies as a means), its outcome (i.e., digital technologies as an end), or both (Ciriello et al., 2018; Nambisan et al., 2017).

The research field of social innovation was triggered by several economic, political, technological, and socio-cultural changes, such as digitalization, involuntary unemployment, and financial crisis (Edwards-Schachter and Wallace, 2017). Social innovation aims to create solutions that are "more effective, efficient, sustainable or just than existing solutions" (Phills et al., 2008, p. 38). It focuses on creating social value, guided primarily by social rather than purely economic objectives (Phills et al., 2008). Social value is understood as "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). Therefore, social innovation extends beyond pursuing profit, prioritizing social

goals and developing solutions that promote social and environmental well-being (Choi and Majumdar, 2015; Phills et al., 2008). Accordingly, the societal challenges targeted by social innovation can be subsumed through the 17 SDGs, which encompass the three pillars of sustainability: people (e.g., quality education – SDG 4), planet (e.g., life below water – SDG 14), and profit (e.g., decent work and economic growth – SDG 8) (Eichler and Schwarz, 2019; Palmer and Flanagan, 2016; Wu et al., 2018).

Digital technologies play an essential role in addressing societal challenges and, consequently, in advancing social innovation. As these technologies become increasingly affordable, scalable, available and efficient, they offer the potential to reach a large part of the population (Fichman et al., 2014; Grigore et al., 2017; Onsongo, 2019; Walsham, 2012). Moreover, digital technologies facilitate novel forms of communication, enabling the connection of key stakeholders. Thus, digital technologies help to actively create a better society by providing access to services, the sustainability of business, and information (Grigore et al., 2017). Ultimately, digital technologies lead to a wide range of application opportunities for social innovation by fostering the connection of people, mobilizing collective exchange, and enabling the co-creation of solutions to complex societal challenges (Bria, 2015).

DSI has emerged as a distinct and evolving research stream by integrating the manifold opportunities of digital technologies within digital innovation and the social-value-driven focus of social innovation. DSI combines the understanding of digital innovation and social innovation, while also entailing constitutive characteristics (Buck et al., 2023b). For example, digital innovation focuses on using digital technologies within the innovation process or its outcomes (Ciriello et al., 2018), while social innovation addresses societal challenges (Phills et al., 2008). DSI merges these two dimensions by leveraging digital technologies to tackle societal challenges (Bonina et al., 2021; Dong and Götz, 2021; Tim et al., 2021) while also pursuing the goal of "doing good" and identifying or capitalizing on existing or new market opportunities (Buck et al., 2023b). Therefore, DSI integrates the opportunities of digital innovation and social innovation by leveraging digital technologies to generate social and economic value (Bonina et al., 2021). In essence, *DSI develops solutions through its actions, outcomes, and environment that address societal challenges across the three pillars of sustainability, i.e., people, planet, and profit*.

DSI is gaining increasing significance in practice, prompting a diverse range of organizations - from the private to the public sector - to develop DSI initiatives to advance sustainable development (Qureshi et al., 2021). As for public sector organizations, governmental agencies

utilize digital technologies to enhance service quality and create value to the public beyond merely fulfilling statutory obligations (Cluley and Radnor, 2019; Lindgren et al., 2019; Matheus et al., 2020; Moore, 1995). Thus, digital technologies empower governments to enhance their structures and operations, enabling more convenient, citizen-centric, and cost-efficient service delivery (Lindgren et al., 2019; Matheus et al., 2020). For example, the region of Bayreuth launched the digital platform "Stadt, Land, Leben" to transparently showcase information about local events. In doing so, the event portal supports preserving and promoting the region's cultural heritage (Landkreis Bayreuth, 2025). As for private sector organizations, incumbent firms have immense leverage to contribute to sustainable development owing to their large employee bases, deep-rooted societal embeddedness, global customer reach, and substantial resources (Grant, 1991; Oberländer et al., 2021; Yu and Hang, 2010). Moreover, incumbent firms are increasingly expected to "do good" beyond profit generation, as they are often perceived as social actors with human-like motives, traits, and intentions and are thus evaluated based on qualities such as morality (Bauman and Skitka, 2012). As a result, socially responsible actions shape stakeholder perceptions - particularly among employees and customers (Barakat et al., 2016; Bartikowski et al., 2011). Thus, DSI offers a strategic instrument (Chen et al., 2010; Gable, 2010; Kohli and Melville, 2019) that incumbent firms can leverage to strengthen their position in the competition for customers, markets, attention and resources while addressing societal challenges and creating social value (Buck et al., 2023b). For example, the incumbent firm Vodafone and its subsidiary Safaricom developed the DSI initiative M-Pesa, which offers banking services to individuals previously excluded from the financial system. It leverages existing digital technologies, allowing M-Pesa to scale rapidly, generating significant social value while substantially boosting the incumbent firm's revenue (Onsongo, 2019).

As the examples illustrate, DSI is experiencing growing practical relevance and adoption. Nevertheless, academic research on the topic remains in its early stages. Building on Kohli and Melville's (2019) framework for digital innovation and the conceptual foundations of social innovation, DSI research can be categorized across three core dimensions: outcomes, actions, and environment. These dimensions intersect with the broader sustainability pillars: people, planet, and profit. Within this, research is currently highly scattered across different disciplines and terminologies, making it hard to grasp the richness of prior research and failing to understand DSI's *structural foundations*. Furthermore, research currently lacks an understanding of how organizations can successfully develop and implement DSI over the long term due to many barriers arising along the *overall DSI process* (Oeij et al., 2019). Moreover, there is a research gap in how to systematically and reproducibly develop successful DSI

initiatives and thus foster *DSI actions* (Bonina et al., 2021; Tim et al., 2021). As for *DSI outcomes*, research lacks a unified understanding regarding DSI's characteristics and implementation possibilities (e.g., Bonina et al., 2021; Dong and Götz, 2021; Suseno and Abbott, 2021). Lastly, there is a knowledge gap within *DSI environments* regarding the broader systemic contexts of societal challenges in which digital technologies, and thus DSI efforts, are embedded. Therefore, further research is needed to deepen the overall understanding of DSI, particularly in the areas of its actions, outcomes, and environment to fully harness DSI's transformative potential.

2 Research Objectives

In response to the identified research gaps, this dissertation contributes to the field of DSI with seven research papers (see Figure 1). Through the different research papers, the dissertation pursues two primary research objectives: (1) exploring the structural foundations of DSI and (2) examining the processual foundations of DSI in general and along its actions, outcome, and environment.

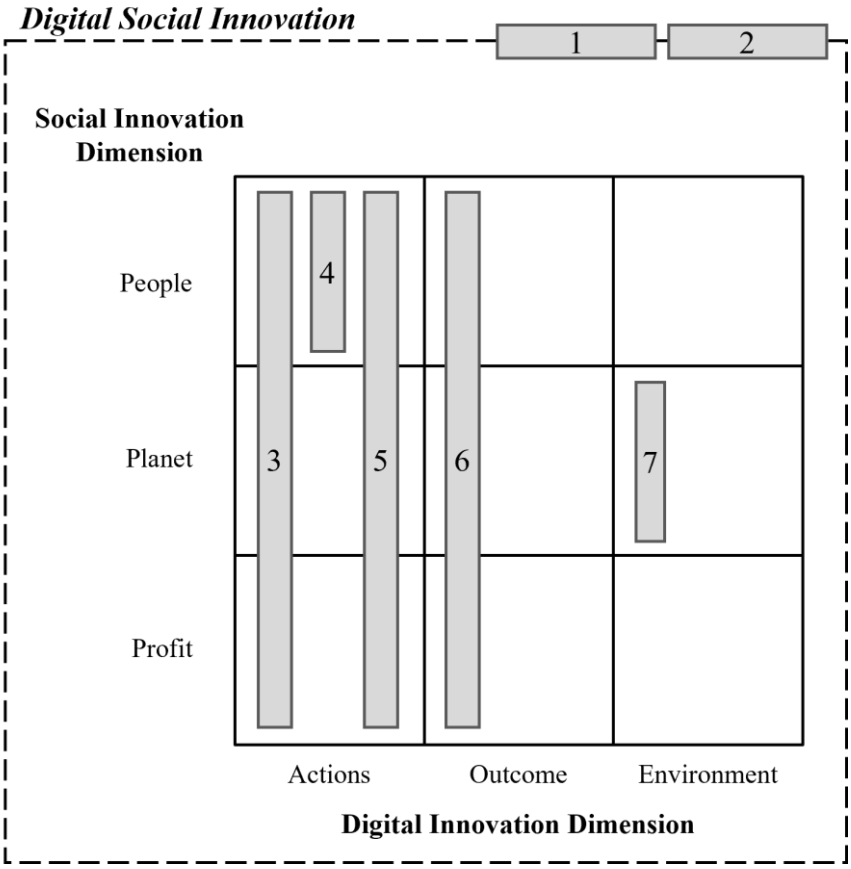

Figure 1. Assignment of the research papers to key research areas of the dissertation

First, the dissertation touches upon the overall structure of DSI with one research paper. The research paper outlines an understanding of the overall DSI concept and investigates the current state of DSI research, followed by a discussion of further research opportunities. Second, the dissertation touches upon the process of DSI with six research papers. These papers contribute to the understanding of the foundations of the DSI process and to the DSI actions, DSI outcomes, and the DSI environment intersecting with the broader sustainability pillars of people, planet, and profit. Figure 1 illustrates the dissertation's conceptual framework built from the understanding of DSI according to its definition as outlined above – drawing from digital innovation, with an integral part being digital technologies and social innovation. Further, Figure 1 illustrates the assignment of the dissertation's research papers to the conceptual framework. Providing novel insights into DSI, this thesis is relevant for researchers and practitioners.

3 Structure of the Dissertation and Embedding of the Research Papers

The dissertation includes seven research papers contributing to the research objectives outlined above. Table 1 provides an overview of the dissertation and the associated research papers.

Section I outlines the motivation of the thesis, defines the dissertation's main concepts, DSI, digital innovation, social innovation, and digital technologies, identifies the research gaps of the thesis and outlines the addressed research objectives. Section II addresses research objective 1, i.e., exploring the structural foundations of DSI. The included research paper sheds light on the current state of DSI research and offers research pathways for future DSI research. Section III addresses research objective 2, i.e., examining the processual foundations of DSI in general and along its actions, outcome, and environment and includes six research papers. The included papers address 1) the processual foundations of DSI, 2) the DSI actions, 3) the DSI outcomes, and 4) the DSI environment. First, one of the research papers touches upon the *processual foundations of DSI* and outlines current barriers organizations face when developing and implementing DSI initiatives along the overall DSI process. Second, three included papers address the *DSI actions* and identify key success factors for developing DSI initiatives within private-sector organizations, highlight success factors for creating citizen-centric digital public services as a specific form of DSI in the public sector, and uncover patterns that illustrate how incumbent firms can leverage their existing resource portfolio to drive DSI efforts. Further, one included paper addresses the *DSI outcomes*. The paper conceptualizes DSI with its underlying characteristics and dimensions in the context of incumbent firms. Finally, one included paper addresses the *DSI environment*. This paper investigates how a specific digital technology (i.e.,

artificial intelligence (AI)) influences the system of a particular societal challenge (i.e., deforestation), focusing on a specific facet of DSI. Section IV summarizes the research findings and outlines the dissertation's limitations and further research opportunities. Section V lists the references, while Section VI outlines the Appendix, which includes an index of the dissertation's research papers, a summary of my individual contribution to each research paper, and an abstract or extended abstract of the research papers.

I	**Introduction**
II	**The Structure of Digital Social Innovation**
	Research Article #1 Krombacher, A.; Lindenthal, A.K.; Oberländer, A.M.; Schäfer, R. (2024). Digitally Social: Review, Synthesis, and Future Directions for Digital Social Innovation. Conditionally Accepted: *Outlet hidden due to the double-blind review process of the journal*
III	**The Process of Digital Social Innovation**
	Research Article #2 Buck, C.; Kempf, L.; Kneissel, K.; Krombacher, A. (2023). Barriers along the Digital Social Innovation Process: A Structured Literature Review. Proceedings of the 18th International Conference on Wirtschaftsinformatik (WI). 60.
	Research Article #3 Buck, C.; Heim, L.; Krombacher, A.; Röglinger, M. (2025). Making the most of digital social innovation: An exploration into success factors. Journal of Business Research. 190.
	Research Article #4 Körner-Wyrtki, K.; Buck, C.; Krombacher, A.; Röglinger, M. (2024). Exploring success factors for developing citizen-centric digital public services - insights from a case study. Electronic Government, an International Journal. 20 (5).
	Research Article #5 Buck, C.; Heidenreich, T.; Heim, L.; Krombacher, A.; Weissmann, H. (2025). Know your worth – Resource-centric patterns for creating digital social innovation. Major Revision: *Outlet hidden due to the double-blind review process of the journal*
	Research Article #6 Buck, C.; Krombacher, A.; Körner-Wyrtki, K.; Röglinger, M. (2023). Doing good by going digital: A taxonomy of digital social innovation in the context of incumbents. Journal of Strategic Information Systems. 32 (4).
	Research Article #7 Krombacher, A.; Buck, C.; Heim, L.; Röglinger, M. (2025). AI in the web of trees: A systems thinking approach to understanding how AI affects deforestation. Under Review: *Outlet hidden due to the double-blind review process of the journal*
IV	**Conclusion**
V	**References**
VI	**Appendix**

Table 1. Overview of the dissertation and the associated research papers

II. The Structure of Digital Social Innovation

As outlined in Section I, a meaningful contribution to the field of DSI requires an *exploration of its structural foundations*. DSI research is scattered across disciplines and terminologies, presenting challenges in synthesizing and building upon existing knowledge. To address this challenge, it is essential to understand the dimensions of DSI, synthesize prior contributions, and identify future research opportunities. Developing this integrative understanding is critical for establishing a common foundation that can accelerate the advancement of DSI research. In response, this dissertation identifies key dimensions that constitute DSI, examines the current state of DSI research and proposes twelve research pathways to guide future research (see Section II, Research Paper #1).

Research Paper #1: Digitally Social: Review, Synthesis, and Future Directions for Digital Social Innovation.

DSI has a tremendous potential to "do good" while also creating economic value by leveraging digital technologies to address societal challenges (Bonina et al., 2021). DSI is an emerging phenomenon, with scholarly work explicitly using this term only beginning to appear in recent years (e.g., Bonina et al., 2021; Dong and Götz, 2021; Rodrigo et al., 2022). While the specific term and conceptualization of DSI are relatively recent, the underlying idea of leveraging digital technologies to address societal challenges is not new. It has been explored across various research disciplines under diverse terminologies. Thus, additional literature exists at the intersection of digital innovation and social innovation, with different terms being used in the respective areas, such as digital eco-innovation, green information and communication technologies (ICTs), or information technology (IT)-enabled social innovation (Butler and Hackney, 2015; Carberry et al., 2019; Gogan et al., 2020). Consequently, the fragmentation of existing research across multiple disciplines makes it challenging to capture the richness of prior work and to assess the current state of DSI research comprehensively. Therefore, research needs to identify the key dimensions that constitute DSI, synthesize prior contributions across diverse disciplines and terminologies, and, based on these insights, outline future research pathways to advance the development of the DSI field. Against this backdrop, Research Paper #1 investigates the following research question: *What are critical DSI research pathways?*

In response to the research question, Research Paper #1 conceptualizes DSI as consisting of the dimensions of digital innovation, social innovation, and digital technologies. In doing so, a multi-dimensional framework is drawn, that builds the basis for assessing prior contributions and identifying areas where further research is needed (see Figure 2).

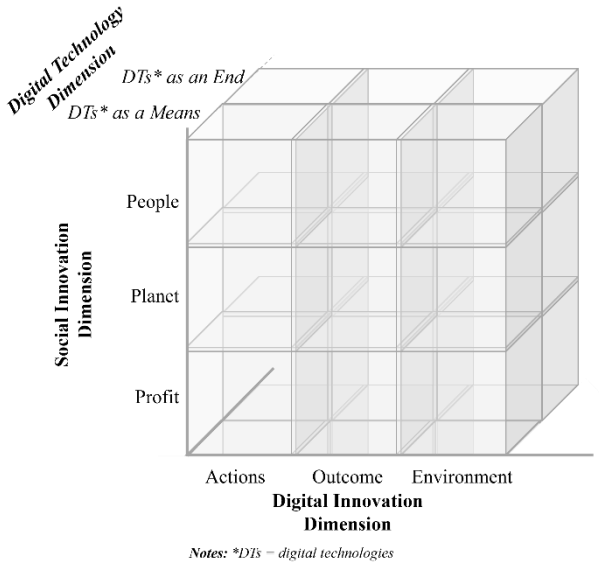

Figure 2. Digital social innovation analysis framework

The framework is built along the dimensions of digital innovation, social innovation, and digital technologies. For digital innovation, the research paper draws from the scholarly work of Kohli and Melville (2019) and understands digital innovation as consisting of digital innovation actions, environment, and outcomes. Digital innovation actions consist of four iterative steps: initiating, developing, implementing, and exploiting digital innovation (Kohli and Melville, 2019). The digital innovation outcomes entail new services, products, processes, or business models (Ciriello et al., 2018; Fichman et al., 2014; Hund et al., 2021; Kohli and Melville, 2019). Lastly, the digital innovation environment includes the internal organizational environment and the external competitive environment (Kohli and Melville, 2019). To date, the external competitive environment is conceptualized beyond its competitors and includes the ecosystem in which an organization functions, including innovation networks or end-users (e.g., Abrell et al., 2016; Hosseini et al., 2018; Jacobides et al., 2018; Schmitt and Muyoya, 2020). As the second dimension, digital technologies comprise four loosely coupled layers, i.e., device, network, service, and content (Henfridsson et al., 2018; Yoo et al., 2010). The boundaries and scope of digital technologies remain ambiguous, with the term frequently being used interchangeably with IT, Information Systems (IS) and ICTs (Denner et al., 2018; Dittes and Smolnik, 2019; Zuppo, 2012). Within digital innovation, digital technologies are either used as a means, i.e., as part of the digital innovation actions, or as an end, i.e., as part of the digital innovation outcome (Ciriello et al., 2018; Nambisan et al., 2017). Lastly, regarding the third DSI dimension, social innovation is defined as developing solutions driven primarily by social rather than purely economic objectives (Phills et al., 2008). These solutions often align with the

17 SDGs and span the three dimensions of sustainability, i.e., people, planet, and profit (Eichler and Schwarz, 2019; Palmer and Flanagan, 2016; Wu et al., 2018).

Research Paper #1 follows a two-step research approach: 1) development of a research agenda for DSI using a structured literature review following Boell and Cecez-Kecmanovic (2015), 2) evaluation, discussion, and extension of the research agenda based on conducted semi-structured expert interviews (Myers and Newman, 2007). The search strings used in the first step of the research approach were developed by integrating a range of terms associated with the previously defined DSI dimensions (see Table 2). After searching and selecting the literature, the findings of the final pool of 135 papers were summarized by coding the research objective of each research paper along the outlined DSI dimensions, i.e., social innovation (people, planet, profit), digital innovation (actions, outcome, environment), digital technologies (digital technologies as a means, digital technologies as an end) (Stock et al., 1996; Wolfswinkel et al., 2013). In the second step of the research approach, the authors conducted 10 expert interviews with IS scholars specializing in DSI or one of its intersecting domains (e.g., digital innovation) (Myers and Newman, 2007). The expert interviews helped to evaluate and extend the proposed research agenda.

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*")

Table 2. Overview of search strings

Building on the multi-dimensional research framework presented in Figure 2, the final sample of 135 research papers was classified according to the outlined dimensions. Consequently, six research clusters were extracted by splitting the dimensions according to digital technologies as a means or digital technologies as an end. Further, the research clusters differentiate between DSI actions, outcomes, and environment dimensions. Within each cluster, an additional classification was made based on the three pillars of sustainability, i.e., people, planet, and profit (see Figure 3). In doing so, the research paper investigates current DSI contributions along the clusters 1) Digital Technologies as a Means and Actions, 2) Digital Technologies as a Means and Outcome, 3) Digital Technologies as a Means and Environment, 4) Digital Technologies as an End and Actions, 5) Digital Technologies as an End and Outcome, 6) Digital Technologies as an End and Environment.

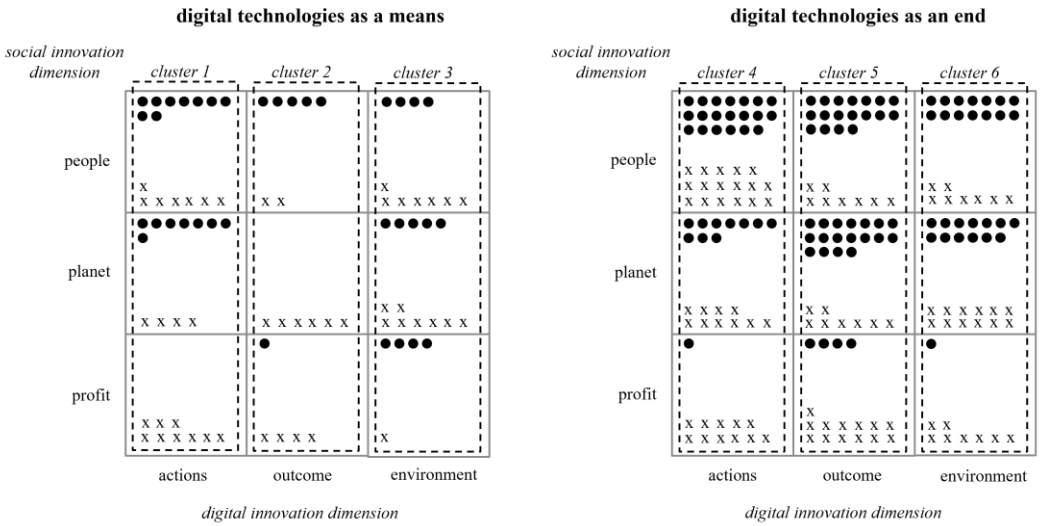

Figure 3. Digital social innovation clustering results

This paper identifies key research pathways that inform a comprehensive DSI research agenda based on the analysis of 135 studies, their classification into six research clusters, and a detailed review of their contributions. The proposed DSI research agenda comprises 12 research pathways with substantial potential for future exploration. These pathways are informed by existing literature, identified research gaps, and insights gathered from expert interviews with IS scholars. The research paper identified two research pathways (RPs) per cluster. The RPs and their corresponding objectives are outlined in Table 3. Notably, there are thematic overlaps and interdependencies among the RPs. For instance, RP2 informs RP6: While RP2 focuses on developing design principles to support DSI actions within digital ecosystems, RP6 addresses enhancing stakeholder involvement in DSI. Elements of the design principles proposed in RP2 may relate to mechanisms for stakeholder engagement, thereby contributing to the solution space of RP6. These interdependencies highlight the necessity for researchers to reflect critically on the broader implications of their work and recognize the limitations of treating each pathway as fully parallelizable.

Building on the identified research pathways and the analysis of the literature sample, the paper further distills a set of overarching, recurring themes, which are elaborated in the Discussion section of Research Paper #1. These themes include: 1) DSI ecosystems, 2) DSIs for potential conflicts and synergies between sustainability dimensions, 3) DSI's integration into different contexts and environments, 4) Role of data within DSI, and 5) The assessment of DSI success. The themes represent overarching topics that drive DSI research emerging from the general understanding of DSI (see Figure 4).

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.

Table 3. Overview of digital social innovation research pathways

By outlining key research clusters within the field of DSI and proposing a comprehensive research agenda, Research Paper #1 builds upon foundational contributions such as those of Qureshi et al. (2021) and Bonina et al. (2021). It advances their work by offering a more nuanced and holistic perspective on DSI. The synergy between the proposed DSI research framework and the twelve identified RPs establishes a solid foundation for future research within the evolving landscape of DSI. Developing a DSI research agenda also marks a shift toward a more structured and mature engagement with this emerging multidisciplinary field. Furthermore, the five overarching themes outlined in the Discussion section of Research Paper #1 offer valuable theoretical perspectives to guide future DSI research. Although theoretical in nature, Research Paper #1 also provides practical implications by equipping practitioners with a deeper understanding of DSI's relevance, thereby providing a foundation for observing, measuring, analyzing, and managing key aspects of DSI.

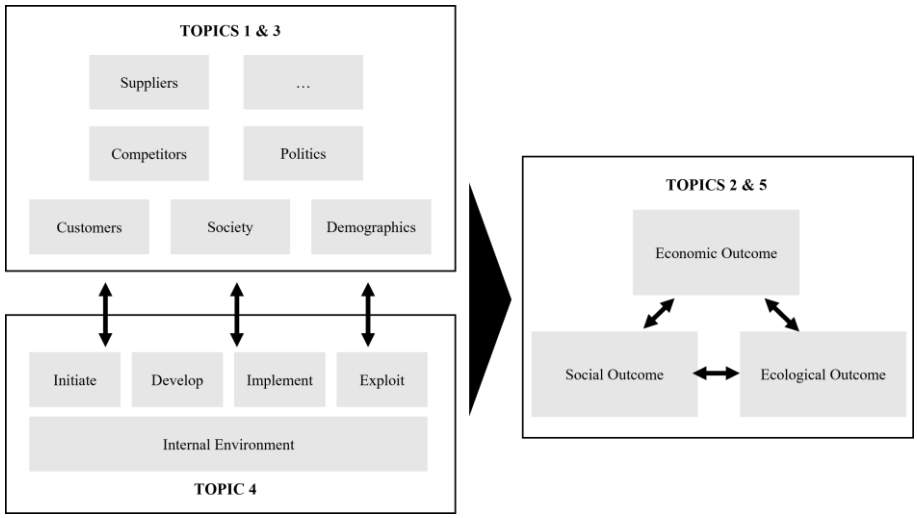

Figure 4. Central topics driving digital social innovation research

III. The Process of Digital Social Innovation

As outlined in Section I, DSI can be conceptualized along DSI actions, DSI outcomes, and the DSI environment. All three dimensions currently lack in-depth knowledge. Thus, this dissertation aims to contribute research to all three dimensions by *examining the processual foundations of DSI in general and along its actions, outcomes, and environment*.

1 Processual Foundations of Digital Social Innovation

For organizations to effectively harness DSI's potential to generate social and economic value, they must develop a clear understanding of the foundational basis of the DSI process, as well as the current challenges associated with DSI development. Therefore, this dissertation proposes a comprehensive framework of the DSI process and identifies key barriers associated with each of its elements (Section III.1, Research Paper #2).

Research Paper #2: Barriers along the Digital Social Innovation Process: A Structured Literature Review

DSI is an emerging phenomenon, and organizations are still far from unlocking its full potential. Many organizations struggle with the long-term development and implementation of DSI initiatives due to numerous barriers that arise throughout the DSI process, hindering its successful development (Oeij et al., 2019). Kohli and Melville (2019) present a theoretical framework that structures the digital innovation process across three dimensions: actions, environment, and outcomes. While their work offers essential insights into the dynamics of digital innovation, it does not explicitly address the role of digital innovation in tackling societal challenges. Given the importance of understanding the barriers that hinder the effective development of DSI (Lettice and Parekh, 2010; Neumeier, 2017), Research Paper #2 seeks to identify these barriers and, in doing so, contribute to a deeper understanding of the DSI process. Accordingly, Research Paper #2 focuses on barriers that emerge throughout the DSI process from the perspective of the implementing organization, aiming to address the following research question: *What are the barriers along the DSI process?*

To answer the research question, a structured literature review was conducted (Sharma and Bansal, 2023; Wolfswinkel et al., 2013). The first step involved defining the search protocol, which included the development of the following search string: (“digital innovation*” OR “social innovation*”) AND (barrier OR challenge OR risk). The search string was used for title, abstract, and keyword searches within the Web of Science Core Collection. Articles were included when they (1) investigated the process perspective of digital innovation, social

innovation, and/or DSI and when they (2) described at least one barrier. Furthermore, articles were excluded when they (1) were written neither in English nor German and (2) did not refer to an organizational context. Following a multi-stage screening process of the 1,128 initial results, supplemented by a backward search (Wolfswinkel et al., 2013), the search yielded a final sample of 33 research papers. Applying open, axial, and selective coding (Sharma and Bansal, 2023; Wolfswinkel et al., 2013), Research Paper #2 identified 28 barriers grouped into 12 overarching categories. These categories were then mapped onto the elements of the DSI process using Kohli and Melville's (2019) digital innovation framework, extended to include the societal environment, resulting in the Digital Social Innovation Barrier Framework (DBF).

The DBF comprises 28 barriers grouped into 12 categories and five main elements (see Figure 5). The five main elements include the societal environment, the internal organizational environment, the external competitive environment, the DSI actions, and the DSI outcomes.

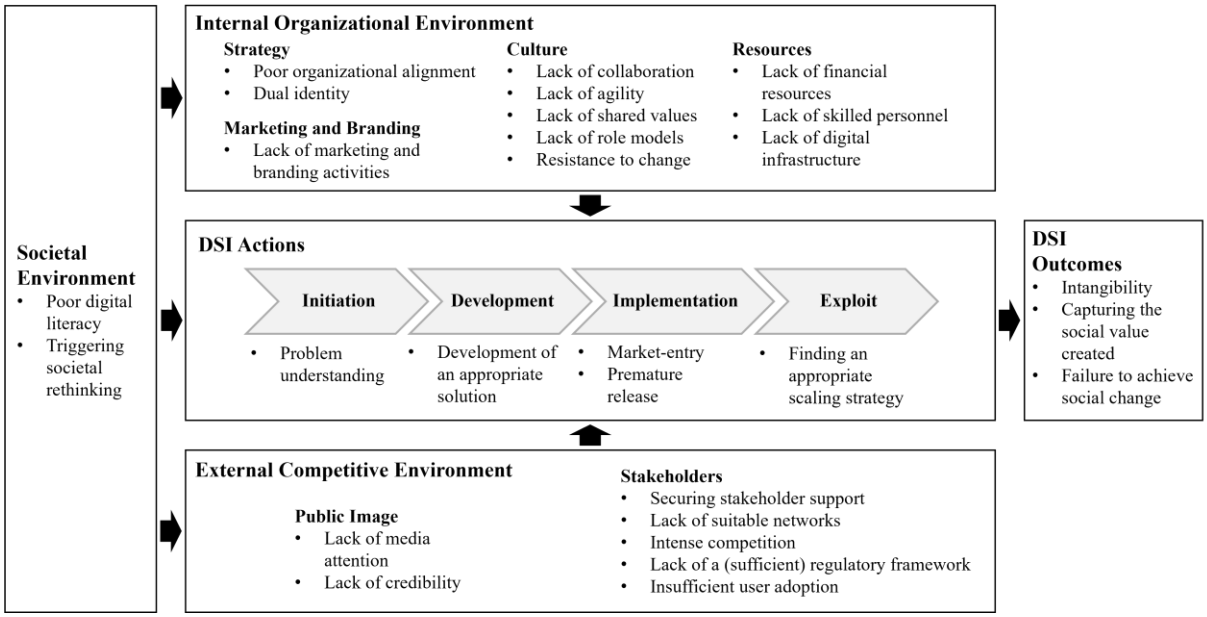

Figure 5. Digital social innovation barrier framework (based on Kohli and Melville (2019))

The **societal environment** captures barriers within the broader societal environment, extending beyond individual organizations and their immediate stakeholders. It includes two barriers: poor digital literacy (Ramilo and Embi, 2014; Rosa, 2017) and triggering societal rethinking (Scott, 2005). The **internal organizational environment** refers to organizational barriers (Kohli and Melville, 2019) and includes eleven barriers in the four categories: strategy, culture, resources, and marketing and branding. The category *strategy* consists of the barriers poor organizational alignment (e.g., Ramilo and Embi, 2014; Vicente et al., 2020) and dual identity (e.g., Battistella et al., 2021; Deserti and Rizzo, 2020) and outlines an organization's strategic orientation, guiding how it allocates resources to generate value (Bharadwaj et al., 2013). The

category *culture* subsumes the barriers lack of collaboration (e.g., Brock et al., 2020; Dufour et al., 2014), lack of agility (e.g., Brock et al., 2020; Kayser et al., 2018), lack of shared values (Newth and Woods, 2014; Solov'eva et al., 2018; Vicente et al., 2020), lack of role models (e.g., Brock et al., 2020; Suseno and Abbott, 2021), and resistance to change (e.g., Battistella et al., 2021; Newth and Woods, 2014). It reflects the organizational working environment and prevailing attitudes toward DSI. The category *resources* includes the barriers lack of financial resources (e.g., Chalmers, 2013; Grant, 2017), lack of skilled personnel (e.g., Arena et al., 2018; Battistella et al., 2021), and lack of digital infrastructure (e.g., Tim et al., 2021; Vicente et al., 2020) and refers to an organization's assets and capabilities that are critical for identifying and pursuing DSI opportunities (Wade and Hulland, 2004). Lastly, the category *marketing and branding* subsumes the barrier lack of marketing and branding activities (Tim et al., 2021) and describes the strategies necessary to effectively communicate the value of DSI to customers (Roundy, 2017). The **external competitive environment** encompasses organization-external barriers that hinder the DSI process (Kohli and Melville, 2019) and includes seven barriers in the two categories of stakeholders and public image. The category *public image* consists of the two barriers lack of media attention (Schartinger et al., 2020; Solov'eva et al., 2018) and lack of credibility (Roundy, 2017; Roundy and Bonnal, 2017) and reflects societal perceptions and attitudes toward DSI. The category *stakeholders* refers to an organization engaging with various stakeholders in its external competitive environment, including regulatory bodies, other organizations, community groups, and the mass media (Henriques and Sadorsky, 1999). It subsumes the barriers securing stakeholder support (e.g., Solov'eva et al., 2018; Wood, 2012), lack of suitable networks (Chalmers, 2013; Lettice and Parekh, 2010; Sammut et al., 2020), intense competition (Tim et al., 2021), lack of a (sufficient) regulatory framework (e.g., Newth and Woods, 2014; Popov et al., 2016), and insufficient user adoption (Purtik and Arenas, 2019; Roundy, 2017). The **DSI actions** include five categories: initiation, development, implementation, and exploitation (Kohli and Melville, 2019). The category *initiation* refers to identifying novel business opportunities to create new DSI ideas (Kohli and Melville, 2019). It includes the barrier problem understanding (Lettice and Parekh, 2010; Roundy and Bonnal, 2017). The category *development* subsumes the barrier development of an appropriate solution (e.g., Kayser et al., 2018; Roundy and Bonnal, 2017) and refers to the development of new DSI initiatives or the adaptation of existing ones (Kohli and Melville, 2019). The category *implementation* includes the barriers market-entry (Lettice and Parekh, 2010) and premature release (Roundy and Bonnal, 2017) and describes the roll-out of a DSI initiative (Kohli and Melville, 2019). The category exploitation refers to the utilization of a DSI initiative (Kohli and

Melville, 2019) and subsumes the barrier of finding an appropriate scaling strategy (Deserti and Rizzo, 2020; Tim et al., 2021; Westley et al., 2014). The **DSI outcomes** can be either services, processes, or products (Bonina et al., 2021) and are confronted with three barriers: intangibility (Brock et al., 2020), capturing social value (Battistella et al., 2021; Geobey et al., 2012), and failure to achieve societal change (Bonina et al., 2021; Lettice and Parekh, 2010; Westley et al., 2014).

Research Paper #2 offers two theoretical implications. First, the paper advances research on the factors influencing the DSI process by identifying 28 barriers across its various stages. The resulting DBF offers descriptive insights that provide a comprehensive overview of these barriers, laying the groundwork for future research to generate descriptive, explanatory, and prescriptive knowledge (Gregor, 2006). Second, by extending Kohli and Melville's (2019) digital innovation framework to a DSI framework, Research Paper #2 advances the field of DSI by establishing a foundational basis for theorizing the DSI process. Furthermore, Research Paper #2 offers two practical implications. First, the DBF includes a comprehensive overview of the various barriers organizations encounter throughout the DSI process, raising awareness of the challenges involved. Second, the DBF provides organizations with valuable insights into the process of DSI.

2 Digital Social Innovation Actions

DSI actions build on Kohli and Melville's (2019) digital innovation framework and encompass all activities related to developing DSI initiatives across the steps of initiation, development, implementation, and exploitation. Despite growing interest in the field, there remains a limited understanding of how to systematically and reproducibly develop successful DSI initiatives (Bonina et al., 2021; Tim et al., 2021). To address this gap, this dissertation explores success factors for developing DSI initiatives. Specifically, the dissertation examines the organizational considerations necessary for designing and implementing successful DSI initiatives (Section III.2, Research Paper #3). Furthermore, the dissertation focuses on the public sector, investigating the enablers of success in the context of citizen-centric digital public services as a particular form of DSI (Section III.2, Research Paper #4). Additionally, this dissertation examines how incumbent firms can strategically leverage their resource base to systematically and reproducibly develop impactful DSI initiatives (Section III.2, Research Paper #5).

Research Paper #3: Making the Most of Digital Social Innovation: An Exploration into Success Factors.

DSI offers numerous opportunities for organizations as it facilitates the development of innovative products, services, and business models, leading to a competitive advantage (Buck et al., 2023b; Mirvis et al., 2016; Porter and Kramer, 2006). In doing so, DSI supports organizations in meeting new regulatory requirements and the heightened demand from investors, employees, and customers for socially responsible solutions (Bonina et al., 2021; Eichler and Schwarz, 2019; Porter and Kramer, 2006). Currently, however, organizations face several challenges when developing DSI, such as the satisfaction of a wide range of stakeholders with varying priorities, the realization of social value that is also financially viable, and the high degree of complexity and unpredictability (Buck et al., 2023a; Hall and Vredenburg, 2003; Nambisan et al., 2017). Therefore, to overcome these challenges and enable DSI to realize its full potential, it is essential to understand the underlying success factors in developing DSI initiatives (Tim et al., 2021). These success factors can inform the development of DSI initiatives and identify key areas where strong performance is essential to fully realize the potential of DSI (Evanschitzky et al., 2012; Kuester et al., 2013). Against this backdrop Research Paper #3 asks the following research question: *What are success factors for DSI?*

To answer the research question, Research Paper #3 follows a two-step methodological approach (see Table 4). First, the authors conduct a structured literature review on digital innovation, social innovation, and DSI following Moher et al. (2015) to derive a preliminary success factor overview as a conceptual foundation. Second, the preliminary success factor overview was enriched and further contextualized to DSI through 21 semi-structured expert interviews, resulting in the DSI Success Factor Framework (DSF) (Myers and Newman, 2007). The structured literature review was conducted in the databases Business Source Premier, Web of Science Core Collection, Scopus, and Association for Information Systems Electronic Library Journals with the search string (“social innovation” OR “sustainab* innovation” OR “digital innovation” OR “ICT innovation” OR “information technolog* innovation” OR “information system* innovation”) AND (success OR enabler OR determinant OR driver OR “critical factor*” OR “crucial factor*”) on title, abstract, and keywords. The search string included digital innovation and social innovation as DSI draws from these concepts (Bonina et al., 2021; Dong and Götz, 2021). Further, sustainability innovation, ICT innovation, IT innovation, and IS innovation are often used interchangeably with social and digital innovation. Therefore, these terms were further added to the search string. Lastly, terms such as enabler, determinant, driver, critical factor, and crucial factor were included, as the concept of success

factors is often referenced by these synonyms in the literature (Chandra et al., 2021; Cooper, 2019; Ghobakhloo et al., 2021; Nilsson and Göransson, 2021; Niroumand et al., 2021). Following Gioia et al. (2013), the final pool of 83 papers was coded through open and axial coding, leading to 14 success factors within the preliminary success factor overview. Further, as part of selective coding, the success factors were categorized according to the frameworks "Technology-Organizations-Environment" (Tornatzky and Fleischer, 1990) and "Human-Organization-Environment" (Yusof et al., 2008), leading to the success factor categories human, organization, and environment. To ensure that the identified success factors were DSI-specific, the authors conducted 21 exploratory expert interviews with experts from varying organization sizes and industries. Through the expert interviews, four codes were added, leading to a final set of 18 success factors.

#	Step	Method	Coding	Result
1	Conceptualization	83 relevant papers through a systematic literature review	- 315 open codes - 14 axial codes - 3 selective codes	Preliminary success factor overview: - 14 success factors - 3 success factor categories
2	Transfer	21 semi-structured interviews with DSI experts	- 155 open codes - 18 axial codes - 3 selective codes	DSI Success Factor Framework: - 18 success factors - 3 success factor categories

Table 4. Research approach

The results of Research Paper #3 consist of the DSI success factor overview and the DSI success factor framework. The DSI success factor overview describes the 18 success factors across the three categories of human, organization and environment and specifies key action fields to develop DSI initiatives successfully (see Table 5). The first category of **human** contains six success factors. It outlines employees' competencies and training requirements (Orji et al., 2020) and includes success factors related to a person's level of use, knowledge, beliefs, and expectations (Yusof et al., 2008). The second category **organization** contains eight success factors and describes characteristics and attributes of organizations that facilitate the successful development of DSI initiatives (Nilashi et al., 2016; Orji et al., 2020). The third category **environment** contains four success factors and encompasses success factors linked with externalities of an organization related to DSI (Orji et al., 2020).

	Success factor	Resource*	Description	Illustrative statement	References from the literature review: Digital innovation	References from the literature review: Social innovation	References from the literature review: DSI	Interviews
Human	Digital technology knowledge	C	The understanding of the digital world, programming skills, and deep comprehension of specific digital technologies to identify where digital technologies can add real social value and enable successful technical implementation.	"One major point that prevents DSI success is that people start with solutions without any knowledge of the digital world and without someone in the team who has programming skills and truly understands the digital technology". (E17)	Carlan et al. (2017), Choi et al. (2021), Gierlich-Joas et al. (2020), Guinan et al. (2019), Hussain et al. (2024), Johansson et al. (2020), Kaewsaengon et al. (2023), Khin and Ho (2019), Kohli and Melville (2019), Müller et al. (2019b), Shah et al. (2024), van Riel et al. (2004), Wiesböck and Hess (2020)	Aksoy et al. (2019), de Arruda Torresa (2017), de Medeiros et al. (2022), Golgeci et al. (2022), Li and Bacete (2022), Lu et al. (2023), Sanzo-Perez et al. (2015), Taneja et al. (2023), Yun et al. (2019)	Schweitzer et al. (2015)	E1, E2, E4, E5, E6, E8, E10, E12, E14, E15, E17, E18, E19, E21
	Entrepreneu-rial resilience	C	The ability to withstand and overcome adversity, bounce back from negative experiences and persist in the face of scepticism and constraints to tackle legal, political, environmental, and technological restrictions in addressing wicked societal challenges.	"A hands-on and problem-solving nature is important to turn ideas for wicked societal challenges into action". (E17)	-	-	-	E2, E4, E7, E17, E18, E19, E20, E21
	Interdisciplini-nary collaboration	C	The close collaboration of different business units (e.g., IT, legal, R&D) and intensive knowledge and resource sharing to effectively address the complexity of DSI.	"A single department can never develop a successful DSI. Organizations always need IT, cross-sectional functions such as legal or data protection, and sometimes specialist departments. Thus, the collaboration between these departments is essential". (E11)	Gierlich-Joas et al. (2020), Guinan et al. (2019), Johansson et al. (2020), Kohli and Melville (2019), Müller et al. (2019a), Müller et al. (2019b), van Riel et al. (2004), Wiesböck and Hess (2020)	Charalabidis et al. (2014), de Arruda Torresa (2017), de Medeiros et al. (2022), Dias et al. (2024), Halila and Rundquist (2011), Metszősy (2020), Meyer and Hartmann (2023), Neumeier (2017), Oliveira and Sbragia (2012), Petropoulou et al. (2022), Taneja et al. (2023), Urban and Gaffurini (2017)	-	E1, E2, E4, E5, E6, E7, E8, E10, E11, E12, E14, E15, E17, E18, E19, E20, E21
	Networking skills	C	The ability to connect with the surrounding network to build strategic partnerships with various stakeholders, foster collaboration, and stay updated on societal challenges and digital trends.	"Many different disciplines and stakeholders are involved in DSI, which means that one cannot develop a successful DSI independently. That is why networking is essential". (E10)	Müller et al. (2019b), Shojaei and Burgess (2022), Svahn et al. (2017)	Charalabidis et al. (2014), Halila and Rundquist (2011), Metszősy (2020), Oliveira and Sbragia (2012), Perrini et al. (2010), Petropoulou et al. (2022), Urban and Gaffurini (2017), Westley et al. (2014)	-	E2, E4, E5, E6, E7, E9, E10, E12, E14, E15, E17, E18, E19, E20, E21
	Social knowledge	C	Skills like empathy, humility, listening, and understanding the social domain (e.g., culture, beneficiaries) to genuinely help people and discern DSI with the potential for societal change.	"In contrast to conventional innovation, DSI requires the ability to empathize and understand different stakeholders even more. With DSI, you do not only want to induce buying behavior, but you want to help people. Furthermore, if you want to do so, you must be able to understand them". (E13)	Gierlich-Joas et al. (2020), van Riel et al. (2004)	Aksoy et al. (2019), Canestrino et al. (2019), de Medeiros et al. (2022), Deserti and Rizzo (2020), Golgeci et al. (2022), Martínez-Martínez et al. (2023), Metszősy (2020), Binti Mustapha and Bin Abu Seman (2023), Naranjo-Valencia et al. (2020), Taneja et al. (2023), Westley et al. (2014)	-	E6, E7, E8, E10, E11, E12, E13, E15, E16, E17, E18, E19, E20, E21
	Systemic thinking	C	The ability to deliberately and systematically gain deep insights into complex domains, considering potential rebound effects, and understanding the interdependencies between the conceptual, social, and technological levels to create social value while avoiding unintended negative consequences.	"If you make a mistake in the whole system logic, you may damage more in society or environment than you solve". (E12)	-	-	-	E1, E2, E9, E10, E12, E16, E17, E19

	Continuous monitoring	A	The tracking of progress, re-evaluation of assumptions, and use of financial, social, and technological KPIs enable proactive risk management and organizations to maintain engagement by sharing the progress and successes achieved with stakeholders.	"Throughout the development, you need some impact analysis running in parallel to check if you are creating the desired social impact". (E16)	Guinan et al. (2019), Müller et al. (2019a)	Pfitzer et al. (2013), Wirth et al. (2023)	E3, E4, E6, E8, E10, E12, E14, E15, E16, E18, E19, E20, E21
	Dual value creation	A	The creation of socially responsible and financially sustainable DSI to enable long-term success by exploring innovative revenue models (e.g., beyond traditional data monetization and advertising) and leveraging the affordability and accessibility of digital technologies to scale social value.	"There must be an economic perspective in social value creation because there must be some funding in the long-term. Otherwise, organizations build a DSI that does not exist two years later because there is no more money". (E3)	Müller et al. (2019b)	Aksoy et al. (2019), Casale Mashiah et al. (2023), de Arruda Torresa (2017), Deserti and Rizzo (2020), Dopelt et al. (2023), Fellnhofer (2017), Metszősy (2020), Perrini et al. (2010), Pfitzer et al. (2013), Weppen and Cochrane (2012)	Bonina et al. (2021)	E1, E2, E3, E4, E5, E6, E7, E8, E9, E11, E12, E13, E14, E15, E17, E18, E19, E20, E21
	Openness for Experimenta-tion	C	The emphasis is on values such as accepting failure, embracing a learning mindset, and being receptive to change and new digital technologies to tackle the complex nature of DSI, with its legal, political, social, and technological constraints.	"Due to the legal, political, environmental, and technological restriction and the complex systemic dependencies in DSI, failure is probably even more likely than in conventional innovation and thus requiring risk tolerance". (E6)	Al Issa and Omar (2024), Choi et al. (2021), Del Giudice et al. (2021), El-Haddadeh (2020), Gierlich-Joas et al. (2020), Goncalves et al. (2020), Guinan et al. (2019), Li et al. (2022), Lyu et al. (2024), Meland et al. (2023), Müller et al. (2019a), Müller et al. (2019b), Nylén and Holmström (2015)	Aksoy et al. (2019), Bright and Godwin (2010), Chalmers (2013), de Medeiros et al. (2022), Erdiaw-Kwasie and Abunyewah (2024), Fellnhofer (2017), Herrera (2015), Hsu et al. (2019), Lu et al. (2023), Najib et al. (2021), Urban and Gaffurini (2017)	-	E1, E2, E4, E5, E6, E8, E10, E11, E12, E13, E14, E15, E17, E18, E19, E20, E21
Organization	Organizatio-nal identity	A	The shared norms and beliefs within the organization to embrace the commitment to social value creation through digital technologies, as introducing digital options, are often met with resistance.	"When things get difficult, which is often the case with DSI, the question is always: Why am I doing this? When motivation comes from within, organizations can handle complex situations more easily because the team wants to change the world positively". (E13)	Gierlich-Joas et al. (2020), Müller et al. (2019b), Wiesböck and Hess (2020)	Aksoy et al. (2019), Casale Mashiah et al. (2023), Dias et al. (2024), Divella and Sterlacchini (2021), Dopelt et al. (2023), Fellnhofer (2017), Herrera (2016), Ko et al. (2019), Metszősy (2020), Meyer and Hartmann (2023), Neumeier (2017), Oliveira and Sbragia (2012), Pearce and van Knippenberg (2023), Perrini et al. (2010), Petropoulou et al. (2022), Sanzo-Perez et al. (2015), Urban and Gaffurini (2017), Wirth et al. (2023)	Rodrigo and Palacios (2021)	E2, E4, E5, E6, E7, E10, E11, E13, E15, E18, E19, E20, E21
	Privacy and security	A	The careful consideration of data collection, acquisition, usage, storage, and sharing, with a strong emphasis on protecting personal and sensitive data to ensure compliance and prevent causing harm when addressing sensitive societal challenges.	"For example, if I offer a digital solution to support children experiencing domestic violence and make a mistake in data protection, I can quickly cause more harm than help. Since societal challenges are far more sensitive, organizations must put data protection and security first". (E12)	-	-	-	E1, E12
	Strategic alignment	A	The active promotion of DSI as an integrated part of the business strategy, IT strategy, and corporate social responsibility to merge organizational processes, digital technologies, and social responsibility activities to prevent mission drift.	"It is enormously important to commit to DSI strategically, take the social topic seriously, and not just let it run parallel to day-to-day business. If the strategic alignment to DSI is missing, employees will be burdened with day-to-day business, and DSI will not be actively fostered". (E10)	Johansson et al. (2020), Khin and Ho (2019), Khrais and Alghamdi (2022), Lyu et al. (2024), Shah et al. (2024), Shojaei and Burgess (2022), Svahn et al. (2017), Wiesböck and Hess (2020)	Alegre and Berbegal-Mirabent (2016), Battistella et al. (2021), Bright and Godwin (2010), Casale Mashiah et al. (2023), de Arruda Torresa (2017), de Medeiros et al. (2022), Deserti and Rizzo (2020), Fellnhofer (2017), Herrera (2015), Herrera (2016), Lu et al. (2023), Neumeier (2017), Pearce and van Knippenberg (2023), Perrini et al. (2010), Petropoulou et al. (2022), Pfitzer et al. (2013), Sigurdsson and Candi (2020)	-	E1, E2, E4, E5, E6, E7, E9, E10, E11, E12, E13, E14, E15, E17, E18, E19, E21
	Structures and processes	A	The clearly defined structures and processes harness digital technologies' iterative and constantly evolving process while aiming for long-term behavioral and structural change.	"Unlike conventional innovation, where success is often achieved after a short period, DSI often aims to change behaviors and local structures in the long-term. Accordingly, organizations	Del Giudice et al. (2021), Guinan et al. (2019), Johansson et al. (2020), Khrais and Alghamdi (2022), Müller et al. (2019a), Svahn et al. (2017), Wiesböck and Hess (2020)	Aksoy et al. (2019), Battistella et al. (2021), Battisti (2012), de Medeiros et al. (2022), Herrera (2015), Hillgren et al. (2011), Mair and Schoen (2007), Metszősy (2020), Meyer and Hartmann	-	E2, E4, E6, E8, E10, E11, E12, E14, E15. E18, E19, E21

			require clear structures and processes designed for the long-term". (E21)		(2023), Neumeier (2017), Pfitzer et al. (2013), Taneja et al. (2023)		
Environment	Top management support	A	The leadership's commitment to become familiar with digital technologies, effectively communicate their potential for social value creation to employees, and inspire a digital and social culture shift that includes lower risk aversion, incentives, organization decision-making, and talent development to support DSI efforts.	"If an organization decides to move more in the direction of social in its digital innovation department and the top management does not support this, it will not happen. At the same time, if top management is interested in it, it becomes much more exciting, which is also related to the empowerment of employees". (E17)	Al Issa and Omar (2024), Guinan et al. (2019), Johansson et al. (2020), Kohli and Melville (2019), Müller et al. (2019b), Shojaei and Burgess (2022), Wiesböck and Hess (2020)	Aksoy et al. (2019), Alegre and Berbegal-Mirabent (2016), de Medeiros et al. (2022), Deserti and Rizzo (2020), Erdiaw-Kwasie and Abunyewah (2024), Fellnhofer (2017), Golgeci et al. (2022), Halila and Rundquist (2011), Herrera (2016), Horte and Halila (2008), Hsu et al. (2019), Metszősy (2020), Najib et al. (2021), Neumeier (2017), Oliveira and Sbragia (2012), Pasricha and Rao (2018), Pearce and van Knippenberg (2023), Petropoulou et al. (2022), Westley et al. (2014)	-	E2, E5, E6, E7, E8, E10, E11, E13, E14, E15, E17, E18, E19, E21
	Beneficiary integration	A	The placement of beneficiaries at the center of the development process, involving them in co-creation and feedback cycles, understanding their comfort levels with digital technologies, and designing DSI that aligns with their specific context, culture, and needs to increase the adoption and generation of social value.	"You develop DSI because you want to generate impact. Moreover, you can only impact if the DSI is accepted and used in the market. Accordingly, you must put the beneficiary at the center". (E19)	Johansson et al. (2020), Xie et al. (2024)	Battisti (2012), Canestrino et al. (2019), Chalmers (2013), de Arruda Torresa (2017), Herrera (2015), Hillgren et al. (2011), Maclean et al. (2013), Mair and Schoen (2007), Nordberg et al. (2020)	-	E2, E3, E4, E5, E6, E7, E9, E10, E11, E12, E14, E16, E17, E18, E19, E20, E21
	Opportunity sensing	C	The continual analysis of the digital environment, market conditions, and distant knowledge domains to exploit emerging digital opportunities.	"Especially in the field of digital solutions, things happen very quickly. You must stay up to date because otherwise, another organization will be faster". (E20)	Carlan et al. (2017), El-Haddadeh (2020), Kohli and Melville (2019), Nylén and Holmström (2015), van Riel et al. (2004)	Aksoy et al. (2019), Alegre and Berbegal-Mirabent (2016), Chalmers (2013), de Medeiros et al. (2022), Dias et al. (2024), Dopelt et al. (2023), Halila and Rundquist (2011), Herrera (2015), Metszősy (2020), Pfitzer et al. (2013), Taneja et al. (2023), Weppen and Cochrane (2012)	-	E2, E4, E5, E6, E7, E8, E9, E10, E11, E17, E18, E20, E21
	Partner integration	A	The engagement of diverse experts from various disciplines, countries, and industries to address wicked societal challenges emphasizes the need for multidisciplinary inter-organizational cooperation, formal governance, and mutual trust among stakeholders to effectively manage and share data, knowledge, and resources.	"DSI often addresses complex systemic challenges you cannot tackle on your own, as many different actors are involved" (E20)	Carlan et al. (2017), Johansson et al. (2020), Meland et al. (2023), Shojaei and Burgess (2022), Svahn et al. (2017)	Aksoy et al. (2019), Alegre and Berbegal-Mirabent (2016), Battistella et al. (2021), Battisti (2012), Divella and Sterlacchini (2021), Herrera (2015), Herrera (2016), Horte and Halila (2008), Mair and Schoen (2007), Meyer and Hartmann (2023), Neumeier (2017), Petropoulou et al. (2022), Pfitzer et al. (2013), Phillips et al. (2019), Rauter et al. (2019), Wirth et al. (2023)	-	E1, E2, E4, E6, E7, E8, E10, E11, E12, E13, E14, E16, E17, E18, E19, E20, E21
	Societal problem understanding	C	The deep understanding of wicked societal challenges is needed before evaluating the potential of digital technologies to address their root effectively and not only alleviate symptoms.	"These wicked societal challenges are deeply rooted in society and some benefit from these circumstances. That is why societal challenges are so difficult to solve. Thus, in DSI development, organizations must be clear about the societal challenge they want to solve and understand why it is so wicked before talking about the possibilities of digital technologies". (E10)	-	-	-	E4, E8, E9, E10, E11, E13, E15, E16, E17, E19, E18, E21

*A = Asset, C = Capability

Table 5. Digital social innovation success factor overview

The DSF consists of the DSI success factors, moderating factors and DSI success (see Figure 6). The DSF goes beyond the DSI success factor overview and includes specific contexts that influence the identified success factors. Therefore, to ensure the success of DSI initiatives, organizations must account for specific moderating factors, such as the targeted SDG, organizational type, and overarching purpose, which influence the relationship between DSI success factors and the overall effectiveness of these initiatives.

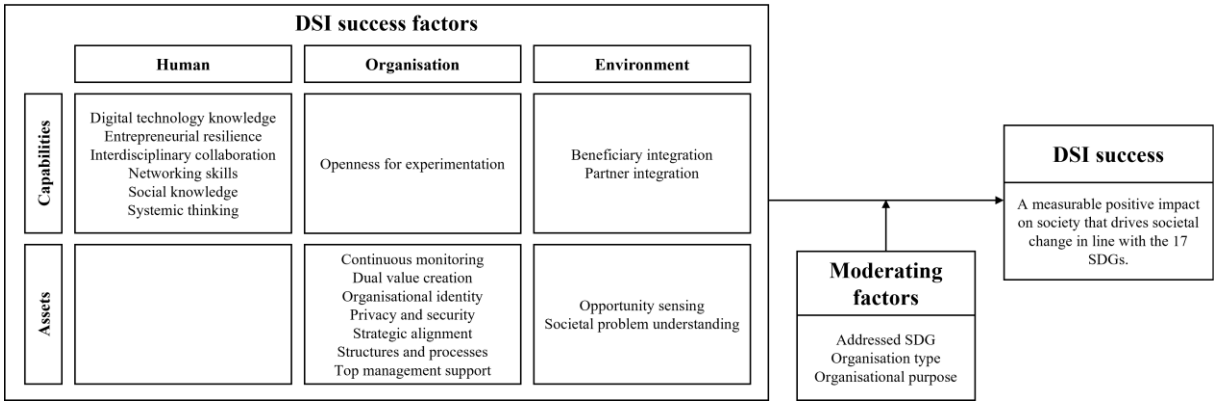

Figure 6. Digital social innovation success factor framework

Through the contributed DSF Research Paper #3 offers two theoretical implications. First, through expert interviews, Research Paper #3 provides an empirical foundation for advancing theoretical development in the field of DSI. Thus, researchers can further conceptualize DSI and elaborate on its distinctive characteristics and how they diverge from those associated with digital and social innovation. Second, as the results of Research Paper #3 represent a theory for analyzing, they build the foundation for higher-order theories such as theories for explanation, theories for prediction and explanation, and theories for design and action (Gregor, 2006). Furthermore, Research Paper #3 offers two practical implications. First, organizations can build on the DSF for operational support in developing DSI initiatives. Thus, the categories assist practitioners in structuring and comprehending the DSI development process, while the 18 success factors offer practical guidance through distinct measures for implementing DSI initiatives. Second, the results of Research Paper #3 underline that organizations should follow DSI as part of their strategic agenda. Therefore, the DSF supports practitioners in identifying the critical success factors necessary for developing DSI initiatives. It clarifies which existing resources to leverage and highlights areas where additional resources must be developed to ensure successful implementation.

Research Paper #4: Exploring Success Factors for Developing Citizen-Centric Digital Public Services - Insights from a Case Study

The widespread adoption of digital technologies presents significant opportunities for e-government to enhance service quality beyond fulfilling statutory obligations (Lindgren et al., 2019; Matheus et al., 2020). Realizing these opportunities necessitates the development of citizen-centric digital public services (CCDPS), i.e., services that harness digital technologies to deliver highly personalized and context-sensitive responses to citizens' needs (Lindgren et al., 2019). However, contemporary public services are typically designed with limited citizen involvement (Vries et al., 2016), leading to low user adoption (Holgersson et al., 2018) and, consequently, an underutilization of their potential to improve service quality (Rose et al., 2015). Thus, the public sector requires guidance in developing successful CCDPS, making identifying success factors essential (Benbunan-Fich et al., 2020). Using these success factors supports increased service quality and adoption by meeting the needs of citizens (Holgersson et al., 2018). Against this backdrop, Research Paper #4 asks: *What are success factors for the development of CCDPS?*

To answer the research question, Research Paper #4 conducted a single exploratory case study (see Figure 7) (Yin, 2009). CCDPS development is considered to be an IT project in broader terms. Thus, before conducting the case study, a conceptual foundation was built by identifying an initial set of success factors and respective categories for IT projects in the public sector through a structured literature review (vom Brocke et al., 2015; Webster and Watson, 2002). To identify relevant success factors and respective categories, the Web of Science Core Collection was searched with the search string (public sector OR public administration OR e-government OR eGovernment OR e-governance) AND success AND project AND (information AND (system* OR technolog*)) on title, abstract and keywords. The structured literature review and subsequent open and selective coding identified 39 success factors in four categories (Corbin and Strauss, 1990; Creswell, 2008; Wolfswinkel et al., 2013). The following exploratory case study was conducted in a medium-sized German region and consisted of data collection and analysis phases. Data was collected during more than 800 hours of fieldwork and through 9 semi-structured expert interviews. The case study, conducted over more than 16 months, examined a digital platform designed to facilitate citizen participation in regional life. The final set of success factors was identified through the subsequent open and axial coding (Corbin and Strauss, 1990; Creswell, 2008; Wolfswinkel et al., 2013).

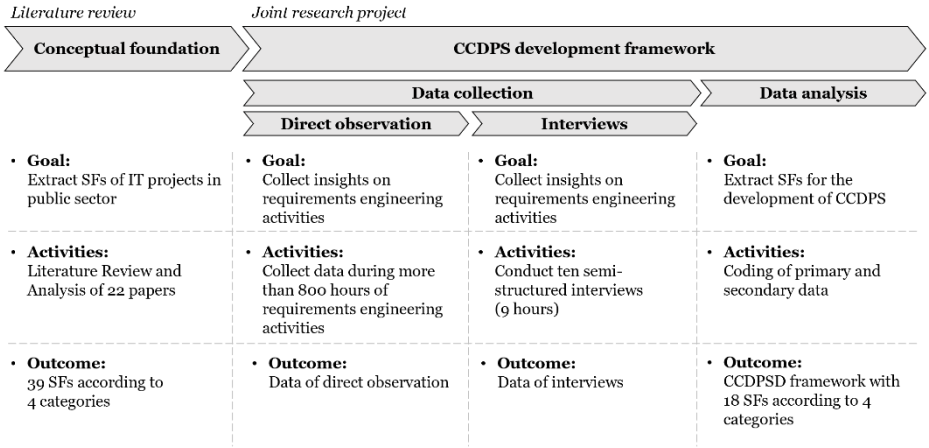

Figure 7. Case study research approach

The final CCDPS development framework consists of 18 success factors grouped into the four categories: strategy and objectives, citizen and stakeholder integration, development activities, and project management (see Table 6). The first category of **strategy and objectives** includes four success factors that refer to the importance of a project team having a joint strategy and joint commitment to the development of CCDPS (e.g., Capra et al., 2007; Edwita et al., 2017; Elkadi, 2013). The second category **citizen and stakeholder integration** contains six success factors and refers to the necessity for actively including citizens and stakeholders to understand their needs (e.g., Capra et al., 2007; Napitupulu, 2014; Petter et al., 2013). The third category **development activities** includes four success factors that pertain to the process- and project-related activities involved in the development of CCDPS (Napitupulu, 2014; Sharifi and Manian, 2010; Ziemba and Kolasa, 2016). The fourth category **project management** contains four success factors and refers to project management activities that lead to the successful development of CCDPS (e.g., Capra et al., 2007; Edwita et al., 2017; Guntur et al., 2018).

Dimension	Success Factor	Description	Operationalization
Strategy and Objectives	Innovation Ambition	The project's objective and the project team's underlying mindset of the project team is to develop an innovative service beyond statutory duties	• Project team is determined to develop something new – an innovation that is wanted by the citizens • Integration of external partner that has experience in developing innovation and fosters innovative mindset • Innovation is used as a rational in decisions
	Aligned Objectives	All project parties are involved in the definition of the project's strategy and objective	• Joint project kick-off with a clear statement of the goal • Joint meetings of the project team and team discussions to achieve a common goal • Usage of pictures, illustrations, prototypes so that everyone has the same understanding

Dimension	Success Factor	Description	Operationalization
	Continuous Commitment and Resource Availability	Project resources (e.g., funding) are constant even with a change of government	• Leadership within city is constantly informed of the project • Financial resources are available in a funding pot for municipal innovations and do not need to be raised before / throughout the project
	Transparency and Comprehensibility	Culture of sharing opinions, expectations, and objectives, and room for communication and discussions	• Open moderated discussions, where everyone can be honest • Distinct times in meetings for discussions
Citizen and Stakeholder Integration	Diverse Integration Levels	Stakeholders are integrated at various levels: Informative, Deciding, Operative collaboration	• Several formats for involving stakeholders: o operative: daily basis o deciding: weekly o informative: quarterly
	Access to Citizens	Stakeholders provide access to relevant citizen groups	• Involve stakeholders that have direct contact to citizens through their daily work
	Purpose-driven Integration	Integrate relevant citizen groups purposefully at specific points in the project	• Integrating citizens where suitable, e.g., as part of the ideation (what do they want?) or as part of the testing (do they like the innovation?)
	Empathic Approach	Understand citizens' contexts and perspectives, pains, and wishes; interact with citizens in the natural environment	• Workshops with citizens in their natural environment: School, Elderly Institution, Family Events etc. • Get to know citizens in their personal environment
	Outside-in Perspective	An external party provides an outside-in perspective to break through old barriers	• External perspectives are integrated through an external party or through citizen surveys
	Agreement on External Partners	Agreement of project team on external partners and tasks that are sourced to them	• Council involves external partners that have the needed expertise • Council objectively decides on an external party through a uniform and neutral procurement system
Development Activities	Citizen Modelling	Characterization of citizens via appropriate methods (e.g., persona design, customer journey design)	• Create personas of different citizen types • Conduct workshop with each citizen group • Develop customer journeys and requirements according to the different personas
	Need-centered Requirements Elicitation	Querying citizen about their needs, not specific software functions	• Ask questions: How do you want to (not) be informed, and not: Which function must be integrated?
	Feasibility Check	Select and prioritize requirements regarding feasibility; resolve contrary requirements and dependencies	• Not every requirement is possible regarding the public context
	Modular Requirements	Structure requirements in distinct modules for modular implementation	• Cluster requirements thematically, according to priorities
Project Management	Clear Roles and Responsibilities	Transparency in the team about roles and responsibilities	• Choose a responsible team member for project management activities who is the single point of contact

Dimension	Success Factor	Description	Operationalization
			• Assign roles according to the team member's strengths
	Anticipatory Project Management	Proactive project management adapts to changing internal and external conditions (e.g., early risk mitigation, project plan changes)	• Experienced project management reflects on possible risks and threats (e.g., through SWOT analysis) • Re-evaluate on identified risks and threats
	Continuous Evaluation	Conduct continuous project reviews with main stakeholders to evaluate the project's progress	• Have continuous meetings with the main stakeholders (e.g., once a month)
	Skill Diversity	The operating team has skills (e.g., domain knowledge, method knowledge) that are relevant to CCDPS development	• Staff the team with diverse skills • Use external parties with a complementing skill set

Table 6. CCDPS development framework

The CCDPS development framework offers a basis for understanding the measures required for the successful development of CCDPS. The framework serves as a guide for enhancing public services. The four deductively derived success factor categories result from a high-level analysis that supports the conceptualization of the CCDPS development process and highlights key focus areas applicable to public sector IT projects. The 18 identified success factors offer actionable practices to enable successful CCDPS development. Collectively, Research Paper #4 sets the foundation for future research on CCDPS development and innovation in public sector IT projects. Furthermore, practitioners can use the results of Research Paper #4 as guidance while developing CCDPS. While the four categories enable the structuration and understanding of the CCDPS development process, the success factors can be used for operational support in CCDPS development.

Research Paper #5: Know Your Worth – Resource-Centric Patterns for Creating Digital Social Innovation

Incumbent firms can build on their rich resource base (e.g., engaged employees, financial strengths, or established networks) to create impactful DSI initiatives (Grant, 1991; Oberländer et al., 2021; Yu and Hang, 2010). Thus, incumbent firms can leverage their existing assets with minimal effort, as innovative solutions often arise from the recombination of existing ideas and resources, unlocking substantial impact for DSI (Beverungen et al., 2018; Gassmann et al., 2013; Mulgan et al., 2007). However, incumbent firms currently have difficulties recognizing the potential of their existing resource base and understanding how to repeatedly and systematically leverage their resource base through digital technologies to create social and economic value (Bonina et al., 2021; Lock and Seele, 2017). Therefore, incumbent firms lack guidance on systematically creating DSI initiatives through leveraging and orchestrating their

rich resource base (Yu and Hang, 2010). Against this backdrop, Research Paper #5 asks the following research question: *What are resource-centric patterns of DSI initiatives?*

To answer the research question, Research Paper #5 conducts a cluster analysis following three steps (Field, 2013; Hair et al., 2010). First, 618 real-world DSI initiatives were collected from the 2018/2019 and 2021/2022 annual and corporate social responsibility reports of the 30 largest German and United States incumbent firms. Second, the collected real-world DSI initiatives were categorized along the dimensions of resources, purpose-related digital technology archetype, and SDG target. The dimension **resources** builds on Barney's (1991) categorization of resources. Therefore, the dimensions include the categories physical, social, and human. *Physical resources* include physical capital resources that encompass all tangible assets utilized by an incumbent firm, including buildings, factories, equipment, financial capital, access to (natural) raw materials, and digital technologies (Beheshti and Beheshti, 2010; Bosler et al., 2021; Jain et al., 2020; Wernerfelt, 1984). *Human resources* include human capital resources that relate to employees of incumbent firms and their skills, experience, judgement, knowledge, and insights within the incumbent firm for creating DSI initiatives (Dr et al., 2022; Kok and Uhlaner, 2001; Qian et al., 2017; Tarigan and Siagian, 2021). *Social resources* enhance Barney's (1991) view by contributing to the understanding of organizational capital resources by including social capabilities, i.e., utilizing internal and/or external relations (Jain et al., 2020; Tate and Bals, 2018). Due to digital technologies being an essential part of DSI initiatives, the dimension **purpose-related digital technology archetypes** was considered as a separate analysis dimension and not included in Barney's (1991) resources. The dimension builds on the categorization of Baier et al. (2023) by differentiating between connectivity & computation, platform provision, personal mobile communication, sensor-based data collection, actor-based data execution, analytical insight generation, self-dependent material agency, augmented interaction, and natural interaction. Finally, the dimension **SDG target** draws from the 17 SDGs categorized into the context of people, planet, peace, prosperity, and partnerships (Eichler and Schwarz, 2019; United Nations, 2015; Wu et al., 2018). After classifying the 618 real-world DSI initiatives, a cluster analysis was conducted (Field, 2013; Hair et al., 2010), resulting in eight resource-centric patterns of DSI (see Figure 8).

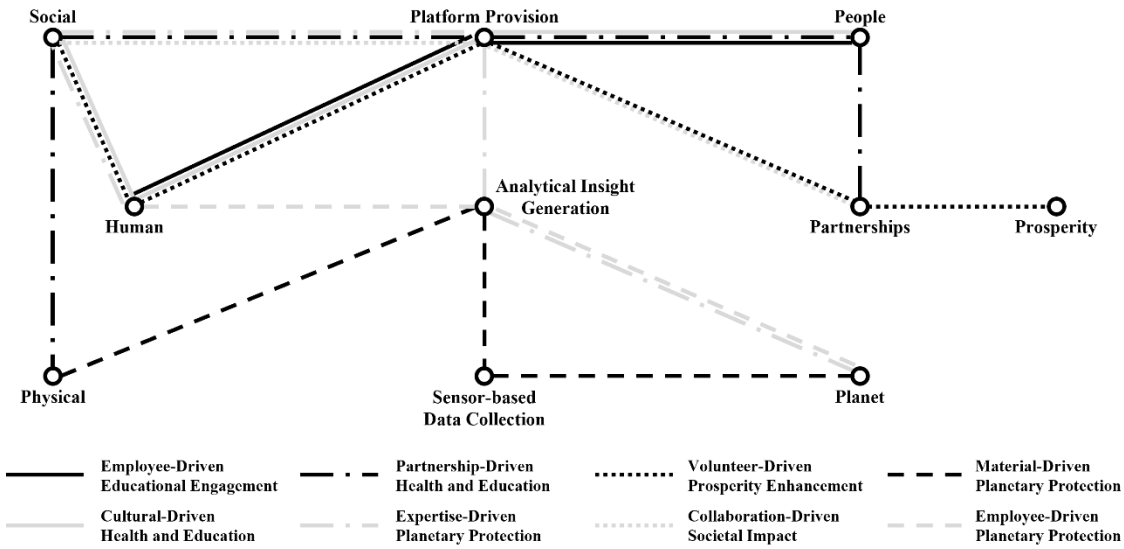

Figure 8. Digital social innovation pattern map

The pattern **Employee-Driven Educational Engagement** contains 110 real-world DSI initiatives and focuses on how the resource *human* can be leveraged with *platforms* to address the SDG target *people*. The pattern **Cultural-Driven Health and Education** consists of 151 real-world DSI initiatives and describes how *social* and *human* resources can be leveraged through the *provision of platforms* to address the SDG target *people*. The third pattern **Partnership-Driven Health and Education** contains 61 real-world DSI initiatives and centers on leveraging *social* and *physical* resources through *platforms* to address *people* and *partnerships*. The pattern **Expertise-Driven Planetary Protection** subsumes 98 DSI initiatives and describes how the digital technologies *platform provision* and *analytical insight generation* can leverage *social* and *human* resources to address the SDG target *planet*. The fifth pattern **Volunteer-Driven Prosperity Enhancement** includes 31 DSI initiatives and describes how *social* and *human* resources are leveraged through *platforms* to address the SDG target *partnerships*. The sixth pattern **Collaboration-Driven Societal Impact** includes 57 DSI initiatives and utilizes *platforms* to leverage *social* resources to address the SDG target *partnerships*. The pattern **Material-Driven Planetary Protection** contains 74 DSI initiatives and includes *physical* resources that are leveraged by the digital technologies *sensor-based data collection* and *analytical insight generation* to address the SDG target *planet*. The final and eighth pattern **Employee-Driven Planetary Protection** contains 36 DSI initiatives and describes leveraging *human* resources through the digital technology *analytical insight generation* to address the SDG target *planet*.

Research Paper #5 offers two theoretical implications. First, the DSI patterns advance existing research by providing the first comprehensive analysis of DSI through a resource-centric lens.

Thus, the results contribute to theory building within the emerging DSI research domain and help lay the groundwork for developing higher-order theories (Doty and Glick, 1994). Second, Research Paper #5 enables a resource-centric understanding of DSI. Therefore, the results contribute to the understanding of resources in the context of DSI by demonstrating how incumbent firms can strategically leverage their resource portfolios through purpose-related digital technology archetypes to systematically and reproducibly develop DSI initiatives aimed at achieving competitive advantage (Sirmon et al., 2011). Furthermore, Research Paper #5 offers two practical implications. First, the results support incumbent firms in using their existing resource base to develop DSI initiatives. Second, incumbent firms can use the developed DSI patterns as inspiration for creating DSI initiatives.

3 Digital Social Innovation Outcome

DSI outcomes build on Kohli and Melville's (2019) understanding of digital innovation outcomes and include new products, services, processes, or business models (Ciriello et al., 2018; Kohli and Melville, 2019; Nambisan et al., 2017; Vega and Chiasson, 2019). Organizations currently lack a unified understanding of DSI's characteristics and implementation possibilities. To address this gap, this dissertation outlines DSI's individual characteristics and implementation possibilities (Section III.3, Research Paper #6).

Research Paper #6: Doing Good by Going Digital: A Taxonomy of Digital Social Innovation in the Context of Incumbents

Given an incumbent firm's extensive structures, resources, networks, and digital capabilities, they have a responsibility to integrate DSI into their strategic agendas to fulfill their societal obligations (Arvidsson et al., 2014; Chen et al., 2010). Thus, incumbent firms can use DSI as a strategic instrument to address pressing societal challenges (Bonina et al., 2021; Chen et al., 2010; Gable, 2010; Kohli and Melville, 2019). Despite DSI becoming increasingly important in practice, research currently lacks a unified understanding of DSI and its underlying characteristics. DSI draws knowledge from digital and social innovation (Bonina et al., 2021; Dong and Götz, 2021) while entailing constitutive characteristics (see Table 7). Moreover, given the significant opportunities for incumbent firms to harness the potential of DSI, a unified understanding of DSI is essential for advancing scientific progress and practical application. First, it establishes a theoretical foundation that transcends individual DSI initiatives, thereby enabling further theorization. Second, a comprehensive understanding of DSI equips incumbent firms to fully realize DSI's potential and to align their IS and corporate strategies accordingly

(Arvidsson et al., 2014; Chen et al., 2010). Thus, Research Paper #6 poses the following research question: *What are the characteristics of DSI initiatives in the context of incumbents?*

Perspective	Digital innovation	Social innovation	Digital social innovation
Driver	Using digital technologies as a means or an end (Ciriello et al., 2018)	Tackling societal challenges (e.g., poor education, poor health, gender inequality, climate change) with more effective, efficient, sustainable, or just solutions (Eichler and Schwarz, 2019; Phills et al., 2008; Solis-Navarrete et al., 2021)	Using possibilities of DTs to tackle societal challenges (Bonina et al., 2021; Dong and Götz, 2021; Tim et al., 2021) Intrinsic motivation to do good and extrinsic motivation to leverage new market potentials through exploitation and/or exploration (Bonina et al., 2021)
Value focus	Economic value (Kohli and Melville, 2019; Vega and Chiasson, 2019)	Social value (Altuna et al., 2015; Phills et al., 2008; Solis-Navarrete et al., 2021)	Dual value creation: social value and economic value (Bonina et al., 2021)
Addressee	Especially addressing unmet market needs and consumer needs (Fichman et al., 2014; Lettice and Parekh, 2010)	Especially economically disadvantaged groups (Altuna et al., 2015; Dong and Götz, 2021; Phills et al., 2008)	Addressees independent of their societal backgrounds, i.e., addressing societal challenges from an incumbent's internal and external perspectives
Effects	Connecting people and products through DI (Battisti et al., 2022; Huber et al., 2019; Spagnoletti et al., 2015)	Creating new social relationships and collaborations through SI (Altuna et al., 2015; Eichler and Schwarz, 2019; Murray et al., 2010)	Connecting people or products through DSI initiatives (Foster and Heeks, 2013; Onsongo, 2019) Connecting people when developing DSI initiatives independent of time and place (Bria, 2015)

Table 7. Constitutive aspects of digital innovation, social innovation and DSI

To answer the research question, Research Paper #6 follows McKelvey's (1982) organizational systemics approach and develops a taxonomy of DSI initiatives in the context of incumbent firms and related clusters (Field, 2013; Hair et al., 2010; Nickerson et al., 2013). For the taxonomy development, Research Paper #6 follows the taxonomy development method by Nickerson et al. (2013) and applies two conceptual-to-empirical and two empirical-to-conceptual iterations (see Figure 9) until the defined ending conditions were met. For the conceptual-to-empirical iterations, a systematic literature review was conducted (Boell and Cecez-Kecmanovic, 2015). For the first iteration, titles within the Web of Science Core Collection with the search string "social innovation" were searched. The search string "digital innovation" was applied for the second iteration. After the first two iterations, the taxonomy was built using 17 papers. Both iterations were accompanied by the application of 29 real-world DSI initiatives drawn from the 2018 annual reports of the 30 largest German incumbent firms. This was done to ensure that the taxonomy represents characteristics of real-world objects (Oberländer et al., 2018).

Iteration	Approach	Objects	Number of dimensions / characteristics	Major changes	Ending conditions
1	Conceptual-to-empirical	29 DSI initiatives from German incumbents' annual reports	5 / 14	Adding 5 dimensions (Agent, Direction, Objective, Payoff, Target) and the various characteristics	× New dimensions or characteristics were added × Not comprehensive
2	Conceptual-to-empirical	29 DSI initiatives from German incumbents' annual reports	7 / 20	Adding 2 dimensions (Role of DT, Outcome) and the various characteristics	× New dimensions or characteristics were added
3	Empirical-to-conceptual	29 DSI initiatives from German incumbents' annual reports	6 / 18	Abandonment of the dimension *Direction*	× New dimensions or characteristics were added
4	Empirical-to-conceptual	296 DSI initiatives from the annual reports and CSR reports of German and U.S. incumbents	6 / 18	No further changes	✓All subjective and objective ending conditions were met

Figure 9. Iterations of the taxonomy development process

For the third iteration (empirical-to-conceptual), the 29 real-world DSI initiatives were analyzed and compared to the taxonomy for additional and dispensable dimensions or characteristics (Nickerson et al., 2013). The sample of real-world DSI initiatives was extended for the fourth and final iteration. Through analyzing the 2018 annual and corporate social responsibility reports of the 30 largest German and US incumbent firms, the sample was extended to 296 real-world DSI initiatives. Since all ending conditions were met after the fourth iteration, the taxonomy development process stopped (Nickerson et al., 2013). Building on this and following McKelvey's (1982) organizational systematics approach, the authors aimed to identify and understand typical configurations of DSI initiative characteristics that commonly co-occur in practice. Thus, a cluster analysis using the sample of 296 real-world DSI initiatives was conducted (Field, 2013; Hair et al., 2010). Applying agglomerative hierarchical clustering in the form of the Ward (1963) algorithm and using the Manhattan distance as a distance measure, 12 clusters were derived (Strauss and Maltitz, 2017).

The taxonomy comprises six dimensions (i.e., Agent, Objective, Payoff, Target, Role of Digital Technology, and Outcome) with 18 characteristics (see Figure 10). Four dimensions (i.e., Agent, Objective, Payoff, and Role of Digital Technology) are mutually exclusive, meaning only one characteristic is observed at a time. Two dimensions (i.e., Target and Outcome) are non-exclusive, which means that more than one characteristic is observed at a time.

The **Agent** dimension captures the collaborative setting in which an incumbent firm develops a DSI initiative - ranging from initiatives pursued independently (isolated) to those developed in collaboration with external partners (with partners) or facilitated entirely through external partners (through partners) (Caroli et al., 2018; Phillips et al., 2019; Sanzo et al., 2015). The **Objective** dimension addresses the DSI initiative's objective. It differentiates between the

exploration of new markets and new customers (exploration) or the exploitation of existing markets and existing markets (exploitation) (Benner and Tushman, 2003; Park et al., 2020).

DIMENSION	CHARACTERISTICS					GUIDING QUESTION
Agent	isolated	with partners	through partners			In what cooperation setting is the DSI initiative being developed?
Objective	exploration		exploitation			What is the DSI initiative's objective?
Payoff	direct		indirect			What is the payoff of the DSI initiative?
Target	people	planet	peace	prosperity	partnerships	Which social topic is being addressed by the DSI initiative?
Role of Digital Technology	enabler		supporter			What is the role of DT in the DSI initiative's outcome?
Outcome	device	network	service	content		What is the key DT layer in the DSI initiative's outcome?

Figure 10. Taxonomy of the incumbent firms' digital social innovation initiatives

The **Payoff** dimension refers to the financial effect generated by a DSI initiative. It distinguishes between initiatives that produce direct financial effects (direct) and those that yield indirect financial effects (indirect) (Baptista et al., 2019; Dawson and Daniel, 2010). The **Target** dimension refers to the social topic that is addressed by the DSI initiatives and differentiates between people, planet, peace, prosperity, and partnerships (Eichler and Schwarz, 2019; United Nations, 2015; Wu et al., 2018). The dimension **Role of Digital Technology** describes how digital technology is used within the DSI initiative. Digital technology can improve the DSI initiative through its usage (supporter), or the existence of the DSI initiative is dependent on the usage of the digital technology (enabler) (Benbasat and Zmud, 2003; Nambisan et al., 2017; Suseno and Abbott, 2021). Lastly, the **Outcome** dimension depicts the digital technology layer crucial to the DSI initiative (device, network, service, content) (Henfridsson et al., 2018; Yoo et al., 2010).

The 12 clusters of DSI initiatives describe the combination of different DSI initiatives' characteristics outlined in the taxonomy (see Table 8).

Six clusters describe DSI initiatives that are developed in isolation. The cluster **Isolated-Exploitation-Indirect-Supporter** includes DSI initiatives that address an incumbent firm's internal perspective, i.e., for instance, its employees, through enhancing employees' experiences. Digital technologies, such as platforms, support the DSI initiatives in this cluster. The cluster **Isolated-Exploitation-Direct-Enabler** exploits the incumbent firm's existing business model while gaining direct financial returns. Most of the digital technologies in this cluster operate autonomously and thus play a key role in the DSI initiative.

Cluster	n*	Agent	Objective	Payoff	Target	Role of DT	Outcome**	Brief description
Isolated-Exploitation-Indirect-Supporter	62 (21%)	isolated (100%)	exploitation (100%)	indirect (100%)	people (85%)	supporter (100%)	S / C (85% / 61%)	Related DSI initiatives are developed in **isolation**, **exploiting** existing markets and customers while generating **an indirect** payoff and using DTs as a **supporter**.
Isolated-Exploitation-Direct-Enabler	43 (15%)	isolated (100%)	exploitation (100%)	direct (100%)	planet (63%)	enabler (100%)	D / N / S / C (49% / 65% / 56% / 51%)	Related DSI initiatives are developed in **isolation**, **exploiting** existing markets and customers while generating a **direct** payoff and using DTs as **an enabler**.
Isolated-Exploration-Indirect-Supporter	15 (5%)	isolated (100%)	exploration (100%)	indirect (100%)	people (87%)	supporter (100%)	S / C (73% / 73%)	Related DSI initiatives are developed in **isolation**, **exploring** new markets and customers while generating an **indirect** payoff and using DTs as a **supporter**.
Isolated-Exploration-Direct-Enabler	11 (4%)	isolated (100%)	exploration (100%)	direct (100%)	planet (82%)	enabler (100%)	D / N / S / C (45% / 100% / 73% / 91%)	Related DSI initiatives are developed in **isolation**, **exploring** new markets and customers while generating a **direct** payoff and using DTs as an **enabler**.
Isolated-X-Indirect-Enabler	20 (7%)	isolated (100%)	exploitation (65%)	indirect (100%)	people / planet (50% / 50%)	enabler (100%)	S / C (80% / 60%)	Related DSI initiatives are developed in **isolation**, while generating an **indirect** payoff and using DTs as an **enabler**.
Isolated-X-Direct-Supporter	28 (9%)	isolated (100%)	exploitation (71%)	direct (100%)	planet (71%)	supporter (100%)	S / C (89% / 64%)	Related DSI initiatives are developed in **isolation**, while generating a **direct** payoff and using DTs as a **supporter**.
With Partners-X-Indirect-Supporter	30 (10%)	with partners (100%)	exploitation (70%)	indirect (100%)	people / partnerships (87% / 100%)	supporter (100%)	S / C (87% / 83%)	Related DSI initiatives are developed **with partners**, while generating an **indirect** payoff and using DTs as a **supporter**.
With Partners-X-Indirect-Enabler	11 (4%)	with partners (100%)	Exploration / exploitation (55% / 45%)	indirect (100%)	people / partnerships (73% / 100%)	enabler (100%)	D / N / S / C (18% / 45% / 91% / 91%)	Related DSI initiatives are developed **with partners**, while generating an **indirect** payoff and using DTs as an **enabler**.
With Partners-X-Direct-Supporter	11 (4%)	with partners (100%)	exploration / exploitation (45% / 55%)	direct (100%)	People / partnerships (82% / 100%)	supporter (100%)	S / C (64% / 91%)	Related DSI initiatives are developed **with partners**, while generating a **direct** payoff and using DTs as a **supporter**.
With Partners-X-Direct-Enabler	33 (11%)	with partners (100%)	exploration (73%)	direct (100%)	partnerships (100%)	enabler (100%)	D / N / S / C (30% / 58% / 79% / 73%)	Related DSI initiatives are developed **with partners**, while generating a **direct** payoff and using DTs as an **enabler**.
Through-Partners-X-Indirect-Supporter	13 (4%)	through partners (100%)	exploitation (69%)	indirect (100%)	people (92%)	supporter (100%)	S / C (92% / 85%)	Related DSI initiatives are developed **through partners**, while generating an **indirect** payoff and using DTs as a **supporter**.
Through Partners-X-X-Enabler	19 (6%)	through partners (100%)	exploration / exploitation (53% / 47%)	Direct / indirect (37% / 63%)	people (84%)	enabler (100%)	D / N / S / C (32% / 32% / 95% / 68%)	Related DSI initiatives are developed **through partners** and using DTs as an **enabler**.

Notes: * n = number of DSI initiatives; grey fields = distribution unambiguous; ** D = device, N = network, S = service, C = content.

Table 8. Clusters of digital social innovation initiatives

The cluster **Isolated-Exploration-Indirect-Supporter** explores new markets and new customers by targeting educational activities without aiming for direct financial effects. The cluster **Isolated-Exploration-Direct-Enabler** focuses on DSI initiatives with direct financial returns by employing innovative digital technologies that address ecological sustainability. The cluster **Isolated-X-Indirect-Enabler** subsumes DSI initiatives that have indirect financial effects. The digital technology enables the DSI initiatives and addresses ecological and social sustainability challenges while the incumbent firm is improving its position in its current market or exploring new markets. The cluster **Isolated-X-Direct-Supporter** includes DSI initiatives that are supported by digital technologies that address ecological sustainability challenges while generating direct financial effects.

Four clusters focus on developing DSI initiatives with partners, such as other incumbent firms or startups. The cluster **With Partners-X-Indirect-Supporter** offers DSI initiatives supported by digital technologies. The included DSI initiatives have indirect financial effects by exploiting the incumbent firm's current markets and customer base. The cluster **With Partners-X-Indirect-Enabler** uses digital technologies such as AI or software as enablers to exploit current markets or explore new markets while offering indirect financial effects. The cluster **With Partners-X-Direct-Supporter** contains DSI initiatives supported by digital technologies and have direct financial effects by exploiting current markets and exploring new markets. In contrast, the cluster **With Partners-X-Direct Enabler** includes DSI initiatives that are enabled by digital technologies and explore new markets.

Lastly, two clusters focus on DSI initiatives enabled through partnerships, i.e., through investments in start-ups or donating to Non-Governmental Organizations. The cluster **Through Partners-X-Indirect-Supporter** includes DSI initiatives that have indirect financial effects and utilize digital technologies as supporter. Digital technologies enable the DSI initiatives in the cluster **Through Partners-X-X-Enabler** and offer direct financial effects.

Research Paper #6 offers two theoretical implications. First, the taxonomy and clusters represent a theory for analyzing (Gregor, 2006). While the taxonomy enables the analysis of DSI initiatives individually, the clusters provide typical combinations of DSI initiatives that co-occur in practice. As theories for analyzing the taxonomy and clusters form the basis for theories for explaining, theories for predicting and theories for design and action (Gregor, 2006). Second, the research paper contributes to and extends the existing body of knowledge within the IS and social innovation disciplines. Thus, the findings are a foundational step toward enhancing the understanding and management of integrating social topics into digital

innovation efforts and harnessing the potential of digital technologies to advance social innovation. Furthermore, Research Paper #6 offers three practical implications. First, the findings can be used to structure the design space of current and future DSI initiatives. Second, incumbent firms can use the clusters as strategic implementation options to design their DSI initiatives. Third, the sample of 296 real-world initiatives can be used as inspiration for initiating and developing DSI initiatives.

4 Digital Social Innovation Environment

Drawing from Kohli and Melville's (2019) digital innovation framework, DSI actions are influenced by an organization's internal organizational and external competitive environment, including the ecosystem in which an organization operates. To date, research lacks an understanding of the broader systemic contexts of societal challenges in which digital technologies, and thus DSI efforts, are embedded. To address this gap, this dissertation investigates how a specific digital technology (i.e., AI) influences the system of a specific societal challenge (i.e., the system of deforestation) (Section III.4, Research Paper #7).

Research Paper #7: AI in the Web of Trees: A Systems Thinking Approach to Understanding How AI Affects Deforestation

Deforestation is one of today's most pressing societal challenges, as it is a prime emitter of CO2 emissions and thus drives climate change (Harris et al., 2021; UNEP, 2024). Digital technologies are essential for addressing this urgent challenge. One such digital technology is AI, a specific, general-purpose digital technology, which offers numerous opportunities to tackle societal challenges and deliver positive societal outcomes, including efforts to combat deforestation (Cowls et al., 2021). Current literature explores various applications of AI in addressing deforestation (e.g., Alshehri et al., 2023; Ball et al., 2022; Moreira et al., 2024; Neptune and Mothe, 2023). Despite these valuable contributions, there is currently a lack of understanding of how AI influences the whole system of deforestation. While AI has the potential to positively address the societal challenge of deforestation, it may also generate unintended negative consequences. For example, AI algorithms require substantial energy (Shankar and Reuther, 2022; Strubell et al., 2020), increasing energy demand, a known driver of deforestation (Geist and Lambin, 2002). Thus, even when AI effectively mitigates deforestation in specific contexts (e.g., managing forest fires), it might unintentionally exacerbate deforestation elsewhere (e.g., demand for energy leading to deforestation). Thus, to fully leverage AI's opportunities in addressing deforestation, it is essential to understand AI's systemic impact on the whole system of deforestation. Against this backdrop, Research Paper

#7 asks the following question: *How can AI impact the system of deforestation?*

To answer the research question, Research Paper #7 applies the concept of systems thinking, particularly the methodology of causal loop diagrams (CLDs) (Coletta et al., 2021; Haraldsson, 2004; Senge, 1990). Systems thinking is a holistic approach to problem-solving that focuses on recognizing patterns, interconnections, and relationships within complex systems (Haraldsson, 2004). CLDs are used within systems thinking to understand feedback loops and the overall behavior within a system. CLDs consist of variables, their relationships and their polarity (Coletta et al., 2021; Haraldsson, 2004). A polarity can be either a "+", meaning that the relationship moves in the same direction (i.e., the more of variable A, the more of variable B or the less of variable A, the less of variable B) or in an inverse direction (i.e., the more of variable A, the less of variable B or the less of variable A, the more of variable B) (Sterman, 2000). Research paper #7 follows a five-step methodological approach inspired by Alvarado et al. (2023) and Jalali and Beaulieu (2023) (see Figure 11). First, the system of deforestation was built by scanning grey literature, i.e., reports and websites from the UN Reducing Emissions from Deforestation and Forest Degradation (UN-REDD+) program, the UN Environmental Program (UNEP), the Food and Agriculture Organization (FAO) of the UN, the UN Development Programme (UNDP), the UN Forum on Forests (UNFF) and the Federal Ministry for Economic Cooperation and Development (BMZ). The variables, their relationships and polarity in the initial draft of the CLD were validated and extended with scientific literature.

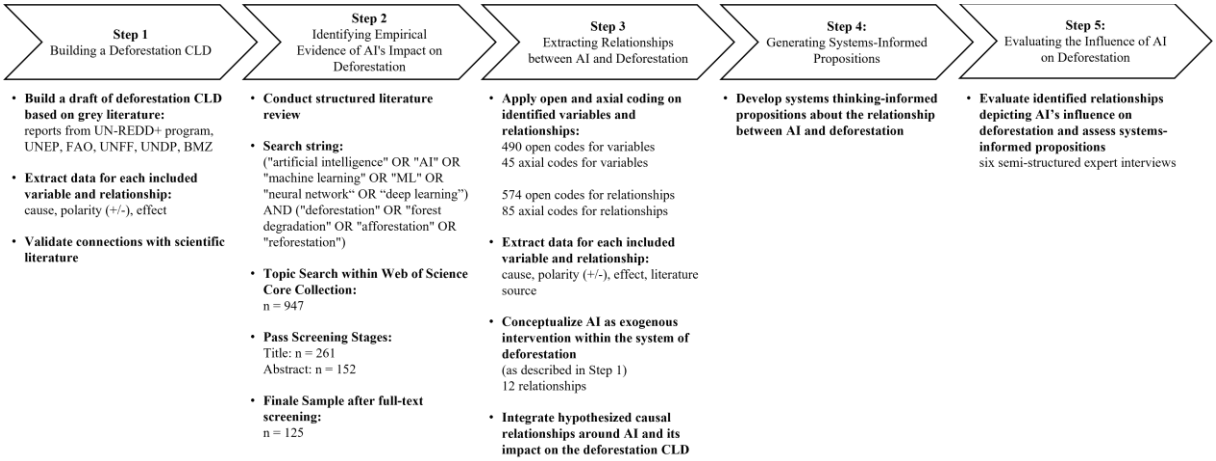

Figure 11. Methodological approach of Research Paper #7

Second, a structured literature review (Boell and Cecez-Kecmanovic, 2015) was conducted to understand AI's influence on the deforestation system. Using the search string ("artificial intelligence" OR "AI" or "machine learning" OR "ML" or "neural network" OR "deep learning") AND ("deforestation" OR "forest degradation" OR "afforestation" OR

"reforestation") on the topic search within Web of Science Core Collection and applying defined inclusion and exclusion criteria led to an initial sample of 947 papers. After title, abstract, and full-text screening, 125 papers remained. Third, the final sample of 125 papers was coded following the coding techniques by Wolfswinkel et al. (2013). Applying open and axial coding led to a final set of 45 variables and 85 relationships, whereas 84 of those relationships move in the same direction, and one relationship moves in an inverse direction. Further, 12 direct relationships were drawn depicting AI's influence on the system of deforestation (see Table 9). Fourth, based on the overall CLD, five systems-informed propositions were drawn that offer overarching insights into how AI impact the system of deforestation. Fifth, six semi-structured expert interviews (Myers and Newman, 2007) were conducted to validate the 12 relationships between AI and deforestation and the five systems-informed propositions.

The results of Research Paper #7 are an overarching CLD and systems-informed propositions. The CLD integrates the system of deforestation and AI's systemic effects and comprises 84 variables and 172 relationships, whereas 142 of those relationships move in the same direction and 30 in inverse directions.

Cause *(AI part)*	**Polarity**	**Effect** *(deforestation system)*
Alert to Legal Authorities	-	Forest Fires
Alert to Legal Authorities	-	Illegal Logging
Preventive Measures Against Forest Fires	-	Forest Fires
Preventive Measures Against Forest Disease	-	Forest Disease
Information on Afforestation Suitability	+	Resilience of Forest
Energy Demand	+	Demand for Energy Resources
Targeted Conservation Plans	-	Deforestation
Targeted Conservation Plans	+	Terrestrial Biodiversity
Mitigation Benefits (e.g., REDD+)	+	Local Economy
Strategies Against Landslides	-	Landslides
Impact of Landslides on Infrastructure	+	Infrastructure Development
Informed Decision-Making Regarding Climate Change and Sustainable Development	-	Climate Change

Table 9. Cause-and-effect relationships between AI and the system of deforestation

Within the overall CLD, three application scenarios can be derived, i.e., "the more AI, the better", "the more AI, the worse", and "the more AI, the greater the backfire". The scenario **"the more AI, the better"** includes balancing loops indicating that AI can contribute to fostering a more sustainable deforestation system, i.e., one where forest resources are used

within ecological boundaries, helping to prevent ecosystem destabilization due to overexploitation. One exemplary balancing loop is "Informed Decision Making Regarding Current Deforestation" (see Figure 12). Within this, AI is used to monitor the forest's current structure (variable: Information on Forest Structure) (e.g., Carter et al., 2024; Guhan and Revathy, 2024; Morford et al., 2024), which aids in deriving information on past and current deforestation (variable: Information on Past and Current Deforestation) (Carter et al., 2024; More et al., 2023; e.g., Wahab et al., 2021). This contributes to an understanding of what drivers cause deforestation (variable: Information on Drivers of Deforestation) (Noor et al., 2024; Zulfiqar et al., 2021), which helps decision-makers to adopt policies for the conservation of forests and the prevention of deforestation (variable: Informed Decision-Making Regarding Prevention of Deforestation) (Ball et al., 2022; Noor et al., 2024; Zulfiqar et al., 2021). This can lead to the adoption of targeted conservation plans (variable: Targeted Conservation Plan) (Moreira et al., 2024), mitigating deforestation (variable: Deforestation) (Expert 1-6). Data on deforestation feeds back into AI, which can restart the described cycle (e.g., Ramadan et al., 2024; Singh et al., 2022; Slagter et al., 2024).

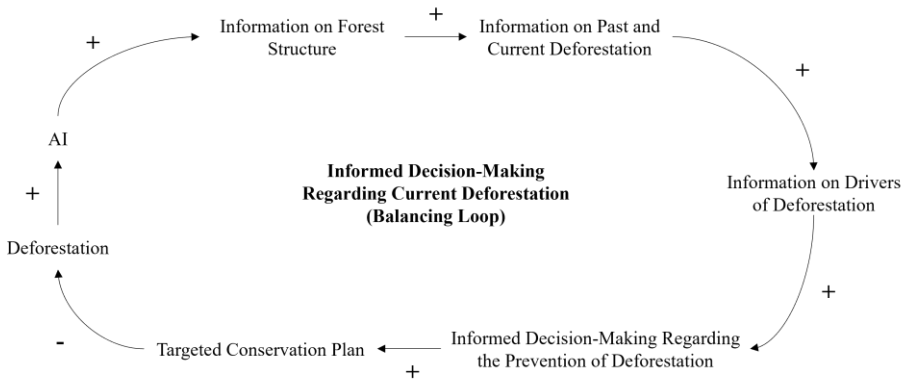

Figure 12. Balancing loop "Informed Decision-Making Regarding Current Deforestation"

The scenario **"the more AI, the worse"** reflects an immediate and direct negative effect on the system of deforestation. It includes the reinforcing loop "Heightened Demand for Energy" (see Figure 13). This loop outlines that AI (variable: AI) demands energy in its usage (variable: Energy Demand) (Shankar and Reuther, 2022; Strubell et al., 2020), which increases the demand for energy resources extracted from forests (variable: Demand for Energy Resources) (Expert 1-6), leading to more deforestation (variable: Deforestation) (Liu et al., 2017; Tran et al., 2023). Deforestation data is fed back into AI systems (variable: AI) (e.g., Ramadan et al., 2024; Slagter et al., 2024), restarting the outlined loop.

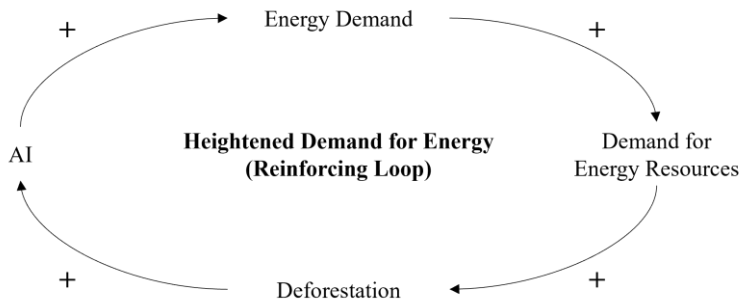

Figure 13. Reinforcing loop "Heightened Demand for Energy"

The scenario **"the more AI, the greater the backfire"** outlines an initial positive effect of AI on the system of deforestation. However, over time, these benefits can mask underlying structural dynamics, eventually leading to unintended negative consequences. One exemplary loop within this scenario is the reinforcing loop "From Mitigation Success to Ecological Overshoot" (see Figure 14). Within this loop, AI (variable: AI) helps to accurately account for carbon (variable: Accurate Carbon Accounting) (Mascaro et al., 2014; Sanderman et al., 2018), which supports the assessment of mitigation benefits (variable: Mitigation Benefits (e.g., REDD+)) (Angelsen, 2008; Hussin and Gilani, 2011). These mitigation benefits can positively contribute to local economies (variable: Local Economy) (Expert 1-6), which positively affects the livelihoods of local communities (variable: Livelihood of Local Community) (Cen and Yan, 2022). This leads to an increase in human health (variable: Human Health) (Cen and Yan, 2022; Ullah and Bavorova, 2024) and subsequently in the growth of the global population (variable: Global Population Growth) (Bongaarts, 2009), which increases the development of infrastructure (variable: Infrastructure Development) (Mahtta et al., 2022; UNEP et al., 2009) fostering further deforestation (variable: Deforestation) (e.g., Duke et al., 2014; Haq et al., 2024). Data on deforestation is then fed into AI systems (variable: AI) (e.g., Mascaro et al., 2014; Sanderman et al., 2018), restarting the outlined cycle.

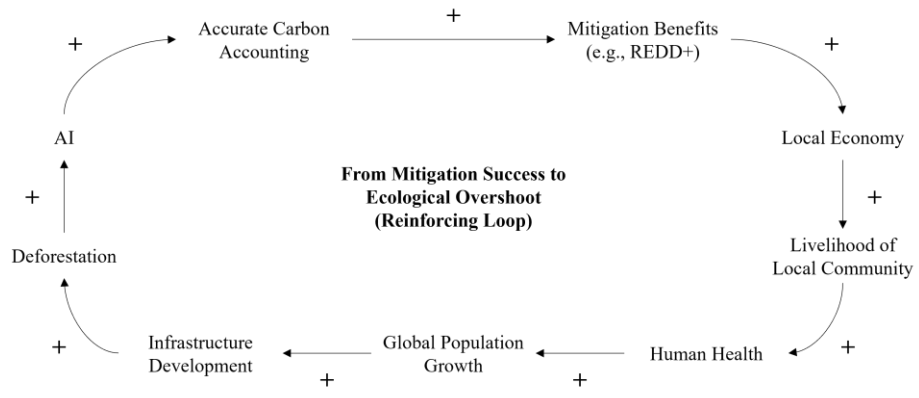

Figure 14. Reinforcing loop "From Mitigation Success to Ecological Overshoot"

Building on the developed CLD, five systems-informed propositions can be derived. Proposition 1, **"AI solutions mainly address the symptoms of deforestation rather than its root causes"**, outlines that current AI solutions function in isolation and focus on addressing deforestation's symptoms rather than its root causes. The proposition concludes that addressing deforestation's root causes is complicated but necessary to fully harness AI's potential in addressing deforestation. Proposition 2, **"AI solutions assist in informed decision-making regarding combatting deforestation"**, stresses that current AI solutions mainly deliver information that helps decision-makers integrate conservation plans to combat deforestation. The proposition concludes that greater value can be realized by advancing AI-driven decision-making from merely supporting decisions to actively generating policy recommendations and providing actionable guidance based on real-time insights. Proposition 3, **"AI can only unfold its potential in addressing deforestation when data quality is ensured"**, outlines the importance of data quality in AI systems to refrain from biased decision-making and false recommendations. The proposition concludes that AI can only reach its full potential in combatting deforestation when trained on high-quality, unbiased data and integrated into systems designed to monitor and address unintended feedback effects continuously. Proposition 4, **"AI can have negative consequences in combatting deforestation"**, sensitizes towards AI's potential negative effects on the system of deforestation with the example of AI's energy demand through training the AI system. The proposition concludes that each application of AI involves a trade-off between the continuance of training the AI algorithm and thereby increasing energy consumption or conserving energy by accepting the algorithm's current level of performance as adequate. The final and fifth proposition, **"AI can optimize locally and centered on specific needs, which might not lead to a destined outcome within the overall system"**, stresses that current AI solutions mainly focus on creating locally beneficial outcomes that might not align with the overall deforestation system. Proposition 5 concludes that while locally optimized AI solutions may effectively address specific causes or symptoms of deforestation, they may not be sustainable or beneficial at the system-wide level and could lead to unintended negative consequences. Therefore, AI interventions should be more holistically integrated and systemically aligned to support the optimization of the deforestation system.

Research Paper #7 offers two theoretical implications. First, the CLD of Research Paper #7 represents a "theory for explaining" (Gregor, 2006), building the foundation for comprehensive system dynamics models (Binder et al., 2004). Thus, the illustrated understanding of AI's influence on the deforestation system, as captured through the CLD, lays the conceptual foundation for developing dynamic scenarios within a comprehensive system dynamics model

of deforestation. Second, the results serve as a blueprint for investigating other digital technologies' influence on different societal challenges. Thus, research can build on the results of Research Paper #7 and, for example, explore how AI influences marine plastic pollution systems or how remote sensing technology addresses the system of biodiversity loss. Furthermore, Research Paper #7 offers three practical implications. First, organizations can use the findings to develop value-adding AI solutions to combat deforestation. Second, organizations can use the findings to assess the systemic consequences of their developed AI solutions. Third, the findings can inform policymakers to adopt incentives to build AI solutions that combat deforestation.

IV. Conclusion

1 Summary, Contributions and Implications

Considering today's societal challenges, DSI appears as a ray of hope in leveraging digital technologies to contribute to sustainable development (Bonina et al., 2021; Dong and Götz, 2021; Tim et al., 2021). Despite DSI becoming increasingly relevant in practice, research remains in its early stages. Thus, research currently misses an understanding of the overall structure and process of DSI and its underlying DSI actions, outcomes, and environments.

In response to these gaps, the dissertation contributes to the DSI field with two primary research objectives: (1) exploring the structural foundations of DSI and (2) examining the processual foundations of DSI in general and along its actions, outcomes, and environment.

First, the dissertation touches upon the overall structure of DSI with one research paper in Section II. Research Paper #1 conceptualizes DSI as consisting of the dimensions digital innovation, social innovation, and digital technologies. In doing so, a multi-dimensional framework is drawn that builds the basis for assessing prior contributions and identifying areas where further research is needed. The paper presents a research agenda for DSI research consisting of twelve research pathways that offer significant potential for future exploration. Research Paper #1 offers a nuanced and holistic perspective on DSI. The synergy between the proposed DSI research framework and the twelve identified research pathways establishes a solid foundation for future research within the evolving landscape of DSI.

Second, the dissertation touches upon the process of DSI with six research papers in Section III. These papers contribute to understanding the DSI process's foundations and the DSI actions, DSI outcomes, and the DSI environment intersecting with the broader sustainability pillars of people, planet, and profit.

Regarding *the foundations of the DSI process*, Research Paper #2 builds the DBF consisting of 28 barriers grouped into twelve categories and five main elements. Research Paper #2 extends Kohli and Melville's (2019) digital innovation framework to a DSI framework by including the societal environment. Along the DSI framework, Research Paper #2 investigates factors influencing the DSI process by identifying 28 barriers across its various stages.

Considering the *DSI actions*, Research Paper #3 builds a DSI success factor overview and the DSF. The DSI success factor overview includes 18 success factors across the three categories of human, organization and environment and specifies key action fields to develop DSI initiatives successfully. The DSF consists of the DSI success factors, moderating factors and

DSI success. The DSF goes beyond the DSI success factor overview and includes specific contexts that influence the identified success factors. Research Paper #3 offers an empirical foundation for advancing theoretical development in the field of DSI. Further, representing a theory for analyzing, Research Paper #3 builds the foundation for higher-order theories such as theories for explanation, theories for prediction and explanation, and theories for design and action (Gregor, 2006). Research Paper #4 builds the CCDPS framework consisting of 18 success factors grouped into the four categories of strategy and objectives, citizen and stakeholder integration, development activities, and project management. The CCDPS framework offers a basis for understanding the measures required to successfully develop CCDPS. Thus, Research Paper #4 sets the foundation for future research on CCDPS development and innovation in public sector IT projects. Research Paper #5 identifies eight resource-centric patterns of DSI that offer guidance on systematically creating DSI initiatives through leveraging and orchestrating an incumbent firm's rich resource base. With this, Research Paper #5 advances existing research by comprehensively analyzing DSI through a resource-centric lens. Therefore, the results contribute to theory building within the emerging DSI research domain and help lay the groundwork for the development of higher-order theories (Doty and Glick, 1994). Moreover, Research Paper #5 enables a resource-centric understanding of DSI. Therefore, the results contribute to understanding resources in the context of DSI by demonstrating how incumbent firms can strategically leverage their resource portfolios through purpose-related digital technology archetypes to systematically and reproducibly develop DSI initiatives aimed at achieving competitive advantage (Sirmon et al., 2011).

Considering *DSI outcomes*, Research Paper #6 follows McKelvey's (1982) organizational systemics approach and develops a taxonomy of DSI initiatives in the context of incumbent firms and related clusters (Field, 2013; Hair et al., 2010; Nickerson et al., 2013). The taxonomy and clusters represent a theory for analyzing and thus form the basis for theories for explaining, theories for predicting and theories for design and action (Gregor, 2006). Moreover, Research Paper #6 contributes to and extends the existing body of knowledge within the IS and social innovation disciplines.

Considering *DSI environment*, Research Paper #7 investigates how AI influences the system of deforestation. The paper applies systems thinking, particularly CLD, as a methodology (Coletta et al., 2021; Haraldsson, 2004; Senge, 1990). It contributes a comprehensive CLD that comprises 84 variables and 172 causal relationships that illustrate how AI influences the system of deforestation. Additionally, Research Paper #7 offers five systems-informed propositions with overarching insights into AI's influence on deforestation. Through its results, Research

Paper #7 contributes a theory for explaining (Gregor, 2006) by illustrating causal mechanisms. This lays the basis for system dynamics models and, thus, theories for prediction (Gregor, 2006). Further, the paper results can be used as a blueprint for understanding digital technologies' impact on specific societal challenges.

This dissertation contributes substantially to the emerging field of DSI by offering descriptive knowledge (Gregor and Hevner, 2013) and explanatory knowledge (Seidel and Watson, 2020). As for descriptive knowledge, the dissertation's Research Paper #1 through Research Paper #6 provide "what" knowledge that characterizes a natural phenomenon (i.e., DSI), identifying its underlying laws and regularities (Gregor and Hevner, 2013). Thus, these research papers contribute to or represent a theory for analyzing by analyzing and describing the phenomenon of DSI and what it constitutes in terms of its characteristics, resource-centric patterns, success factors, and barriers (Gregor, 2006). As for explanatory knowledge, the dissertation's Research Paper #7 specifies causal mechanisms (Seidel and Watson, 2020). Thus, Research Paper #7 represents a theory for explaining through explaining how and why specific phenomena occur, i.e., how a specific digital technology affects a specific societal challenge, analyzing the respective causal relationships (Gregor, 2006).

The theories for analyzing and explaining lay the groundwork for theories for predicting and theories for design and action (Gregor, 2006). As for theories for predicting, further research into the DSI phenomenon can use the dissertation's results to describe "what will be", thus forecasting future observations (Gregor, 2006; Seidel and Watson, 2020) by, for instance, investigating how the DSI phenomenon changes drawing prediction models for its success. As for theories for design and action, further research into the DSI phenomenon can use the dissertation's results to describe "how to do" things (Gregor, 2006; Gregor and Hevner, 2013) by for instance developing design principles that help to develop concrete DSI artefacts. Overall, the findings of this dissertation provide a foundation for future sense-making and design-led research on the DSI phenomenon (Gregor and Hevner, 2013).

2 Limitations and Future Research

As with any scholarly work, this dissertation is subject to certain limitations that open avenues for future research. This section offers a consolidated overview of the dissertation's overarching limitations, while specific limitations related to each research paper are discussed within the respective papers (see Appendix VI.3 to VI.9). Additionally, this section outlines directions for future research on the emerging phenomenon of DSI.

First, in exploring the *overall structure of DSI*, the dissertation provides valuable direction for future research. Research Paper #1 identifies twelve research pathways derived from synthesizing prior contributions and identifying research gaps. However, these pathways are not prioritized, nor are their interrelationships or dependencies examined. Thus, further research can prioritize these pathways while also incorporating a temporal lens to account for the evolving relevance of specific pathways over time.

Second, the dissertation advances understanding of the overall *processual structure of DSI* and of the *DSI actions* by offering descriptive insights into the development and implementation of DSI initiatives. Specifically, it outlines the overarching processual structure and its associated barriers (see Research Paper #2), identifies success factors (see Research Papers #3 and #4), and presents resource-centric design patterns (see Research Paper #5). While these findings offer valuable propositions, their explanatory power remains to be validated through quantitative methods. Future research could empirically assess the identified barriers, success factors, and patterns, for example, through survey-based studies.

Third, the dissertation contributes to understanding *DSI outcomes* by offering insights into DSI initiatives' dimensions, characteristics and typical combinations of the latter that co-occur in practice (see Research Paper #6). While these insights enhance our understanding of how DSI manifests in practice, they remain descriptive in nature. The dissertation does not explain the broader DSI phenomenon. Building on this foundation, future research should aim to develop prescriptive knowledge and revisit the proposed taxonomy and clusters - particularly considering the rapid evolution of digital technologies and the increasingly complex societal challenges they seek to address.

Fourth, the dissertation contributes to understanding the *DSI environment* by offering targeted insights into a specific DSI initiative, namely, the impact of AI on the system of deforestation (see Research Paper #7). This contribution provides explanatory insights into one facet of DSI by identifying causal mechanisms within a particular context. However, the dissertation does not examine how these causal relationships evolve over time. To address this gap, future research could develop quantitative models to simulate dynamic changes within the system, enabling a better understanding of how variables and causal relationships adapt in response to temporal and external influences.

In addition to the research opportunities stemming from the outlined limitations, this dissertation also contributes to broader avenues for future research in the field of DSI.

First, as highlighted in the Introduction, we remain far from achieving the UN's SDGs, essential for addressing today's most pressing societal challenges (United Nations, 2024). Therefore, further research is needed to explore how digital technologies can support progress toward each of the 17 SDGs, including how specific goals and their associated indicators can be advanced through DSI. Going further, integrating digital efforts with the SDGs should be deepened. Initial frameworks, such as the *Principles for Digital Development*, provide a valuable foundation in this direction. These principles guide policymakers, practitioners, and technologists striving to promote sustainable and inclusive development in an increasingly digital world. By using these principles as a compass, stakeholders can better ensure that digital initiatives are inclusive and equitable (The Digital Impact Alliance, 2025). Building on this foundation, there is an opportunity to derive actionable guidance that advances both academic research and practical advancements at the intersection of digital innovation and sustainable development.

Second, since DSI seeks to tackle wicked societal challenges spanning all 17 SDGs and, subsequently, the three pillars of sustainability (i.e., people, planet, profit), addressing these challenges is difficult since they are inherently complex, uncertain and ill-structured (Weber and Khademian, 2008). For instance, a ride-sharing app that reduces carbon emissions by promoting carpooling (supporting the "planet" pillar) might also lead to decreased income opportunities for traditional taxi drivers, potentially undermining aspects of social and economic well-being, thus affecting the "people" and "profit" pillars. Given the inherent complexity of these tensions, interdisciplinary collaboration is essential to advance DSI research. Similar to the field of *ICT for Development*, Walsham's (2012, p. 92) call to "include ethical goals and critical approaches, welcoming other disciplines with open arms" can be extended to DSI, emphasizing the need for cross-disciplinary research. Integrating perspectives from IS, ethics, and philosophy, in particular, can help evaluate how each sustainability dimension should be addressed and how they intersect, which will ultimately guide us toward ethically sound and socially responsible digital solutions.

Third, in addition to the contributions of various research disciplines required to address today's wicked societal challenges, there is a growing need for the deeper integration of systems thinking into DSI research. Addressing societal challenges is inherently difficult, and proposed solutions often fail to tackle their root causes. Instead, they tend to treat only the symptoms through "end-of-pipe" approaches (Haraldsson, 2004). To fully harness the potential of digital technologies in addressing such challenges, it is essential to understand their intended and unintended systemic impacts within these broader structures to ensure that digital solutions

contribute meaningfully and sustainably to addressing societal challenges. Future research should, therefore, place greater emphasis on incorporating systems thinking into DSI efforts.

Fourth, beyond the scope of DSI, the emerging field of Twin Transformation is rapidly gaining momentum. It emphasizes the simultaneous advancement of digital and sustainability transformations, arguing that digital transformation can enable sustainability transformation while sustainability transformation guides digital transformation (Christmann et al., 2024). DSI and Twin Transformation share a common objective: leveraging digital technologies to promote sustainable development (Bonina et al., 2021; Christmann et al., 2024). In this context, I view DSI initiatives as the foundational basis and practical implementations necessary to realize the broader vision of Twin Transformation. Despite their shared goals, these two research domains are rarely examined in relation to one another, and it remains unclear how they can mutually reinforce each other. For example, a comprehensive Twin Transformation strategy could provide the strategic alignment needed to embed DSI initiatives within organizations. At the same time, DSI can serve as a concrete means of operationalizing Twin Transformation goals. Therefore, further research is needed to explore the synergies between these fields and identify how insights from one can inform the other.

This dissertation provides the foundational groundwork for all of these outlined future research opportunities. As discussed in Section IV.1, the included research papers represent theories for analyzing and explaining, laying the basis for developing higher-order theories (Gregor, 2006). The conceptualization of DSI presented in Research Papers #2 to #6 offers a valuable starting point and a source of inspiration for exploring the integration of digital efforts with the SDGs. Furthermore, Research Paper #1 discusses research pathways that address tensions between competing sustainability goals, informing further research opportunities of DSI at the intersection with other research disciplines. Research Paper #7 contributes to integrating systemic perspectives within DSI research, while the dissertation as a whole offers a comprehensive understanding of DSI. This enables future research into DSI's intersection with Twin Transformation.

In summary, the dissertation offers valuable insights into the emerging phenomenon of DSI and serves as a springboard for future research. DSI represents a highly promising research domain and a key lever in addressing today's urgent societal challenges. Continued research is essential to fully harness the potential of digital technologies "to do good" and to further shape and advance the development of the DSI field.

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VI. Appendix

1 Index of Research Papers

Number of the Research Paper	Information on the Research Paper
#1	**Sustainable through digital – A research agenda for digital social innovation** **Krombacher, A.**, Lindenthal, A.-K., Schäfer, R., Oberländer, A. M. (2025). Sustainable through digital – A research agenda for digital social innovation. Conditionally Accepted: *Outlet hidden due to the double-blind review process of the journal* Earlier version published in Proceedings of the 30th European Conference on Information Systems (ECIS) 2022. https://aisel.aisnet.org/ecis2022_rp/39 (VHB-24: A (Proceedings), VHB-JQ3: B)
#2	**Barriers along the digital social innovation process: A structured literature review** Buck, C., Kempf, L., Kneissel, K., **Krombacher, A.** (2023)**.** Barriers along the digital social innovation process: A structured literature review. Proceedings of the 18th International Conference on Wirtschaftsinformatik. https://aisel.aisnet.org/wi2023/60 (VHB-24: B (Proceedings), VHB-JQ3: C)
#3	**Making the most of digital social innovation: An exploration into success factors** Buck, C., Heim, L., Körner-Wyrtki, K., **Krombacher, A.**, Röglinger, M. (2025). Making the most of digital social innovation: An exploration into success factors. Journal of Business Research. https://doi.org/10.1016/j.jbusres.2025.115215 (VHB-24: B, VHB-JQ3: B, IF: 10.5)
#4	**Exploring success factors for developing citizen-centric digital public services - Insights from a case study** Körner-Wyrtki, K., Buck, C., **Krombacher, A.**, Röglinger, M. (2024). Exploring success factors for developing citizen-centric digital public services - insights from a case study. Electronic Government, an International Journal. https://doi.org/10.1504/EG.2024.140777 (VHB-24: -, VHB-JQ3: -, IF: -)
#5	**Know your worth – Resource-centric patterns for creating digital social innovation** Buck, C., Heidenreich, T., Heim, L., **Krombacher, A.**, Weissmann, H. (2025). Know your worth – Resource-centric patterns for creating digital social innovation, Major Revision: *Outlet hidden due to the double-blind review process of the journal*
#6	**Doing good by going digital: A taxonomy of digital social innovation in the context of incumbents** Buck, C., **Krombacher, A.**, Röglinger, M., Körner-Wyrtki, K. (2023). Doing good by going digital: A taxonomy of digital social innovation in the context of incumbents. The Journal of Strategic Information Systems. https://doi.org/10.1016/j.jsis.2023.101806 (VHB-24: A, VHB-JQ3: A, IF: 8.7) Earlier version published in Proceedings of the 28th European Conference on Information Systems (ECIS) 2020. https://aisel.aisnet.org/ecis2020_rp/87 (VHB-24: A (Proceedings), VHB-JQ3: B)

Number of the Research Paper	Information on the Research Paper
#7	**AI in the web of trees: A systems thinking approach to understanding how artificial intelligence affects deforestation** **Krombacher, A.**, Buck, C., Heim, L., Röglinger, M. (2025). AI in the web of trees: A systems thinking approach to understanding how artificial intelligence affects deforestation. Under Review: *Outlet hidden due to the double-blind review process of the journal*

2 Individual Contribution to the Included Research Articles

This cumulative dissertation includes seven research papers, which were all written with multiple co-authors. The following section outlines the paper settings and describes my individual contribution to each paper. The explanations follow the contributor roles taxonomy (CRediT) by Allen et al. (2019).[1]

Research Paper #1 *Sustainable through digital – A research agenda for digital social innovation* (Krombacher et al. (2025); Section II) was written in a team of four co-authors. I contributed to the paper through the study's conceptualization, i.e., in formulating the overarching research goals and aims. Additionally, I was involved in data curation (i.e., in the structured literature review, coding, and expert interviews), writing parts of the original draft as well as the revised version. In sum, I was involved in each part of the paper. As a team, we agreed that we all contributed to this research paper in equal parts.

Research Paper #2 *Barriers along the digital social innovation process: A structured literature review* (Buck et al. (2023a); Section III.1) was written in a team of four co-authors. I contributed to the conceptualization of the research project. In addition, I mainly contributed through the review and editing of the original manuscript as well as during the revision process through overtaking a supervising role. As a team, we agreed that we all contributed to this research paper in equal parts.

Research Paper #3 *Making the most of digital social innovation: An exploration into success factors* was written in a team of four co-authors (Buck et al. (2025); Section III.2). I contributed to the conceptualization of the research paper. Moreover, I contributed through reviewing and editing the original manuscript as well as taking over a supervising role for the original draft.

[1] Allen, L., O'Connell, A., & Kiermer, V. (2019). How can we ensure visibility and diversity in research contributions? How the Contributor Role Taxonomy (CRediT) is helping the shift from authorship to contributorship. Learned Publishing, 32(1), 71-74.

In addition, I contributed to the data curation, writing parts of the manuscript as well as reviewing and editing the manuscript during the revision process. In sum, I was involved in each part of the paper. As a team, we agreed that we all contributed to this research paper in equal parts.

Research Paper #4 *Exploring success factors for developing citizen-centric digital public services - Insights from a case study* (Körner-Wyrtki et al. (2024)); Section III.2) was written in a team of four co-authors. I was involved in the conceptualization of the research paper and writing parts of the original manuscript as well as assisting in data curation. Moreover, I was involved in the review and editing process of the original draft. Additionally, I was responsible for reviewing and editing the manuscript during the revision process. I acted as a subordinate author on this manuscript.

Research Paper #5 *Know your worth – Resource-centric patterns for creating digital social innovation* (Buck et al. (2025); Section III.2) was written in a team of four co-authors. I was involved in the conceptualization of the research paper and writing parts of the original draft. Moreover, I was involved in data curation and responsible for investigation (i.e., carrying out the cluster analysis). Furthermore, I overtook a supervising role in the beginning of the research project. In sum, I was involved in each part of the paper. As a team, we agreed that we all contributed to this research paper in equal parts.

Research Paper #6 *Doing good by going digital: A taxonomy of digital social innovation in the context of incumbents* (Buck et al. (2023b); Section III.3) was written together in a team of four co-authors. I contributed to the conceptualization of the research paper. Moreover, I was responsible for the investigation (i.e., data collection) as well as data curation (i.e., taxonomy development and cluster analysis). Moreover, I played a key role in writing the original draft as well as in revising the manuscript. In sum, I was involved in each part of the manuscript. As a team, we agreed that we all contributed to this research paper in equal parts.

Research Paper #7 *AI in the web of trees: A systems thinking approach to understanding how artificial intelligence affects deforestation* (Krombacher et al. (2025)); Section III.4) was written in a team of four co-authors. Being the lead author, I had a main role in initiating and driving the entire research project. I was responsible for the conceptualization of the research paper. Moreover, I was responsible for investigation (i.e., conducting the structured literature review, applying the methodology of CLDs and expert interviews) and data curation. Furthermore, I was responsible for writing and editing the original draft. I acted as the lead author, while the other three co-authors acted as subordinate authors.

3 Research Paper #1: Sustainable through digital – A research agenda for digital social innovation

Authors:

Anna Krombacher, Anna-Katharina Lindenthal, Anna Maria Oberländer, Ricarda Schäfer

Conditionally accepted:

Outlet hidden due to double-blind review process of the journal

Extended Abstract:

Digital Social Innovation (DSI) has a tremendous potential to "do good" while also creating economic value by leveraging digital technologies to address societal challenges (Bonina et al., 2021). DSI is an emerging phenomenon, with scholarly work explicitly using this term only beginning to appear in recent years (e.g., Bonina et al., 2021; Dong and Götz, 2021; Rodrigo et al., 2022). While the specific term and conceptualization of DSI are relatively recent, the underlying idea of leveraging digital technologies to address societal challenges is not new. It has been explored across various research disciplines under diverse terminologies. Thus, additional literature exists at the intersection of digital innovation and social innovation, with different terms being used in the respective areas, such as digital eco-innovation, green information and communication technologies (ICTs), or information technology (IT)-enabled social innovation (Butler and Hackney, 2015; Carberry et al., 2019; Gogan et al., 2020). Consequently, the fragmentation of existing research across multiple disciplines makes it challenging to capture the richness of prior work and to assess the current state of DSI research comprehensively. Therefore, research needs to identify the key dimensions that constitute DSI, synthesize prior contributions across diverse disciplines and terminologies, and, based on these insights, outline future research pathways to advance the development of the DSI field. Against this backdrop, the research paper investigates the following research question: *What are critical DSI research pathways?*

To answer the research question, the research paper follows a two-step approach: 1) development of a research agenda for DSI using a structured literature review following Boell and Cecez-Kecmanovic (2015), 2) evaluation, discussion, and extension of the research agenda based on conducted semi-structured expert interviews (Myers and Newman, 2007). The search strings used in the first step of the research approach were developed by integrating a range of terms associated with conceptualized DSI dimensions, i.e., social innovation, digital innovation, and digital technologies. After searching and selecting the literature, the findings of the final pool of 135 papers were summarized by coding the research objective of each

research paper along the conceptualized DSI dimensions: social innovation (people, planet, profit), digital innovation (actions, outcome, environment), digital technologies (digital technologies as a means, digital technologies as an end) (Stock et al., 1996; Wolfswinkel et al., 2013). In the second step, 10 expert interviews with Information Systems scholars specializing in DSI or one of the intersecting domains (e.g., digital innovation) were conducted to evaluate and extend the proposed research agenda (Myers and Newman, 2007).

As a result, the study extracts six research clusters in which the 135 research articles were classified, i.e., Digital Technologies as a Means and Actions, Digital Technologies as a Means and Outcome, Digital Technologies as a Means and Environment, Digital Technologies as an End and Actions, Digital Technologies as an End and Outcome, Digital Technologies as an End and Environment. Further, the research paper proposes 12 research pathways based on the analysis of the 135 studies, their classification into the six research clusters, and a detailed review of their contributions. The research pathways form a comprehensive research agenda with substantial potential for future exploration. Building on the findings, the research paper further discusses five overarching, recurring themes: 1) DSI ecosystems, 2) DSIs potential conflicts and synergies between sustainability dimensions, 3) DSI's integration into different contexts and environments, 4) Role of data within DSI, and 5) The assessment of DSI success.

The research paper builds upon the foundational contributions of Qureshi et al. (2021) and Bonina et al. (2021) and advances their work by offering a more nuanced and holistic perspective on DSI. The research paper findings establish a solid foundation for future research within the evolving landscape of DSI. The DSI research agenda marks a shift toward a more structured and mature engagement with DSI. Furthermore, the five overarching themes offer valuable theoretical perspectives to guide future DSI research. The research paper provides practical implications by equipping practitioners with a deeper understanding of DSI's relevance, thereby providing a foundation for observing, measuring, analyzing, and managing key aspects of DSI.

Keywords:

Digital Social Innovation, Literature Review, Research Agenda, Sustainability

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4 Research Paper #2: Barriers along the digital social innovation process: A structured literature review

Authors:

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https://aisel.aisnet.org/wi2023/60

Abstract:

Digital social innovation (DSI) is an emerging phenomenon drawing knowledge from digital innovation (DI) and social innovation (SI), offering opportunities to contribute to societal change by leveraging the potential of digital technologies. Although DSI has evoked increasing interest, research and practice are far from realising its full potential as many barriers arise along the DSI process. Thus, holistic insights into DSI process and its barriers are essential. Therefore, we identify barriers along the DSI process through a structured literature review considering DI, SI, and DSI literature. As a result, we identified 28 barriers and classified them into the DSI barrier framework. The DSI barrier framework builds on the DI framework of Kohli and Melville (2019) and extends it by including the societal environment. We thus shed light on the DSI process and provide holistic insights into the barriers along the DSI process.

Keywords:

Digital Social Innovation, Digital Innovation, Social Innovation, Barriers

5 Research Paper #3: Making the most of digital social innovation: An exploration into success factors

Authors:

Christoph Buck, Laura Heim, Katrin Körner-Wyrtki, Anna Krombacher, Maximilian Röglinger

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Abstract:

Digital social innovation (DSI) is an emerging phenomenon that leverages digital technologies to address societal challenges. With the growing interest of customers, employees, and investors in societal challenges, as well as the availability and affordability of digital technologies, DSI gains importance for organisations to achieve long-term success. Although DSI has evoked increasing interest, research and practice are far from realising the potential of DSI as guidance on its successful development is missing. To minimise the risk of failure and fully exploit the benefits of DSI, this research explores DSI success factors based on a systematic literature review and explorative interview. Building on these valuable insights, we present the DSI success factor framework (DSF) consisting of 18 DSI success factors in three categories, moderating factors, and the DSI success. The DSF con-tributes descriptive knowledge on DSI development and is a foundation for further research while inspiring practitioners to successfully develop DSI.

Keywords:

Digital Social Innovation, Digital Innovation, Social Innovation, Success Factors. Systematic Literature Review, Interview Study

6 Research Paper #4: Exploring success factors for developing citizen-centric digital public services - Insights from a case study

Authors:

Katrin Körner-Wyrtki, Christoph Buck, Anna Krombacher, Maximilian Röglinger

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Electronic Government, an Internatioanl Journal. 20(5). 591-620 (2024). DOI:

10.1504/EG.2024.140777

Abstract:

Digital technologies open opportunities to use e-government to increase service quality beyond statutory duties. However, most digital public services are not designed to be citizen-centred, i.e., personalised to the heterogeneous range of citizens' needs. Hence, public sector organisations do not tap the full service quality potential, and research and practice alike require guidance on developing citizen-centric digital public services (CCDPS). This article provides success factors for CCDPS development using an exploratory case study. Building on a deductively derived conceptual foundation on the success factors of information technology projects for public sector organisations, we conducted a 16-month case study investigating a German region's CCDPS development project. This led to the empirically compiled framework for CCDPS development, which comprises 18 success factors. Our work provides guidance and a blueprint for CCDPS development using the success factors from our explor-atory case study.

Keywords:

Citizen-Centric Digital Public Service, Digital Service, E-Government, Requirements Engineering, Service Innovation, Success Factors, IT Project

7 Research Paper #5: Know your worth – Resource-centric patterns for creating digital social innovation

Authors:

Christoph Buck, Tim Heidenreich, Laura Heim, Anna Krombacher, Hannah Weißmann

Major Revision:

Outlet hidden due to double-blind review process of the journal

Extended Abstract:

Incumbent firms can build on their rich resource base (e.g., engaged employees, financial strengths, or established networks) to create impactful digital social innovation (DSI) initiatives (Grant, 1991; Oberländer et al., 2021; Yu and Hang, 2010), i.e., initiatives that leverage digital technologies to address societal challenges (Bonina et al., 2021). Thus, incumbent firms can leverage their existing assets with minimal effort, as innovative solutions often arise from the recombination of existing ideas and resources, unlocking substantial impact for DSI (Beverungen et al., 2018; Gassmann et al., 2013; Mulgan et al., 2007). However, incumbent firms currently have difficulties recognizing the potential of their existing resource base and understanding how to repeatedly and systematically leverage their resource base through digital technologies to create social and economic value (Bonina et al., 2021; Lock and Seele, 2017). Therefore, incumbent firms lack guidance on systematically creating DSI initiatives through leveraging and orchestrating their rich resource base (Yu and Hang, 2010). Against this backdrop, the research paper asks the following research question: *What are resource-centric patterns of DSI initiatives?*

To answer the research question, the research paper conducts a cluster analysis following three steps (Field, 2013; Hair et al., 2010). First, 618 real-world DSI initiatives were collected from the 2018/2019 and 2021/2022 annual and corporate social responsibility reports of the 30 largest German and United States incumbent firms. Second, the collected real-world DSI initiatives were categorized along the dimensions of resources, purpose-related digital technology archetypes, and Sustainable Development Goal (SDG) target. The dimension resources builds on and extends Barney's (1991) categorization of resources and includes the categories of physical, social, and human resources. The dimension purpose-related digital technology archetypes builds on the categorization of Baier et al. (2023) and differentiates between connectivity & computation, platform provision, personal mobile communication, sensor-based data collection, actor-based data execution, analytical insight generation, self-

dependent material agency, augmented interaction, and natural interaction. The dimension SDG target draws from the 17 SDGs and distinguishes between people, planet, peace, prosperity, and partnerships (Eichler and Schwarz, 2019; United Nations, 2015; Wu et al., 2018). Third, a cluster analysis was conducted (Field, 2013; Hair et al., 2010).

Based on the cluster analysis, eight resource-centric DSI patterns were extracted that describe which resources can be leveraged with which digital technologies to address different SDGs: 1) Employee-Driven Educational Engagement, 2) Cultural-Driven Health and Education, 3) Paternship-Driven Health and Education, 4) Expertise-Driven Planetary Protection, 5) Volunteer-Driven Prosperity Enhancement, 6) Collaboration-Driven Societal Impact, 7) Material-Driven Planetary Protection, 8) Employee-Driven Planetary Protection. For instance, the first pattern Employee-Driven Educational Engagement focuses on how the resource human can be leveraged with platforms to address the SDG target people. As another example, the fifth pattern Volunteer-Driven Prosperity Enhancement describes how social and human resources are leveraged through platforms to address the SDG target partnerships.

Building on the results, the research paper offers two theoretical implications. First, the DSI patterns advance existing research by providing the first comprehensive analysis of DSI through a resource-centric lens. Thus, the results contribute to theory building within the emerging DSI research domain and help lay the groundwork for developing higher-order theories (Doty and Glick, 1994). Second, the research paper enables a resource-centric understanding of DSI. Therefore, the results contribute to the understanding of resources in the context of DSI by demonstrating how incumbent firms can strategically leverage their resource portfolios through purpose-related digital technology archetypes to systematically and reproducibly develop DSI initiatives aimed at achieving competitive advantage (Sirmon et al., 2011). Furthermore, the research paper offers two practical implications. First, the results support incumbent firms in using their existing resource base to develop DSI initiatives. Second, incumbent firms can use the developed DSI patterns as inspiration for creating DSI initiatives.

Keywords:

Digital Innovation, Social Innovation, Digital Social Innovation, Resources

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8 Research Paper #6: Doing good by going digital: A taxonomy of digital social innovation in the context of incumbents

Authors:

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Abstract:

Digital social innovation (DSI) offers incumbents a strategic field of action to leverage the opportunities of digital technologies to address pressing societal challenges. By proposing a taxonomy and 12 clusters of incumbents' DSI initiatives based on a sample of 296 real-world objects, we develop a unified under-standing of DSI and its characteristics. This lays the foundation for further theorising on DSI from an incumbent perspective and for researchers to shape the DSI field. The taxonomy provides incumbents with an orientation to realise DSI's rich strategic potentials throughout the DSI ideation process and in assessing DSI types.

Keywords:

Digital Innovation, Social Innovation, Digital Social Innovation, Taxonomy, Cluster Analysis

9 Research Paper #7: AI in the web of trees: A systems thinking approach to understanding how AI affects deforestation

Authors:

Anna Krombacher, Christoph Buck, Laura Heim, Maximilian Röglinger

Under Review:

Outlet hidden due to double-blind review process of the journal

Extended Abstract:

Deforestation is one of today's most pressing societal challenges, as it is a prime emitter of CO2 emissions and thus drives climate change (Harris et al., 2021; UNEP, 2024). Digital technologies are essential for addressing this urgent challenge. One such digital technology is Artificial Intelligence (AI), a specific, general-purpose digital technology which offers numerous opportunities to tackle societal challenges and deliver positive societal outcomes, including efforts to combat deforestation (Cowls et al., 2021). Current literature explores various applications of AI in addressing deforestation (e.g., Alshehri et al., 2023; Ball et al., 2022; Moreira et al., 2024; Neptune and Mothe, 2023). Despite these valuable contributions, there is currently a lack of understanding of how AI influences the whole system of deforestation. While AI has the potential to positively address the societal challenge of deforestation, it may also generate unintended negative consequences. Thus, to fully leverage AI's opportunities in addressing deforestation, it is essential to understand AI's systemic impact on the whole system of deforestation. Against this backdrop, the research paper asks the following question: *How can AI impact the system of deforestation?*

To answer the research question, the research paper applies the concept of systems thinking, particularly the methodology of causal loop diagrams (CLDs) (Coletta et al., 2021; Haraldsson, 2004; Senge, 1990), following five steps. First, the system of deforestation was built by scanning grey literature, i.e., reports and websites from different institutions such as the United Nations Reducing Emissions from Deforestation and Forest Degradation program. In doing so, the research paper extracted variables, their relationships, and their polarity for an initial draft of the deforestation CLD. Scientific literature validated and extended the initial draft of variables, relationships, and polarity. Second, a structured literature review (Boell and Cecez-Kecmanovic, 2015) was conducted to understand AI's influence on the deforestation system, resulting in a final pool of 125 papers. Third, the final sample of 125 papers was coded following the coding techniques by Wolfswinkel et al. (2013), resulting in a final set of 45

variables and 85 relationships. Further, 12 direct relationships were drawn depicting AI's influence on the system of deforestation. Fourth, based on the overall CLD, five systems-informed propositions were drawn that offer overarching insights into how AI impacts the system of deforestation. Fifth, six semi-structured expert interviews (Myers and Newman, 2007) were conducted to validate the 12 relationships between AI and deforestation and the five systems-informed propositions.

The results of the resarch paper are an overarching CLD and systems-informed propositions. The CLD integrates the system of deforestation and AI's systemic effects and comprises 84 variables and 172 relationships, whereas 142 of those relationships move in the same direction and 30 in inverse directions. Within the overall CLD, three application scenarios can be derived, i.e., "the more AI, the better", "the more AI, the worse", and "the more AI, the greater the backfire". These application scenarios provide insights into how AI can either "mitigate" or "exacerbate" deforestation. Based on these insights, the following five systems-informed propositions were derived: 1) AI solutions mainly address the symptoms of deforestation rather than its root causes, 2) AI solutions assist in informed decision-making regarding combatting deforestation, 3) AI can only unfold its potential in addressing deforestation when data quality is ensured, 4) AI can have negative consequences in combatting deforestation, 5) AI can optimize locally and centered on specific needs, which might not lead to a destined outcome within the overall system.

The research paper offers two theoretical implications. First, the CLD represents a "theory for explaining" (Gregor, 2006), building the foundation for comprehensive system dynamics models (Binder et al., 2004). Thus, the illustrated understanding of AI's influence on the deforestation system, as captured through the CLD, lays the conceptual foundation for developing dynamic scenarios within a comprehensive system dynamics model of deforestation. Second, the results serve as a blueprint for investigating other digital technologies' influence on different societal challenges. Furthermore, the research paper offers three practical implications. First, organizations can use the findings to develop value-adding AI solutions to combat deforestation. Second, organizations can use the findings to assess the systemic consequences of their developed AI solutions. Third, the findings can inform policymakers to adopt incentives to build AI solutions that combat deforestation.

Keywords:

AI, Deforestation, Systems Thinking, Causal Loop Diagram

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