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Creating Digital Sustainability

Organizational Practices and Conditions for Sustainable Development

Sara Bomark

UMEÅ UNIVERSITY

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Abstract

Contemporary organizations are currently exploring the possibilities of using digital technologies for business benefits while meeting external and internal demands for increased sustainability (George et al., 2021). Emerging at the intersection of these somewhat contradictory objectives, practitioners have recently recognized digital sustainability as a potential solution to their, and ultimately ours, sustainability problems. In the information systems (IS) field, digital sustainability has been identified as an opportunity for IS sustainability scholars to contribute to the organizational push towards a digitalization and sustainability convergence. By focusing on how to leverage digital technologies for sustainability purposes, this discourse assumes that IS sustainability research will make a positive contribution to sustainable development (Kotlarsky et al., 2023). While the encouraging findings of this one-sided exploration might encourage organizations to pursue digital sustainability in practice, this dissertation argues that it might also expose organizations to the risk of prioritizing the opportunities of digitalization (Chatterjee & Sarker, 2024) while ignoring the contradictions, tensions and challenges that also comes with the organizational pursuit for digital sustainability (Schoormann et al., 2025).

This dissertation identifies this one-sidedness as a research limitation in the digital sustainability discourse. To remedy this gap in literature, and consistent with recent calls for research (Veit & Thatcher, 2023; Fors et al., 2024), this dissertation adopts a nuanced and holistic sustainability lens to advance our current understanding of the opportunities and challenges that comes with digital sustainability. In addition, this dissertation adopts an explorative and interpretative research approach to explore digital sustainability in practice. By drawing upon the findings of an extensive literature review and four empirical case studies, this dissertation makes the following research contributions. Firstly, this dissertation presents a new definition for digital sustainability. Secondly it develops an integrated, holistic and non-technology-deterministic sustainability lens for IS sustainability research. Thirdly, it presents four characteristics of digital sustainability practices and the organizational conditions that supports them. Finally, it presents a sustainability-first approach to move beyond a digital first agenda in research and in practice. Accordingly, this dissertation advances our understanding of digital sustainability on an organizational level and provides new and important insights for IS sustainability scholars and practitioners.

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Preface

This dissertation consists of a cover chapter and five appended papers reporting on a literature review and three empirical case studies. The papers are placed directly after the cover chapter. The papers included in this compilation thesis are:

Article I: Bomark, S., & Karlsson, M. (2024). The foundations of digital sustainability: A rhetorical analysis of core assumptions in Green IT and Green IS discourse, submitted to *IRIS 2024*.

Article II: Saarikko, T., Bomark, S., Lundström, A., Brunklaus, B., & Chiew, Y. L. (2023). The trash is always greener on the other side: A life cycle assessment of IoT implementation, *AMCIS 2023 Proceedings*.

Article III: Bomark, S., & Westergren, U. H. (2024). Digital sustainability projects: Organizational convergence of digitalization and sustainability outcomes, *ICT4S 2024 Proceedings*.

Article IV: Bomark, S., Öbrand, L., & Westergren, U. H. (2025). Paper was never the problem: The paperless idea as a persistent symbol for organizational digitalization and sustainability, *HICSS 2025 proceedings*.

Article V: Öbrand, L., & Bomark, S. (2025). Making sense of digital sustainability: Bounded rationality in digitalization management practices. Submitted to *Information Systems Practice Journal*.

1. Introduction

In 2015, the 196 parties of the United Nations (UN) Climate Change Conference made anthropogenic (i.e., human created) climate change an international priority by issuing the Paris Agreement. The treaty declared that climate change represented a threat to human and planetary wellbeing and that the world was facing a global climate crisis (see also IPCC, 2023). Accordingly, the 196 countries signing the treaty were required to take immediate action against climate change. In addition to this call for urgent and global action, the General assembly of the UN (2015) also presented 17 sustainable development goals (SDGs) to guide a simultaneous effort to address other interrelated, environmental and socio-economic issues, such as poverty, inequalities and environmental degradation, while limiting global warming to 2 °C degrees above pre-industrial levels.

Together, the UN and the IPCC urged societies, organizations and individuals to achieve a systemic, far-reaching, deep and rapid change in the structures, operations and livelihoods of people to create steep reductions in global GHG emissions before the end of 2040. For society to navigate this shift, and create long-lasting change, stakeholders from different societal levels (e.g., policy makers and households) have been asked to create a positive change across three overlapping dimensions of sustainability: social, environmental and economic (Purvis et al., 2019). These outcomes are expected to be created through processes of sustainable development (Ruggerio, 2021) – a development which was famously defined by the World Commission on Environment and Development (WCED) in 1987 as "*to meet the needs and aspirations of the present without compromising the ability to meet those of the future*" (§49).

On a societal level, sustainable development is epitomized by policymakers through an operationalization of SDGs (Purvis et al., 2019). This operationalization presents a challenging undertaking for policymakers since each SDG symbolizes a grand challenge that is not easily solved by a single nation or stakeholder, especially not when two or more grand challenges are to be solved together (George et al., 2016). In addition to being a representation of grand challenges, the SDGs are also designed to create increased sustainability within each of the three dimensions of sustainability: social, environmental, and economic (Purvis et al., 2019). As a result, policymakers need to identify synergies between

goals from different sustainability dimensions and present policy measures that stimulate these synergies while avoiding trade-offs.

On an individual level, sustainable development is characterized by people's ideas and beliefs about sustainability and how these can be translated into action. As opposed to the societal level, this presents a cognitive and affective challenge for individuals whose main contribution to the SDGs lies in changed behaviors. The cognitive and affective challenge presents a complication for people's commitment to sustainable development since sustainability can be interpreted differently (Purvis et al., 2019. For instance, sustainability can have different connotations depending on how it is defined (LéLé, 1991) and people's attitudes towards sustainability can vary depending on people's perceptions, emotional engagement, personal experiences, and supposed risk of being subject to e.g., climate hazards (Weber, 2010) which is often complicated by the global, abstract, slow and indirect threat that these grand challenges often represent (Bouman et al., 2020).

On an organizational level, sustainable development is embodied as the organization's ability to increase its sustainability performance while continuing to deliver value to its stakeholders over time (Hart, 1997; Dyllick & Hockerts, 2002). As opposed to the societal and individual levels, sustainable development presents an operational challenge for organizations since the aim of long-term sustainability questions established ways of doing business (Ergene et al., 2021). For instance, previous research has shown that sustainability presents a new dominant logic for organizations (Watson et al., 2012) and that organizations are expected to become the antidote for the sustainability problems that human societies are facing (Hart, 1997). This paradigm shift will inevitably question the very existence of some organizations (Ergene et al., 2021), while forcing others to reduce their environmental and social burden (Dyllick & Hockerts, 2002) and creating new pathways for sustainable development on a societal and an individual level (Elliot, 2011).

Connected to the latter, organizations have been identified as an important intermediary for sustainable development (UNDESA, 2022; Melville, 2010). For instance, the UN has highlighted the pivotal role of local authorities in developing sustainable cities, while highlighting businesses as an important source for sustainable consumer goods and services that allow for customers to make more sustainable choices (UN, 2015; UNDESA, 2022). However, in order for organizations to establish this position, they must incorporate sustainability goals into their

business strategies, develop new capabilities (Dyllick & Hockerts, 2002) and adopt new organizational practices and technologies to put their sustainability ambitions into action (Hart, 1997). Recognizing that this push towards sustainable development must be facilitated on multiple societal levels at once, policymakers and researchers have identified pervasive digitalization as a pivotal tool for societies, organizations and individuals worldwide to bring about sustainable development (UN Trade and Development, 2024; Sachs et al., 2019). To boost organizations in this direction, policymakers have issued new legislation and guidelines to stimulate a responsible and inclusive twin transition, also known as the pursuit and creation of digital sustainability (UN Trade and Development, 2024).

1.1 Research problem and research question

On a policy level, digital sustainability has been introduced as a way to leverage the positive societal changes that digitalization has created and ease the negative sustainability impact that comes with continued digitalization (Muench et al., 2022). As opposed to the policy level, however, practitioner-oriented outlets, such as Forbes and MIT Sloan, have frequently depicted digital sustainability as a new business opportunity. For instance, it has been associated with the potential to create more efficient and sustainable operations (Binder & Wade, 2024), increased revenues, improved reputation (Eastwood, 2025) and better customer experiences (Critchley, 2023). These benefits are often linked to the strategic application of digital technologies in a user phase (see, e.g., Binder & Wade, 2024; Eastwood, 2025) and rarely encompass the negative sustainability impact of digitalization in other life-cycle phases. This one-sided focus is problematic since it makes the business opportunities of digital sustainability a primary concern for practitioners (Chatterjee & Sarker, 2024) while reducing the complexity that inevitably comes with acknowledging the “dark side” of digital sustainability (Muench et al., 2022; Schoormann et al., 2025).

While practitioners pursue digital sustainability for business advantages, the information systems (IS) discipline has recently been introduced to digital sustainability as an important opportunity for IS scholars to contribute to the political and industrial surge for digital sustainability (Kotlarsky et al., 2023; Rosati et al., 2024). This research typically identifies digital technologies as a positive force to be reckoned with and is considered by many to be a potential solution to our sustainability problems (see, e.g., Pan et al., 2022; Kotlarsky et al., 2023; Sekulic, 2024;

Crome et al., 2024). In general, this research has also presented findings in support of this idea. For instance, digitalization has been identified as a tool for organizations to operationalize the SDGs into actionable targets (Ribeiro et al., 2021), to monitor and analyze data for corporate sustainability reporting (Krasikov & Legner, 2023), to simultaneously increase the operational and sustainability performance of an organization (Sekulic, 2024), to develop more sustainable work practices (Seidel et al., 2013), and to create alternative pathways for sustainability across different societal levels (Corbett et al., 2023; Crome et al., 2024).

Despite having presented encouraging findings, digital sustainability research has typically mirrored the one-sided focus on business benefits that has also dominated in the practitioner-oriented discourse. As previously stated, this is problematic since a one-sided exploration can leave organizations toothless once the tensions, contradictions and unintended consequences of the organizational pursuit for digital sustainability begin to arise (Schoormann et al., 2025). Indeed, previous research suggests that digitalization can have adverse effects on sustainability if the environmental costs and potential pitfalls of digitalization are not carefully managed (Hilty, 2008; Sachs et al., 2019). Previous research also suggests that the organizational pursuit for digital sustainability is not a trivial one since digitalization is contested with challenges, such as continued exploitation of natural resources (Fors et al., 2024; Aanestad et al., 2024), rebound effects (Hilty, 2008; Veit & Thatcher, 2023) and greenwashing (Elliot & Webster, 2017).

Recognizing that digital sustainability is an emergent and multifaceted phenomenon with contradictory features, this dissertation seeks to advance our current understanding of digital sustainability at the intersection of these contradictions. In line with recent suggestions, this dissertation identifies the one-sided focus of the current discourse as a research limitation that deserves further investigation (Chatterjee & Sarker, 2024). For this purpose, this dissertation will be exploring the digital sustainability discourse and its antecedents, i.e., the Green IT and Green IS discourse (Kotlarsky et al., 2023), from a nuanced and holistic sustainability perspective (Veit & Thatcher, 2023; Schoormann et al., 2025). Following this conceptual exploration, this dissertation will also explore how organizational stakeholders create digital sustainability in practice. For this purpose, this dissertation will be studying stakeholders' actions and the conditions that support these practices (Corbett et al., 2023). To guide this empirical investigation, this dissertation asks the following research question: *How can organizational conditions for digital sustainability practices be created and sustained?*

1.2 Chapter overview

This dissertation is structured as follows.

Chapter 1: Has introduced the challenges of sustainable development and identifies digitalization as a potential solution to sustainability problems. By placing a special emphasis on the organizational level, Chapter 1 has also identified digital sustainability as a challenging undertaking for contemporary organizations and an emergent research phenomenon in IS research that requires further investigation.

Chapter 2: Reviews the literature on sustainable development, sustainability, Green IT, Green IS and digital sustainability. It also develops a sustainability lens for IS sustainability research and identifies the research limitations that this dissertation will be addressing and how this dissertation closes these gaps in research.

Chapter 3: Outlines the reasons for empirically exploring digital sustainability from a practice perspective.

Chapter 4: Outlines the philosophical assumptions and methodological considerations that underlie this research.

Chapter 5: Presents the article summaries of the appended papers (Articles I-V).

Chapter 6: Presents the research contributions of this dissertation and provides some recommendations for future research.

Chapter 7: Concludes this dissertation work.

Chapter 8: Reflects upon the problem of e-waste and how to address it in digital sustainability research and introduces a new research concept: toxic digitalization.

2. Digitalization and sustainability

The previous chapter introduced the concept of sustainability and sustainable development in a political context by describing how the UN adopted the Paris Agreement and the SDGs to reduce environmental degradation and social injustice. Following this brief introduction, the previous chapter also introduced the three dimensions of sustainability and sustainable development. So far, however, this dissertation has not described the distinction between these concepts, nor how these concepts have been used in the IS literature. As such, the first aim of this chapter is to clarify what sustainability and sustainable development is by providing a general overview of their antecedents and central concepts. Secondly, this chapter presents a literature review and a synthesis of IS sustainability research to describe the research limitations that this dissertation will be addressing.

2.1 Sustainability and sustainable development

Sustainability and sustainable development, although sometimes used interchangeably in the literature (Purvis et al., 2019), are generally thought of as two separate concepts with different historical and political roots (Mebratu, 1998; Purvis et al., 2019) as well as different linguistic properties and connotations (LéLé, 1991; Mebratu, 1998). For instance, one form of sustainability can be traced back to indigenous traditions where the idea of "living in harmony with nature and in society" (p. 498) has formed the foundation on which indigenous people have developed their societies for hundreds of years (Mebratu, 1998). While the modern concept of sustainability emerged in the 17th century when forestry experts began to discuss the long-term use of forestry resources in Europe (Scoones, 2007). Around the same time, an early antecedent of sustainable development was also coined by economists who, in the wake of industrialization, began to discuss "environmental limits" to economic and social growth in relation to soil erosion (Mebratu, 1998). These problems were, however, resolved through technical innovations, such as the development of fertilizers. As a result, the economists' predictions of environmental limits were temporarily pushed forward into the future (Mebratu, 1998).

Much later, in 1972, a group of scientists, managers and industrialists, also known as the Club of Rome, published their report: "Limits to Growth" (Pezzoli, 1997). As opposed to the observations of problems being resolved

in the 17th century, this report revealed that environmental degradation and social injustice were worsening on a global scale. Based upon these findings, the report also predicted that "*the industrial society was going to exceed most of the environmental limits within matter of decades*" (Mebratu, 1998, p. 501). In 1987, the concepts of sustainability and sustainable development also found their way into the public discourse through the publishing of the WCED report: "Our Common Future" (Mebratu, 1998; Scoones, 2007; Purvis et al., 2019). In their report, the WCED stated that sustainability was to be achieved through sustainable development and famously defined the latter as the development that "*meets the needs of the present without compromising the ability of future generations to meet their own needs*" (§49). More specifically, sustainable development was to be understood as a global change process in which wealthy nations were to assist "less" wealthy nations to advance their economic and societal structures, and by extension, achieve a state of human and environmental wellbeing.

The WCED report, often taken as a starting point for the contemporary discourse on sustainability and sustainable development (see, e.g., Mebratu, 1998; Hilty, 2008; Purvis et al., 2019), initiated what has later become known as the Rio process and the first Earth Summit conference arranged by the UN in 1992 which resulted in the Rio Declaration and Agenda 21 (Pezzoli, 1997; Purvis et al., 2019). According to Scoones (2007), the Rio Declaration encouraged policy efforts on a global level while Agenda 21 inspired local initiatives. Together, these documents mobilized various stakeholders on different societal levels around a common mission, to achieve sustainable development as defined in "Our Common Future". According to Purvis et al. (2019), the WECD had achieved the impossible task of providing a definition that was vague enough for consensus-building amongst otherwise diverse and disparate stakeholders, and ambiguous enough for everyone to interpret and define sustainable development in ways that would personally benefit them the most. Hence, sustainable development was being institutionalized in almost all corners of the world by stakeholders who saw themselves as contributing to this important mission.

During the 21st century, however, the practical impact of this discursive devotion was being challenged by empirical observations in the natural sciences. For instance, in 2009, Rockström et al. (2009) published their seminal paper on a "safe operating space for humanity", concluding that three thresholds, out of nine planetary systems, had already been exceeded at that point. In 2015, the same year as the UN adopted the Paris Agreement and the SDGs, Steffen et al. (2015) also published their

seminal paper on the “great acceleration” in which the authors described how socio-economic and earth system trends had been increasing, almost exponentially, since the 1950s and forward. Based upon their visual appearance, the scientific community soon came to refer to these trends as the “hockey stick” curves (Sörlin, 2017). In 2023, the Stockholm Resilience Centre (2025) further reported that six out of nine planetary boundaries had been exceeded and that we were at risk of exposing ourselves and nature to irreversible tipping points. In their latest update from 2025, they reported that we had breached yet another boundary.

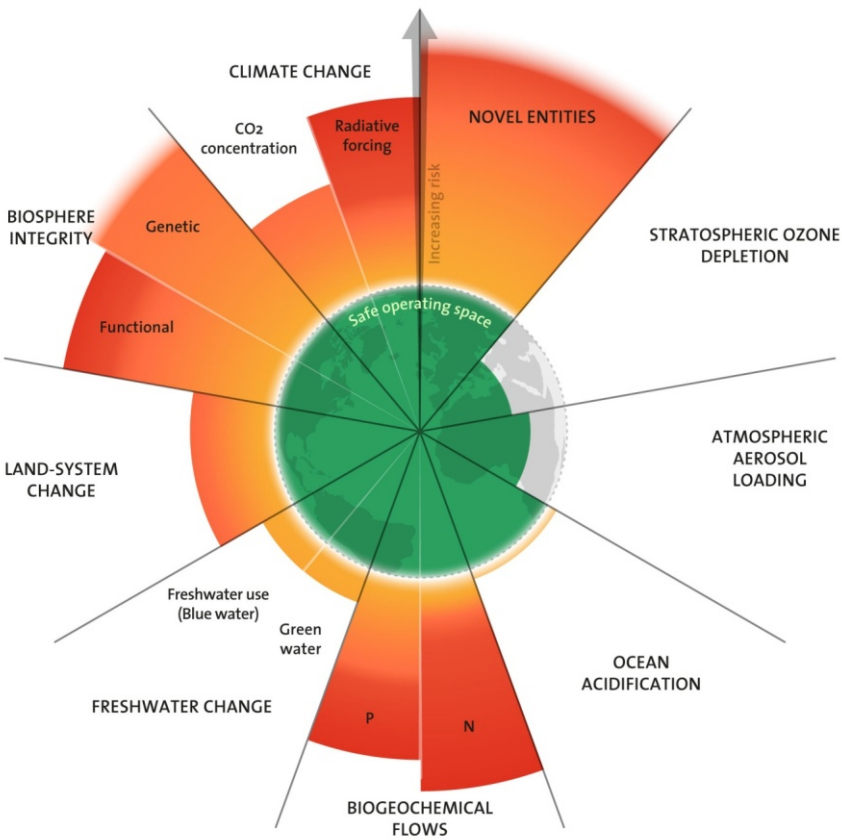

Illustration 1. Nine planetary boundaries, with seven crossed in 2025 according to Stockholm Resilience Centre.

Illustration 1 demonstrates that the natural environment is showing symptoms of severe distress despite the political and global efforts to break these trends. In the social sciences, the lack of practical and global impact has been discussed as something to be expected from such a broad and vague definition of sustainable development and sustainability. More

specifically, this research has argued that the vague definitions make these concepts open for different stakeholder interpretations (LéLé, 1991; Pezzoli, 1997; Purvis et al., 2019). For instance, some might use the literal meaning of sustaining something when referring to sustainability (Hilty & Aebischer, 2015), while others might use sustainability to refer to the idea of sustaining the environment (Purvis et al., 2019). In a similar manner, stakeholders can interpret the concept of sustainable development differently (LéLé, 1991). However, as opposed to sustainability, sustainable development presents an oxymoron (Mebratu, 1998;) meaning that stakeholders must define what ought to be sustained and, in contradiction to sustaining something, also define what stakeholders want to develop (Purvis et al., 2019). For some, this process of developing something can be interpreted as continued economic growth (LéLé, 1991), while for others it can be interpreted as a development process through which we achieve intergenerational and distributive justice on a global scale (Hilty & Aebischer, 2015). Taken together, these examples demonstrate that stakeholders' ideas and definitions of sustainability and sustainable development differ and are very much shaped by stakeholders' political and ideological motivations (Pezzoli, 1997). According to some, this ambiguity has also allowed for various disciplines to use sustainability and sustainable development as buzzwords at the expense of their original meaning (LéLé, 1991; Mebratu, 1998; Purvis et al., 2019), including IS research (Hilty & Aebischer, 2015).

The conceptual ambiguity surrounding these concepts has translated into sometimes contrasting approaches to sustainability and sustainable development. For instance, while the UN assumes that poverty is the root-cause of unsustainability and considers economic growth as a key solution to environmental degradation and social injustice (Purvis et al., 2019), the "degrowth" movement considers economic growth and the capitalistic system as the source of environmental degradation and social injustice (Demaria et al., 2010). This polarization can also be observed in the academic discourse, where it is common to see concepts such as weak and strong sustainability approaches (Hilty, 2008), shallow and deep ecology perspectives, and holistic and reductionist methodologies (Mebratu, 1998). Despite their differences, however, these discourses tend to agree upon and use what Purvis et al. (2019) calls the "language of sustainability", i.e., how to achieve a balance between environmental, social and economic sustainability, an aspiration which is commonly visualized as an intersecting circles diagram (see, Illustration 2).

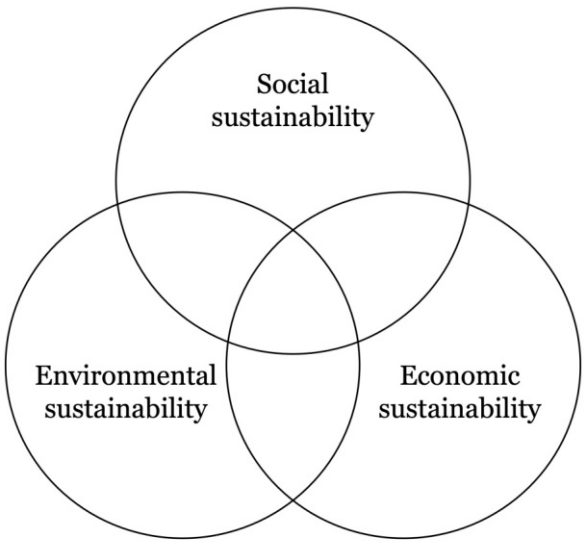

Illustration 2. The intersecting circles diagram with the three sustainability dimensions; environmental, social and economic sustainability.

2.1.1 The intersecting circles diagram

The intersecting circles diagram consists of three sustainability dimensions: environmental, social and economic sustainability (Purvis et al., 2019). As previously stated in this section, these dimensions are associated with different attributes by various stakeholders and can thus be subject to different interpretations. It should also be noted that the sustainability dimensions are sometimes conjoined with additional dimensions, such as institutional, cultural and technical aspects (Purvis et al., 2019). To avoid conceptual confusion, however, this dissertation will treat these aspects as subsets of the original three. In recognition of this discursive heterogeneity, this subsection will provide a general description of the central positions that these dimensions have been associated with.

Starting with the first dimension, environmental sustainability has generally come to represent: "*the existence of the environmental conditions necessary to support human life at a specified level of well-being through future generations*" (LéLé, 1991, p. 609). The most well-known and most pressing issue in this arena has become known as anthropogenic climate change (IPCC, 2023). In this sense, environmental sustainability draws attention to the widening rupture between human activity and the environmental foundation on which our livelihoods depend (IPCC, 2023). In addition, it draws attention to the aim of creating and sustaining an environmental basis that fosters human life in the near-

and long-term future (Rockström et al., 2009). This approach to environmental sustainability is also consistent with the "Limits to growth" report and the WECDs definition of sustainable development.

Turning to the second dimension, social sustainability generally refers to the idea of meeting basic human needs from an inter-generational perspective (Strange & Bayley, 2008), i.e., meeting the "*needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987). In this regard, inter-generational equity adds an element of fair distribution of resources across generations (Strange & Bayley, 2008). It should, however, be noted that there has been some debate regarding what those basic human needs are and to what extent the current generation is able to predict what future generations will be needing (Strange & Bayley, 2008). In response to this critique, it has been argued that "basic needs" should be defined as universal "satisfiers", such as adequate housing and nutrition (Gough, 2015). These are consistent with declarations of internationally agreed minimum standards for human wellbeing, such as the Universal Declaration of Human Rights (Dearing et al., 2014) and the SDGs.

Turning to the third and final dimension, economic sustainability generally refers to the idea of continued economic growth to satisfy basic human needs for all (Purvis et al., 2019). While this has been emphasized by the UN as an important element of sustainability, it has also spurred a complex debate regarding the need for economic growth, as well as the inadequate structures of the global economy to support sustainable development (Hornborg, 2009) and whether established measures for economic growth, i.e., gross domestic product (GDP) can adequately capture the nuances of the other sustainability aspects (Hilty & Aebischer, 2015). In recognition of this criticism, the UN (2015) has also emphasized that economic growth should be given priority in developing countries to curb environmental and social unsustainability. However, for many, the third dimension is a controversial aspect of sustainability since economic growth is typically associated with the idea of "unlimited" development (Purvis et al., 2019).

In addition to the sustainability dimensions, the intersecting circles diagram has also been associated with certain properties and constraints of its own (Purvis et al., 2019). One such characteristic is the idea of inseparability which implies that all dimensions need to be considered simultaneously. This might be done through e.g., holistic thinking which implies that there is a natural state of inseparability of these dimensions and a need to understand their dependencies to achieve sustainability

(Mebratu, 1998). Another attribute is the idea of achieving a balance between these dimensions, or what has also become known as a synergetic effect (Purvis et al., 2019). In the intersecting circles diagram, this balance is visualized as the intersection of environmental, social and economic sustainability. Related to the second attribute is also the idea of 'balancing' these dimensions by identifying and managing trade-offs (Purvis et al., 2019). These trade-offs are characterized by conflicting goals and interests that require trade-offs at the expense of either existing standards or sustainability (Strange & Bayley, 2008).

A frequently discussed limitation of the intersecting circles diagram is its Venn-diagram shape (Purvis et al., 2019). According to Mebratu (1998), this shape gives rise to at least three constraints. Firstly, by illustrating the sustainability dimensions as intersecting circles, stakeholders are presented to an unrealistic representation of their dependencies since the sustainability dimensions are, in reality, nested and more suitably illustrated as a concentric circles diagram (see, e.g., Mebratu, 1998) or a doughnut (see, e.g., Dearing et al., 2014). Secondly, by illustrating the sustainability dimensions as intersecting circles, the model also implies that the sustainability dimensions are, at least to some extent, interdependent systems. As a result, stakeholders are also free to focus on one of the three dimensions without taking the others into account. For instance, by focusing on the social dimension alone, social sustainability is sometimes represented as the desire to maintain social values, such as social structures and cultures, without necessarily emphasizing the need to maintain those values within environmental limits (LéLé, 1991). Thirdly, by encouraging an analysis which departs from one "part" of the "whole", the intersecting circles diagram inspires a linear way of thinking (Mebratu, 1998). A practical example of this approach is to formulate goals for each dimension and balance those goals against each-other (Purvis et al., 2019), e.g., by adopting a triple bottom line (TBL) approach to corporate sustainability (Elkington, 1997). In this view, the dimensions are considered equally important aspects (Veit & Thatcher, 2023), which is different from a holistic approach since holistic thinking recognizes that the sustainability dimensions are "parts" of a larger "whole" (Mebratu, 1998).

In addition to the above, the intersecting circles diagram has also been criticized for its simplicity. While this has benefitted the distribution of a "sustainability language" on a global scale (Purvis et al., 2019), the intersecting circles diagram alone does not convey the meaning of sustainability. In this respect, the intersecting circles diagram is dependent upon the normative connotations assigned to each

sustainability dimension. This means that, for those who are not familiar with these connotations, the intersecting circles diagram does not provide a stakeholder with any direction on what sustainability is, where and how it is achieved, and for whom sustainability should be created. As such, the intersecting circles diagram can easily be used for other purposes than sustainability and sustainable development since the diagram alone does not require stakeholders to adopt the aforementioned positions on environmental, social and economic sustainability (Mebratu, 1998). It should also be mentioned that the intersecting circles diagram does not sufficiently deal with the factor of time which is arguably of the essence when it comes to sustainability nor the process of recognizing, measuring and evaluating sustainability (or its anti-thesis, i.e., unsustainability) when this is achieved. Despite the aforementioned limitations, however, the intersecting circles diagram has become a widely accepted model in research and in practice (Purvis et al., 2019) including IS research (see, e.g., Dao et al., 2011; Kotlarsky et al., 2023).

2.1.2 Defining sustainability and sustainable development in this dissertation

Based upon this review of the sustainability and sustainable development literature, this dissertation adopts the following definitions of these concepts. First, in recognizing that sustainable development is a process through which sustainability ought to be achieved, this dissertation defines sustainable development as *a change process with the purpose of creating and sustaining sustainability over time*. Leaning on the aforementioned characterization of the sustainability dimensions, this dissertation further defines sustainability as: *using economic means to meet basic human needs within environmental limits*. By adopting these definitions for sustainable development and sustainability, this dissertation answers the recent call for IS research to be explicit about how sustainable development and sustainability are defined (Veit & Thatcher, 2023).

2.2 Sustainability in IS research

As previously noted, the IS discipline has also adopted the concept of sustainability and sustainable development (Hilty & Aebischer, 2015), and similar to that of other disciplines, IS scholars have also approached, defined and attached different meanings to these concepts over time. For instance, IS research has used sustainability as a theoretical framework to explain the role of IS in an organizational setting (see, e.g., Kettinger et al., 1994; Melville et al., 2004) and as an analytical concept to characterize

the long-term use of IS (see, e.g., Jacucci et al., 2006; Mindel et al., 2018). What these examples have in common is the tendency to adopt and use sustainability in its literal sense rather than adopting its normative connotations as advocated by, e.g., the WCED and the 2030 agenda.

In parallel to the general IS discourse, however, the IS field has also seen scholars adopting the intersecting circles diagram (Dao et al., 2011) and studying the relationship between IT/IS applications and environmental sustainability in Green IT and Green IS research (Seidel et al., 2017). More recently, digital sustainability has also been suggested as a new research venue for IS scholars to study contemporary IS phenomena from a sustainability perspective and to streamline previous studies of digitalization and sustainability under a shared concept (Kotlarsky et al., 2023). Congruent with the definitions presented in the previous section of this chapter, this section will review the Green IT, Green IS and digital sustainability literature to position this dissertation and its research contributions within the emergent and nascent stream of digital sustainability research.

2.2.1 Green IT and Green IS

Green IT and Green IS were recently identified as precursors of the digital sustainability literature (Kotlarsky et al., 2023). The principal reason for establishing these streams of research was to collectively engage in the pressing issues of climate change and environmental degradation (see, e.g., Elliot, 2007; Chen et al., 2008; Melville, 2010). To promote this important mission, early adopters presented guidelines on "how" environmental sustainability could be established as a new research domain for IS research (see, e.g., Chen et al., 2008; Melville, 2010; Watson et al., 2010; Elliot, 2011). The general purpose of these sub streams was at least twofold. Firstly, it was the ambition of this research to study the relationship between IT/IS applications and the natural environment (Elliot, 2007; Chen et al., 2008; Melville, 2010). Secondly, it was the principal purpose of this research to show how organizations could successfully implement and use IT to establish more eco-friendly practices and behaviors (Melville, 2010; Watson et al., 2010; Elliot, 2011). This research initially approached IT as a contributor to our environmental problems and as potential solution to them (Veit & Thatcher, 2023). However, over time, Green IT became increasingly associated with research focusing on the environmental impact of IT, while Green IS became increasingly associated with research focusing on the possibilities of using IT for supporting and improving environmental sustainability. As a result, two separate discourses began to emerge.

Green IT appeared as a new research topic for IS scholars in the beginning of the 2000s (Elliot, 2007). The early scientific discourse was dedicated to a conceptual and theoretical exploration of Green IT in practitioners' literature and adjacent fields of research (see, e.g., Elliot, 2007; Elliot & Binney, 2008; Watson et al., 2008; Dedrick, 2010). At the time of its appearance, Green IT had already been popularized in practitioner outlets (e.g., Gartner) as a timely solution to contemporary organizational challenges. For instance, Green IT initiatives promised energy-efficient hardware at a point in time when organizations were facing an energy crisis (Brill, 2007), and Green IT initiatives promised reductions in carbon emissions at a time when organizations were called to reduce the carbon footprint of their IT infrastructures (Elliot, 2007; Hilty & Aebischer, 2015). In principle, organizations were incentivized to invest in Green IT solutions since they promised cost-reducing effects. However, other organizational motives such as environmental considerations and social acceptance were also at play (Molla et al., 2009). For instance, organizations were encouraged by environmental rights organizations and political institutions to take responsibility for the environmental and social costs of resource extraction, manufacturing and discarded IT equipment (Elliot, 2007). In this respect, organizations were also incentivized to engage in Green IT initiatives for other purposes than cost-reducing effects, such as corporate reputation (Dao et al., 2011).

Connected to the above, Green IT research was early acknowledged by Elliot (2007) as a promising avenue for solutions to economic, environmental and social costs associated with IT infrastructures. To capture the nuances of these aspects, Elliot (2007) defined Green IT as "*the design, production, operation and disposal of ICT and ICT-enabled products and services in a manner that is not harmful and may be positively beneficial to the environment during the course of its whole-of-life*" (Elliot, 2007, p. 107). This approach was described as a holistic research agenda for the study of IT and environmental sustainability since it covered both direct[1] and indirect[2] effects of IT production and use (Elliot, 2007). However, this integrated approach did not receive much attention from other IS scholars who were, at the time, preoccupied with

[1] Direct effects of IT refer to the negative environmental effects of IT from a life-cycle perspective, including, extraction, production, use and disposal of IT (Hilty, 2008).

[2] Indirect effects of IT refer to the positive effects of IT applications, e.g., dematerialization and optimization, which results in, e.g., reduced resource consumption and harmful outputs in processes not involving the IT artifact itself (Hilty, 2008). Examples of such processes include business operations where non-IT products are produced and decision-making processes where IT can have a mediating role (Dedrick, 2010). Indirect effects can also refer to negative environmental effects of IT use e.g., induction and rebound effects (Hilty, 2008). When making this distinction, this dissertation describes indirect effects as either "positive" or "negative" depending on what kind of impact the text is referring to.

a parallel discussion regarding the conceptual limitations of Green IT research. These limitations were being debated by e.g., Watson et al. (2010), Dedrick (2010) and vom Brocke et al. (2013) in reference to a definition of Green IT that had originated from the computer science (CS) discipline.

The CS approach to Green IT was to identify and provide solutions to the negative impact of IT artifacts to increase the environmental sustainability performance of IT hardware and software from a life-cycle perspective (Hilty & Aebischer, 2015). This subfield was defined by Murugesan (2008) as: "*the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, and networking and communications systems—efficiently and effectively with minimal or no impact on the environment*" (p. 25-26). In line with this definition, the CS field began to explore the direct and negative environmental impact of using IT to provide new directions for hardware and software design, such as new programming languages for software development (see, e.g., Murugesan, 2008), or new methods for environmental assessment of digital technologies (see, e.g., Delliere & Grange, 2018). As such, CS scholars focused more on the study of direct effects of IT rather than the positive and indirect effects of IT use (Dedrick, 2010; Loeser, 2013).

In the early 2010s, Green IS scholars argued that this lack of attention towards indirect effects was a considerable limitation since the negative impact of IT was supposedly lower than the positive and indirect effects of IT use (see, e.g., Dedrick, 2010; Watson et al., 2010). For instance, Elliot (2011) noted that the IT sector was only responsible for 2 percent of global greenhouse gas emissions and suggested that IT could be used to increase energy-efficiency in other industries to lower the other 98 percent. By echoing these prospects, the objections against the CS definition gained a foothold in the discourse. As a result, Green IT was defined in IS research as the study of IT's direct and negative effects on the environment. Unlike the CS field, however, the IS discipline adapted this definition to the organizational context which resulted in a business and management-oriented perspective on Green IT.

By adopting this approach, IS scholars began to investigate "how" organizations could successfully implement or manage their IT infrastructures in an eco-friendlier manner, often with economic incentives in mind. For instance, Bose and Luo (2011) showed how Green IT initiatives could generate both economic and environmental benefits

by decreasing power consumption in the organization's IT infrastructure while achieving a related decrease in carbon emissions. Similarly, Hedman and Henningsson (2016) showed that their case study organization could save $360,000 and 4,000 tons of carbon emission annually by simply switching off their 46,000 computers during night. In addition, Green IT research has shown that organizations can make environmentally sound choices and establish more eco-friendly practices in a user phase. For instance, Loeser et al. (2017) developed a set of Green IT practices to support eco-friendly choices when investing in new IT hardware, such as, choosing products with eco-labels. Similarly, Zeiss et al. (2020) suggested that organizations could adopt circular principles, such as recycling and refurbishing IT hardware, to establish more environmentally sound practices. These examples shows that Green IT research has investigated how stakeholders can manage the negative environmental impact of IT infrastructure in a user phase. However, it should be noted that there are examples in the IS literature in which the Green IT focus and the Green IS focus are combined (see, e.g., Bose & Luo, 2011; Chan & Ma, 2017; Loeser et al., 2017).

As previously noted, the Green IS literature was established around the same time as the Green IT literature. However, as opposed to the latter, Green IS was introduced as a research concept for studying the indirect and potentially positive effects of using IT to reduce the environmental impact of socio-technical systems (see, e.g., Watson et al., 2010; Melville, 2010; Dedrick 2010; Jenkin et al., 2011; vom Brocke et al., 2013). Congruent with this ambition, most Green IS research has revolved around the idea of "how" Green IS can support organizations to reduce and substitute harmful outputs, such as, carbon emissions, resource consumption, waste, toxins, and noise (Watson et al., 2010; Seidel et al., 2018). At the heart of this "how" lies the idea of implementing Green IS to influence human behavior and actions (Dedrick, 2010; Elliot, 2011; Jenkin et al., 2011) to create more eco-friendly practices (Seidel et al., 2013; Corbett, 2013), often in the form of eco-efficiency gains (Chen et al., 2008), dematerialization and process optimization (Hilty, 2008). To that end, Green IS scholars have explored how IS can support more eco-friendly behaviors on different societal levels.

For instance, Green IS research has shown how smartphone applications can increase the eco-awareness of consumers by suggesting more eco-friendly alternatives at e.g., the grocery store (Pitt et al., 2011) and how smart metering technology can decrease energy consumption in private households (Wunderlich et al., 2019). In addition, Green IS research has shown how carbon management systems (Corbett, 2013), output

management systems (Seidel et al., 2013), and video conferencing systems (Hanelt et al., 2017) can support more eco-friendly behaviors in organizations and how these can be successfully adopted through e.g., sensemaking (e.g., Seidel et al., 2013; Degirmenci & Recker, 2023). Moreover, Green IS researchers have demonstrated how intelligent transportation systems can decrease carbon emissions and traffic congestion on a societal scale (Marett et al., 2013; Cheng et al., 2020). Other initiatives also include wildlife management analytics systems to combat diminishing animal populations (Pan et al., 2021). As shown by these examples, Green IS research has investigated how IT applications can reduce harmful outputs, substitute resource consumption and preserve biodiversity in a user phase.

To summarize, the early IS literature on sustainability has investigated the relationship between IT/IS and the natural environment under the concept of Green IT and Green IS. By reviewing these streams of research, this section has shown that the existence of two scientific discourses can be explained by an early decision of Green IT and Green IS scholars to adopt contrasting views on IT (for an overview, see Table 1). For instance, while the Green IT discourse tends to approach IT as a technology that adds to our environmental problems, the Green IS discourse tends to approach IT as a solution. In addition, this section has shown that depending on which research tradition the concept of Green IT is approached from, i.e., the CS or IS discipline, Green IT can either be understood either as a problem to be mitigated in technology (CS discipline) or as a problem to be mitigated in a user phase and in the sociotechnical system in which IT is implemented, e.g., organizations (IS discipline).

Discourse	View on IT	Impact	Focus	Ex. ref.
Green IT (CS)	A problem to be mitigated	Direct effects	Technology	Dedrick (2010); Watson et al., (2010)
Green IT (IS)	A problem to be mitigated	Direct effects	User phase	Hedman & Henningsson (2016); Loeser et al., (2017)
Green IS	A solution to problems	Indirect effects	User phase	Melville (2010); Seidel et al., (2018)

Table 1. The different views that Green IT (CS), Green IT (IS) and Green IS literature typically adopts on technology's role and impact.

2.2.2 Problematization of Green IT and Green IS literature

Despite presenting valuable insights into the relationship between IT/IS and environmental sustainability, IS scholars have also voiced their concerns regarding three major limitations in Green IT/IS research: lack of attention to the negative impact of IT from a full life-cycle perspective, lack of impactful research, and the lack of an integrated sustainability perspective on IT. The first limitation, i.e., the lack of scholarly recognition for the direct and negative environmental impact of IT artifacts from a full life-cycle perspective, reveals several blind-spots in the discourse – ranging from the extraction of natural resources to the disposal of hardware and decommissioning of software (Dwivedi et al., 2022; Aanestad et al., 2024; Fors et al., 2024). A major predicament with this limitation is that it gives IS research permission to approach and label e.g., a resource intensive smartphone (Greenpeace, 2017) as a "green" technology (see, Pitt et al., 2011) despite the environmental and social costs that testify against such a statement. This choice to neglect the real-world impact of IT artifacts also allows for IS researchers to promote digitalization as a solution to environmental issues without considering the consequences of pervasive digitalization (Fors et al., 2024).

The reasons for why Green IT/IS research has separated itself from the environmental and social costs of technology have been discussed in a

more critical stream of research. While some have settled with on a general observation that there is no self-reflexivity on the matter (El Idrissi & Corbett, 2016; Seidel et al., 2017; Aanestad et al., 2024), others have analyzed the underlying reasons as to why this might be the case. For instance, Hovorka and Corbett (2012) showed that the IS literature early adopted a belief early on that environmental issues could be resolved with minimal modifications to social, political and economic structures through e.g., technological innovation. In addition, the authors also showed how the early Green IT/IS discourse has focused on organizational productivity gains and the costs of adopting Green IT/IS as to promote and give directions on how practitioners could overcome these barriers to realize IT's potential.

More recently, Veit and Thatcher (2023) also discussed how the historical and general purpose of IS research, i.e., promoting technology adoption and maximizing value creation, has also come to characterize Green IT/IS research. The authors call this the "make-buy" approach, which refers to the idea that Green IT/IS research has focused on the opportunities of new technologies rather than adopting a set of sustainability principles that would re-direct the research focus to e.g., a "stay put" approach. In contrast to the "make-buy" approach, this idea of "staying put" encourages scholarly attention to how stakeholders can increase the longevity of IT artifacts rather than adopting new ones. This would at least indirectly address the environmental and social costs of IT artifacts (Veit & Thatcher, 2023), since increased longevity could potentially decrease consumer demand for IT hardware and hopefully achieve a related decrease in resource extraction and electronic (e-) waste (Fors et al., 2024).

In addition to these historical accounts, others have also tried to explain this first limitation as a misfortunate expression of our collective enthusiasm for technological development (Murugesan, 2008). Others still have suggested that the increased level of complexity that comes with analyzing both positive and negative effects (Elliot & Webster, 2017) and a lack of appropriate methods to perform such an analysis (Melville, 2010) have prevented a more holistic approach. Despite the underlying reasons, however, there is an imminent risk that this limitation will put IS research at risk of greenwashing IT's role in creating a positive impact for the natural environment and potentially worsening the problems. Hence, to avoid waking up to the harsh reality of what a techno-solutionist approach can do to the environment (Melville, 2010), the IS field must find ways to repair the separation between Green IT/IS research and the environmental and social costs of IT artifacts. In this vein, future research

on Green IT/IS has been encouraged to focus on the "greening of IT" (Fors et al., 2024) which is similar to that of a CS approach to Green IT research.

The second limitation specifically addresses the lack of impactful contributions in Green IT/IS research (Malhotra et al., 2013; Corbett et al., 2023) and a lack of studies on the "truly" positive effects of IT applications on the natural environment (Elliot & Webster, 2017; Veit & Thatcher, 2023; Fors et al., 2024). In raising their concerns for the latter, Fors et al., (2024) recently stated that the positive environmental impact of IT remains mainly theoretical and that: "*Truly Sustainable ICT, with the power to greatly reduce the negative environmental impact of other polluting sectors of society, has, as of yet, not been deployed on a large scale, and it is difficult to say whether this potential will be unleashed*" (p.40). As opposed to the first limitation, however, the second one has been discussed by the vast majority of Green IT/IS literature. For instance, Malhotra et al., (2013) were amongst the first to illustrate and problematize this limitation by categorizing the early research on Green IT/IS into their value spaces framework. In 2015, Gholami et al. (2016) presented an updated version of this literature review, showing that IS scholars had yet to address this limitation in Green IT/IS research. A little more than a decade later, Veit and Thatcher (2023) also presented yet another version of the value spaces framework in which they were able to show that the limitation persisted. Considering, however, that the need for impactful research intensifies as we are steadily approaching the year of 2030, IS research can no longer afford to ignore this limitation (Fors et al., 2024).

Previous literature has presented several reasons as to why there is a lack of impactful research in the IS community and how to remedy this limitation. In general, these recommendations have focused on realizing the potential of IT use. For instance, Malhotra et al. (2013) recommended that future research should study best-practices in successful case study organizations to advise practitioners on how to harvest the opportunities of Green IT/IS implementations. In a similar vein, Gholami et al. (2016) discussed how IS research could potentially create more impactful research by studying how business process innovation and transformation can result in more eco-friendly business practices in an organizational context. In addition, Corbett et al. (2023) recently acknowledged this limitation by stating that: "*the IS community must move from discussion to action*" (p. 24). In their editorial, the authors also argued that impactful research comes from exploring the "how" IT/IS applications are creating results in practice. However, unlike the vast majority before them (with the exception of from Molla et al., 2009), Corbett et al. (2023) has also

emphasized the need for IS research to evaluate the success of IT applications against measurable sustainability targets; in their case, the SDGs.

A more critical stream of research has pointed to other explanations for this limitation. According to these authors, the second limitation might be an expression of underdeveloped theory on, and empirical investigation of, the environmental outcomes of IT applications and their greater impact. For instance, Elliot and Webster (2017) pointed early on to the general tendency to equal traditional IS outcomes, such as optimization and efficiency gains, with environmental outcomes. In addition, the authors pointed to a lack of recognition for and research on rebound effects – even though the latter was also identified by Melville (2010) as an important area of study for Green IT/IS research so as to better understand the nature of rebound effects in order to anticipate and thus account for their negative effects. According to Veit & Thatcher (2023), this lack of representative language might be the result of a swiftly adopted sustainability concept and an under-theorized sustainability lens. As such, there is a need for IS research to expand our theoretical and empirical understanding of what sustainability is and how to adopt this lens. In this vein, Veit and Thatcher (2023) have encouraged future research to provide definitions for these concepts and design their research from an integrated sustainability perspective.

Connected to the latter, the Green IT/IS literature has also been identified with a third limitation: a single focus on environmental sustainability (Seidel et al., 2017; Kotlarsky et al., 2023). Although having been fundamental in the process of conceptualizing and forming an identity around Green IT (Elliot, 2007; Loeser et al., 2017) and Green IS research (Melville, 2010; Seidel et al., 2017), this single focus on environmental sustainability has also resulted in a discourse that has paid less attention to the social and economic dimensions of sustainability (Seidel et al., 2017; Kotlarsky et al., 2023). In response to this significant gap (see, Veit & Thatcher, 2023), the IS field has recently been encouraged to reorient its previous focus on environmental sustainability towards the three sustainability dimensions. According to Kotlarsky et al. (2023), this shift in discourse is a timely progression of the Green IT/IS literature since it better reflects the reality of contemporary digitalization and the three dimensions of sustainability.

2.2.3 Digital sustainability

Digital sustainability has recently been introduced as a new research phenomenon (Rosati et al., 2024) and proposed as an umbrella concept for IS sustainability research (Kotlarsky et al., 2023). The principal reason for introducing digital sustainability has been to encourage new and impactful research at the intersection of contemporary digitalization and sustainability (Kotlarsky et al., 2023; Rosati et al., 2024). According to previous research, contemporary digitalization is driven by a new generation of digital technologies, such as AI, blockchain and IoT solutions (Kotlarsky et al., 2023). These technologies come with opportunities for business (Legner et al., 2017) and for sustainable development (Sachs et al., 2019). However, they also come with challenges for business (George et al., 2021) and threats to socio-environmental sustainability (Fors et al., 2024). In recognition of this complexity, it is the general purpose of digital sustainability research to continue the ongoing exploration of digital technologies and their effects on sustainability (Kotlarsky et al., 2023) focusing on both the opportunities and the consequences of pursuing digital sustainability in practice (Rosati et al., 2024).

Digital sustainability is currently attracting interest amongst practitioners (see, e.g., CODES, 2022; Eastwood, 2025) and academics who are acknowledging the opportunities and challenges that this combination might yield (see, e.g., George et al., 2021; Kotlarsky et al., 2023). This concept is generally depicted as the ultimate convergence of digitalization and sustainable development (Rosati et al., 2024), often in the form of digital transformation and sustainability transformations (see, e.g., Zimmer & Järveläinen, 2022; World Economic Forum, 2023; Crome et al., 2024). Connected to this idea is the general assumption that digital sustainability represents a new business opportunity that offers several potential benefits (CODES, 2022; Eastwood, 2025), such as increased productivity and lowered production costs (Sachs et al., 2019). In addition to being represented as a new business opportunity, digital sustainability has also been represented as a new existential imperative for contemporary organizations (Watson et al., 2012), meaning that organizations are ultimately required by policy makers and consumers to innovate their operations with digital resources while simultaneously increasing their sustainability performance (George et al., 2021).

In contrast to these benefits and necessities, digital sustainability has also been depicted as a challenging endeavor fraught with tensions. For instance, in their report, Muench et al. (2022) identified several pitfalls

and unwanted consequences when pursuing sustainable development with digital means: e.g., unequal distribution and access to digital infrastructures, lack of trust in technology and reluctance to change, increased technological complexity, cyber security threats, high energy requirements and resource footprints of digital technologies, outdated standards, lack of political consensus and rebound effects. In taking these challenges into account, practitioners and academics alike, are now advocating for digital sustainability as a new paradigm shift in contemporary and future digitalization to make digitalization more sustainable, i.e., "sustainable digitalization" (CODES, 2022), and use digitalization for sustainability purposes, i.e., "digitalization for sustainability" (Kotlarsky et al., 2023). As such, digital sustainability has been framed as an opportunity, a necessity, a challenge and a virtue.

Although having been limited in number, IS researchers have been discussing the potential benefits and challenges of joining digitalization and sustainability since the late 2000s (see, e.g., Standing & Jackson, 2007; Pernici et al., 2012). The general purpose of this research has been two-fold: to introduce an integrated sustainability perspective in IS research (see, e.g., Dao et al., 2011) and to show how digital technologies can be used for sustainability purposes (see, e.g., Zimmer & Järveläinen, 2022; Corbett et al., 2023; Schoormann et al., 2025). Considering that this investigation began before digital sustainability was introduced, this research has been published under other but similar constructs, such as, a "sustainability framework for IS" (Dao et al., 2011) and digital-sustainability co-transformation (Zimmer & Järveläinen, 2022). Acknowledging, however, that this research offers a timely response to the political and industrial surge for a digital sustainability, Kotlarsky et al. (2023) recently suggested that this research should be streamlined under the concept of digital sustainability.

The early literature in this domain has been predominantly conceptual and focused on the first purpose, i.e., introducing an integrated sustainability perspective. For instance, Standing and Jackson (2007) discussed the practical implications of adopting a sustainability approach to IS research and developed a set of sustainability principles to guide IT professionals on how to best acquire, develop, maintain and govern IS to increase to, e.g., longevity and usability and reduce waste. When describing how future IS research could contribute to this work, Standing & Jackson (2007) argued that: "*... the discipline of IS must look beyond an economic rationale to embrace a wider purpose that incorporates social and environmental issues. [...] However, this will require a mindset shift within the IS discipline since the majority of research*

papers examine the contribution of IS from a purely economic perspective" (p. 174). A couple of years later, this message was also echoed in Dao et al. (2011), who showed how IT capabilities could increase the sustainability performance of organizations with a focus on socio-eco-economic effects. The authors also concluded that "*it is critical that all three factors of the TBL*" (p. 76) are considered when studying IT and sustainability.

In addition to these conceptual contributions, IS sustainability scholars have also investigated the second purpose, i.e., the role of digital technologies in creating sustainability. In giving the IS field its first definition of this research phenomenon, the editorial of Kotlarsky et al. (2023) recently suggested that IS research on digital sustainability should study "*the development and deployment of digital resources and artifacts toward improving the environment, society, and economic welfare*" (Kotlarsky et al., 2023, p. 938). By presenting this definition, Kotlarsky et al. (2023) have paved the way for a new research venue that streamlines prior and future studies on "how" digital resources (see, e.g., Stuermer et al., 2017) can be used for sustainability purposes and how different forms of digitalization processes, such as digital innovation (e.g., Corbett et al., 2023) and digital transformation (e.g., Zimmer & Järveläinen, 2022) can advance sustainability. To this end, digital sustainability research has continued to focus on the "how" digital technologies can create sustainability by investigating the positive and indirect effects of using digital technologies to achieve, e.g., dematerialization, waste reduction and efficiency gains.

For instance, Stuermer et al. (2017) pointed early on to digital artifacts as a more sustainable option compared to their analog counterparts, such as paper, due to the characteristics of digital artifacts, i.e., reproducibility, transmutability and indestructability. In addition, Falcke et al. (2024) showed how digital innovation can mitigate path dependencies by allowing organizational stakeholders to imagine what, e.g., a net-zero solution could potentially look like before embarking on a net-zero journey. Similarly, by focusing on digital innovation for sustainable development, Joukhadar et al. (2023) showed why public sector organizations struggle to use digital innovation for sustainability purposes: i.e., for reasons such as lack of digital capabilities and innovation skills, no digital mindset and reluctance to change. Moreover, Sekulic (2024) showed how an IoT solution could increase organizational sustainability by improving stakeholders' ability to monitor, analyze, detect, predict and resolve sustainability issues through preventive measures and optimization gains. In addition, Zimmer and Järveläinen

(2022) recently argued that innovation is the linchpin between digital transformation and sustainable transformation, specifically arguing that organizations must strike a balance between all sustainability dimensions when innovating their operations with digital technologies.

In parallel to this investigation, however, IS sustainability scholars are also beginning to reflect upon the "dark side" of digital sustainability (Schoormann et al., 2025) and the direct effects of digital technologies (see, e.g., Falcke et al., 2024; Aanestad et al., 2024). In this vein, an academic discussion on the consequences of ignoring the contradictions, tensions and challenges with digital sustainability (Schoormann et al., 2025), such as the direct effects of digital technologies is beginning to flourish (Fors et al., 2024). For instance, in an attempt to nuance the scholarly attention on opportunities, Rosati et al. (2024) recently revised Kotlarsky et al.'s (2023) definition by adding the concept of "decommissioning" as one of the actions that a stakeholder might perform to create digital sustainability. In motivating this revision, the authors stated that: "*In some cases, shutting down or decommissioning digital artifacts and resources may be the most sustainable outcome*" (p. Rosati et al., 2024, p. 8). A practical example of this activity is the idea of reducing "data waste" in organizations which refers to the activity of deleting data to reduce energy consumption while simultaneously creating more manageable data repositories (Säntti, 2022). In IS research, this possibility was recently acknowledged and explored by Savarimuthu et al. (2023), who showed how machine learning (ML) techniques could reduce data waste in user-generated content.

To summarize, an emergent research stream on digital sustainability is currently in the process of reorienting the previous focus on environmental sustainability and IT/IS implementations to include all dimensions of sustainability and digital resources. Congruent with Kotlarsky et al.'s (2023) definition of digital sustainability, IS research has mainly been investigating the "how" digital technologies can be used for sustainability purposes. This research is similar to that of Green IS research since this approach maintains the idea that digital technologies offer a solution to sustainability problems. In parallel to this call, Rosati et al. (2024) have introduced "decommissioning" as an alternative activity to development and deployment of digital resources. As such, Rosati et al. (2024) acknowledge and provide a definition that, at least to some extent, conceptualizes the negative and direct effects of digital technologies in a user phase.

Discourse	View on DT	Impact	Focus	Ex. ref.
Digital sustainability	A solution to problems	Indirect effects	User phase	Kotlarsky et al., (2023); Crome et al., (2024)
	A problem to be mitigated and a solution to problems	Direct and indirect effects	User phase	Rosati et al., (2024); Schoormann et al., (2025)

Table 2. The different views that the digital sustainability literature typically adopts on technology's role and impact.

2.2.4 Problematization of digital sustainability literature

Although considered by many to be a promising new research avenue, a more critical stream of research has begun to voice its concerns for the sustainability challenges that come with digital sustainability. One of these challenges is the environmental and social impact of sourcing virgin materials for the production of new IT components to satisfy the increasing demand for digital technologies (Fors et al., 2024). Another challenge is the increased expansion of energy-consuming IT infrastructure, e.g., data centers (Uddin & Rahman, 2012), to use and support the development of new digital technologies, such as AI (Deloitte, 2025), along with the negative environmental and social impact of expanding such infrastructures (Upham et al., 2022). These concerns are similar to that of the research limitations in Green IT/IS literature, yet, multiplied by the current race for, e.g., AI tools (Crawford, 2021; van Wynsberghe, 2021). Table 2 shows that digital sustainability research shares some similarities with the Green IT/IS literature in this respect. This is not surprising considering that Green IT and Green IS research has been acknowledged as the precursors of digital sustainability research and thus the foundation on which the empirical investigation and theoretical development of digital sustainability is currently being built (Kotlarsky et al., 2023).

However, as of now, few papers on digital sustainability research have addressed the research limitations in the Green IT/IS literature. In fact, a majority of research continues to address the positive and indirect effects of digital sustainability despite being aware of the direct and negative effects of digital technologies. For instance, when discussing the choice of deliberately advocating for the positive and indirect effects of digital

artifacts, Stuermer et al. (2017) specified that: "*We have neglected this aspect in our paper and, thus, implicitly assumed that, compared to the benefits of higher accessibility, the negative impact on the environment of the large-scale use of hardware is marginal in the view of the advantages*" (p. 259). In a similar vein, when discussing their findings, Falcke et al. (2024) stated that "*so far, we primarily presented potential positive aspects of digital innovation for net zero*" [yet considering however that digital innovation can pose a risk to sustainability,] "*we want to highlight the importance of investigating the unintended consequences of digital sustainability*" (p. 429). Connected to the latter, IS sustainability research in general, and research on digital sustainability in particular, has several gaps to fill (Fors et al., 2024).

In addition to the above, Zimmer and Järveläinen (2022) have voiced their concerns about adopting general IS research concepts, such as digital innovation and transformation, into digital sustainability literature without exploring the depths of these concepts from a sustainability perspective. According to Zimmer & Järveläinen (2022) there is a risk that IS research on digital sustainability will serve other purposes than sustainability and sustainable development if the research on digital sustainability does not challenge the assumptions that are associated with these concepts and anchor them in the sustainability and sustainable development literature. To exemplify, the authors use the triple bottom line to trace the antecedents of digital transformation research to discover that economic value is generally emphasized in this research (Zimmer & Järveläinen, 2022). As such, we know a lot about digital transformation from an economic perspective, but what do we know about it from a sustainability perspective?

2.3 Advancing the digital sustainability discourse

The above literature review has shown that the concept of digital sustainability is the most recent manifestation of a theoretical and empirical exploration of the intricate relationship between IS and sustainability. This exploration has been ongoing since the 2010s but is now expected to intensify once again with the recent calls for new research on digital sustainability (Kotlarsky et al., 2023). Alongside these calls for scholarly investigation, several limitations and pitfalls have been identified in previous research. For instance, the previous sections have shown that IS scholars have adopted the concept of environmental sustainability without properly accounting for the other sustainability dimensions (Veit & Thatcher, 2023) and focused on the positive and

indirect effects of technology applications in a user phase without considering the negative and direct effects of IT and digital resources (Fors et al., 2024). These gaps have also been identified by previous literature as limitations that might prevent the IS field from making a positive and impactful contribution to research and practice (see, e.g., Elliot & Webster, 2017; Veit & Thatcher, 2023). In this respect, previous research has suggested, that to address these limitations and overcome these barriers, IS scholars must find ways to challenge their previous assumptions and biases about technology, sustainability and the intricate relationship between them (El Idrissi & Corbett, 2016; Zimmer & Järveläinen, 2022; Aanestad et al., 2024; Fors et al., 2024). In response to these observations, it has recently been suggested that IS scholars should develop a sustainability lens (Veit & Thatcher, 2023).

2.3.1 A sustainability lens for IS sustainability research

According to Veit and Thatcher (2023), a sustainability lens is a matter of shifting our perspective as to better understand the challenges and opportunities that accompany the idea of creating sustainability with IT and digital resources. This idea of shifting our perspective comes from their recognition of sustainability as something more than environmental sustainability and something more than the positive and indirect effects of technology adoption and use. For instance, by taking the sustainability problems of hardware into account, Veit and Thatcher (2023) suggests that future research should investigate how the longevity of hardware can be extended. Adding to this idea, the authors also suggest that IS research should study the act of abandoning IT hardware to understand the causes that precedes this decision. These examples demonstrate that IS scholars can generate new research questions, and theoretically more impactful knowledge contributions, by illuminating and challenging the assumptions that underlie IS sustainability research. Following this line of thinking, this dissertation posits that a sustainability lens should offer a new point of view from which other assumptions about technology, sustainability and the intricate relationship between them can emerge.

Connected to the latter, Veit and Thatcher (2023) argues that a sustainability lens should be anchored in the sustainable development and sustainability literature. In their article, and similarly to that of others before them (see, e.g., Dao et al., 2011), the authors specifically identify the three sustainability dimensions as a suitable foundation for a sustainability lens. Following this line of thinking, this dissertation has used the sustainability and sustainable development literature as a reference discipline to zoom in on the central ideas, assumptions, and

constraints of the three sustainability dimensions and the intersecting circles diagram (see, Section 2.1.1). In line with Veit and Thatcher's (2023) recommendation on defining sustainable development and sustainability, this dissertation has also used the three sustainability dimensions and the intersecting circles diagram to define sustainable developments as "*a change process with the purpose of creating and sustaining sustainability over time*" and sustainability as "*using economic means to meet basic human needs within environmental limits*." Taken together, these constructs represent the essence of the sustainability lens that has been adopted in this dissertation through which new assumptions about technology, sustainability and the intricate relationship between them can be developed and adopted.

To characterize the purpose and nature of this lens, this dissertation will use Nordberg's (2022) typography of a theoretical lens. According to Nordberg (2022), researchers can develop different kinds of theoretical lenses for different purposes. For instance, we use our theories to adjust and make sense of what we see in the data and add new lenses to correct these theories when we find them inadequate (Nordberg, 2022). In addition, we can use theoretical lenses to distort our image of the world to imagine tentative truths that might help us explain things that are not apparent to us, such as social norms (Nordberg, 2022, p. 156). According to Nordberg (2022), these are lenses that we use to sensitize ourselves to what we expect to see or what is usually hidden from plain view. Another kind of theoretical lens, which works similarly to that of a "filter", can instead augment and suppress the things that come into view when we use lenses that adjusts, corrects and distorts the world (Nordberg, 2022). These filters help us to imagine other "truths" about what we have come to take for granted and are typically used when there are reasons to doubt the soundness of the theories we normally employ (ibid). This is also the ambition of the sustainability lens in this dissertation, i.e., to provide a filter through which we can challenge our current dispositions about technology, sustainability and their intricate relationship.

To exemplify, similar to that of a filter, the sustainability lens represents our "best guess" of what we currently believe sustainable development and sustainability to be. More specifically, it represents an ideal vision of a desired state (Mebratu, 1997) that "*help[s] us to imagine what might be*" (Nordberg, 2022, p. 159). Accordingly, a key feature of the sustainability lens is to augment what we desire to achieve, such as, the instances when IT and digital resources positively influence sustainable development by creating conditions for long-term sustainability. As such, this filter requires that we can imagine and define what sustainable development

and sustainability are in order to understand how digitalization contributes to this ideal. Considering, however, that digitalization is also a source of sustainability issues, it is unlikely that an observer will find that the real-world matches this ideal state in all instances. Under these conditions, the sustainability lens will augment the problems that must be managed and resolved to close the gap between our lived reality and our best guess of what sustainable development and sustainability are. For instance, in the situations when stakeholders pursue digitalization for other purposes than sustainable development (Fors et al., 2024), or when IT and digital resources are used for these purposes despite imposing a threat to sustainable development (van Wynsberghe, 2021).

In addition to having an augmenting ability, a filter can also suppress certain aspects of the real-world to enhance the things that might be (Nordberg, 2022). In the review of the literature, this dissertation has found that most IS sustainability research is invested in the idea that IT and digital resources might be imperative components in sustainable development. This idea has also been combined with a scholarly desire to position the IS field as an important contributor to sustainable development (see, e.g., Melville, 2010; Malhotra et al., 2013; Kotlarsky et al., 2023). These ideas have inspired IS researchers to pay specific attention to the opportunities and capabilities of IT (see, e.g., Chen et al., 2008; Watson et al., 2010; Melville, 2010; vom Brocke et al., 2013) and more recently digital technologies (see, e.g., Corbett et al., 2023). Alongside this discourse, however, a more critical stream of IS sustainability research has voiced its concerns about the negative environmental and social consequences of these technologies and that a technology-optimistic agenda could create a worsened situation. In response to these observations, this dissertation has adopted a sustainability lens which, at the outset of this research, has not been integrated with a technology-component. As a result, a second feature of the sustainability lens is to encourage IS sustainability research to put sustainability *first* and remain open to the idea of decommissioning e.g., digital objects when needed (Rosati et al., 2024; Savarimuthu et al., 2023) by suppressing what this dissertation will refer to as, technological determinism.

2.3.2 Using the sustainability lens to shift our assumptions

Adding to the recent work of Veit and Thatcher (2023), Fors et al. (2024) and Rosati et al. (2024), this section will demonstrate how the sustainability lens shifts established assumptions about technology, sustainability and the intricate relationship between them. To identify

these assumptions, this section will present a synthesis of the literature in the form of a conceptual model in which the established and idealistic views on technology and sustainability are represented as two axes, each of which forms a continuum between two pairs of nodes: Technology-Process and Instrumental-Holistic (see, Illustration 10, p. 40). This section will begin with a description of the Technology-Process continuum. Here, the synthesis will be focusing on our established assumptions about technology, technology impact, and technology's role in sustainable development. Following the first pair, the section will continue in a description of the Instrumental-Holistic continuum. Here, the synthesis will demonstrate how our assumptions about sustainability also influence our ideas about technology impact and technology's role in sustainable development. Subsequent to these descriptions, this section will present the conceptual model and characterize the different research positions that IS sustainability research can adopt relative to technology, sustainability and the intricate relationship between them. The synthesis and the conceptual model are presented concurrently below.

Y-axis: The Technology-Process continuum

The first pair of nodes are derived from the literature review in Section 2.2.1 and 2.2.3. These reviews showed that IS research on sustainability typically focuses on questions related to technology (e.g., Green IT) or questions related to the socio-technical processes in which technology is used (e.g., Green IS). For the purpose of highlighting this distinction, this dissertation has decided to label these approaches as technology- and process-oriented research (see, vertical axe in Illustration 10). What kind of technology or process these research streams are interested in typically varies between research papers. For instance, the technology component can be IT in its traditional sense, such as IT hardware (see, e.g., Melville, 2010) and IT virtualization (Bose & Luo 2011), or digital technologies and resources in its novel sense, such as artificial intelligence (AI) and digital objects (Kotlarsky et al., 2023). The research focusing on the process-component is more heterogenous since it can involve a variety of human activities that might be supported, substituted or rearranged by IT and digital means.

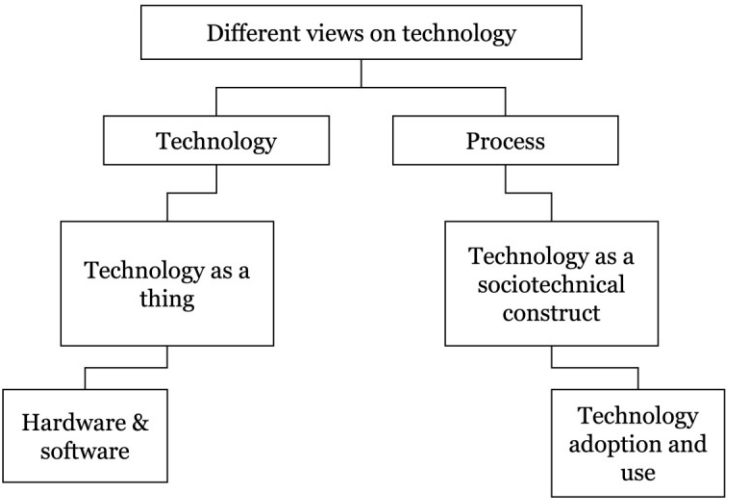

Illustration 3. A conceptual map of the different views on technology in the IS sustainability literature.

In addition to being technology-, and process-oriented, the literature review in Sections 2.2.1 and 2.2.3 further showed that technology-, and process-oriented research typically explores different categories of technology impact: direct, indirect and tertiary[3] effects. These effects demonstrate what kind of impact technology- and process-oriented research aspires to achieve and where this impact can be achieved (see, e.g., Hilty, 2008). For instance, technology-oriented research characteristically searches for problems and solutions in technology to address the direct effects of IT from a life-cycle perspective, such as, the negative environmental impact of producing, using and disposing of IT hardware (Hilty, 2008). Process-oriented research, on the other hand, typically searches for problems and solutions in sociotechnical processes, more specifically human activities, to create indirect or tertiary effects with technology-applications. As previously stated in the literature review, the indirect effects typically involve process-optimization and resource-substitution (Hilty, 2008). However, process-oriented research can also explore how technology adoption can create tertiary effects, i.e., achieving a fundamental and structural change on a societal level.

[3] With their higher-level impact, tertiary effects typically create deep and structural change on a societal level (Hilty, 2008).

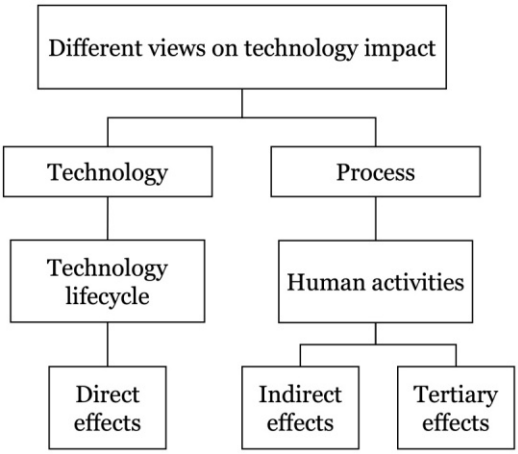

Illustration 4. A conceptual map of the different views on technology impact in the IS sustainability literature.

In addition to having different approaches to technology impact, the literature review further showed that IS research typically approaches technology as either "a problem to be mitigated" and or a "solution to problems," or a combination of both. These approaches describe what kind of role technology has in sustainable development. As seen in Section 2.2.1, the contrasting views have inspired two corresponding research streams in IS sustainability research: Green IT and Green IS. Following this line of thinking, Green IT research typically approaches IT as a problem and seeks to limit the negative and direct effects of IT, while Green IS research typically approaches IT as a solution and searches for problems for which IT can create positive and indirect effects. Unlike this widely accepted distinction, however, Hilty (2008) pointed out early on that technology- and process-oriented research can approach IT and digital resources from either one of these perspectives. For instance, in addition to approaching technology as a problem, technology-oriented research can also view IT and digital resources as a solution. When it does, the research typically searches for problems and solutions to make technology a more malleable platform that can be used for multiple purposes (Hilty, 2008), e.g., derive more value out of a device (see, Illustration 5). Similarly, when process-oriented research adopts a "problem to be mitigated" approach to technology, it will search for the problems caused by technology adoption, such as induction and rebound effects, so as to come up with a solution to these problems (see, Illustration 6).

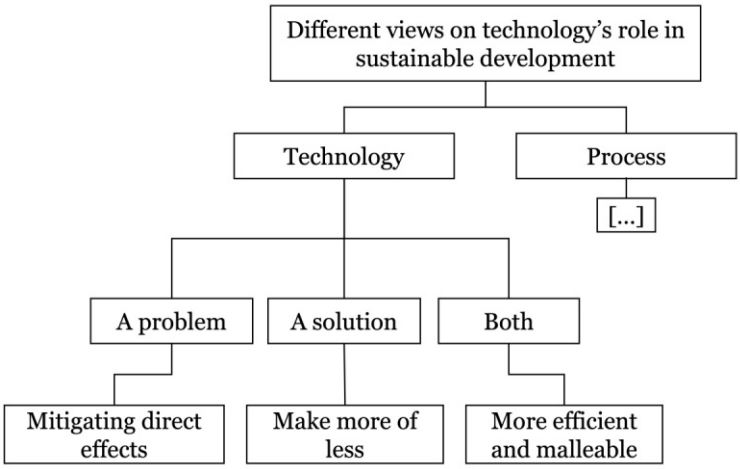

Illustration 5. A conceptual map of the different views on technology's role in sustainable development, focusing on technology-oriented research.

In addition to Hilty's observations, this dissertation has also identified literature that takes on a "double-edged sword"[4] approach to technology impact. This research typically "*acknowledge[s] that IT in and of itself is not inherently good or bad for the environment; rather, it is how individuals, organizations and society make use of information technology and systems that determines its impacts*" (Corbett, 2010, p. 3). As such, it typically views IT and digital resources as part of the problem *and* the solution (Corbett, 2010). In these cases, technology-oriented research is likely to identify problems and come up with solutions that makes the technology e.g., more efficient *and* malleable. Conversely, process-oriented research is likely to search for applications and activities that limits the problems that technology adoption might have caused while creating or amplifying the indirect and tertiary effects that these technologies might enable.

[4] An expression used by Corbett (2010) in her article "Unearthing the Value of Green IT".

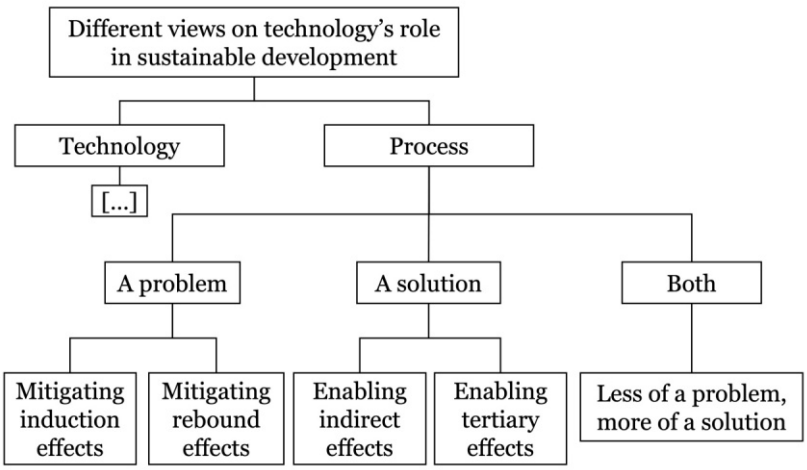

Illustration 6. A conceptual map of the different views on technology's role in sustainable development, focusing on process-oriented research.

X-axis: The Instrumental-Holistic continuum

As opposed to the first pair, the second pair of nodes is derived from the literature review of IS sustainability research and the sustainability lens in Section 2.3.1. These sections showed that IS sustainability research typically adopts a one-dimensional view on sustainability by primarily focusing on environmental sustainability and typically evaluates technology's impact by measuring a single indicator, such as, carbon emissions or paper consumption (see, Illustration 7). These reviews also showed that there might be untapped benefits to adopting a multi-dimensional and integrated sustainability approach to understand the synergies and trade-offs between multiple indicators. The previous section referred to these perspectives as the established and idealistic view on sustainability. However, since these labels do not communicate the nature of these sustainability perspectives, this section has relabeled these views by referring to the former as an Instrumental approach to sustainability and the latter as a Holistic approach (see, horizontal axe in Illustration 10). This means that the Instrumental node represents the assumptions that IS sustainability research has already adopted, whereas the Holistic node represents a new set of assumptions about sustainability, technology and the intricate relationship between them. Similar to the previous axis, this section will demonstrate how the Instrumental and Holistic approaches also influences our ideas about technology impact and technology's role in sustainable development.

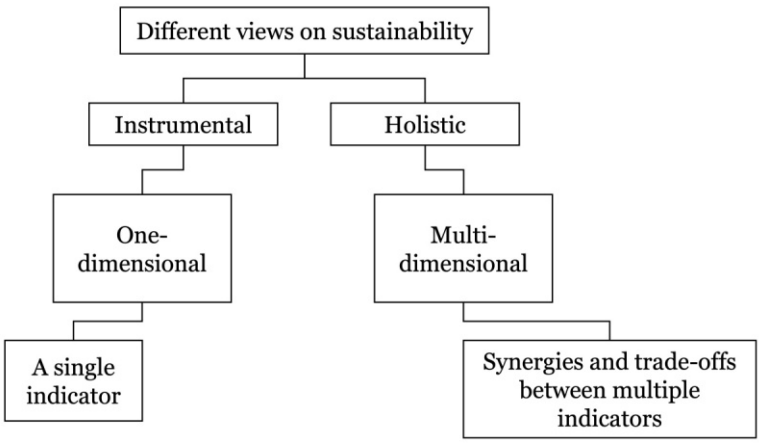

Illustration 7. A conceptual map of the different views on sustainability that IS sustainability research can adopt.

In addition to the above, this dissertation has also found that our views on sustainability tend to influence our ideas about IT and digital resources. For instance, the literature review also showed that technology- and process-oriented research tends to adopt a one-dimensional view on technology impact by focusing on problems and solutions in a user phase, or on a single process or a discrete system, respectively (see, Illustration 8). This one-dimensional view on technology impact successfully reduces the complexity of taking other life-cycle phases or processes into account. At the same time, however, it limits our ability to study the nuances of technology impact, such as impact-shifting between life-cycle phases and processes, which might prevent IS sustainability research from producing impactful research contributions. In response to the latter, this dissertation has suggested that IS sustainability research should adopt a multi-dimensional and holistic approach to technology impact. This means that IS sustainability research should shift its previous focus on a single life-cycle phase or a process in a discrete system to assess technology's impact from a full life-cycle perspective and to examine the interactions between processes and systems.

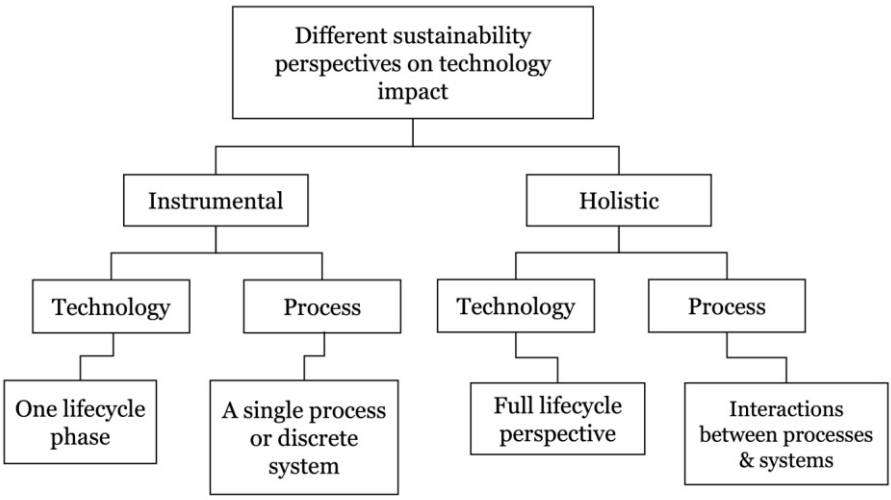

Illustration 8. A conceptual map over the Instrumental and Holistic sustainability perspectives on technology- and process-oriented research.

As previously shown in Section 2.3.1, this dissertation has also identified that Instrumental research is typically characterized by a technology-deterministic approach to IT and digital resources. Illustration 9 demonstrates how this determinism makes technology- and process-oriented research preoccupied with problems in either technology or sociotechnical systems and how these problems can be resolved by making changes to IT and digital resources or the process of applying them. These observations demonstrates that Instrumental research typically assumes that our IT related or non-IT-related sustainability problems are tightly coupled with these technologies. As such, Instrumental research typically assumes that the problem itself is a matter of designing, configuring, implementing, and levering these technologies, and not the environmental, social and economic consequences thereof. As such, Instrumental research tends to reproduce and reinforce the idea that technology is an important contributor to sustainable development.

Considering that this assumption might prevent IS sustainability research from making an impactful research contribution, this dissertation has suggested that IS sustainability research should adopt a Holistic sustainability perspective to circumvent technological determinism and redirect scholarly attention towards the possibility to, e.g., decommission technology when it jeopardizes long-term sustainability (see, e.g., Rosati et al., 2024). As seen in Illustration 9, this dissertation chooses to

formulate this non-technology-deterministic view for technology- and process-oriented research as IT and digital technologies that should not be produced, used and disposed of if the hardware, software or data jeopardizes long-term sustainability, nor if they are used for other purposes than sustainable development.

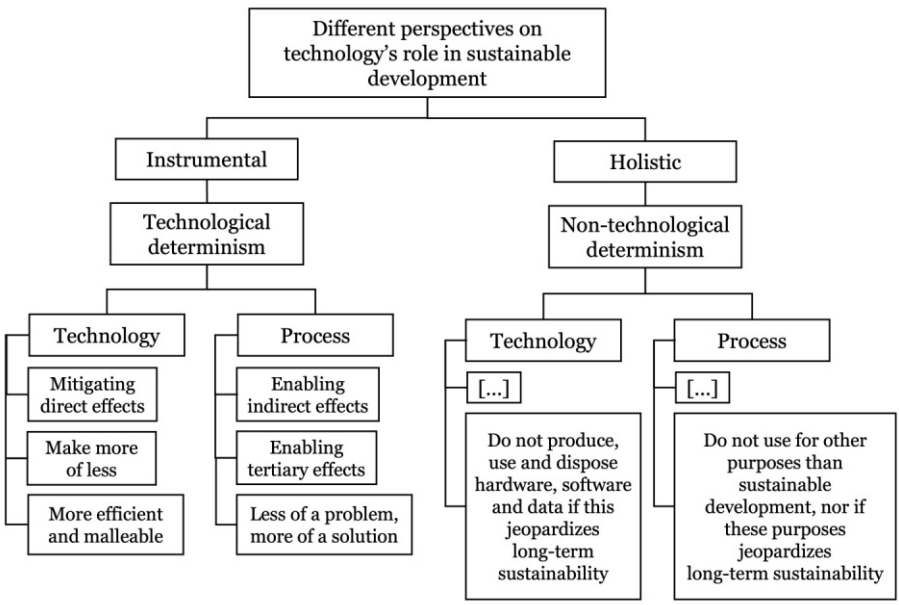

Illustration 9. A conceptual map of the different perspectives that Instrumental and Holistic research have on technology's role in sustainable development.

The conceptual model: an overview

When these pair of nodes are converted into a vertical and a horizontal axis, they form a conceptual model of four, roughly divided, quadrants: Technology-Instrumental, Technology-Holistic, Process-Instrumental, and Process-Holistic (see, Illustration 10). These quadrants represent four different research positions that IS sustainability researchers can adopt when they explore the role of technology, technology impact and the intricate relationship between technology and sustainability. Two of these positions, i.e., Technology-Instrumental and Process-Instrumental, are the most common research positions in the IS field. However, as this section will show, there are still some aspects of these research positions that IS sustainability research has yet to adopt and explore. Unsurprisingly, the remaining two, i.e., Technology-Holistic and Process-

Holistic, have yet to be adopted and are therefore largely unexplored. By using this conceptual model as a structuring device, this section will return to the IS sustainability literature in Section 2.2 to characterize each position and reveal the limitations that our established assumptions places upon the research. In addition, this section will demonstrate how IS sustainability research can adopt new assumptions to spur impactful research contributions.

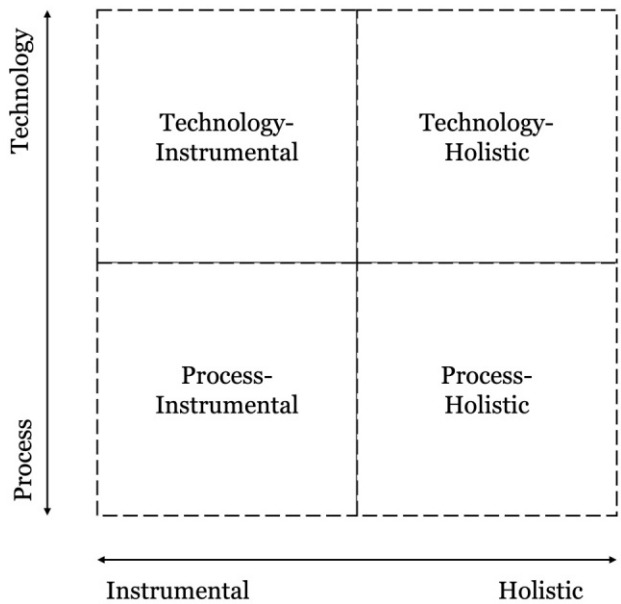

Illustration 10. Conceptual model consisting of two axes: Technology-Process and Instrumental-Holistic. These form four positions: Technology-Instrumental, Technology-Holistic, Process-Instrumental, and Process-Holistic, each with different views on technology and sustainability.

The Technology-Instrumental position

In the upper-left corner of the conceptual model we find Technology-Instrumental research, which typically focuses on a single life-cycle phase when exploring, or in other ways acknowledging, the direct effects of IT and digital resources (see, Illustration 11). This research normally relates these effects to a single sustainability dimension (e.g., environmental sustainability) and analyzes the technology's impact in this dimension through the use of a single indicator, e.g., carbon emissions (see, e.g., Hedman & Henningsson, 2016; Chan & Ma, 2017). At its heart, Technology-Instrumental research is characterized by a technology-

deterministic view on technology. As such, it typically assumes that the solutions and the positive impact it produces, such as, creating less energy-consuming hardware, increases the sustainability of the technology (see e.g., Murugesan, 2008).

There are also examples of Technology-Instrumental research taking a more process-oriented and holistic approach to technology and sustainability. In the first case, the Technology-Instrumental research is influenced by the sociotechnical view on technology but stays within the Technology-Instrumental quadrant as long as the research maintains the idea of technology as a "thing" with a focus on its direct effects. In the second case, the research takes on a multi-dimensional approach to sustainability and the life-cycle phases of technology but stays within this quadrant as long as the research maintains a deterministic view on technology.

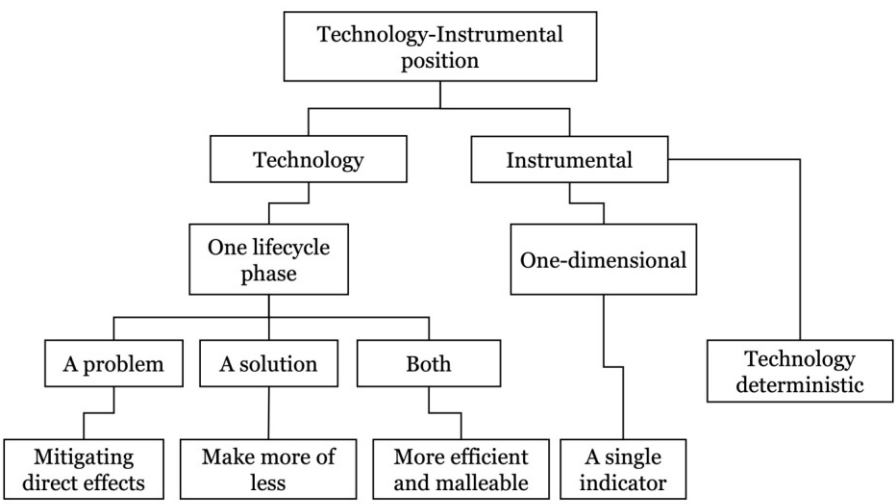

Illustration 11. A conceptual map over the Technology-Instrumental view on technology and sustainability.

After reviewing the IS sustainability literature, this dissertation has found that there are two streams of research that adopts a Technology-Instrumental position to technology and sustainability: Green IT (IS) research and some examples from the digital sustainability literature, such as the paper of Savarimuthu et al. (2023). Overall, the literature review showed that this research typically adopts a "problem to be mitigated" approach to technology. The other approaches, i.e., a "solution to problems" (exceptions include Pitt et al., 2011) and "double-edged sword" approach (exceptions include Corbett, 2010) are less explored. As

such, there is potential for IS sustainability research to explore these aspects of the Technology-Instrumental position.

In addition, the literature review showed that Green IT (IS) and digital sustainability research typically investigates these problems and solutions relative to environmental sustainability. At most, it explores the potential synergies, and sometimes trade-offs, between economic benefits and environmental sustainability, such as the favorable and sometimes challenging combination between cost reductions and carbon emissions (e.g., Hedman & Henningsson, 2016; Chan & Ma, 2017). In this regard, this dissertation has found that less attention has been paid to other sustainability dimensions, i.e., the social and the economic dimensions, and the synergies and trade-offs between all sustainability dimensions (exceptions include Dao et al., 2011). Moreover, the literature review also showed that Green IT (IS) research typically investigates these problems and solutions in a user phase. As such, there is potential for IS sustainability research to explore technology's impact in other life-cycle phases and relative to other and more than one sustainability dimension.

The final takeaway from the literature review, is that Green IT (IS) research adopts a more process-oriented approach to problems and solutions associated with technology than, for example, Green IT (CS) research. As such, Green IT (IS) research typically investigates how stakeholders in non-IT-related processes can mitigate the negative and direct effects of IT and digital resources in a user phase by establishing more environmentally friendly practices, such as, choosing eco-labelled IT hardware. These observations indicate that Green IT (IS) research has decoupled its solutions from the technology itself. As such, Green IT (IS) has moved closer to the Process node than Green IT (CS) research, which typically explores problems associated with technology and suggests solutions on how to design, program and configure the technology to mitigate its direct effects. These findings demonstrate that IS sustainability research has yet to adopt the archetypical characteristics of the Technology-Instrumental position when exploring technology's role and impact.

The Technology-Holistic position

In the upper-right corner of the conceptual model we find the Technology-Holistic research position. Unlike Technology-Instrumental research, the Technology-Holistic position typically adopts a full life-cycle perspective when exploring, or in other ways acknowledging, the direct effects of IT and digital resources (see, Illustration 12). In addition, Technology-

Holistic research typically adopts a multi-dimensional and integrated approach to sustainability. As a result, this research analyses technology's impact relative to all sustainability dimensions and uses multiple indicators to explore the synergies and trade-offs between these dimensions. As opposed to Technology-Instrumental research, Technology-Holistic research is anchored in a non-technology-deterministic approach to technology's role in sustainable development. As such, Technology-Holistic research can find it advisable to, e.g., decommission technologies if the environmental, social and economic costs of producing, using and disposing of IT and digital resources jeopardizes long-term sustainability.

There is also a possibility for Technology-Holistic research to take a more process-oriented and instrumental approach to technology and sustainability. Similar to Technology-Instrumental research, Technology-Holistic research can position itself closer to the Process-node. As a result, the research is likely to be influenced by the sociotechnical approach that characterizes this node but stays within the Technology-Holistic quadrant as long as the research conceptualizes technology as a 'thing' and continues to acknowledge its direct effects. In the second case, Technology-Holistic research moves closer to the Instrumental node which is characterized by a one-dimensional view on sustainability and technology. As a result, the research is likely to assess only parts of the technology's life-cycle and/or do so in relation to only one or two sustainability dimensions. Despite losing some of its nuances, this research stays within the Technology-Holistic quadrant by continuing to operate from a non-technology-deterministic stance.

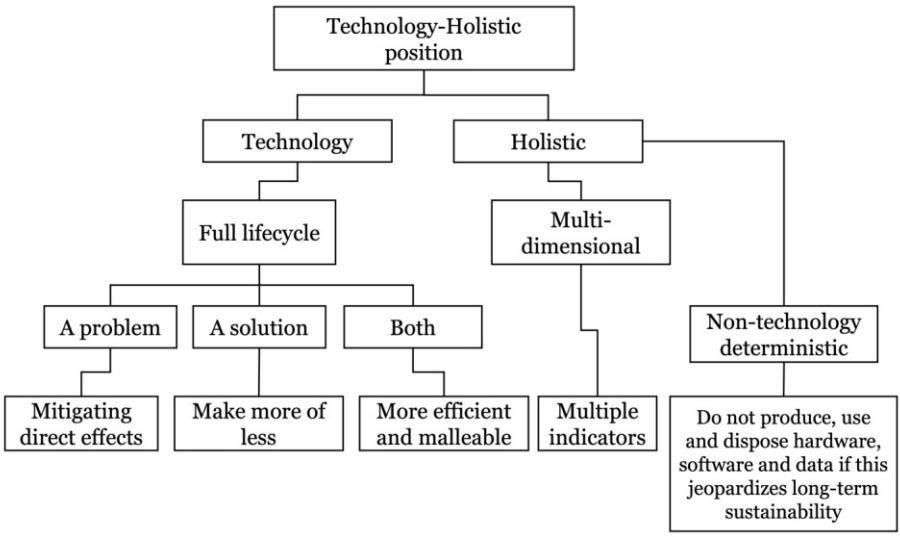

Illustration 12. A conceptual map of the Technology-Holistic view on technology and sustainability.

After reviewing the IS sustainability literature, this dissertation has found that IS scholars have yet to adopt a Technology-Holistic position in their research. Here, it should be noted that some papers have adopted this approach in part, as seen in, e.g., Elliot's (2007) early definition of Green IT research or Melville's (2010) idea of using life cycle analysis (LCA) to calculate the negative and direct effects of IT applications. Despite these examples, this dissertation has not been able to identify papers that have adopted this position in full. As such, there is a possibility for IS sustainability research to expand its previous research focus by adopting a Technology-Holistic view.

The Process-Instrumental position

In the lower-left corner of the conceptual model we find the Process-Instrumental position, which typically focuses on a single process or discrete sociotechnical system when exploring, or in other ways acknowledging, the indirect and tertiary effects of IT and digital resources (see, Illustration 13). This research normally relates these effects to a single sustainability dimension (e.g., environmental sustainability) and analyzes the technology's impact in this dimension by using a single indicator, such as, carbon emissions. Similar to the Technology-Instrumental position, Process-Instrumental research is characterized by a technology-deterministic view on technology. As such, it typically assumes that the solutions and the positive impact it produces, such as, substituting resources or creating process-optimizations, increases the

sustainability of the process and the sociotechnical system it targets (see, e.g., Stuermer et al., 2017; Degirmenci & Recker, 2023).

There are also examples of Process-Instrumental research taking a more technology-oriented or holistic approach to technology and sustainability. In the first case, the Process-Instrumental research moves closer to the Technology node. As a result, the research is influenced by the technology-oriented research approach to technology as a "thing." However, this movement stays within the Process-Instrumental quadrant as long as the research conceptualizes technology as a sociotechnical construct with indirect and tertiary effects. To exemplify, this position is archetypical to studies of how IT applications can be designed to support sensemaking and establish eco-friendlier practices in organizations (see, e.g., Seidel et al., 2018). In the second case, the research moves closer to the Holistic node. As such, it takes on a multi-dimensional approach to sustainability and technology but stays within this quadrant as long as it continues to operate from a technology-deterministic stance.

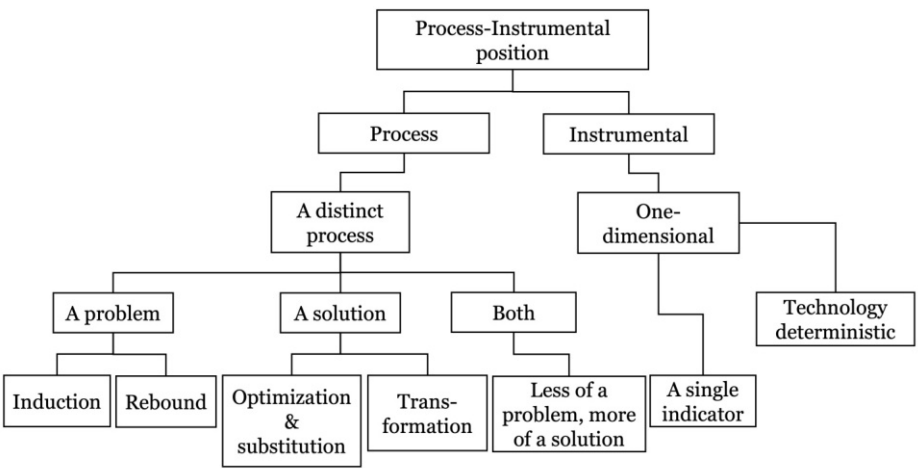

Illustration 13. A conceptual map of the Process-Instrumental view on technology and sustainability.

After reviewing the IS sustainability literature, this dissertation has identified two streams of research that typically adopts a Process-Instrumental position on technology and sustainability: Green IS and digital sustainability research. Overall, the literature review showed that this research adopts a "solution to problems" approach to technology when exploring the indirect and tertiary effects of technology adoption in non-IT-related processes (Molla et al., 2009). Correspondingly, this dissertation has found that few papers adopt a "problem to be mitigated"

(see, e.g., Elliot & Webster, 2017; Veit & Thatcher, 2023) and a "double edged sword" approach. As such, there is potential for IS sustainability research to explore these aspects of the Process-Instrumental position, such as, studying induction and rebound effects and how these unwanted effects can be offset by indirect and tertiary effects.

The literature review also showed that Process-Instrumental research typically investigates problems and solutions in a single process or a discrete sociotechnical system (e.g., an organization) relative to environmental sustainability, or at most, environmental and economic sustainability. In these cases, Green IS research typically finds that IT applications increase both environmental and economic sustainability since resource substitution and optimization often result in cost reductions (see, e.g., Seidel et al., 2013; Cheng et al., 2020). In addition, the literature review showed that studies of synergies, and sometimes trade-offs, between all sustainability dimensions (exceptions include Bengtsson & Ågerfalk, 2011; Dao et al., 2011; Sekulic, 2024) are less common (see, e.g., Kotlarsky et al., 2023). As such, there is potential for IS sustainability research to study more than one process or system as well as their interactions. In addition, there is potential for IS sustainability research to study technology impact from a social and economic dimension or adopt a multi-dimensional perspective.

A final takeaway from the literature review, is that Green IS scholars typically adopts a Process-Instrumental position since it is considered by many to be a more IS-oriented approach than what is typically offered by its counterpart, i.e., the Technology-Instrumental position. The review also found that this decision was established at the outset of the Green IS discourse and that the Green IS literature has continued to reinforce this distinction. In parallel to the dominant discourse, however, this dissertation has also identified some critical voices that have been raised against the tendency to adopt only a Process-Instrumental position only (El Idrissi & Corbett, 2016; Seidel et al., 2017; Aanestad et al., 2024). In this respect, the literature review has shown that there is a literature-gap at the intersection of the Technology-Instrumental and Process-Instrumental quadrants (exceptions include Zhang et al., 2011). Accordingly, there is potential for IS sustainability research to produce new and impactful research contributions at the intersection of these positions.

The Process-Holistic position

In the lower-right corner of the conceptual model we find the Process-Holistic position, which typically focuses on the interactions between multiple processes and systems when exploring, or in other ways acknowledging, indirect and tertiary effects of IT and digital resources (see, Illustration 14). Unlike Process-Instrumental research, this research typically adopts a multi-dimensional approach to sustainability. As a result, it analyzes technology's impact in relation to all sustainability dimensions and uses multiple indicators to explore the synergies and trade-offs between these dimensions. Similar to Technology-Holistic research, the Process-Holistic position is anchored in a non-technology-deterministic approach to technology. As a result, Process-Holistic research does not assume that technology adoption will lead to increased sustainability and can find it advisable that stakeholders e.g., restrict themselves from acquiring technology or postpone technology adoption if the purpose for acquiring the technology is other than sustainable development or if the use thereof jeopardizes long-term sustainability.

Similar to the other research positions, there is also a possibility for Process-Holistic research to take a more technology-oriented and instrumental approach. In the first case, the Process-Holistic research moves closer to the Technology node. As a result, the research is somewhat influenced by the technology-oriented research approach to technology as a "thing" but stays within the Process-Holistic quadrant as long as the research conceptualizes technology as a sociotechnical construct with indirect and tertiary effects. In the second case, the Process-Holistic research moves closer to the Instrumental node. As such, the research is influenced by the one-dimensional view on sustainability and technology that characterizes this node. Hence, it is likely that the research adopting this position will partially analyze processes, systems and their interactions relative to one or more sustainability dimensions. Despite losing some of its nuances, this research stays within the Process-Holistic quadrant by continuing to operate from a non-technology-deterministic stance.

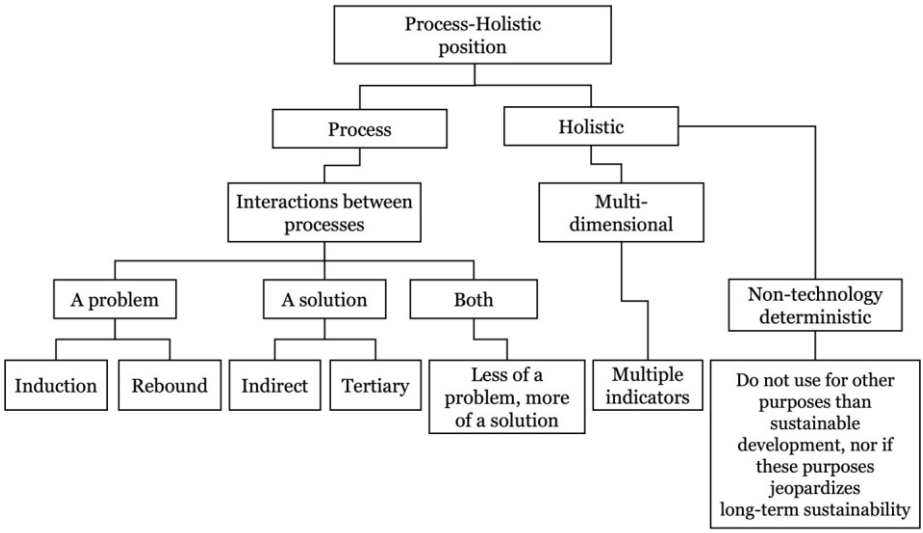

Illustration 14. A conceptual map of the Process-Holistic view on technology and sustainability.

When reviewing the IS sustainability literature, this dissertation has found that IS scholars have yet to adopt a Process-Holistic position. As such, there is a possibility for IS sustainability research to explore the research assumptions that underlie this position, such as, the different roles that technology can play in sustainable development and its impact on the sustainability dimensions and adjacent views at the intersection of other quadrants.

2.4 Positioning this research

The previous section showed that IS sustainability research typically adopts a Technology-Instrumental or a Process-Instrumental position to technology, sustainability and the intricate relationship between them. The synthesis also showed that Green IT (IS), Green IS and digital sustainability research is usually one-dimensional and process-oriented. For instance, the synthesis showed that Technology-Instrumental research has focused on how technology adoption can become more eco-friendly by demonstrating how stakeholders develop and adopt more eco-friendlier practices in a user phase. Process-Instrumental research, on the other hand, has demonstrated that technology adoption can be considered eco-friendly by demonstrating that IT and digital resources substitute natural resources or create efficiency and optimization gains. In addition, the synthesis showed that Green IT (IS), Green IS and digital sustainability generally adopts a deterministic approach to technology's

role in sustainable development. As such, IS sustainability research typically assumes that increased eco-friendliness is a matter of successfully acquiring, adopting, designing, configuring, implementing, and using these technologies in eco-friendly ways or for eco-friendly purposes.

The synthesis also demonstrated that there are several gaps to explore within and across these positions. In general, IS sustainability research has either adopted a "problems with technology" approach when taking a Technology-Instrumental position or adopted a "solution to problems" approach when taking a Process-Instrumental position. In addition to these gaps, the synthesis could also point to a gap at the intersection of the Technology-Instrumental and Process-Instrumental positions, which has also been identified and criticized by previous research (see, e.g., El Idrissi & Corbett, 2016; Seidel et al., 2017; Aanestad et al., 2024). Here, the synthesis identified a need for IS sustainability research to assess the negative environmental impact of IT and digital resources as well as their enabling effects. To exemplify, in their article, Zhang et al., (2011) assessed the carbon footprint of an IT solution and the carbon footprint of an organizations' paper consumption that the IT solution was intended to substitute. Based upon their analysis, the authors argued that the carbon footprint of the IT solution could be offset if it successfully substituted paper consumption. This study is one of few papers that have tried to bridge this gap. Moreover, the synthesis showed that IS sustainability research has yet to adopt a Technology-Holistic or Process-Holistic position.

This analysis of the IS sustainability literature has shown that IS sustainability research can advance its current understanding of technology, sustainability and their intricate relationship by adopting new research assumptions. More importantly, this synthesis has shown that there is potential for IS sustainability research to advance our understanding of how IT and digital resources can have a "truly" positive impact on sustainable development and sustainability by bridging the gap between a technology-oriented and a process-oriented research focus and adopting a Technology-Holistic or Process-Holistic position. In line with these insights, and to remedy these gaps in research, this dissertation advances our current understanding of technology, sustainability and the intricate relationship between them by adopting different research positions while exploring the overall research question: *How can organizational conditions for digital sustainability practices be created and sustained?*

More specifically, this dissertation closes some of these gaps by adopting different research positions within and across the Technology-Holistic and Process-Holistic quadrants in three empirical papers. As seen in Illustration 15, Article II adopts a position at the intersection of the Technology-Holistic and Process-Holistic quadrants to bridge the gap between technology- and process-oriented research. More specifically it bridges the gap between a "problem to be mitigated" approach with technology and a "solution to problems" approach to technology adoption. This paper specifically advances ours understanding of the challenges and risks that accompany the idea of trying to offset the direct and negative impact of IT with indirect effects. Unlike Article II, Article III adopts a Process-Holistic position and a "solution to problems" approach, whereas Article IV adopts a Process-Holistic position and a "double-edged sword" approach to technology adoption and impact. Taken together, these articles advance our current understanding of how organizational stakeholders pursue and create digital sustainability in practice.

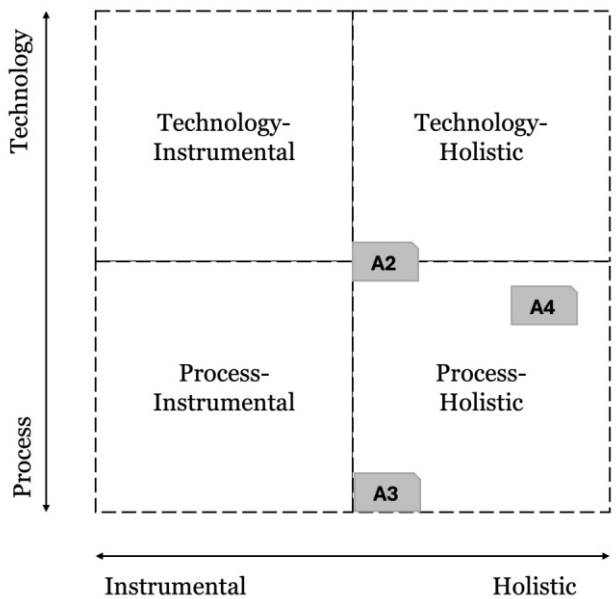

Illustration 15. The different research positions that underlie Articles II-IV.

3. Digital sustainability in practice

The previous chapter showed that digital sustainability is the most recently introduced research phenomenon in IS sustainability research and that there is a need for new empirical exploration and theoretical development to advance our understanding of digital sustainability (see, e.g., Kotlarsky et al., 2023). Joining the ongoing efforts of exploring this phenomenon, the previous chapter showed that this dissertation adopts a Technology-Holistic and Process-Holistic position to explore the overall research question: *How can organizational conditions for digital sustainability practices be created and sustained?* To contextualize this research question, this chapter will begin in a characterization of the digital sustainability phenomenon and a description of how digital sustainability manifests on an organizational level. Following these sections, the third section describes the benefits and constraints of practice-oriented research. In line with these insights, the fourth section outlines the foundations of a practice perspective, while the final section explains how this research uses a practice perspective to study digital sustainability in organizations.

3.1 The complexities of digital sustainability

Digital sustainability is a multidimensional and sometimes controversial phenomenon located at the intersection of two equally complex phenomena: sustainability and digitalization. Sustainability, on the one hand, is a multifaceted phenomenon with many different levels and stakeholders on a planetary scale with manifold manifestations emerging across different natural systems (Elliot, 2011). This means that sustainability can be observed in, e.g., the existence of healthy and regenerative ecosystems and in a healthy balance between short-term and long-term human impact on the natural environment (Dearing et al., 2014). In an equally wide, but different sense, sustainability is also a socially constructed phenomenon with manifold manifestations across different social structures on a global scale. This means that sustainability can emerge on multiple societal levels (e.g., societal, industrial, organizational and individual) and across different societal systems (whether these are political, economic, social, or cultural) through different forms of stakeholder engagements.

On this level, sustainability can be observed as actions and interactions between a diverse set of stakeholders in different arrangements. To

exemplify, sustainability can manifest as ideological motives, political decisions, policy measures, business models, strategies, goals, specialized roles, technologies, methods, techniques, measurements, capabilities, mindsets, personal values, priorities, actions, and behaviors. The nature of these manifestations varies with stakeholder interests (e.g., mission, goals, values) their level of operation (e.g., geographical location, economic system, spheres of authority, influence), and the resources they possess (e.g., capabilities, financial or technological). This means that sustainability is created based upon different stakeholder interpretations and processes of localization (i.e., translating and embedding sustainability into a local context on a subnational level), operationalization (i.e., translating sustainability into actionable goals and putting them into practice), and contextualization (i.e., integrating sustainability into existing social structures, mindsets and actions of people).

Digitalization, on the other hand, is a sociotechnical phenomenon that is, similar to that of sustainability, multifaceted with its many different levels and stakeholders (Lyytinen et al., 2017). On an aggregate level, digitalization is an emergent and globally, but not equally, distributed phenomenon (although some improvements have been made during the last decades, inequalities persist; see Corbett et al., 2023) with manifold and increasingly pervasive manifestations across different social structures. In its widest sense, digitalization can be observed as an expanding, interconnected but loosely coupled infrastructure that emerges through different forms of stakeholder engagements and is kept together by e.g., shared standards and interfaces (Lyytinen et al., 2017). In this respect, digitalization materializes as a flexible infrastructure (e.g., features and capabilities) that is prone to grow in scale and scope with unprecedented speed (Venkatraman, 2017).

Connected to the above, digitalization also emerges as a socially embedded and localized infrastructure that is jointly created by a diverse set of stakeholders operating across different social structures. In this respect, digitalization can manifest as political decisions, policy measures, strategies, industry standards and norms, programming languages, technological innovations, online communities, societal norms, business models, capabilities, actions, and behaviors, such as, new patterns for social interactions, communication or consumption of goods and services, e.g., retail e-commerce, remote workers, e-services and telehealth. As in the case of sustainability, these manifestations can take on similar forms. However, the nature of these will inevitably vary with stakeholders' interpretations and actions (i.e., varying with the levels and systems in

which they operate, stakeholders' interests, influence and access to resources).

As the above assessment illustrates, sustainability and digitalization are two inherently complex and multifaceted phenomena with similar characteristics. By merging these phenomena, digital sustainability is likely to be attributed with the same qualities as sustainability and digitalization (i.e., multifaceted, inherently social and emergent). This means that manifestations of digital sustainability are likely to diverge between different social settings since digital sustainability will be interpreted, operationalized, localized, and contextualized by different actors and stakeholders (on different societal levels) to make digital sustainability a workable, achievable, and measurable outcome. In addition, it is likely that stakeholders seeking to create digital sustainability will experience great complexity when translating digital sustainability into practice since the different ideas and beliefs contained by these notions can result in various tensions (e.g., competing demands, conflicting goals, or diverging outcomes). As such, digital sustainability can manifest as similar and yet fundamentally different opportunities, constraints and challenges for stakeholders.

3.2 Digital sustainability on an organizational level

As "*systems of inputs, throughputs and outputs*" (Shrivastava, 1994, p. 706), organizations are the principal instrument through which humans can produce goods and services that satisfy basic human needs. At the same time, organizations are also the "*primary instrument by which humans impact their natural environment*" (Shrivastava, 1994, p. 705). Recognizing this paradoxical relationship, policy makers and researchers have identified organizations as important intermediaries for sustainable development (Melville, 2010; Elliot, 2011; UNDESA, 2022) as well as a major contributor to climate change and unsustainable anthropogenic activity (Shrivastava 1994; Melville, 2010; Steffen et al., 2015). On a societal level, policy makers are tackling this problem by presenting policy recommendations and new legislation to hold organizations accountable for their environmental and social impact as well as incentivize them towards sustainable development.

For instance, the European Commission (EU) has presented the European Green Deal (2019) with the purpose of aligning the economies and societies of the European countries with the Paris Agreement and the

SDGs. It has also presented the European Climate Law (2021) which makes the member states legally obliged to achieve the targets in the European Green Deal (EU, 2025a). In addition to policy measures, policy makers are also trying to incentivize organizations towards new modes of operating, such as circular economy (EU, 2025b). In this respect, the EU has, for example, announced that it can offer financial support of at least EUR 100 billion to advance the European countries towards climate-neutrality by 2050 (EU, 2025b). As such, organizations are not only expected to increase their sustainability performance in the light of new legislation, but also to become instruments through which societal and individual sustainability can be achieved (Hart, 1997: Elliot, 2011).

For most organizations, however, the operational challenge of becoming more sustainable and creating sustainability for others is presented at a time of intensive digitalization efforts (George et al., 2021; Lichtenthaler, 2022). While this situation is not unique – indeed, organizations have been coping with advances in computation technology since the 1950s (Hirschheim & Klein, 2012) and the need to strike a balance between organizational activity and environmental protection since the 1960s (Hart, 1997) – the circumstances in which organizations must innovate their operations with digital technologies has notably changed. In essence, digitalization is no longer a matter of creating more efficient information flows within the organization (Legner et al., 2017). Instead, it offers a new arena for doing business, such as reaping the benefits of transforming one's value propositions to meet new customer demands (see, e.g., Bharadwaj et al., 2013; Hanelt et al, 2021).

Previous research has called this the digital imperative for organizations, an era of indisputable opportunities and challenges for organizational innovation that is now to coincide with a sustainability imperative – meaning that organizations must find ways to leverage the digital imperative for sustainable development (George et al., 2021; Lichtenthaler, 2022). A recent example of this is the concept of a "twin transition" which has been coined in the EU as a simultaneous green and digital transition that aims to: "*combat climate change and environmental degradation" [while] "delivering a sustainable, fair, and competitive future*" (Muench et al., 2022, p. iv). For some organizations, this new reality has presented itself as external demands, for example, policy measures and changing customer demands (George et al., 2021), whereas, for others, it has presented itself as a new business opportunity (e.g., Fairphone).

However, the undertaking of converging organizational digitalization and sustainability in practice is by no means a trivial pursuit for organizations (Batista et al., 2023) since sustainability, at its heart, presents a new dominant logic for organizational activity (Watson et. al., 2012). This logic does not only require organizations to innovate their operations with digital technologies (i.e., where sustainability gains are possible) to become more sustainable in themselves and create sustainability for others (Sachs et al., 2019), it also requires that organizations simultaneously address the negative environmental and social impact of digitalization (i.e., sustainable digitalization) while using digitalization for sustainability purposes (CODES, 2022). More specifically, digitalization must become sustainable in the following aspects: natural resource extraction, energy use, consumption, misinformation, digital exclusion and rights violations (CODES, 2022; Fors et al., 2024; Schoormann et al., 2025).

As previously stated in Chapter 2, the IS sustainability literature on digital sustainability has recently begun to explore how organizations can use digitalization to increase their sustainability performance (see, e.g., Zimmer & Järvälinen, 2022) and contribute to the SDGs (see, e.g., Corbett et al., 2023) or achieve a so-called twin transition (Crome et al., 2024). However, Chapter 2 also showed that less attention has been paid to the problems and challenges that are attached to digitalization. To explore how organizations approach this multidimensional, multilevel and somewhat controversial phenomenon in practice, this dissertation choose to explore the organizational practices and conditions that successfully allow for organizations to merge these megatrends in their daily activities. Accordingly, this research joins previous efforts to explore digital sustainability practices (see, e.g., Krasikov & Legner, 2023) and their conditions on an organizational level (see, e.g., Sekulic, 2024). In addition, by taking a Technology-Holistic and Process Holistic position, this dissertation advances our previous understanding of these practices and conditions by studying how organizational stakeholders approach digital sustainability in practice and analyzing these findings from a multidimensional, holistic and non-technology-deterministic perspective.

3.3 Practice-oriented research

The idea of studying practices is not an original one. In fact, it has been argued that a key concern for the social sciences has been to translate the theoretical, and oftentimes vague, idea of what sustainability and sustainable development “are” into practical results (Mebratu, 1998;

Scoones, 2007). While the approaches to studying practices have varied between disciplines (see, e.g., Pezzoli, 1997) and different schools of thought (see, e.g., Ergene et al., 2021), most scholars have agreed that sustainability can only be achieved through a change in practice (Purvis et al., 2019). When reviewing the IS literature, it becomes apparent that the idea of creating more "sustainable practices" has been fundamental to Green IT and Green IS research (see, e.g., Loeser et al., 2017) and is also becoming a prioritized concern for digital sustainability research (see, e.g., Corbett et al., 2023).

As previously stated, the IS sustainability discourse has presented several useful findings in a user phase, especially practices related to design, development, configuration and deployment (see, e.g., Kotlarsky et al., 2023; Rosati et al., 2024). When reviewing this literature in Chapter 2, this dissertation showed that this discourse has typically studied how IT and digital resources can be designed, used and implemented to e.g., afford new eco-friendly practices and behaviors in organizations (see, e.g., Watson et al., 2011; Seidel et al., 2013; Loock et al., 2013, Seidel et al., 2018), to inform users about their unsustainable practices and behaviors (see, e.g., Loock et al., 2013; Marett et al., 2013; Degirmenci & Recker, 2022), and to be effectively adopted by end-users (see, e.g., Seidel et al., 2013; Marett et al., 2013). Previous research has also shown that the in-house IT department emerges as a principal stakeholder of Green IT practices since these are related to the organization's IT infrastructure (Loeser et al., 2017). Green IS practices, on the other hand, can emerge on the initiative of various stakeholders in the organization, although are often created in collaboration with the IT department (Seidel et al., 2013).

In addition to studying practices, IS research has also explored the conditions that surrounds these practices and influences their results. For instance, while this literature has demonstrated that IT and digital resources certainly hold the potential to support eco-friendly practices, it has also shown that the organizational culture and stakeholders' attitudes, motivations, interests (see, e.g., Jenkin et al., 2011; Seidel et al., 2013) and roles (Leidner et al., 2022) are consequential for stakeholders' actions. In the digital sustainability literature, previous research has also identified data analytics capabilities as consequential to sustainability reporting (see, e.g., Krasikov & Legner, 2023) and digital maturity levels as consequential to an organizations ability to digitally innovate its operations (see, e.g., Joukhadar et al., 2023). Taken together, this research has demonstrated that IT and digital technologies must not only be designed and implemented in ways that ensures technology adoption

and adaptation, but that also meet user requirements, such as, stakeholders' roles, interests, attitudes, and motivations.

These examples of Green IT, Green IS, and digital sustainability practices demonstrate that there is an established tradition in IS research to study stakeholders' actions and their conditions to explain how IT and digital resources can be successfully designed, developed, configurated, implemented and used by stakeholders to increase their (eco-) sustainability performance. Recognizing that practice-oriented research holds the potential to generate knowledge contributions that might be directly translated to practice, Corbett et al. (2023) recently argued that IS scholars should continue their investigation of practices to generate knowledge that might be translated into interventions and solutions in the light of pressing sustainability issues. Despite this opportunity, however, previous research has also shown that practice-oriented research can come across as neutral, although the research itself is undeniably value driven and can sometimes mirror stakeholders' interests (Purvis et al., 2019).

For instance, in the IS field, there has been a historical tendency to adopt and use concepts "*in [their] everyday, layperson sense*" (Lee, 2010, p. 337), such as buzzwords used by IT managers or system developers, instead of adopting a scientific language against which the appropriateness of these ideas, actions and results can be evaluated (Lee, 2010). For instance, in the case of Green IS, Davison (2018) finds that Green IS research has been "*driven by what is good for organizations and how they can leverage IS to enhance their profit margins and competitiveness*" (p. 2) rather than exploring IS implementation from other stakeholder perspectives, such as the natural environment. In these instances, IS scholars have become messengers of the solutions that practitioners have developed based upon practitioners' interests, experiences and value-laden beliefs instead of questioning, e.g., for what purpose and for whom these solutions have been developed.

This pitfall is especially problematic when it comes to digital sustainability, since the interests and activities that organizational stakeholders typically perform are usually unsustainable (Ergene et al., 2021). This means that IS scholars might develop an understanding of technology, sustainability and the intricate relationship between them based upon practitioners' interests, beliefs and ideas without reflecting upon the consequences of doing so. Recognizing these opportunities and potential pitfalls of a practice perspective, this dissertation posits that IS sustainability scholars must not only be mindful of their own research

assumptions and interpretations when investigating digital sustainability (as shown in Chapter 2), but should also be mindful of stakeholders' ideas and interests that precedes their decisions and actions. Connected to the latter, this dissertation argues that a practice perspective should be complemented with a reflexive approach to stakeholders' interests, ideas and beliefs about digital sustainability.

3.4 A practice perspective

As previously illustrated, a practice perspective encourages scholarly attention towards stakeholders' actions and the context in which these actions are performed to explain why, how and with what results stakeholders perform these actions (Feldman & Orlikowski, 2011). A practice perspective also places a special emphasis on the every-day-activities of stakeholders, since the performing of these activities are considered to be "*consequential in producing the structural contours of social life*" (Feldman & Orlikowski, 2011, p. 1241). Central to this perspective is also the idea that practices are produced, reproduced and developed through ongoing interactions between structures and human agency (Feldman & Pentland, 2003). As a result, a practice perspective not only sensitizes the observer towards the actions stakeholders perform, but also the conditions in which these practices emerge.

On a fundamental level, a practice perspective assumes that our social reality is produced and reproduced through the development and enactment of social practices (Reckwitz, 2002). These practices represent *"a pattern which can be filled out by a multitude of single and often unique actions reproducing the practice*" (Reckwitz, 2002, p. 250). According to Sahakian and Wilhite (2014), these activities are expressions of the bodily, material and social aspects that individuals associate with these practices and are influenced by at the time. These agential aspects include, but are not exclusive to, bodily behaviors, beliefs, aims, symbolic meaning, technologies, resources and social rules. Since these aspects are in constant flux, it is also likely that the actions performed to accomplish a practice differ between individuals, settings and locations, and are likely to change over time (Sahakian & Wilhite, 2014).

In addition to approaching practices as heterogenous and emergent, a practice perspective also assumes that social practices can become routinized behaviors (Reckwitz, 2002). Routinized practices are recurrent practices that are socially repeated over time (Reckwitz, 2002), often performed and accomplished by individuals with minimal or no effort

(Sahakian & Wilhite, 2014). These practices are typically regarded as social structures in practice theory, but not in a "fixed" sense, since incremental changes are to be expected in everyday practice (Reckwitz, 2002). At the same time, however, there is an inherent stubbornness to these structures that makes them resistant to change, especially rapid and transformative change, such in the case of sustainability and sustainable development (Sahakian & Wilhite, 2014) [5].

Routinized practices are an important aspect of our social lives, including at the organizational level, in which routinized practices are important for our collective ability to organize our actions. As previously stated, a practice perspective assumes that stakeholders produce and reproduce their social reality in their everyday activities. In organizations, the everyday activities of organizational stakeholders are often performed for specific purposes connected to the organization's overall mission, vision and goals (Czarniawska & Joerges, 1995). In this context, routinized practices are a source of stability, providing accountability, legitimacy, efficiency, reduced conflict, and continued productivity, all of which are associated with positive outcomes for the organization (Feldman & Pentland, 2003). These routines are often formalized into standardized procedures and guidelines on how to perform organizational work, often in the form of abstract representations to make these formalized procedures transferable between context specific situations. By nature of becoming automated, however, routinized practices can also become a source of stagnation, leading to inertia, inflexibility, deskilling, demotivation, and reluctance to change, all of which might hamper the organization's ability to adapt or develop its practices in the light of new conditions (Feldman & Pentland, 2003).

A key takeaway from the research on organizational routines is the frequently observed discrepancy between the ostensive aspects of routinized work (i.e., the formalized artifacts) and the performative aspects of organizational routines (i.e., what stakeholders actually do) (Feldman & Pentland, 2003). The ostensive aspect is commonly thought of as the "ideal" version of a routine, while the performative aspect represents the "raw" and enacted version. According to Feldman and

[5] To illustrate a practice: A well-known but somewhat tedious practice is washing the dishes. The activities leading up to this practice, the performing thereof, and the end-result, might differ from day to day, but you will always refer to this practice as "washing the dishes". When comparing this practice between cases, it is also likely that our location, time, and unique conditions (e.g., access to resources and bodily abilities) will shape how we perform this practice. For instance, while some might do it by hand, others will use a dishwasher. Even as time passes and conditions change, the dishes will continue to appear. This will make the practice of "washing the dishes" a heterogenous, emergent and routine practice.

Pentland (2003), there is a messiness to the performative aspect of a routine that is rarely accounted for in the ideal version since these are often stripped of their contextual elements to become transferable. For instance, whereas the ostensive routine might be formalized as a step-by-step guide, the performative routine is often improvised by stakeholders in relation to e.g., available resources, competencies and the manifold, and not always mutually conducive, practices that organizational stakeholders must perform on a daily basis (Feldman & Pentland, 2003).

3.5 Digital sustainability from a practice perspective

As explained in the previous sections, a practice perspective draws attention to the why, the how and the what stakeholders do to create digital sustainability. This dissertation explores these aspects of the overarching research question by studying how the in-house IT department approaches digital sustainability in practice and how other organizational stakeholders are affected by these changes. Previous IS sustainability research has identified the IT department as an important stakeholder in digital sustainability efforts (Standing & Jackson, 2002; Pernici et al., 2012; Kotlarsky et al., 2023), particularly when it comes to the "sustainability of IT" perspective (Pernici et al., 2012; Loeser et al., 2017) but also in regard to increasing the organization's sustainability performance in collaboration with other organizational stakeholders (Kotlarsky et al., 2023). With digital sustainability on the horizon, there are also reasons to believe that the IT department's role will change and that it will have to develop new strategies, capabilities and practices to meet new sustainability requirements (Standing & Jackson, 2002; Pernici et al., 2012; Kotlarsky et al., 2023).

In the case of the IT department, this research explores how IT professionals interpret digital sustainability against their existing frames of reference (see Articles III, Article V) and how IT professionals translate their ideas about digital sustainability into a pursuable and measurable outcome (see Articles II, III and IV). For instance, the empirical exploration demonstrates how IT professionals use formalized goals, strategies, policy documents, and measurements to legitimize digital sustainability as a prioritized concern and the performative aspects of realizing these goals and objectives in practice (see Article III). In addition, this dissertation explores how this shift towards digital sustainability affects other organizational stakeholders on an operational level. More specifically, it explores the why, the how and the what users

do to create digital sustainability in their daily activities (see Articles II, III and IV). For instance, the empirical exploration includes users' opinions and interests (Article IV) as well as their reasons for adopting, resisting or abandoning a digital solution once it has been implemented (see Articles II and III). By contrasting the findings from these stakeholder perspectives, this dissertation exposes the tensions and contradictions that emerge when digital sustainability is pursued on an organizational level.

4. Method

As previously stated, this dissertation advances our understanding of digital sustainability by adopting a Technology-Holistic and Process-Holistic research position and exploring digital sustainability in practice. The aim of this empirical investigation is twofold: first, to study what organizational stakeholders do to create digital sustainability in their respective contexts and, second, to study the organizational conditions in which these practices emerge. In line with these aims, and to provide an answer to the overarching research question "*How can organizational conditions for digital sustainability practices be created and sustained?*" this dissertation explores digital sustainability practices and their organizational conditions through an exploratory and interpretivist research approach. Since the research methodology has been outlined in each paper, this section will provide the reader with an explanation of the philosophical and methodological considerations leading up to this research. In addition, this chapter will explain why this dissertation has adopted an exploratory and interpretative research approach. It will also present how the exploratory research processes have unfolded over time and present an overview of the data collection and analysis. To close it off, this chapter will explain how this research has generalized the empirical findings of this dissertation and end with some reflections on method.

4.1 Exploratory and interpretative research

In line with previous IS sustainability research, this dissertation has approached digital sustainability as a new IS sustainability phenomenon that requires further empirical investigation (Kotlarsky et al., 2023). Recognizing that digital sustainability is an emergent and socially embedded phenomenon, this dissertation has adopted an exploratory and interpretative research approach. An exploratory research design is suitable when the phenomenon under investigation is new, when prior research about the phenomenon is scarce, or in cases when a researcher has reasons to believe that a phenomenon might contain new or previously undiscovered elements worth investigating (Stebbins, 2001). By reviewing the IS sustainability literature (as seen in Chapter 2), this dissertation has identified several research areas in which new knowledge development is needed. More specifically, Chapter 2 identified that the digital sustainability literature would benefit from further exploration of technology's role, impact and intricate relationship to sustainability from a Technology-Holistic and Process-Holistic research position.

An exploratory research design is often characterized by flexibility, open-mindedness and inductive reasoning (Stebbins, 2001). However, as with any research, this exploration has been guided by the ontological and epistemological positions that also inform our choices on how to explore and explain a research phenomenon (Mason, 2007). In this research, the exploratory process has been guided by a critical realist stance on ontology and a pragmatic view on epistemology. As such, the empirical and theoretical exploration of digital sustainability has, on the one hand, assumed that that there are some aspects of reality that can be considered objective – since these aspects will not cease to exist even if humans did (Mingers et al., 2013). On the other hand, it has also assumed that our understanding of this reality is inevitably filtered through the subjective experience of the human mind – which makes our knowledge, and this dissertation work, about the world socially constructed and "fallible" (Buch-Hansen & Nielsen, 2020).

To exemplify, a realist stance on global warming supports the idea that our observations of rising surface temperatures implies that global warming exists. A realist stance would also argue that it exists irrespective of our human experience of it (Buch-Hansen & Nielsen, 2020). However, ours subjective and intersubjective explanations for why global warming exists, and the potential consequences thereof are likely to differ from person to person. For instance, some might see global warming as a result of unsustainable human activity and believe it to be an immense threat to humanity while others might see it as a result of natural consequences, such as of the Earth's natural cycles, and be looking forward to a warmer climate. As such, a realist stance on ontology posits that humans do not have to know about global warming in order for global warming to take place, nor does global warming have to be interpreted in the same way just because the data are the same.

By adopting a critical realist stance on ontology, this research does not reject, but also does not fully accept, that our reality is socially constructed. One of the benefits of this ontological position is that the empirical exploration of stakeholders' ideas and beliefs about digital sustainability are not considered as ultimate truths about reality, but just subjective truths that can advance our understanding of reality. To exemplify, by performing qualitative interviews with different stakeholder groups, this research can advance our understanding of why, how and with what results stakeholders pursue digital sustainability according to their subjective and sometimes intersubjective experiences. By recognizing that these findings are subjective and that there is, to some extent, an objective reality, this research can also draw upon other

sources, such as quantitative data points, or contrast these findings against other qualitative sources, to show how these digital sustainability efforts can also have a detrimental impact on the natural environment (see, Article II, IV).

In addition to adopting a critical realist stance on ontology, this dissertation also adopts a pragmatic stance on epistemology. According to Mason (2007), epistemology is a researcher's theory about knowledge, what Chowdhury (2019) describes as "*how we may come to know*" (p. 107) reality. Essentially, a researcher's epistemological position will reveal what a researcher would regard as empirical evidence and guide the practical choices of how a researcher will go about finding that evidence (Mason, 2007). By adopting a pragmatic approach to epistemology, this dissertation posits that our knowledge about reality can be obtained through quantitative and qualitative methods and that the choice thereof should be identified as the best possible way in which the research can provide an answer to the research question (Lawani, 2021). This means that quantitative and qualitative methods are seen as "tools in a toolbox" rather than being associated with, and sometimes restricted to, a specific research tradition (Lawani, 2021).

In line with this pragmatic stance on epistemology, the exploration of organizational conditions and digital sustainability practices has been guided by the research questions posed in each of the individual papers. In general, however, these research questions have found common ground in an interpretivist approach for collecting and analyzing data. Interpretative research is typically concerned with why, how and what stakeholders make specific situations and objects mean (Walsham, 1995) and sensitizes the researcher to the *in-situ* arrangements of these interpretations (Leonardi & Barley 2010) – both of which are reflected in the overarching and the individual research questions in this dissertation. In addition, interpretative research is often performed through in-depth case studies with qualitative interviews as a primary data collection technique (Walsham, 2006) – which is also the case with Articles III, IV and V. Thus, it can be established that the exploratory research in this dissertation work is predominantly characterized by an interpretative and qualitative research approach.

Article	Research question	Type of research
I	What are the assumptions underlying the Green IT and Green IS discourse?	Literature review
II	How does the positive influence of IT implementation offset the negative environmental impact of the IT implementation itself?	Mixed-methods case study
III	How can organizations leverage internal IT-projects with external sustainability demands?	Qualitative case study
IV	How has the paperless idea been consequential for digitalization and sustainability efforts in organizations?	Qualitative case study
V	How do digitalization managers understand and operationalize sustainability in their practices?	Qualitative case study

Table 3. An overview of the different research questions posed in the appended papers (Article I-V) and the research design of each study.

4.2 The exploratory research process

To describe how this research project has unfolded, this section will present an overview of the research project. During my first year as a PhD student, I was working with a dataset from my first level master thesis. I began in a literature review of the digital transformation literature to frame and theorize my findings. A first draft was presented at the IRIS conference in 2021 (which was arranged online due to Covid-19 restrictions), and an improved draft was presented at the EGOS conference in the summer of 2022. During this time, I was beginning to develop an interest in sustainable development. However, as a novice PhD student during the covid-19 pandemic, I was utterly convinced that it would be easier to get started (and accepted to conferences) by studying digital transformation rather than combining the two topics. As I was trying to convince myself that this was the most logical course of action, I noticed that my personal interest in sustainable development was making it increasingly difficult for me to continue on the path of digital transformation without questioning why we were not talking about digitalization and sustainability together.

In the middle of 2021, I therefore began my open-ended exploration of the Green IS literature. While reading up on this literature, I soon came to realize that the topic I intended to study, i.e., the intricate relationship between technology and sustainability, had typically been focusing on environmental sustainability (see, e.g., Watson et al., 2011; Seidel et al., 2017) and foregrounded Green IS issues without sufficiently problematizing or accounting for the environmental, social and economic consequences of these technologies (see, e.g., Seidel et al., 2017). I also came to realize that my research interest in an integrated sustainability perspective was underrepresented in the field and that the majority of researchers were focusing on the indirect effects of IT and digital resources (see, e.g., Elliot & Webster, 2017) while disregarding the problems associated with technology and the unwanted effects of technology adoption and use (see, e.g., El Idrissi & Corbett, 2016).

In my pursuit for empirical and theoretical input on these perspectives, I turned to other disciplines and schools of thought, and perhaps more contemplative communities, such as the SICT doctoral summer school and the ICT4S conference. These communities have developed from the works of Lorenz M. Hilty, whose writings have also inspired my work. More specifically, I have used Hilty's (2008) original framework of "IT as part of the solution" and "IT as part of the problem" to identify and interpret the research assumptions that underlie IS sustainability research (see, Illustration 16).

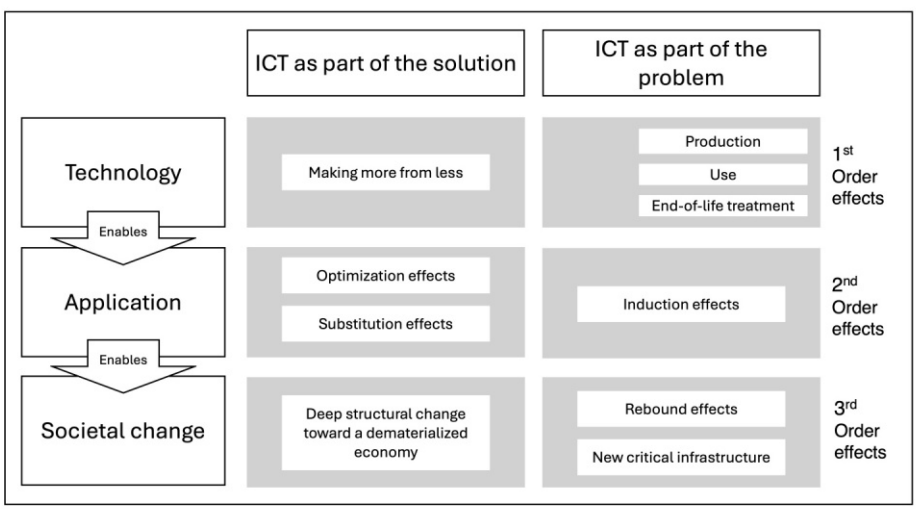

Illustration 16. Adapted from Hilty (2008).

During the process of writing this cover chapter, I have also been fortunate to discover more thought-provoking work that has recently started to emerge in the IS discipline, such as the recently published literature reviews by Fors et al. (2024) and Veit and Thatcher (2023) whose perspectives resonates with my own work. Another IS scholar who has also influenced this exploration, is Jaquline Corbett whose work (with colleagues) has also shown me that it is possible to challenge established assumptions (Hovorka & Corbett, 2012; El Idrissi & Corbett, 2016), break new theoretical ground (Corbett, 2010; Savarimuthu et al., 2023) while remaining sensitive to the real-world complexities of a practitioner perspective and produce research contributions with practical implications (Corbett, 2010; Corbett 2013; Corbett et al., 2023).

My ongoing exploration of the literature also informed my empirical work. As seen in Illustration 17, the first case study, an open-ended interview study in a public sector IT department, was performed during the second half of 2022. This study was closely followed by a more focused case study in the same organization. At the time, I was also contributing as a co-author in an article project in which I was responsible for the framing of the study. This article was presented at the AMCIS conference in 2023. The data from case studies 1 and 2 were analyzed during the beginning of 2023 and presented at the ICT4S conference in the summer of 2024. During the first half of 2024, I was also analyzing and writing a second article based upon the empirical dataset from case studies 1 and 2. This time, however, the framing was different, and the dataset was supplemented with a new literature search and analysis of the paperless idea in practitioner-, and research-oriented outlets. This work was later presented at the HICSS conference in 2025.

In parallel with these article projects, I was also prepared for and conducted my third case study, which was analyzed in the autumn of 2024 and submitted as an extended abstract to Information Systems Practice Journal in November 2025. In addition, I was participating as a co-author in a third article project that was based upon an analysis of the Green IT and Green IS literature that a colleague and I had been working on during 2023. This article was submitted and accepted to the IRIS conference in the summer of 2025. Unfortunately, however, we had to cancel our presentation and conference participation at the last minute. As such, the paper was never presented. As seen in Illustration 17, I have also included the activities and events, such as PhD courses, summer schools and practitioner-oriented forums. These activities have also influenced my understanding of sustainable development and sustainability beyond the IS sustainability literature.

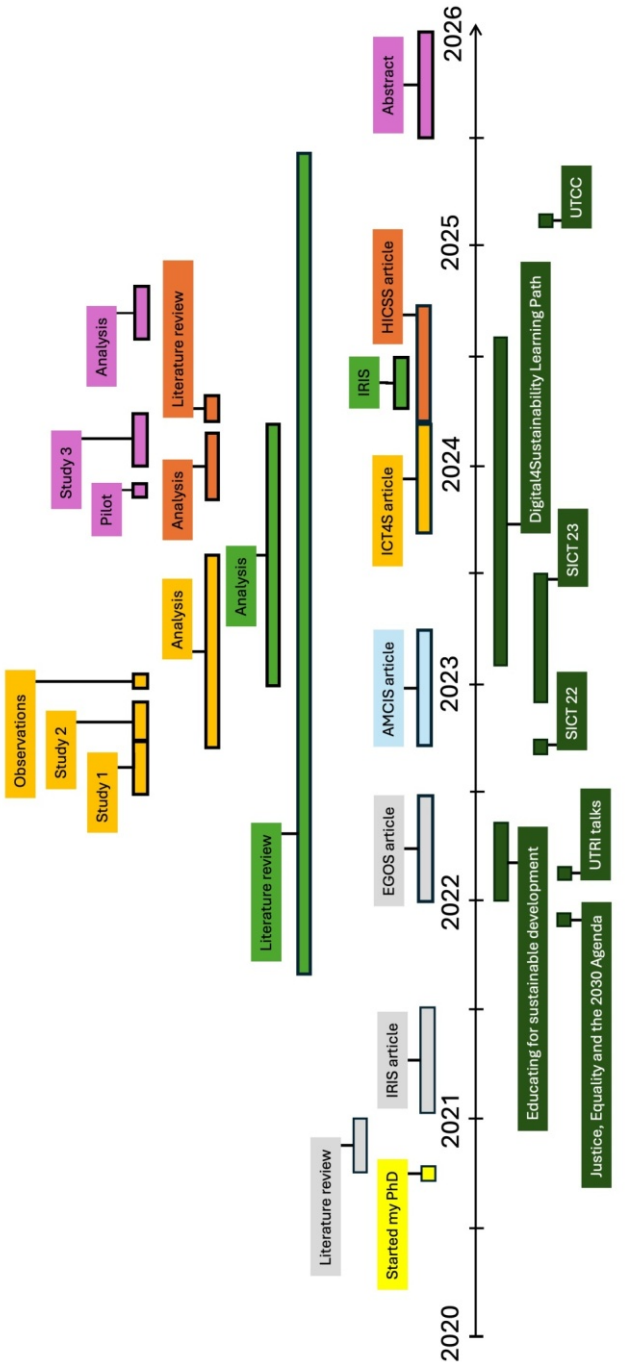

Illustration 17. A timeline illustrating the research process from when I started my PhD studies in September 2020 to the end of 2025.

4.3 Data collection and analysis

This section will dive deeper into the literature review of the Green IT, Green IS and digital sustainability discourse. In addition, this section will give a brief account of the quantitative and qualitative data sources that underly the empirical exploration of this dissertation work and what data analysis techniques I have used to analyze these data.

4.3.1 Literature reviews

As with any research project, this research process began in a literature review of published work (see, e.g., Webster & Watson, 2002). The first literature review of the IS sustainability literature was initiated in 2021 and included the basket of eight journals (i.e., EJIS, ISJ, ISR, JAIS, JIT, JMIS, JSIS, and MISQ). The open-ended question of this study was: What is being produced within IS sustainability research? The idea was to explore the knowledge contributions of this literate and to identify discontinuances, discrepancies, contradictory findings, conflicting arguments, or lack of synergies between articles. For the literature search, I decided to alternate between the following search terms: "environmental sustainability", "sustainable development" and "social sustainability". These concepts were derived from the WECD report and the intersecting circles diagram. I did not include “economic sustainability” since the idea of creating economic value has been of primary concern for IS research (see e.g., Kohli & Grover, 2008). Instead, I expected to find the articles that addressed economic sustainability as defined in 2.2.1 by using sustainable development as a search term. Also, I did not use “*”, "AND" and "OR" since some search engines did not support wildcards.

The selection of articles was based upon a screening of the abstracts, keywords, content and conclusions. Articles were included in the dataset if they addressed one of the sustainability dimensions as a core concern in the paper (see, Section 2.1.1) Articles were excluded if sustainability was merely mentioned. In total, the literature search yielded 43 articles. In the process of analyzing the dataset, I read the article in full and began to build a repository that specified e.g., the research question of each paper and the level of analysis. In this process, I came to realize that IS sustainability research typically revolved around two concepts: Green IT and Green IS. As such, by using the distinction between Green IT and Green IS from Watson et al. (2010), I began to categorize the literature as either Green IT or Green IS research. To be specific about what each article focused on, I also added a label which indicated the primary area of concern, such as strategy, design or adoption. Overall, I found that most of the literature had been focusing on Green IS and that this research typically focused on

Green IS strategy (e.g., Benitez-Amado & Walczuch, 2012), Green IS design (e.g., Pan et al., 2021), Green IS adoption (e.g., Cooper & Molla, 2017) and Green IS practice (e.g., Cheng et al., 2020). Based upon the findings from this analysis I wrote the framing for Article II.

In parallel to this exploration, I also decided to expand my literature search to Google Scholar. This is where I found that other research disciplines, such as, the business and management literature (George et al., 2021; Ribeiro et al., 2021) and media studies (Görland & Kannengießer, 2021) were beginning to refer to digital sustainability. With these observations in mind, I turned to the Web of Science where I decided to search for literature on "digitainability", "digital sustainability" and "sustainable digitalization". Here, I found that digital sustainability was beginning to catch on across different outlets, such as, "Digital policy, regulation and governance" and the MDPI journal "Sustainability"[6]. At the time, it had received less attention in the IS field (except from Pan et al., 2022). I therefore decided to keep with the Green IT and Green IS literature as my main source of prior work.

Since performing these initial literature reviews, I have continuously updated the dataset to include new papers. For instance, in the end of 2022, I updated the literature review by with the addition of the following search terms: "green IT", "green IS", "development goals" and "sdg". This change in search terms yielded the same results as before, as such, it only added new publications from 2022. Following this update, the papers were analyzed with a focus on rhetorics to identify assumptions in the Green IT and Green IS literature. This analysis was reported in Article I. In 2024, these datasets were updated once more and complemented with the basket of eleven journals (i.e., Decision Support systems, Information & Management, and Information & Organization). In the process of reading these articles I found that these papers were referring to the same ideas and assumptions that I had previously identified in the Green IT and Green IS discourse (see, e.g., Kurkalova & Carter, 2017; Butler & Hackney, 2021).

For the purpose of keeping up to date with the digital sustainability research and writing this cover chapter, I have also performed a literature review in the IS field. The literature review was performed during fall 2024 and included the basket of eleven journals and the proceeding of five IS conferences: ICIS, HICSS, AMCIS, ECIS and PACIS. I used two search string. Where wildcards were applicable, I searched for: "digital sus*" or "sus* digital" or "digital* for sus*". Where wildcards were not applicable, I searched for: "digital sustainability" or "sustainable digitalization" or

[6] This journal has been recognized as a predatory journal, as such, I have excluded it in this work.

"digitalization for sustainability". In total, this search yielded 63 results; however, due to lack of access to most conference outlets (where most research papers were found) I could only include six papers in total.

4.3.2 Empirical case studies

Following these literature reviews, I used the insights gained from the IS sustainability literature and the digital sustainability discourse to prepare for, conduct, and analyze my empirical research to explore some of the gaps that I had identified in this literature (see, Section 2.3). The empirical exploration of this research has been guided by the research questions posed in each of the individual papers. As previously illustrated, this research has been performed through case studies using mixed or qualitative methods. According to Yin (2002), the case study method is an appropriate research strategy when the aim of the research is to uncover the contextual conditions in which a phenomenon emerges (Yin, 2002). Similar to that of exploratory research, case studies can be informed by either quantitative and qualitative data sources, or a mix of both (Yin, 2002), which makes it a widely accepted method in positivist and interpretivist research traditions (Walsham, 1995).

Given that the case study method has been developed for the study of contemporary and contextual phenomena, this dissertation argues that the case study method is an appropriate research strategy for studying digital sustainability since digital sustainability is an emergent and socially embedded phenomenon. In addition, this dissertation argues that the case study method is congruent with an exploratory research approach and a pragmatic stance on epistemology since case studies can be informed by qualitative and quantitative methods (Yin, 2002). To provide an overview of the latter, Table 4 outlines the data sources that underlies this dissertation work. Given that the research methodology has been outlined in each paper, this section will provide a general summary of these techniques with a focus on the empirical case studies (see Articles II, III, IV, V).

Article	Research question	Type of research	Data collection	Data analysis
I	What are the assumptions underlying the Green IT and Green IS discourse?	Literature review	Structured literature search using the Basket of Eight as a database	Inductive coding Rhetorical analysis
II	How does the positive influence of IT implementation offset the negative environmental impact of the IT implementation itself?	Mixed-methods case study	Inventory in Ecoinvent v3.8 & NTM Semi-structured interviews Observations during project meetings Documents	Life-cycle analysis (LCA) Qualitative assessment
III	How can organizations leverage internal IT-projects with external sustainability demands?	Qualitative case study	Semi-structured interviews Documents	Inductive thematic analysis
IV	How has the paperless idea been consequential for digitalization and sustainability efforts in organizations?	Qualitative case study	Structured literature search using practitioners' & researchers' outlets as a database Semi-structured interviews	Qualitative content analysis
V	How do digitalization managers understand and operationalize sustainability in their practices?	Qualitative case study	Semi-structured interviews	Inductive thematic analysis

Table 4. An overview of data sources and techniques for analyzing both quantitative and qualitative data in the different case studies.

4.3.3 Data sources and data analysis

The quantitative data sources in this research are represented by a single indicator: carbon dioxide equivalents (CO_2e). Carbon dioxide is an important ingredient in the photosynthesis, but also a greenhouse gas. Since the 1950s, we have witnessed an increase of carbon dioxide in the atmosphere that stretches beyond the proportions of what can be absorbed by nature (Steffen et al., 2015). As a result, carbon dioxide is accumulated in the atmosphere (along with other greenhouse gases) which increases the surface temperature at an unnatural pace (Rockström et al., 2009). With an emphasis on climate change, carbon dioxide serves as an important indicator of unsustainable practice (Strange & Bayley, 2008). In addition, it serves as an important source of information since carbon dioxide equivalents, when sufficiently visualized, can offer stakeholders a possibility to make informed decisions about their choices and actions. Article II provides an example of this by reporting on an inventory of carbon dioxide equivalents (CO_2e) performed using Ecoinvent v3.8 and the Network for Transport Measures (NTM) and the results of a life-cycle analysis (LCA) through which the yearly carbon footprint of an IoT system (e.g., sensors, gateways, server and cloud service) and an urban waste collection process (i.e., transportation and trash bags) was calculated and visualized.

The qualitative data sources of this research include multiple data points: semi-structured interviews, observations, and documents. Common to all case studies is the semi-structured interview, a data collection technique that is often used in interpretative and qualitative research to assess stakeholders' interpretations of social phenomena (Mason, 2007). The semi-structured interview is a focused form of exploration that is supported by an interview guide (Stebbins, 2001) and serves as an important source of data when the research is conducted using a passive style of researcher involvement (Walsham, 1995; Walsham, 2006). With the latter being representative of the case studies in this dissertation, the semi-structured interview has served as a primary source for data on stakeholder interpretations (see, Table 5 for an overview). Following Yin's (2002) recommendations to triangulate qualitative data, the semi-structured interviews have also been complemented with observations and written documentation. These data sources have generally included, strategy documents, written reports, e-mails, official information on websites, instructions, and online demonstration videos.

Study	Minutes	Role
Case 1	60	Department manager 1
	45	Chief development officer (CDO)
	49	Team leader
	67	Division manager 1
	80	Division manager 2
	65	Division manager 3
	54	Division manager 4
	57	Chief medical information officer (CMIO)
Case 2	45	Project owner 1
	18	Project owner 1
	50	Object manager
	53	Project leader
	48	Local system administrator 1
	51	Local system administrator 2
	78	Local system administrator 3
	28	Local system administrator 4
	35	Local system administrator 5
	63	Business developer
	54	Sustainability coordinator
Case 3	28	Division manager 5
	26	Division manager 2
	30	Division manager 3
	27	Division manager 6
	27	Director of department
	27	Department manager 1
	34	Department manager 2

Table 5. Overview of data collected in case study 1-3. The data collected for Article II is not represented in this table.

Congruent with an exploratory research approach, the qualitative material was inductively analyzed using two methods: inductive thematic analysis and qualitative content analysis. According to Braun and Clarke (2006), the principal idea behind thematic analysis is to generate themes from codes to describe meaningful patterns across multiple sources of qualitative data. As such, thematic analysis is considered a systematic and yet flexible method for qualitative data analysis. Because of this flexibility thematic analysis is also compatible with different philosophical positions (Braun & Clarke, 2006). As a result, thematic analysis is congruent with the pragmatic approach to epistemology in this dissertation. In a similar fashion, qualitative content analysis offers a systematic and yet flexible method for generating categories of codes, yet with the aim to describe the

underlying meaning of texts or other forms of visual communication (Selvi, 2019). Article IV provides an example of a "directed" type of qualitative content analysis with the aim to (1) generate a representative data set of articles on the "paperless" idea in the public and academic discourse and (2) to report on the underlying meaning of paperless by coding and interpreting quotes in which the paperless idea is expressed.

4.4 Generalizing interpretative and qualitative research

In IS research, generalizability has been advocated as an important element of interpretative and qualitative research (Walsham, 1995; Klein & Myers, 1999; Seddon & Scheepers, 2012) to create what Klein and Myers (1999) refer to as explanations beyond anecdotal insights. According to Lee and Baskerville (2003) there are four different approaches to generalizability: Generalizing from data to description (EE), generalizing from description to theory (ET), generalizing from theory to description (TE) and generalizing from concept to theory (TT).

4.4.1 Generalizing this research

In line with an exploratory research approach, this dissertation has produced ET generalizations to describe why "*persistent findings have been observed*" (Sutton & Staw, 1995, p. 374-375) in the data. More specifically, this dissertation produces theoretical statements by introducing new concepts and drawing upon implications (as described by Walsham, 1995) to explain the empirical findings of digital sustainability practices and their conditions in the different case studies. On the other hand, this dissertation has also used theoretical statements to explain patterns in the data. To exemplify, Article IV identifies and adopts two concepts, i.e., trope and norm, from adjacent research disciplines as to explain paperlessness as a *trope* in discourse and a *norm* in practice. As a result, we could demonstrate how the paperless trope has come to drive digitalization and sustainability efforts on an organizational level, and how this trope has become a norm which is enacted by organizational stakeholders without any significant consideration for the consequences of doing so.

In addition, this dissertation has presented theoretical statements from theorizing activities, such as "*abstracting, generalizing, relating, selecting, explaining, synthesizing, and idealizing*" (Weick, 1995, p. 389). More specifically, this dissertation has synthesized, problematized and classified research assumptions in the IS sustainability literature. As a result, this dissertation has presented a conceptual model of four different

research positions in IS sustainability research: Technology-Instrumental, Process-Instrumental, Technology-Holistic, and Process-Holistic. By producing this model, this dissertation has presented four new concepts and a framework explaining the links between their core components. This might also serve as a useful classification tool in adjacent disciplines, such as the business and management literature and computer science where digital sustainability is also being investigated.

4.5 Reflections on method

Before conducting my case studies, I gave the idea of studying digital sustainability a lot of thought. Especially how to conduct studies that would allow me to capture this phenomenon, not only in practice but also in the actions that translate digital sustainability into real-world results. As previously described in Section 3.1, digital sustainability can manifest as different forms of actions across multiple levels, however, in order for digital sustainability to be created and have a real-world impact, digital sustainability must be translated into new forms of practice (see, Section 3.2). As such, one of the challenges of studying this phenomenon is to understand why and how these manifestations of digital sustainability emerges. Accordingly, we must investigate stakeholders' motivations for creating this change by investigating what digital sustainability is for them and why it is important, as well as how they can create this change in their particular contexts.

In this research, I have studied manifestations of digital sustainability where the performing of new actions result in change, i.e., instances of practice beyond mere semantics. Prior to identifying the organizational level as the context in which these actions are likely to emerge, I explored the possibility of studying digital sustainability on a policy level by contacting different governmental departments. However, after a pilot interview I found that a case study on this level would not bring me closer to the instances where their policy recommendations would be translated into real-world results. Instead, I found that this translation process would become the responsibility of organizations and, to some extent, individuals. These early observations were consistent with previous IS sustainability research where the organizational level had been identified as an important intermediary for sustainable development (see, e.g., Melville, 2011; Corbett et al., 2023). As such, it became my ambition to explore digital sustainability practices and their conditions on an organizational level.

This research has mainly been carried out through qualitative interpretivist case studies and qualitative interviews. This means that peoples interpretations and contexts have been central to the knowledge contributions of this dissertation. For the purpose of answering the research question, interpretative case studies have offered a suitable way for tapping into informants' ideas about what digital sustainability is and what practices and the conditions they believe bring them closer to the manifestation of their ideas. On the one hand, these data are important since digital sustainability by means of being a socially constructed phenomenon, is likely to emerge as a result of stakeholders' interpretations and their actions. On the other hand, interpretivist case studies and qualitative interviews are not an easy undertaking since they require that stakeholders' interpretations are captured, accessed, and correctly represented throughout the analysis and the writing up of research results (Walsham, 1995).

One way of ensuring this is to use different interview questions and techniques to capture informants' thoughts, beliefs, experiences, and actions without influencing them to use words, expressions or phrases they themselves would not use, or making them describe something they themselves do not believe in or have experience with. To bring some rigor to these interviews, I formulated a semi-structured interview guide to ask the same questions to the informants. When needed, I used follow-up questions by paraphrasing what the informant had said or asked if it could elaborate a little bit further on concepts, expressions, or metaphors that were used. By doing so, I wanted to clarify what message the informant was trying to communicate to me without adding my own reflections to the conversation. Instead, I would argue that my interpretations of these data were added in the process of analyzing them and constructing explanations for my observations. In analyzing the material, I was careful to code the data in iterations and to go back to the source material to verify that the analytical codes I was using were representative to the descriptions and interpretations of the informants.

Despite having taking precaution in these steps, there have also been other factors that have influenced this research. In this dissertation work there have been at least two main sources of influence: limited data access and my role as an outside observer. In general, I have experienced a difficulty to get access to contexts where I can meet, observe and interview practitioners at work. One problem was that my studies were to be carried out in an in-house IT department within public sector healthcare, hence, in the early stages of my PhD the Covid-19 pandemic affected my opportunities to collect data. This hindered me to participate and be

included in the organization as it was originally planned, and in some ways, I think that the Covid-19 restrictions placed me in a role of an outside observer (see, Walsham, 1995). In other ways, I think that I placed myself in this role since I wanted to respect their time, stressful work environment and not come across as an intrusive researcher.

Because of my role as an outside observer, I have not been able to access the daily activities of the informants first-hand, e.g., through observations. Instead, the primary data collection technique for this dissertation has been qualitative interviews. This means that the findings of this dissertation are mostly based on informant's interpretations of their own and other's actions that they have performed. These data were collected during interview-sessions, which means that, on the one hand, the informants could have been sharing information that they felt safe to share with me as a researcher, and on the other hand, were able to recall during the interviews. To overcome the structural boundaries of this setup, and to capture as many nuances as possible, I invited informants from different stakeholder groups to participate in the different cases studies. In this regard, I believe that the data I have collected provide a source of information on how informants make sense of digital sustainability in their organizational contexts (see, e.g., Article III).

As a consequence of focusing on the why and how stakeholders perform digital sustainability practices, this research has not provided insights into the actual impact of these practices. This brings me to my final reflection, the difficulty to assess the real-world impact of digital sustainability manifestations, and by extension, the somewhat misguided focus on the benefits of evaluating the results of technology adoption post-implementation. For instance, by keeping with suggestion of previous research, Article II used a LCA to assess the environmental impact of IT (see Melville, 2010) and contextualized this analysis with a qualitative assessment. This study showed that the IoT system did not generate the real-world impact that it was expected to achieve. In addition, the analysis showed that the municipality could have created the steepest reductions in carbon emissions by replacing the plastic bags. Looking at the results of Article II, and Article III, this exploration has shown that the study of digital sustainability manifestations should focus on the why, what and how these manifestations emerges rather than the evaluation thereof to explain why these manifestations fail. Based upon the insights from these case studies, I have continued to explore how stakeholders interpret and translate their ideas about digital sustainability into practice (see Articles IV and Article V).

5. Paper summaries

The empirical findings of this dissertation are reported in five appended papers. These articles have been published, accepted and submitted to international conferences in the IS discipline (i.e., AMCIS, HICSS and IRIS) and in adjacent fields of research (i.e., ICT4S). Published papers have been subject to a peer-review process comprising at least two reviewers and have been revised accordingly. Similarly, accepted papers have been subject to a peer-review process and are in the process of being revised. Unlike published and accepted papers, however, submitted papers have yet to be reviewed and completed.

Article	RQ	Status	Authorship
I	What are the assumptions underlying the Green IT and Green IS discourse?	Submitted	First: framing of the paper, introduction, RQ, data collection, analysis
II	How does the positive influence of IT implementation offset the negative environmental impact of the IT implementation itself?	Published	Second: framing of the paper, introduction, conclusions
III	How can organizations leverage internal IT-projects with external sustainability demands?	Published	First: framing of the paper, introduction, literature review, data collection, analysis, discussion
IV	How has the paperless idea been consequential for digitalization and sustainability efforts in organizations?	Published	First: framing of the paper, introduction, literature review, data collection, analysis, discussion
V	How do digitalization managers understand and operationalize sustainability in their practices?	Submitted	Second: data collection, analysis

Tabel X. Overview of research Articles I-V.

Article I

Title: The Foundations of Digital Sustainability: A Rhetorical Analysis of Core Assumptions in Green IT and Green IS Discourse.

Authors: Bomark, S., & Karlsson, M.

Accepted to: IRIS 2024.

Keywords: Digital sustainability, Green IS, Green IT, Core assumptions, Rhetorical analysis.

Aim and background

This paper identifies digital sustainability as a new research phenomenon which has yet to be empirically and theoretically explored in the IS field (Kotlarsky et al., 2023). In their editorial, Kotlarsky et al. (2023) encourages IS scholars to begin their investigation in the previous works of Green IT and Green IS scholars. In response to this recommendation, this paper argues that the time is ripe to problematize the core assumptions of Green IT and Green IS research to address some of the limitations that are associated with these streams and to avoid that these limitations being adopted and reinforced in new research on digital sustainability. Against this backdrop, this paper asks: *What are the assumptions underlying the Green IT and Green IS discourse?* To answer this research question, Article I reports on a structured literature review of Green IT and Green IS publications in the AIS "Basket of Eight", which are generally recognized for their influential and governing role in IS discourse (Levy & Ellis, 2006). Following this first step, the paper reports on an inductive coding process of key arguments and a subsequent analysis of controversies to support a rhetorical analysis of the literature. With regards to the latter, Article I posits that the core assumptions of the Green IT and Green IS discourse can be uncovered through rhetorical analysis. This process is, however, a work in progress.

Findings and contributions

As of now, the paper reports on the initial findings from the rhetorical analysis: a table of controversies at the intersection of Green IT and Green IS research and a rhetorical device; the double-edged sword rhetorics, which highlights a central paradox in the Green IT and Green IS literature: the IT environmental paradox.

Positioning Article I

Article I reports on an attempt to identify and synthesize the research assumptions in Green IT and Green IS research. As a result, this paper explores the positions that these research streams adopt relative to technology, sustainability and the intricate relationship between them. Since the paper has not adopted a particular position of its own, it is difficult to position this research in the conceptual model from Chapter 2. Instead, Article I provides a description of the review process, which was later complemented with an additional review of the digital sustainability literature (as seen in Chapter 2). In addition, Article I describes the initial analysis of the Green IT and Green IS literature that preceded the individually performed analysis and synthesis of the IS sustainability literature in Chapter 2. The synthesis is therefore the result of my own interpretations of this literature, and the conceptual model is my own original work.

Article II

Title: The Trash is Always Greener on the Other Side: A Life Cycle Assessment of IoT Implementation.

Authors: Saarikko, T., Bomark, S., Lundström, A., Brunklaus, B., & Chiew, Y. L.

Published in: AMCIS 2023 Proceedings.

Keywords: Sustainability, Green IS, Internet of Things, Life Cycle Assessment.

Aim and background

This paper problematizes the tendency to evaluate Green IS success by measuring the positive outcomes of IS implementation without contrasting these outcomes against the negative environmental impact of the IT implementation itself. Against this problematization, this paper asks: *How does the positive influence of IT implementation offset the negative environmental impact of the IT implementation itself?* To answer this research question, Article II reports on a mixed-methods assessment of an IoT implementation that was expected to lower the costs and carbon footprint of urban waste collection in a Swedish municipality. This was to be achieved through optimization gains – an outcome that was expected to be created through optimized routes. Essentially, waste

collection operators were expected to empty litter bins on demand when litter bins were full in an effort to reduce fuel costs and carbon emissions from vehicles.

The mixed-methods approach included an LCA using CO2-equivalents to estimate the carbon footprint of both the IoT solution and the waste collection process, and a qualitative assessment to contextualize the LCA. By combining these data sources, the paper could successfully report on the theoretical potential of implementing the IoT solution to create optimized routes, and the challenges of realizing this potential in practice. It should be noted that this research was conducted by a group of researchers in a project to which I was invited as a co-author at a point in time when the data collection and analysis had already been performed. Instead, I contributed to the framing of the article.

Findings and contributions

Based upon the results of the LCA, the paper reports on the following findings. First, the LCA showed that plastic bags represented 97% of the carbon footprint in waste collection. Second, the LCA also showed that the outdoor gateways, closely followed by sensors and indoor gateways, represented the main contributors to the carbon footprint for the IoT solution. Third, the LCA further showed that the carbon footprint of the IoT solution was minimal in comparison to the carbon footprint of plastic bags in waste collection. Based upon the qualitative assessment, the paper could also report on two major challenges. First, waste collection operators experienced some technical challenges with the IoT system which made it difficult for them to trust the accuracy of the optimized routes. Second, public littering had not been anticipated by the project team when they had designed the IoT solution. As such, littering could not be registered by the sensors, thus creating a situation where operators began to ignore the optimized routes.

In addition to the above, the paper could also identify and report on some positive outcomes. First, the team considered the project a valuable learning experience even though the expected benefits of the implementation did not materialize. Secondly, the operators experienced a cleaner city since they had time to pick up trash from the streets. By building upon these findings, the paper concludes that the IoT solution could have, at least in theory, created a net positive decrease in fuel costs and CO2 emissions. However, this theoretical potential was never realized. In this respect, the paper discusses the potential reasons for why waste collectors might abandon the solution. For instance, in the

discussion, the paper elaborates on the limitations of the initial problem formulation (i.e., the problem that the IoT solution was expected to solve) which was based upon assumptions about HVO fuel being a similar source of carbon emissions as regular gasoline. The paper also identifies the project teams "innovator's spirit" as a potential explanation for why they failed to anchor the problem formulation in the real-world conditions that influenced waste collectors' "room" for action, i.e., the conditions that permitted and restricted their use of the IoT solution.

Positioning Article II

Article II adopts a position at the intersection of the Technology-Holistic and Process-Holistic quadrants. To bridge the gap between technology- and process-oriented research, this article explores how the direct and negative impact of IT can be offset with positive and indirect effects in urban waste collection. For the purpose of answering the research question, Article II adopts an instrumental approach to sustainability and technology, as such, it focuses specifically on the environmental impact of the IoT-solution in a user phase. Unlike instrumental research, however, Article II also discusses the need to take other life-cycle phases into account. Article II also points to the fact that the plastic bags represented the greatest source of carbon emissions in the waste collection process and that the municipality could achieve the greatest impact by replacing these. As such, Article II demonstrates a non-technology-deterministic stance by showcasing that the municipality can increase the sustainability performance of urban waste collection without digital means. Accordingly, Article II has adopted a position at the intersection of the Technology-Holistic and Process-Holistic quadrants and adjacent to the left-hand side of the conceptual model (see, Illustration 18).

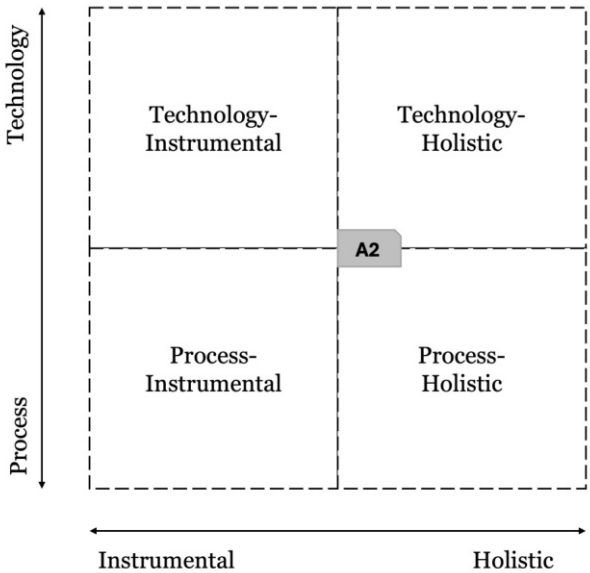

Illustration 18. Positioning Article II at the intersection of the Technology-Holistic and Process-Holistic quadrants, close to the middle of the conceptual model from Chapter 2.

Article III

Title: Digital sustainability projects: Organizational convergence of digitalization and sustainability outcomes.

Authors: Bomark, S., & Westergren, U. H.

Published in: ICT4S 2024 Proceedings.

Keywords: Sustainability, IT implementation, Sustainable value creation, Green IS.

Aim and background

This paper draws attention to contemporary observations of a digitalization and sustainability convergence, which is currently pressuring organizations to digitalize their operations while simultaneously increasing the sustainability performance of their activities. To this end, Article III identifies the IT department as a key organizational actor in creating this convergence in practice. The paper also draws attention to the lack of empirical investigation of this new and

important role and the need for the IT department to expand its traditional focus on economic value creation to include the other sustainability dimensions. Connected to the latter, Article III assumes that the IT department will need to adapt its e.g., strategies, goals and practices to create a convergence. As such, Article III posits that IT departments will take on this challenge by shifting from traditional IT projects to digital sustainability projects. Against this backdrop, this paper asks: *How can organizations leverage internal IT-projects with external sustainability demands?* To answer this research question, this paper reports on a qualitative case study of an IT implementation project (i.e., a printer platform redesign and implementation of a new printer software) that was performed by an in-house IT department in collaboration with other departments to reduce printing in the organization. By reducing printing, the IT department and its collaborators were expected to achieve the following objectives: cost reductions associated with printing, reduced paper and toner consumption, and improved air quality for staff.

Findings and contributions

The qualitative assessment was based upon nine interviews with project team members and local system administrators who represented the user perspective. The interview data were reported through a rich description of the case, focusing on the purpose of the IT project, the different phases of the implementation (i.e., initiating the implementation, performing the printer platform redesign and managing the solution after the implementation) as well as the achieved and experienced sustainability outcomes after the implementation was completed. Based upon these empirical data, the paper reported on the practices and strategies that the project members applied during the implementation process to negotiate and manage conflicting interests between various stakeholders and trade-offs between project targets.

In particular, the paper discusses how the project members had to safeguard the implementation and justify the existence of the IT solution when the solution was met with criticism from several stakeholders. In addition, the paper found that the project members had to prioritize economic objectives above social and environmental goals at different stages of the implementation process when the social and environmental outcomes failed to align with cost reducing effects. When discussing these findings, Article III demonstrates that stakeholders experience an increased complexity when adding a socio-eco-economic perspective to value creation and that the noble idea of converging digitalization and

sustainability in practice is often conflicted by difficult tensions and trade-offs, which reduces the positive outcomes of the IT solution.

Positioning Article III

Article III adopts a Process-Holistic position to generate new insights into the synergies and trade-offs between sustainability dimensions. For the purpose of answering the research question, Article III adopts an instrumental approach to sustainability and technology. As such, it explores how an IT department performs a digital sustainability project to increase the organization's overall sustainability performance to meet new sustainability demands. Unlike instrumental research, however, Article III takes a non-technology-deterministic stance on the implementation by reflecting upon the success of the project from a sustainability perspective. For instance, Article III shows that the implementation project failed to deliver on several of its project targets. The article also shows that economic outcomes were prioritized at the expense of other sustainability dimensions and that the solution created an even worse work environment for medical professionals. Accordingly, Article III has adopted a set of research assumptions that positions it in the lower-left corner of the Process-Holistic quadrant (see, Illustration 19).

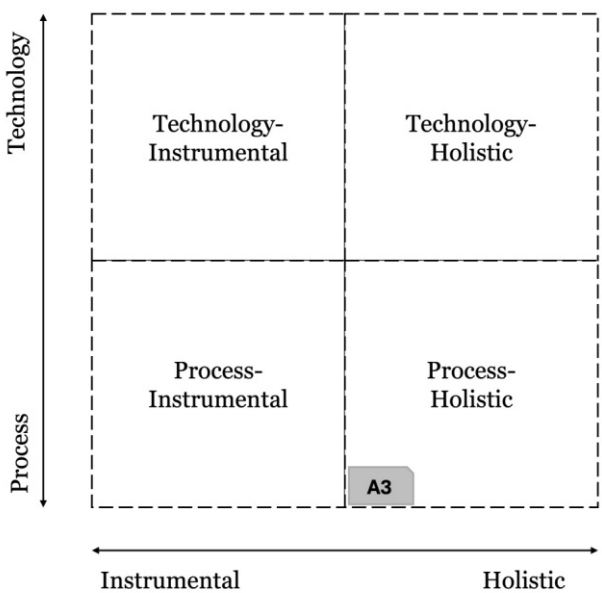

Illustration 19. Article III positioned in the lower-left corner of the Process-Holistic quadrant from Chapter 2.

Article IV

Title: Paper was never the problem: The paperless idea as a persistent symbol for organizational digitalization and sustainability.

Authors: Bomark, S., Öbrand, L., & Westergren, U. H.

Published in: HICSS 2025 proceedings.

Keywords: Paperless, Paper-based systems, Trope, Digitalization, Environmental sustainability.

Aim and background

This paper identifies the 'paperless' idea as a long-lived assumption in the public and academic discourse on digitalization which suggests that the eliminating paper and becoming paperless contributes to organizational digitalization and increases the organization's sustainability performance. Article IV also demonstrates that IS scholars have rarely investigated the consequences of digitalizing the organization based upon this idea. Against this backdrop, this paper asks the following: *How has the paperless idea been consequential for digitalization and sustainability efforts in organizations?* To answer this research question, this paper traces the origins of the paperless idea in an extensive literature review of news publications, magazines & IS journals. In addition to this literature review, the paper also reports on the findings from a qualitative case study of a paper reducing initiative in Swedish public sector healthcare.

Findings and contributions

By investigating this idea in the literature and in practice, the article identifies paperlessness as a trope in discourse, and a norm in practice which drives a digitization logic and creates a sense of doing environmental good in the organization. Based upon these observations, the paper discusses the consequences of digitalizing and increasing the organization's sustainability performance based upon a paperless trope and norm. For instance, organizations following a paperless norm tend to eliminate paper with digital substitutes rather than digitalizing their operations. In addition, organizations who follow the paperless trope and norm also tend to eliminate paper with digital means without taking the environmental impact of IT into account. As a result, the article shows that the paperless idea sometimes has adverse effects for digitalization and sustainability efforts in organizations.

Positioning Article IV

Article IV adopts a Process-Holistic position on technology's role and impact by presenting a historical account of the consequences of digitalizing and increasing an organization's sustainability performance based on the paperless idea. For the purpose of answering the research question, Article IV analyzes technology's role and impact across multiple systems from an integrated sustainability perspective. In addition, Article IV takes a non-technology-deterministic stance by reflecting upon the consequences for sustainability when an organization digitalizes its operations based upon the paperless trope and norm. Article IV also touches upon the life-cycle perspective by pointing to paper as a renewable resource compared to IT hardware, which is more likely to add to a growing mountain of toxic e-waste. Although being characteristic to the Technology-Holistic position, the primary purpose of introducing this perspective on paper and IT hardware is to add some nuances to the idea that IT and digital resources are a solution to problems. Accordingly, Article IV has adopted a set of research assumptions that positions it in the upper-right corner of the Process-Holistic quadrant (see, Illustration 20).

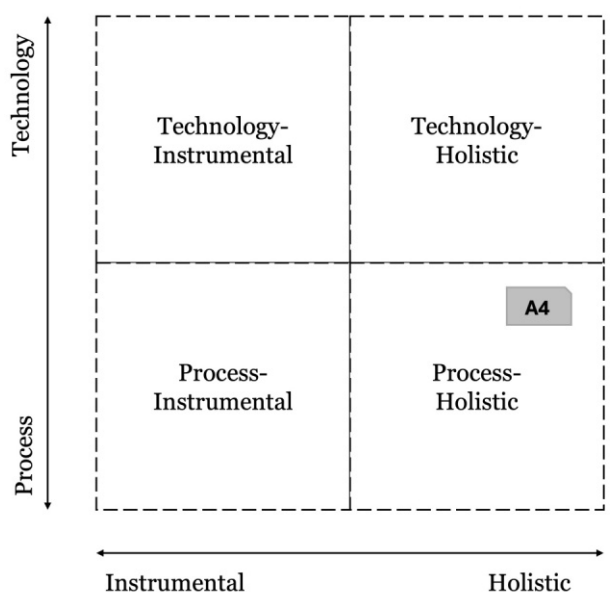

Illustration 20. Positioning Article IV in the upper-right corner of the Process-Holistic quadrant from Chapter 2.

Article V

Title: Making Sense of Digital Sustainability: Bounded Rationality in Digitalization Management Practices.

Authors: Öbrand, L., & Bomark, S.

Submitted to: Information Systems Practice Journal.

Keywords: Sustainability, Managers, Bounded rationality, Digital sustainability capabilities, Sensemaking.

Aim and background

This paper identifies digitalization managers as an important stakeholder in the organizational pursuit for digital sustainability. More specifically, it aims to advance out current understanding of how managers interpret digital sustainability and how they operationalize this concept on an organizational and practical level. Against this backdrop, this paper asks the following research question: *How do digitalization managers understand and operationalize sustainability in their practices?* To answer this research question, Article V reports on a qualitative interview study which included seven digitalization managers working in a public sector organization. In line with the explorative research question, the interview material was inductively coded by two researchers and thematically analyzed to identify patterns.

Findings and contributions

Based upon the results of the analysis, Article V report that digitalization managers are generally aware of the different sustainability dimensions and can give examples on how these are manifested as e.g., recycling practices on and individual level, but struggled to associate this concept with their areas of responsibilities. Article 5 explain these findings as a form of bounded rationality which makes them inclined to identify how already established practices create digital sustainability rather than thinking about digital sustainability as something that challenge established practices. Against these insights, Article V suggest that the organization in general need to develop digital sustainability capabilities by (1) developing business goals that build upon sustainability as a primary outcome, (2) establishing roles, competence and structures to ensure sustainability perspectives on a strategic level, (3) and defining how sustainability should be operationalized on an organizational level.

6. Discussion

This dissertation set out to advance our current understanding of digital sustainability by reviewing the IS sustainability discourse and exploring this phenomenon in practice. This exploration was guided by an overarching research question: *How can organizational conditions for digital sustainability practices be created and sustained?* To answer this research question, and address the appointed gaps in research, this dissertation has adopted different research positions within and across the Technology-Holistic and Process-Holistic quadrants. In addition, this research has empirically explored digital sustainability practices and their conditions on multiple organizational levels and from different stakeholder perspectives. Based on these findings, this chapter will outline the research contributions of this dissertation and explain how these contributions extend previous digital sustainability research.

6.1 A definition for digital sustainability

Recognizing that digital sustainability is a new and emergent research phenomenon (Kotlarsky et al., 2023), this dissertation set out to advance our empirical and theoretical understanding of digital sustainability. While Chapter 2 showed that digital sustainability qualifies as a new research phenomenon, it also showed that our understanding of digital sustainability has developed on the same research assumptions as those adopted in the Green IT and Green IS literature. More specifically, this dissertation has shown that digital sustainability research has continued to investigate the digital sustainability phenomenon from Technology-Instrumental and Process-Instrumental positions, i.e., the typical strongholds of Green IT and Green IS research. This dissertation has also shown that, by adopting either one of these positions, digital sustainability research has typically investigated problems with technology in a user phase and explored how digital resources can be leveraged for sustainability purposes, e.g., reducing energy consumption in digital infrastructures and creating positive and indirect effects through digital innovation (see, e.g., Falcke et al., 2024; Savarimuthu et al., 2023).

Sometimes, this research has adopted a multi-dimensional approach to sustainability while exploring the positive and indirect effects of technology adoption in an organization (Sekulic, 2024). However, a major limitation of the digital sustainability literature is that it is currently shying away from the sustainability issues and challenges of using

digitalization for sustainability purposes. These issues range from the direct and negative sustainability impact of producing, using and disposing of IT and digital resources (Fors et al., 2024) to impact shifting (Hilty, 2008) and greenwashing (Elliot & Webster, 2017). Despite having recognized these problems as worthy of our attention, there is a tendency in IS sustainability research to focus on the opportunities and prospects rather than the challenges and pitfalls of using IT and digital resources for sustainability purposes. Article I called this the double-edged sword rhetoric. A discursive strategy that is commonly employed by IS sustainability scholars to sympathize with the negative impact that IT and digital resources can have on people and nature, while nudging the reader's attention towards the possibilities and opportunities of using these technologies by stating that the sustainability costs are lower compared to the benefits that IT and digital resources might create in non-IT-related processes (as argued in e.g., Elliot, 2011; Stuermer et al., 2017). As a result, the IS sustainability literature typically engages with these problems on a discursive level while failing to address these problems in practice.

While this limitation has been criticized by IS sustainability scholars before (see, e.g., El Idrissi & Corbett, 2016; Seidel et al., 2017), it can be argued that it is even more critical that digital sustainability research addresses this limitation since this research typically involves even more energy-intensive technologies, such as AI applications (see, Crawford, 2021; van Wynsberghe, 2021; Fors et al., 2024). Taking this limitation and challenge into account, this dissertation posits that a contemporary definition for digital sustainability must not only expand upon the novel characteristics and opportunities of digital resources (see, e.g., Kotlarsky et al., 2023), but must also acknowledge that sustainability is an equally, if not more, important element of digital sustainability. Against this reasoning, this dissertation suggests that IS sustainability scholars and practitioners alike should adopt the following definition of digital sustainability: *To sustainably produce, adopt, use, decommission and dispose of IT and digital technologies for sustainable development if the production, use, decommissioning and disposal thereof does not jeopardize long-term sustainability.*

Author(s)	Definition of digital sustainability
Kotlarsky et al. (2023)	"…the development and deployment of digital resources and artifacts toward improving the environment, society, and economic welfare." (p. 938)
Rosati et al. (2024)	"… the design, development, configuration, deployment, and decommissioning of digital resources and artifacts toward improving the environment, and economic welfare." (p. 8)
Bomark (2025)	"… to sustainably produce, adopt, use, decommission and dispose of IT and digital technologies for sustainable development if the production, use, decommissioning and disposal thereof does not jeopardize long-term sustainability." (p. 90)

Table 6. Previous definitions of digital sustainability in IS sustainability research with the addition of my own definition, Bomark (2025).

This new definition builds upon the definitions adopted for sustainable development and sustainability in Section 2.1.2, and as such it comes with certain assumptions. Firstly, by emphasizing sustainable production, this definition assumes that IT and digital resources must be sustainably sourced and produced to be called "sustainable". To meet this requirement, this definition assumes that digital sustainability initiatives are built upon a cradle-to-cradle approach to industrial production (Braungart & McDonough, 2008), as opposed to a cradle-to-grave approach (Ergene et al., 2021). While previous IS sustainability research, has typically adopted a cradle-to-grave approach when discussing circular economy principles, such as reusability, repairability and recyclability (see, e.g., Watson et al., 2010; Zeiss et al., 2020), this dissertation posits that sustainable IT and digital resources should be produced in such a way that prevents the event of reaching the phase of disposal, and once it does enter this phase, it ought to consist of environmentally degradable materials or be fully recyclable (Braungart & McDonough, 2008). Unlike other definitions of digital sustainability (see, Kotlarsky et al., 2023; Rosati et al., 2024), it further identifies "sustainable" IT and digital resources as a prerequisite for technology adoption.

Secondly, this definition builds upon the idea that sustainability is multi-dimensional by nature (i.e., environmental, social and economic) and that these dimensions are inseparable. While it is currently common in IS sustainability research to specify these dimensions to increase the scholarly awareness about the other dimensions (see, e.g., Kotlarsky et al.,

2023; Rosati et al., 2024), this definition uses the concepts of sustainable development and sustainability, while adding a life-cycle perspective to digital sustainability, so as to prevent future research and practitioners from adopting a one-dimensional approach to sustainability and technology.

Thirdly, while previous IS sustainability research has used e.g., the WECD definition or the SDGs to justify why and how stakeholders adopt IT and digital resources to contribute to these objectives by increasing their own performance (see, e.g., Melville, 2010; Elliot, 2011; Seidel et al., 2017; Corbett et al., 2023), this new definition emphasizes that sustainable development and long-term sustainability are the principle aims of digital sustainability. As such, this definition encourages future research to think about digital sustainability as a long-term commitment of an inter-generational and global nature (see, e.g., Hilty & Aebischer, 2015) that should not add to the sustainability "debt" of contemporary and future generations.

Finally, by emphasizing that technology adoption should not jeopardize sustainable development or long-term sustainability, this definition assumes that the adoption and use of sustainable IT and digital technologies must not hamper our ability to be or become sustainable. To meet this requirement, this new definition posits that the precautionary principle must guide technology adoption (see, e.g., Wäger et al., 2005). As opposed to previous IS sustainability research – where technology adoption is usually encouraged (Veit & Thatcher, 2023) despite the environmental and social consequences thereof (Fors et al., 2024) – the precautionary principle encourages stakeholders to assess the costs and risks of technology adoption, pre-adoption (Wäger et al., 2005; Standing & Jacksson, 2007).

As seen in Table 6, the new definition of digital sustainability reflects the core aspects of previous definitions while adding the integrated, holistic and non-technology-deterministic characteristics outlined in Section 2.3.1. For instance, by building upon the idea that digital resources are also dependent upon resource-intensive hardware, the new definition includes both IT and digital resources as part of the technology component in digital sustainability initiatives. The new definition also adds a life-cycle perspective to digital sustainability and a layer of accountability by emphasizing that these technologies must be sustainable to be used, and must be used for sustainability purposes to be regarded as a digital sustainable initiative. To illustrate, when comparing the empirical findings of this research with Kotlarsky et al.'s (2023)

definition, it can be argued that the IoT implementation in Article II and the printer platform redesign in Article III both qualify as digital sustainability initiatives since both project teams aimed to improve social welfare while reducing costs and the environmental impact of their operations. As such, Kotlarsky et al.'s (2023) definition successfully identifies where the ambition to create digital sustainability has manifested. However, it does not allow us to evaluate the success thereof or bridge the gap between the direct and indirect effects.

Conversely, when using the new definition provided in this dissertation, the definition not only identifies the ambition of creating digital sustainability, but it also identifies the challenges and ramifications of translating this idea into practice. For instance, by focusing on the life-cycle perspective, the empirical exploration showed that the costs of producing, using and disposing of IT and digital resources were never considered by practitioners and, as such, these costs were not accounted for when practitioners tried to evaluate the indirect effects of these solutions (see Articles II, III, IV). In addition, this research showed that practitioners typically use these solutions to achieve cost reductions in their organizations while using knock-on effects to strengthen their business case and to show how these initiatives increase the sustainability performance of organizational operations (see Articles II, III, IV). As such, they typically fail to consider the long-term impact of these initiatives and how these benefits contribute to sustainable development. Based upon these observations it can be argued that neither of these cases can be considered a digital sustainability initiative since they fail to use sustainable IT and digital resources and demonstrate how their initiatives contribute to sustainable development and do not jeopardize long-term sustainability.

6.2 A sustainability lens for IS sustainability research

In addition to presenting a new definition for digital sustainability, this dissertation has developed a sustainability lens that offers a radically different perspective on digital sustainability than what has previously been demonstrated in the digital sustainability literature. The radicalness of the sustainability lens can be traced to its multidimensional, holistic and non-technology-deterministic characteristics. By applying this lens, this dissertation has shown that IS sustainability scholars can use a sustainability perspective to identify and problematize established research assumptions about technology, sustainability and their intricate

relationship. In addition, this dissertation has shown that IS sustainability scholars can use this lens to identify gaps in research, develop new research assumptions and advance our conceptual understanding of digital sustainability (as seen in Section 6.1). More specifically, this dissertation has shown that the filtering and suppressing abilities of this lens can assist self-reflection, especially regarding the direct and negative sustainability impact of IT and digital resources, a discussion which is currently missing in IS sustainability research (El Idrissi & Corbett, 2016; Aanestad et al., 2024) and the digital sustainability discourse (Fors et al., 2024).

In line with previous research, this dissertation has also shown that a sustainability lens can inform new research questions (see, e.g., Veit & Thatcher, 2023). For instance, while Instrumental research might ask: "How can big data be used by organizational stakeholders to create sustainability outcomes?", the sustainability lens would consider the following aspects: "How are data sustainably produced and facilitated over time?" and "For what sustainability purposes are these data collected and maintained?". In addition to facilitating new research questions, this research has also shown that the sustainability lens further encourages new methodological considerations. This idea is also consistent with previous research. For instance, to investigate the net savings of IT Melville (2010) pointed out early on that IS scholars would have to explore new tools, such as LCA. In a similar vein, Veit and Thatcher (2023) recently stated that such studies are important since IS sustainability research has yet to show the – currently supposed (Fors et al., 2024) – positive impact of using IT and digital resources in practice. According to the authors, studies of net savings might further reveal potential rebound effects – which have yet to be investigated in IS research (Melville, 2010; Elliot & Webster, 2017; Veit & Thatcher, 2023).

Adding to the above, this dissertation has shown that the sustainability lens can assist the analysis and discussion of empirical findings. For instance, the empirical exploration of digital sustainability can for different reasons (e.g., limited access to data or practitioners' ideas about what digital sustainability is) result in an empirical exploration which is characterized by an instrumental approach to digital sustainability (Article II and III). In these cases, however, this dissertation has shown that IS sustainability scholars can use the sustainability lens to reflect upon these findings, e.g., use a life-cycle perspective to reflect upon the constraints of a digital sustainability initiative or the idea of replacing paper with IT hardware (Article II, IV). Accordingly, this dissertation has shown that the sustainability lens offers a new frame of reference, against

which IS sustainability scholars can evaluate the findings of their research and discuss the appropriateness of practitioners attempts to bring about digital sustainability in practice. The sustainability lens can also be thought of as an instrument through which IS sustainability scholars can distance digital sustainability research from stakeholders' interests.

Finally, a central concept in the sustainability lens is its non-technology-deterministic characteristic. This construct might come across as a somewhat counterintuitive component for a sustainability lens in IS research, especially considering that the field's scientific aspirations centers around human-computer interactions (Avison & Elliot, 2006) and that practitioners' initiatives typically involve technology adoption (see, e.g., Schoormann et al., 2025). However, as previously argued in Section 2.3, the non-technology-deterministic characteristic was added in response to the technological determinism, which generally characterizes IS sustainability research (Fors et al., 2024), to challenge our presuppositions about technology adoption (Veit & Thatcher, 2023). As such, this dissertation joins the recent attempts to exclude the technology component where technology creates unsustainability e.g., in cases where the decommissioning of digital objects is more sustainable (Rosati et al., 2024) than hoarding them (Savarimuthu et al., 2023). Against this reasoning, and by showing how this sustainability lens can be used in IS sustainability research, this dissertation posits that a non-technology-deterministic sustainability lens can place digital sustainability research in a better position to make a "truly" impactful contribution to practice.

6.3 Characterizing digital sustainability practices

In addition to advancing our conceptual understanding of digital sustainability, this dissertation has also explored what organizational stakeholders do to create digital sustainability in practice. In general, this research has shown that the organizational pursuit of digital sustainability has typically resulted in incremental changes. More specifically, it has found that these changes are modifications of existing practices that different stakeholders perform in their daily activities. While these incremental alterations might not bring about rapid and transformative change, the findings of this examination have shown that these adaptations are nevertheless bringing these stakeholders closer to the realization of digital sustainability. Based upon these observations, this section classifies these changes as expressions of digital sustainability practices.

Using the findings from the empirical case studies (see Articles II-V), this section characterizes such practices as intentional forms of actions that organizational stakeholders perform to create, what these stakeholders identify as, digital sustainability outcomes. Similar to other practices, digital sustainability practices are also relationally emergent and situated which means that they are likely to differ between contexts. In addition, this section identifies digital sustainability practices as technology-oriented forms of actions that are performed by organizational stakeholders to implement digital solutions and create digitally enabled sustainability outcomes. By pinpointing these characteristics, this dissertation explains why and how these forms of digital sustainability practices emerge on an organizational level. In addition, this dissertation makes a theoretical contribution to the ongoing exploration of digital sustainability practices and their conditions (see, e.g., Savarimuthu et al., 2023; Krasikov & Legner, 2023).

6.3.1 Intentional

Beginning with the first characteristic, this dissertation has shown that digital sustainability practices are performed by IT professionals and users to create digital sustainability outcomes. For instance, the empirical findings in Articles II and III showed that the in-house IT departments identified and formalized digital sustainability outcomes into actionable project objectives and measurable project targets to make digital sustainability a prioritized concern. What these outcomes are and how they are created differs between cases and stakeholder perspectives. For example, in the case concerning optimized routes in urban waste collection, the project team in Article II identified cost-, and carbon reducing effects as two desirable outcomes, whereas in Article III, the project team identified cost reductions, resource efficiency, increased patient safety, and improved air quality for staff as desirable outcomes. For users, however, the outcomes were not as important as their ability to perform their work. This was demonstrated by users' resistance or users' choices to abandon the digital solutions that the IT department had implemented. In Article III, for instance, users decided to create workarounds to increase work efficiency and reduce stressful situations instead of adapting their work practices to the safe printing solution.

Leaning upon these findings, this dissertation identifies digital sustainability practices as intentional forms of actions that are performed by organizational stakeholders to achieve what they identify as digital sustainability outcomes. Despite being intentional forms of actions, this dissertation has also shown that digital sustainability practices can have

unintended and undesirable effects (Article III). These findings are consistent with Schoormann et al's., (2025) conceptual model of digital sustainability outcomes which characterizes digital sustainability outcomes as both intended and unintended outcomes with both desirable and undesirable effects for digital sustainability on an organizational level. Taking these observations into account, this dissertation asserts that there are no guarantees that digital sustainability practices, even when performed with good intentions, will produce the intended and desirable effects that stakeholders expect to achieve.

6.3.2 Relational and situated

In addition to being intentional forms of actions, this dissertation has also identified digital sustainability practices as relational and situated, meaning that they emerge in relation to existing structures and practices in the context in which organizational stakeholders operate. In this research, the relational aspect of digital sustainability practices has been observed in the stakeholder actions that align sustainability outcomes with organizational objectives (Article III). This dissertation has also shown that the relational aspect of digital sustainability practices can be observed in the actions that negotiate sustainability outcomes against organizational outcomes (e.g., prioritizing cost reductions) and in the actions that foreground organizational outcomes (e.g., abandoning a technical solution or the printing of paper).

For instance, regarding the first observation, the project leader in Article III realized that the project targets required new communication strategies in interaction with different stakeholders, and that the project leader had to prioritize goals and negotiate terms to follow through on the printer platform redesign and safe printing implementation. Regarding the second observation, this research has also shown that users perform digital sustainability practices as long the technologies support users in their activities and help them to produce the organizational outcomes they are intended to create. Article V explains this process of finding this alignment as a way of making sure that the in-house IT department continues to deliver organizational value in relation to its core mission and strategic objectives. On a more individual level, Article V also explains that this process of identifying and operationalizing goals and outcomes from digital sustainability initiatives also comes down to IT professionals' areas of responsibilities and job descriptions.

In addition, by characterizing digital sustainability practices as situated, this dissertation aims to highlight the organizational context in which

these practices emerge. The organizational context contains the relational elements that shape digital sustainability practices. As such, it can be argued that the situated characteristic holds the keys through which the intentional and relational characteristics can be understood. For instance, on a more practical level, this dissertation has shown that digital sustainability practices can emerge as different forms of actions and outcomes depending on whom and with what intentions these actions are performed as well as in what ways these practices are related to other practices. Hence, by characterizing digital sustainability practices as situated, this dissertation claims that digital sustainability practices are inherently shaped by and thus inseparable from the particularities of their specific contexts. As such, and similar to that of other social practices, this research has found that digital sustainability practices consist of heterogenous and emergent forms of actions (Reckwitz, 2002; Sahakian & Wilhite, 2014).

The above findings of a relational and situated characteristic finds support in previous research. For instance, on a general level, previous research has shown that the organizational mission, vision, and goals are consequential for organizational practice (Czarniawska & Joerges, 1995). In IS sustainability research, this tendency to align sustainability outcomes with organizational outcomes has also been observed in studies of Green IT (see, e.g., Hedman & Henningsson, 2016) and Green IS initiatives (Marett et al., 2013; Leidner et al., 2022). For instance, Marett et al. (2013) showed that users can adopt environmentally friendly solutions for other purposes than environmental benefits, such as economic benefits and increased competitive advantage (Marett et al., 2013). Loeser et al. (2017) calls this a strategic process through which organizational stakeholders identify the "perceived organizational benefits" of adopting Green IT and Green IS practices. In general, this can be understood as a process of identifying and aligning sustainability outcomes with economic benefits.

6.3.3 Technology-oriented

In addition, this dissertation has shown that the digital sustainability practices that IT professionals and users perform are technology oriented. Consistent with previous literature, these actions vary depending on what role the stakeholder has in the organization (see, e.g., Seidel et al., 2013). For instance, Articles II and III demonstrated that digital sustainability practices were performed by IT professionals to successfully implement digital solutions (Articles II and III), while users were expected to adopt these technologies and adapt their daily activities to perform digitally

enabled sustainability practices. Connected to these observations, this dissertation has demonstrated that organizational stakeholders can perform both analog and digitally enabled forms of actions as part of their digital sustainability practices. For instance, Articles II and III showed that the project teams were communicating with stakeholders without necessarily using IT and digital resources.

Taken together, these observations show that digital sustainability practices consist of both digitally enabled and analogue forms of actions that are either oriented towards technology adoption or enabled by IT and digital resources. These observations support previous research in which IT and digital resources have been identified as potential solutions to organizational sustainability problems (Melville, 2010) and unique enablers of digital sustainability outcomes (Schoormann et al., 2025). On the other hand, this dissertation has also shown that digitally enabled practices and outcomes are dependent upon the digital infrastructure that enables them. As such, these practices and outcomes are vulnerable to work disruptions caused by malfunctioning hardware or software, such as technical deficiencies and downtime (Articles II, III, and IV).

6.4 Creating organizational conditions

Previous research has shown that a transition towards a more sustainable society requires that humans reshape their established dispositions and practices to shift from unsustainable activities to more sustainable ones (Sahakian & Wilhite, 2014). In their paper, Sahakian & Wilhite (2014) specify three pillars that influence our practices: the human body (e.g., cognitive and physical disposition), the material world (e.g., technology) and the social world (e.g., norms). These pillars are the fundamental "*elements that hold together a practice*" (Sahakian & Wilhite, 2014, p. 30). As a result, we need to create a change in the conditions of at least one of these pillars to stimulate a change in our activities and thereby even potentially the outcomes of these activities.

In line with Sahakian & Wilhite's (2014) suggestions, this part of the discussion will elaborate on the organizational conditions that can support and sustain digital sustainability practices over time. In this context, the three pillars are represented by the cognitive, affective and physical dispositions of people working within the organization, the resources they use to produce different outputs (e.g., natural resources, technologies, etc.) and the organizational structures, cultures and norms that shapes stakeholders' actions. To be specific about the organizational

conditions that create and support digital sustainability practices, this section will show how organizational stakeholders can create such conditions on strategic and operational levels. In addition, this section will show how organizational stakeholders can create conditions to manage tensions and trade-offs.

6.4.1 Conditions on a strategic level

This dissertation has shown that upper-level management must incorporate sustainable development goals as part of their organizational mission (Article II) or in other ways prioritize sustainability outcomes as a strategic concern (Article III) in order for digital sustainability practices to emerge on an operational level. On a general note, this dissertation has shown that in order for organizational stakeholders to pursue and create digital sustainability initiatives they need upper management support (Article III) and the time, money and resources to bring about a change in practice on an operational level (Article V). For instance, Article III showed how the "sustainable economy" initiative triggered a strategic response from the IT department, which made a conscious effort to align its digitalization program, of which the safe printing project was part, with the sustainable economy initiative. Once the IT department was given permission to proceed with its digitalization program, it was also given the time and money required to perform its IT projects.

These observations of a strategic response support previous observations of strategizing for and implementing new goals to spur, e.g., Green IS initiatives on an organizational level (Seidel et al., 2013; Hedman & Henningsson, 2016; Loeser et al., 2017) and digital sustainability practices (Krasikov & Legner, 2023). More specifically, this dissertation has shown that the IT department emerges as a key stakeholder in translating the organizational ambition to create increased sustainability into digital sustainability practices and outcomes on a corporate level. These observations support previous predications about the IT department's role in creating more sustainable organizations (Pernici et al., 2012). However, while this is to be expected from the IT department (Article V), this dissertation has also shown that upper-level management can create a situation where the main responsibility of establishing digital sustainability practices is placed upon the in-house IT department. As seen in Article III, this responsibility can result in changes that negatively affects other stakeholders in the organization.

Based upon these observations, this dissertation asserts that upper-level management must, in addition to adding sustainability objectives to their

strategy- and policy-documents, also support organizational stakeholders in the form of time, money, competence and resources in order for these sustainability objectives to be pursued on an operational level. To make digital sustainability an organizational ambition, upper level management must also be specific about what kind of digital sustainability outcomes the organization need to achieve and communicate how these outcomes are to be created on a corporate level. This would require that other organizational stakeholders would need to make a conscious effort to align their operations with these objectives. As such, by creating these conditions on a strategic level, upper-level management can encourage an operational move across the entire organization, which is also likely to prevent a situation where the main responsibility of establishing digital sustainability practices falls upon the in-house IT department and decrease the risk of conflicts between organizational stakeholders.

6.4.2 Conditions on an operational level

By studying how IT professionals and users create digital sustainability in practice, this dissertation has shown that digital sustainability practices are shaped by stakeholders' interpretations of what digital sustainability is, especially the positive benefits of creating digital sustainability outcomes. For instance, Articles II and III showed that the in-house IT departments identified and formalized digital sustainability outcomes based upon their previous frames of reference, such as, their assumptions about sustainability (Article II) and their understanding of the sustainability dimensions (Article III). On a more aggregate level, the in-house IT departments also seemed to interpret digital sustainability as a form of organizational digitalization, with the only difference being the sustainability outcomes that they expected to achieve.

This approach might explain why sustainability outcomes are typically added by IT professionals as knock-on or post-hoc effects of technology adoption (Article II, III and V), and why IT professionals pursue these objectives by performing traditional IT projects, such as designing, developing, integrating, configuring, implementing and maintaining the IT infrastructure to achieve these effects (Article II and III). In addition, this research has shown that users often perform digital sustainability practices for reasons that are related to the organizational mission and their operational responsibility, such as, increased efficiency (Article II) and patient safety reasons (Article III), rather than purposes related to environmental sustainability, such as printing less paper (Article IV).

These findings support and extend previous research, showcasing that stakeholders' actions are typically colored by their interests, personal beliefs, motivations, and attitudes (Seidel et al., 2013). Adding to this work, this dissertation has also shown that stakeholders' ideas about sustainability can also become a source of misinformation. For instance, Article II showed that the project team had assumed that a reduction in HVO-fuel was also going to reduce the carbon emissions associated with urban waste collection, while in reality, the plastic bags were the greatest source of carbon emissions. As such, Article II showed that the project team's assumption mislead them into believing that their IoT solution would also increase the sustainability performance of urban waste collection. A similar pitfall was demonstrated in Article IV which showed that the idea of reducing paper can mislead stakeholders into believing that paper-reductions will have a positive impact on organizational digitalization and sustainability, when in reality, it can have the opposite effect.

In line with previous research (Bengtsson & Ågerfalk, 2011; Seidel et al., 2013), this exploration has also shown that IT professionals use technology-implementations to unfreeze established practices and enable or enforce more sustainable practices amongst users. For instance, IT professionals can support or force users to adapt their established ways of performing a practice by either adding (Article II), taking away or replacing a technology (Article III and IV). These observations suggests that the in-house IT departments use technology implementations as a strategy to unfreeze automated routines, such as, paper-based practices (Article III and IV), and to establish a structure against which new digital sustainability practices can emerge. To exemplify, in Article II the project team designed and implemented an IoT system to enable optimized routes, and once this solution was implemented, waste collecting operators were expected to perform the digital sustainability practices that the solution afforded.

However, this dissertation has also shown that the IT departments are not always aware of the daily activities that users perform with these technologies (Article II and III) and how technical issues creates an unreliable and stressful work environment for staff (Article III). As such, it might be difficult for the IT department to facilitate new user behaviors, especially in the cases when users are convinced the technology will cause unwanted work disruptions (Article II and III). In such instances, this dissertation has shown that the idea of unfreezing established practices with technology adoption can result in user-resistance, workarounds and abandoned technologies. Taken together, these observations demonstrate

that the positive and indirect effects of technology adoption are dependent upon users' ability to adopt these technologies and adapt their daily practices to achieve these outcomes.

This section has shown that digital sustainability practices and outcomes are shaped by stakeholders' interpretations, the organizational structures in which they operate, and the technological infrastructure that these practices produce or are enabled by. This means that the positive impact and success of these practices and outcomes are the result of how well e.g., IT professionals identify and formulate a sustainability problem that can also be resolved with technology adoption (Article II) and how well the solution meets other user-requirements so that new digitally enabled sustainability practices can emerge (Article II and III). Taken together, these observations demonstrate that, in order for the organization to successfully pursue digital sustainability in practice, organizational stakeholders must have access to relevant information and competence to understand the sustainability impact of its operations.

To do so, organizational stakeholders must either invest in and develop its own sustainability competence or allocate this competence when needed. Connected to the latter, and consistent with previous research (Sekulic, 2024), this dissertation suggests that organizational stakeholders should engage in cross-functional collaborations. According to Sekulic (2024), cross-functional collaborations allow for organizational stakeholders to allocate resources, such as competence and information, to implement digital sustainability solutions and to overcome structural boundaries as to create a long-lasting change. Drawing upon these findings, this dissertation suggests that cross-functional collaborations can increase the in-house IT department's ability to address sustainability problems in the corporate organization, especially, if sustainability competencies are involved early on in the projects, and meet user-requirements by involving users in the development process.

Adding to these recommendations, this dissertation has also shown that implementation projects are often connected to positive and indirect effects of technology adoption. For instance, Articles II and III showed that the project teams did not reflect upon the negative direct effects of acquiring technological components, nor how the iterations of e.g., the IoT solution, added to the socio-environmental debt of the organization, especially in the cases when project targets are not met. These findings support the presupposition that organizations digitalize their operations without considering the direct effects of using these technologies (Fors et al., 2024). In line with these observations, this dissertation asserts that

organizational stakeholders should reflect upon the opportunity costs of implementing IT to e.g., substitute paper consumption (Articles III and IV) or reduce carbon emissions (Article II).

6.4.3 Managing tensions and trade-offs

On multiple occasions, this dissertation has pointed to situations in which organizational stakeholders experience different levels of control, such as authority and influence over technology, actions and outcomes. For instance, Articles II and III showed that IT professionals have more influence over the design and implementation of new technology compared to users. Sometimes, the project teams also have upper-level management support to implement these technologies no matter what lower management and employees say (Article III). At the same time, however, these cases also show that the project teams have less control over the actions of users (Articles II and III). In other words, individual agency can challenge the authority of organizational stakeholders. These findings are consistent with the Green IS literature where human agency has been identified as a condition that can both bring eco-friendly work practices into fruition, such in the case with Green IS champions (see, Hedman & Henningsson, 2016), and also prevent them all together by acting as a barrier to change (see also, Seidel et al., 2013). According to Seidel et al. (2013) this might be explained by a lack of awareness, a negative attitude or a lack of intrinsic motivation to change established practices in favor of more eco-friendly ones.

Unlike previous research, however, this dissertation has shown that most stakeholders adopts a neutral or positive position to digital sustainability initiatives. The main reason for not performing digital sustainability practices resides instead, as this dissertation has demonstrated, in the organizational structures and cultures in which these stakeholders operate, such as missions, purpose, and roles. This is where tensions and trade-offs typically emerge. For instance, Article III identified a tension between the strategic objectives of the safe printing software, which was primarily motivated by cost reductions, and the environmental and social values that the IT department communicated to users. While the latter emphasized the benefits that users typically valued, such as increased patient safety, Article III showed that the IT department had to, first and foremost, deliver on its economic targets. As such, the IT department could not make decisions in favor of the project targets that would benefit the users. This might also explain why the IT department did not respond to user complaints, not even in the cases when users identified situations where the safe printing solution lead to patient safety issues. When facing

these goal-conflicts Article III showed that the project team had to prioritize cost reductions and negotiate terms with users to achieve the economic targets of the project.

The above observations demonstrate that the tension between strategic and operational objectives arise when the IT department manage to align the economic objectives of the implementation project with the strategic level, while failing to align the social and environmental objectives as equally important to cost reductions. In other words, Article III showed that upper-level management failed to support the IT department to prioritize digital sustainability outcomes. As a result, the project team could not prioritize patient-safety reasons or environmental benefits above cost reductions. The project team could, however, prioritize social and environmental values if they were added as knock-on effects, a finding which was also observed in the IoT case where the project team had identified reduced carbon emissions as knock-on effects of reduced HVO-fuel costs (Article II). Taken together, these observations show that stakeholders are prone to make trade-offs when tensions arise between stakeholder interests and sustainability objectives.

As this dissertation has demonstrated, organizational stakeholders tend to make trade-offs in favor of the organizational mission and responsibilities that upper-level management expect of them (Article II, III and V). In the same spirit, users are prone to prioritize their interests, mission and responsibilities as employees, which explains why goal-conflicts arise between organizational stakeholders, and why users decide to abandon solutions if they think that these technologies will prevent them from doing their job (Article II and III). In line with these insights, this dissertation has shown that upper-level management can prevent tensions from arising by making sustainability, not economic outcomes, a priority (Article III and V). In addition, this dissertation has shown that organizations must, in addition to developing new data analytics practices (Krasikov & Legner, 2023) and digital mindsets (Joukhadar et al., 2023), also develop prioritization-, and negotiation-practices to improve stakeholders' ability to manage tensions and trade-offs once these arise.

6.5 Answering the research question

So far, this discussion has reported on the observations of digital sustainability practices and the conditions that shapes them. Leaning upon these findings, this section will answer the overarching research question: *How can organizational conditions for digital sustainability*

practices be created and sustained? In general, this exploration has shown that the practices that organizational stakeholders perform are shaped by the organizational context in which these stakeholders operate. These conditions span from stakeholders' interests' mission, roles, control and access to resources (e.g., financial support, expertise and knowledge) as well as their influence over other organizational stakeholders, and beyond (as seen in the case with public littering in Article II). In addition, this dissertation has pointed to conditions that shapes these practices on an individual level, such as individuals' personal attitudes, values and priorities. By having explored this complexity in the previous sections, this dissertation has identified a set of organizational conditions that will support organizational stakeholders to create and sustain digital sustainability practices over time.

Overall, this dissertation has shown that organizational conditions for digital sustainability practices are created by including digital sustainability goals as a business objective on a strategic level, while allocating the necessary resources needed, for organizational stakeholders to act upon these goals on a practice level. Conversely, this dissertation has shown that digital sustainability practices can be sustained over time by making digital sustainability a prioritized concern for all, establishing collaborative structures to synchronize actions and involve sustainability competencies on a strategic and operational level. To elaborate on these conditions in more detail, this section will show how these conditions can be created by practitioners who are either on the verge of taking on this challenging quest or seeking to increase their digital sustainability efforts.

6.5.1 Conditions that create multiple rooms for action

To begin with, this dissertation has shown that upper-level management can create conditions for digital sustainability practices by incorporating digital sustainability goals as part of their business objectives (Article II, III and V). This will create a movement towards digital sustainability on an operational level if lower-level management respond to this strategic, such as aligning their goals, operations and outcomes with these objectives in mind. This response demonstrates that upper-level management can create a room for action on an operational level. Going back to the previous section, this dissertation has shown that upper-level management should make digital sustainability a prioritized and shared concern for all to ease the burden that might otherwise be placed upon the IT department. Connected to the latter, this discussion has pointed to the responsibility of upper-level management to create a strategic response from different stakeholders (see, Illustration 21).

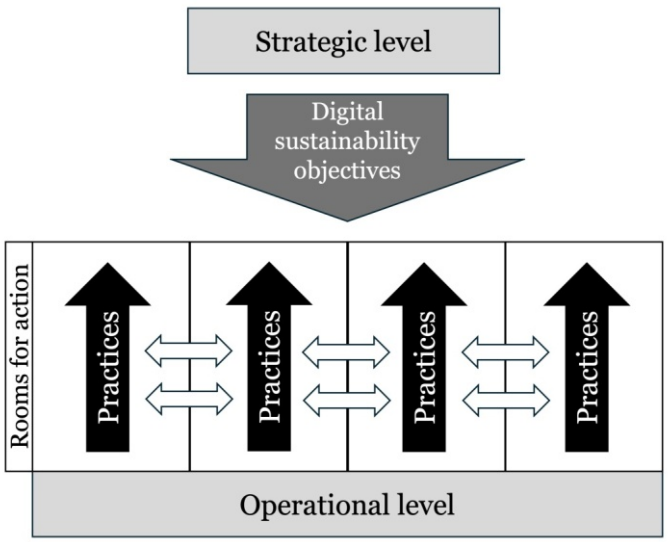

Illustration 21. Creating multiple rooms for action by making digital sustainability objectives a prioritized concern for all.

As such, by including digital sustainability goals on a strategic level, upper-level management will create multiple rooms for action on an operational level. As a result, digital sustainability practices will begin to emerge across the entire organization. On multiple occasions, this dissertation has shown that digital sustainability practices, by means of being relational and situated, are shaped by the organizational conditions in which these stakeholders operate, e.g., the mission, roles, technologies, practices, norms, resources, and their control over their own and others' actions. This means that the top-down initiative will be met with various forms of bottom-up initiatives. As a result, digital sustainability practices are likely to emerge as different forms of actions that are created by various stakeholders on multiple levels and different organizational contexts. Against these insights, this dissertation identifies upper-level management as both responsible for creating multiple rooms for actions and to allocate the necessary resources needed to support the emergence of digital sustainability practices.

6.5.2 Conditions that support synchronized actions

Secondly, this dissertation has shown that, as a result of this bottom-up response, digital sustainability practices are likely to emerge as heterogenous forms of actions across multiple and sometimes overlapping organizational contexts. To synchronize these efforts (see, Illustration 21), organizational stakeholders must find ways to organize for digital sustainability and coordinate their efforts with others. In the first case,

this dissertation has shown that organizational stakeholders on an operational level must identify what kind of digital sustainability outcomes it can produce and formulate goals. They must also establish structures and practices to make these targets actionable in order for digital sustainability practices to emerge. In the second case, this dissertation has identified the need to establish cross functional teams to support cooperation across different contexts and avoid situations where organizational stakeholders act in isolation.

As previously stated, cross-functional teams allow for organizational stakeholders to overcome structural boundaries (Sekulic, 2024), but also to tap into the specifics of different organizational contexts. For instance, both Article II and III demonstrated that the project teams presented solutions that failed to meet users' expectations. As a result, waste collecting operators began to deviate from the optimized routes, while some medical units came up with work arounds. This also meant that the project teams failed to deliver on their project targets. One way of circumventing these situations is to involve different stakeholders, sometimes beyond the actual organization (as suggested by public littering in Article II), as to understand what kind of practices that these technologies need to support and modify these practices. In addition, these case studies also point to instances where IT-professionals have identified sustainability issues tied to specific practices in the organization. By establishing cross-functional collaborations with other organizational stakeholders on an operational level, the IT department might be able to address more complex issues and achieve more profound impact. In addition, this dissertation has pointed to instances where cross-functional teams can make stakeholders aware of tensions and goal-conflicts, as such, cross-functional collaborations can assist stakeholders to explore alternative pathways together or come up with compromises.

Ongoing synchronization of digital sustainability practices serves several purposes. Firstly, it helps connect actors from different practices, thus increasing conditions for knowledge transfer and competence access. Secondly, it helps create an organizational perspective on the collective sustainability efforts carried out throughout the organization. Thirdly, and perhaps most importantly, it allows for the identification and management of sustainability challenges and opportunities that fall outside the scope of individual practices. This is of particular interest, given the complex nature of sustainability and the need to re-invent established ways of working.

6.5.3 Conditions that facilitate new interpretations

Finally, this dissertation has shown that digital sustainability practices are shaped by stakeholders' interpretations of what digital sustainability is, what it means for them and sometimes for others (Articles II, III and V). These interpretations are not only subject to human fallacies, such as biases and assumptions, they are also subject to the shaping effects of established structures and practices. Against these insights, this dissertation has identified improved sustainability competence as a fundamental condition that will facilitate new stakeholder interpretations on a strategic and an operational level. While previous research has pointed to increased sustainability competence as an important condition for organizations (Pernici et al., 2012) and presented principles to specify how technology adoption can be made more sustainable (Standing & Jacksson, 2007; Zeiss et al., 2020), it has rarely discussed how organizations can develop sustainability competence to identify the goals, problems and outcomes that they expect to achieve or solve through technology adoption.

Assisting practitioners in this direction, this dissertation has shown that, sustainability competence is a form of critical engagement with the sustainability problem at hand (Article II), and the increased sustainability performance that digital sustainability outcomes are expected to create. In this regard, practitioners can use tools, such as LCA, to identify where the sustainability problem resides and, sometimes, how to best increase the sustainability performance without using IT and digital resources. For instance, Article II showed that plastic bags were the greatest source of carbon emissions in urban waste collection, a problem which was difficult for the project team to resolve with the IoT solution it had implemented. These findings also point to the need for a non-technology-deterministic approach to digital sustainability. In addition, this dissertation has pointed to instances of holistic thinking, for instance, what are the environmental, social and economic costs associated with reduced paper consumption, versus, increased IT use (Article IV)? As illustrated by these examples, organizations need to improve their sustainability competence to facilitate new interpretations of what digital sustainability is. More specifically, these examples point to the need for upper-level management, as well as for lower-level management and employees to formulate objectives that allow for non-technology-deterministic and holistic digital sustainability practices to emerge on an operational level.

As pointed out above, sustainability competence – including a holistic understanding – is needed in all aspects of organizational operations. A key challenge lies in the identification of sustainability problems to be addressed since the way a problem is framed shapes and limits the way it is resolved. In addition, sustainability competence helps highlight design issues, process issues, or practice issues related to operational sustainability. Finally, sustainability competence is important in developing frameworks or metrics for measuring outcomes and evaluation of operations. In order to make this possible, sustainability competence needs to be understood as a natural part of the domain knowledge in the particular practice.

6.6 Towards a sustainability first approach

Overall, this dissertation has shown that politicians, practitioners, and academics alike tend to think about digital sustainability as something that can be achieved through technology adoption. Looking beyond the IS field, this dissertation has shown that digital sustainability has been depicted as an untapped business opportunity (George et al., 2021) and a potential solution to or source for achieving the SDGs more efficiently (Sachs et al., 2019). Turning to the IS sustainability literature, this dissertation has shown that the digital sustainability literature has echoed these possibilities and continued to explore how these benefits and opportunities can be created across different societal levels (see, e.g., Kotlarsky et al., 2024; Crome et al., 2024; Sekulic, 2024). Consistent with this view, the aforementioned sections have shown how organizations are trying to strike a balance between traditional business objectives and sustainability ambitions which is also reflected in the outcomes that organizational stakeholders decide to pursue on an operational level and the actions that follow.

On the one hand, this widespread adoption of a "digital sustainability language" can, similar to the widespread adoption of a sustainability language (see, Section 2.1), be interpreted as a positive and collective aspiration towards a more sustainable future in the digital era. On the other hand, it can also be interpreted as a swiftly and unnuanced adoption of a complex concept which has yet to be achieved on a local, national and global level and whose positive sustainability impact remains mainly theoretical (see, e.g., Del Río Castro et al., 2021; Veit & Thatcher, 2023; Fors et al., 2024). Connected to the latter, this dissertation has argued that the scholarly preoccupation with indirect and tertiary effects might reinforce the theoretical potential of IT and digital resources instead of

creating a change for the better. In support of this argument, this dissertation has shown that the scholarly preoccupation has resulted in one-sided discourse which zooms in on the sustainability problems that can be resolved with technology adoption without considering the direct or the negative and indirect effects of technology adoption from a holistic perspective. The same can be said about the case study findings of this dissertation.

To bring about a more nuanced approach, this dissertation has presented a new definition for digital sustainability and a sustainability lens for IS sustainability research. As a final recommendation, this section seeks to highlight the digital first approach that typically characterizes digital sustainability research and the need to move towards a sustainability first approach to address the challenges that practitioners face when pursuing digital sustainability in practice. First of all, it should be noted that IS sustainability research is not new to the concept of sustainability. For instance, previous research has referred to the WECD definition (see, e.g., Elliot, 2011; Kotlarsky et al., 2023) and the SDGs (see, e.g., Corbett & Mellouli, 2017; Corbett et al., 2023) when formulating the sustainability issues and challenges that policy makers, practitioners and individual citizens face. However, these grand challenges are often depicted as problems that must be solved through technological advancements (Hart, 1997) and by changing human behaviors (Elliot, 2011). In IS research, this idea of solving problems with technology has translated into the belief that IT and digital recourses might provide a viable solution since IT and digital resources are readily available (Pitt et al., 2011), reprogrammable (Stuermer et al., 2017) and already transforming societies on a fundamental level (Baskerville et al., 2020).

This enthusiasm has inspired what this dissertation identifies as a digital first approach in IS sustainability research. This digital first approach is reflected in the research that typically asks "how" IS can contribute to sustainable development and sustainability (see e.g., Bengtsson & Ågerfalk, 2011; Seidel et al., 2013; Loock et al., 2023; Wunderlich et al., 2019; Crome et al., 2024) and discusses how the unique characteristics of digital technologies can create sustainability advantages (Pitt et al., 2011; Stuermer et al., 2017). This research rarely explores and theorizes the sustainability component of IS sustainability phenomena, including Green IT, Green IS and digital sustainability. While recent attempts have been made to propel the discourse in this direction (see, e.g., Zimmer & Järveläinen, 2022; Veit & Thatcher, 2023; Fors et al., 2024), more efforts are needed. Afterall, the IS field is not new to theorizing the differences

between innovation, transformation and disruption. Hence, we should theorize the sustainability component with an equally amount of effort.

6.7 Suggestions for future research

This dissertation has presented empirical findings from two implementation projects and an interview study of digitalization managers. Turning to the implementation projects, Article II reported on an IoT implementation and Article III reported on a printer platform redesign and a safe-printing implementation. The intended outcomes of these implementation projects extended beyond traditional IT value (see, e.g., Kohli & Grover, 2008) by e.g., targeting reduced carbon emissions (Article II) and reduced paper consumption, increased patient safety, and improved air quality for staff (Article III). Accordingly, the former can be thought of as a Green IS implementation while the latter can be thought of as a digital sustainability project since it targets a synergetic effect between all sustainability dimensions (see, e.g., Sekulic, 2024). These cases also demonstrate that these outcomes are uniquely created by means of these technologies, as such they qualify as digital sustainability initiatives (see, Kotlarsky et al., 2023; Schoormann et al., 2025).

In addition, this dissertation has shown that the problems and the solutions that these stakeholders identified with these technologies, makes it difficult for organizations to replicate these outcomes with analog technologies (see, e.g., Yoo et al., 2010). To exemplify, in Article II the project team designed an IoT system to optimize waste collection by measuring the amount of waste in each litter bin and producing an optimized route for waste collecting operators. In this case, the project team had identified an information problem (see, e.g., Watson et al., 2010) which was not easily resolved with analog technologies. As such, the IoT system became the solution to the problem that the project team had identified. Similarly, Article III showed how the project team had identified several issues with their decentralized printer platform and traced these problems to a generous supply of local printers. In this case, the printing software made it possible for the project team to redesign the printer platform in a way that would support new printing behaviors.

Both of these examples show how the IoT solution and the safe printing software emerge as the unique enabler of the digital sustainability outcomes that the project teams had set out to achieve. However, the findings of digital sustainability outcomes also bring to mind previous observations of the ‘greening’ effects of IT/IS applications, i.e., the

efficiency, optimization and productivity gains that Green IS research has typically focused on (Elliot & Webster, 2017). Essentially, when comparing the findings in this dissertation with this literature, it can be argued that the digital sustainability outcomes that this dissertation have identified are similar to that of Green IS outcomes and, by extension, the outcomes that IS scholars have explored since the 1960s (Hirschheim & Klein, 2012). These findings raises questions about the nature of digital sustainability outcomes and to what extent digital sustainability practices successfully achieves these outcomes. As such future research is recommended to explore the following research questions: What is sustainable with digital sustainability outcomes? What characterizes unsuccessful and successful digital sustainability practices?

Moreover, this dissertation has investigated these practices and outcomes within the context of public sector organizations, more specifically, a Swedish municipality and public sector healthcare, where digitalization initiatives are often performed by in-house IT departments. However, unlike previous predictions about the IT department's role in creating this convergence (Pernici et al., 2012; Kotlarsky et al., 2023) this dissertation has found that the in-house IT department is often bound to the mission and practices that it is expected to perform in its role as a support-unit to the corporate organization. This was especially prominent in the interview study with digitalization managers. While this might be thought of as a constrain or symptom caused by lack of sustainability competence, it can also be thought of as an indication that the in-house IT department might not be the most suitable key player in creating digital sustainability on a corporate level. Against these insights, future research is recommended to explore how other organizational stakeholders create conditions for digital sustainability practices and outcomes.

Finally, when comparing the findings of the implementation projects in Article II and III, this dissertation has shown that IT professionals tend to approach digital sustainability from a one-dimensional perspective, i.e., prioritizing the indirect and positive effects of technology adoption, without assessing the negative sustainability impact of using these technologies. One way of signaling this one-sided approach is to think about such initiatives as "weak" forms of digital sustainability initiatives. Furthermore, this dissertation has identified limitations with these weak initiatives. For instance, Article II showed that these implementation projects can negatively impact the organization's sustainability performance by either (1) failing to achieve these reductions or (2) failing to offset the negative and direct effects of these technologies associated with other life-cycle phases. This dissertation has referred to these

instances as adding to the sustainability "debt" of the organization. Article II also showed that there are iterations to these implementations that further adds to this debt. Against these insights, future research are encouraged to explore how "strong" digital sustainability initiatives can be pursued by contemporary organizations. These are the projects that perform a cost-benefit analysis between direct and indirect effects to justify the use of IT and digital resources for the sustainability purposes that they aim to achieve (see new definition in Section 6.1).

7. Conclusions

The aim of this dissertation was twofold. On the one hand, it was the intention of this research to advance our current understanding of digital sustainability by reviewing the IS sustainability literature. On the other hand, it was the intention of this research to advance our current understanding of digital sustainability in practice by answering the overarching research question: *How can organizational conditions for digital sustainability practices be created and sustained?* By reviewing and synthesizing the literature in Chapter 2, this dissertation has presented a conceptual model, describing four different research positions that IS sustainability researchers can adopt to explore technology's role and impact on sustainable development and sustainability. In addition, this dissertation has used this model to point to gaps in existing research. By addressing some of these gaps, this dissertation has adopted a Technology-Holistic and Process-Holistic research position when exploring digital sustainability in research and in practice.

Based upon the findings of this exploration, this dissertation has presented a new definition for digital sustainability. In addition, it has identified and characterized digital sustainability practices as modified forms of organizational practice that are intentional, relational, situated and technology-oriented. Moreover, this dissertation has also identified the organizational conditions that enable and sustain digital sustainability practices. For instance, it has pointed to the need for a strategic response on a corporate level to achieve a shift towards digital sustainability on an operational level and the need for organizations to develop sustainability competence to successfully translate their digital sustainability objectives into real-world results. Overall, this dissertation has also shown that the IS fields understanding for digital sustainability is currently limited and that new research is needed in this area. Connected to the latter, this research has specifically identified the need to further explore and theorize the sustainability component in IS sustainability research.

8. Reflections on research

Before bringing this dissertation to a close, I would like to take this opportunity to reflect upon some of the concerns, limitations and challenges that I have come to associate with digital sustainability and some potential research areas that future research might expand upon. The first section repeats a widely acknowledged and yet growing issue with digitalization in general, and by extension, digital sustainability: e-waste. Leaning upon these insights, the final section of this dissertation introduces a new research concept for digital sustainability research: toxic digitalization.

8.1 IT hardware: the Chinese wall in the room

First of all, I would like to expand upon our collective inclination to ignore, what I would like to call, the "Chinese wall in the room". This expression is a form of word play where I intentionally combine the common expression of "ignoring the elephant in the room" with the World Economic Forum's (2019) illustrative comparison concerning the weight of the Chinese wall which is currently equal to our (the technology-consuming countries in the world) annual e-waste production. Simply put, to ignore the "Chinese wall in the room" is to ignore the rapidly growing mountain of e-waste that technology intensive countries like Sweden and Norway, who are amongst the top e-waste producers (World Economic Forum, 2019) and the most digitalized countries in the world (IMD, 2025) are currently creating.

The problems with e-waste are many. While some have identified e-waste as an information security risk for users and organizations (Chen et al., 2021), others have taken a more global approach and discussed the inequalities, environmental impact, and health risks associated with e-waste (Elliot, 2007; Heeks et al., 2014). These problems span from geopolitical issues to consumer responsibility, such as asymmetrical relations between developed and developing countries (Heeks et al., 2014), informal sectors for international trade, consumerism (Kumar & Rawat, 2015), linear production based upon a cradle-to-grave model (Naarmala et al., 2024), shorter life cycles (Elliot, 2007), planned obsolescence, and more complex and oftentimes unsustainable product designs which makes it difficult for users or other parties to repair e.g., smartphones (Greenpeace, 2017).

Considering that the World Economic Forum, Greenpeace and research in other fields, such as engineering, have acknowledged e-waste as an urgent issue, it is perplexing that the IS field has largely ignored (with few exceptions see, e.g., Elliot, 2007; Zeiss et al., 2020; Veit & Thatcher, 2023) the growing problem of e-waste (Naarmala et al., 2024). Indeed, to a large extent, IS scholars have treated these problems as if they were to be considered peripheral to IS research, even though IT hardware has been identified as a corner stone of IS research (see, Orlikowski & Iacono, 2001). In their article, Veit and Thatcher (2023) argues that IS sustainability research have traditionally focused on technology adoption. When contemplating on the issues of e-waste and this aspect of the IS field's identity, I have concluded that our definition of what the IS field should be studying, i.e., human-technology interactions, currently restricts its ability to contribute to sustainable development and sustainability.

One can argue that the IS field has yet to explore the many different stages of the IT life-cycle and that a sustainability perspective on digitalization require that the IS field develops a more nuanced approach to human-technology interactions. For instance, it can be argued that the IS field has studied human-technology interactions with "active" and "alive" technology in a user phase, whether this be front-end, back-end, heavyweight, lightweight, peripheral, or right-up-in-our-face technology and failed to account for interactions that lead up to the user phase and continues once the technology is "dead". As such, I want to suggest that IS sustainability scholars expand their previous definitions of human-technology interactions to tackle the e-waste problem. For this purpose, IS sustainability researchers might explore the interactions that include the elementary resources and technical components that are constitutive of these technologies (i.e., the production phase) and the interactions that take place with "inactive" or "dead" technology (i.e., the disposal phase).

8.2 Toxic digitalization: a new research concept

Throughout this dissertation, I have echoed previous attempts to illuminate the sustainability problems that have been associated with digitalization. These problems, if left unaddressed, fundamentally challenges the idea of sustainable digitalization and its role in sustainable development (see, e.g., Elliot, 2007; Berthon et al., 2011; van Wynsberghe, 2021; Fors et al., 2024). Despite previous calls for action (see, e.g., El Idrissi & Corbett, 2016; Elliot & Webster 2017), this dissertation has shown that the IS sustainability discourse have focused on the

opportunities of technology adoption while ignoring the consequences of doing so. Recognizing this as a limitation in the IS sustainability literature, this section invites IS sustainability scholars to reflect upon the environmental and social damage of technological determinism. To become sensitive to this perspective I have decided to suggest a new research concept: toxic digitalization.

Toxic digitalization refers to an unsustainable form of digitalization which specifically draws attention to instances of toxic implications, defined as the decisions and actions that result in: "*poisonous; very unpleasant or unacceptable* [outcomes]*; causing you a lot of harm and unhappiness over a long period of time*" (Cambridge Dictionary, 2025). A concrete example is 'toxic' e-waste (Elliot, 2007). The purpose of using toxic instead of e.g., 'unsustainable' digitalization, is to create an affective reaction which makes it easier for IS sustainability scholars and practitioners alike to augment instances of toxicity. By introducing this metaphor, I wish to redirect our scholarly attention to the toxic traits of digitalization, i.e., the direct and negative effects that causes physical harm to the natural environment and the people affected by these environments.

Unlike other concepts that are typically attached to the so called 'dark side' of digital sustainability (see, Schoormann et al., 2025), this concept originates from the idea that the production, use and disposal of IT hardware and digital resources are an integral part of digital sustainability. Keeping with this perspective, this dissertation suggests that IS sustainability scholars, and IS scholars in general, should explore the toxic traits of digitalization to advance our understanding of the negative sustainability impact of IT and digital resources from a full life-cycle perspective, i.e.,: "*the material preconditions and consequences of digital systems, such as the ecological footprint of production, the use and disposal of digital devices, and the environmental damage inflicted by mining, power generation, data centers, and e-waste*" (Aanestad et al., 2024, p. 190).

The ambition of introducing toxic digitalization is to encourage a holistic and bold research agenda in IS sustainability research that identifies and solves problems with technology on a material level while addressing the systemic and global issues that these technologies are associated with. The purpose of this research is to bring IS sustainability research closer to the material aspects of technology, especially digital sustainability research, to advance our limited understanding of when, where, how and for whom IT and digital resources are sustainably sourced and used.

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