Communications of the Association for Information Systems

Volume 53 Paper 2

10-2-2023

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Recommended Citation
Corbett, J., Dennehy, D., & Carter, L. (2023). Introduction to the Special Section: Digital Innovation for Social Development and Environmental Action. Communications of the Association for Information Systems, 53, 22-41. https://doi.org/10.17705/1CAIS.05302

Communications of the Association for Information Systems

Editorial Introduction DOI: 10.17705/1CAIS.05302 ISSN: 1529-3181

Introduction to the Special Section: Digital Innovation for Social Development and Environmental Action

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Abstract:

In 2022, we launched a call for papers for a special section on digital innovation for social development and environmental action. The call was motivated by the need for the information systems discipline to move beyond talking about sustainability to taking actions to address important challenges facing society and the planet. Many authors responded to the call and we are pleased to present the fruits of their labors. In this introduction to the special section, we discuss the motivations for the special section, explain how the special section came together, highlight key points of interest in the eight papers that make up the special section, and reflect on future directions for information systems research.

Keywords: Digital Innovation, Social Development, Environmental Action, Sustainable Development Goals.

This manuscript underwent editorial review. It was received 7/31/2023 and was with the authors for zero months for zero revisions. Ajay Kumar served as Associate Editor. This special section was reviewed during the tenure of editor-in-chief Fred Niederman.

1 Introduction

In an effort to ensure that "no one is left behind" in the process of global economic and social development, the member states of the United Nations (UN) adopted Agenda 2030. This Agenda is a guiding framework for measuring progress through the Sustainable Development Goals (SDGs) and comprises 17 goals and 169 specific targets. The SDGs are part of a universal program that applies to all governments and societal actors at all levels. Since the inception of the program, the UN, diverse organizations, and governments have done significant work to collect data and build indicators for measuring progress.

According to the 2022 Sustainable Development Goals Progress Chart (United Nations, 2022), substantial progress has been made on three of the 36 measured targets and these are on track to be met globally[1] by 2030. These three targets are:

- achieve universal access to electricity (SDG 7),
- increase access to mobile networks (SDG 9), and
- enhance access to technology by increasing internet use (SDG 17).

In contrast, at the global level, performance on eight of the 36 indicators has shown deterioration and will be difficult to achieve:

- ensure access by all people to safe, nutritious, and sufficient food all year round (SDG 2),
- end the epidemic of malaria (SDG 3),
- increase diphtheria-tetanus-pertussis vaccine coverage among 1-year-olds (SDG 3),
- achieve full employment (SDG 8),
- reduce the proportion of the urban population living in slums (SDG 11),
- reduce global greenhouse gas emissions (SDG 13),
- increase the proportion of fish stocks within biologically sustainable levels (SDG 14), and
- by 2020, protect and prevent the extinction of threatened species (SDG 15).

For the information systems (IS) community, these stats tell an interesting story. Improving access to information and communication technology has been embraced as a priority for global development and, through the actions of myriad stakeholders, universal access to connected, mobile IS is becoming a reality. The internet has become pervasive (Wolcott & Goodman, 2003) as governments and international tech firms have invested millions of dollars in increasing internet connectivity around the world. Still, digital inequalities (also known as the digital divide) persist (Opp, 2021). Further, the investments made to expand access to IS globally have not yet been translated into substantial improvements on other critical human goals – eliminating hunger, improving health, well-being, decent employment, safe living, climate change, and ecological diversity. Why is the sustainability scorecard so unbalanced and what can we do to flip more of these social and environmental indicators from the red zone to the green zone?

The idea that IS can be a positive force for advancing inclusive and sustainable social development is not particularly novel. Numerous authors have called on the IS community to become more engaged in addressing important human problems of equity, poverty, health, education, social development, and the environment (Malhotra et al., 2013; Walsham et al., 2007; Watson et al., 2021). Certain areas, such as physical (Fu et al., 2023) and mental health (Feldman et al., 2022) have been the subject of increasing scholarly attention, particularly during the COVID-19 pandemic and its aftermath (Wright et al., 2023). In addition, over the last fifteen years, the literature on Green IT/IS has become well established (Kotlarsky et al., 2023), with research investigating diverse questions around IS, human behaviors and organizational practices, and the natural environment (Corbett, 2013; Jenkin et al., 2011; Leidner et al., 2022; Wang et al., 2015). Artificial intelligence techniques have also been identified as a powerful lever for sustainability, with various agendas proposed (Dennehy et al., 2021; Nishant et al., 2020; Schoormann et al., 2023) to guide research and development. On the challenge of global social development, IS journals have published research focused on information and communication technologies for development (ICT4D) to advance our understanding of how IS can contribute to (or constrain) economic development (Venkatesh et al., 2019), poverty reduction, and increased human equality (Urquhart et al., 2008).

The difficulty we see is not in intention and interest but in action and impact. Impact implies making a difference that positively affects individuals, organizations, and society (Niederman et al., 2015). As

[1] The Progress Chart also provides details for progress by different regions and level of development of countries.

Gholami et al. (2016) ask in their introduction to a special issue on IS solutions for environmental sustainability, "How can we do more?" Research has acknowledged that addressing societal challenges is a 'wicked problem' with many interacting components, many uncertainties and equivocalities, and many views on methods, even where there is agreement on the end goal. Social development and environmental sustainability are grand global challenges (Hovorka & Corbett, 2012; Sahay et al., 2017) that are complex, multi-layered, transdisciplinary (Elliot, 2011). Moreover, we have to look past traditional conceptualisations of socio-technical systems to consider dynamic socio-technical-ecological systems and interactions (Ahlborg et al., 2019). Contributing to social development and environmental actions is hard, messy, and risky. It is easier to talk about than to do. But, do we must. We must try, learn from our efforts, and persist if we want to make a positive impact on the future of humanity and the planet.

On this premise – that the IS community must move from discussion to action – we proposed this special section with the aim of creating and disseminating readily applicable knowledge in relation to the SDGs for social development and preservation of the natural environment. Several key points differentiated this call. First, we announced that preference would be given to papers that included measurable sustainability outcomes that linked to one or more of the SDGs. Research that considered new dependent variables and outcomes that pertain to issues such as reduction of pollution in the air or water, access to nutritious food, or stable housing were particularly welcomed. Second, while the call was open to all research methodologies, we encouraged solution-oriented submissions that could make immediate contributions to the sustainable practices adopted by organizations, societies, and individuals. Design science and case studies were two methodologies identified as being highly relevant to achieving this objective. Finally, the call sought research with an action-orientation. We were primarily interested in how the research had or could affect global problems and the role of IS and digital technology in the solutions to these problems. In total, we received and considered 18 submissions for the special section. Of these 18 papers, eight are published as part of this special section. Individually, each of these papers reveals how organizations, government and society, and individuals can use IS to advance sustainability objectives. Collectively, these papers also present important insight on IS research in this important area.

The rest of this article is structured in the following manner. Section 2 provides a brief background for the special section. Section 3 outlines how the special issue was assembled through the cocreative efforts of authors, reviewers, and editors. Section 4 summarizes key elements of articles included in the special section and discusses their implications. Section 5 concludes the article with some reflections on future IS work in the area of sustainability.

2 Background for the Special Section

In 2023, we expect that all IS researchers have at least a basic awareness and comprehension of what sustainability means, and most, if only for social desirability reasons, agree that it is an important societal objective. Practically, many public companies are now ranked on a diversity of ESG (environmental, social, and governance) indices such as the S&P 500 ESG Index and the Bloomberg-SASB (Sustainability Accounting Standards Board) ESG indices, making sustainability a compelling business concern over and above the social concerns. Universities are also motivated to adopt sustainability objectives and initiatives in order to place favorably on the *Times Higher Education* Impact Rankings[2]. Although the theoretical foundations are unclear, sustainability is most commonly viewed as being made up of three dimensions — social, environmental, and economic — with the objectives of 'reducing harm' and 'doing good' on one or more of these dimensions (Purvis et al., 2019). The accumulated literatures in Green IS and ICT4D makes it clear that the IS community has the opportunity and expertise to advance inclusive and sustainable social development and tackle environmental problems.

Despite the conceptual softness of the term sustainability and its sister concept of sustainable development (Purvis et al., 2019), this special issue was not focused on definitional or conceptual work. Instead, we purposefully bypassed this question by specifying the United Nations' SDGs as a prescriptive framework for taking action to improve societal and planetary conditions. Rather than inviting research that answered questions related to the *what*, *when*, and *why* of sustainability[3], we called for research that focused on the *how,* while taking into account *where* the actions take place.

[2] https://www.timeshighereducation.com/impactrankings

[3] For example: What is digital sustainability? See Kotlarsky et al. (2023) and Pan et al. (2022). When does the IS community need to address sustainability challenges? Now, of course, see Watson et al. (2021). Why is sustainability important to IS scholars? See Sahay et al. (2017), among others.

The SDGs provide an explicit set of targets with defined timeframes, however, their global nature leaves local communities and organizations in a bit of a quandary of how they can align their activities to make a meaningful positive impact beyond simply doing good or reducing harm. Successful achievement of the UN's Agenda 2030 for sustainable development depends on the mobilization of all actors, particularly at a local level. According to the United Nations Development Programme (2014), localization is required to instantiate the process of "defining, implementing, and monitoring strategies at the local level for achieving global, national, and subnational sustainable development goals and targets." Localization efforts can relate to government efforts to contextualize their approach to their own specific environmental, economic, social, political, and cultural conditions (Corbett & Mellouli, 2017; Pan et al., 2022), and can also apply to other individuals, organizations and businesses that seek to translate the SDGs to their own realities. Returning to the *Times Higher Education* Impact Rankings, universities are evaluated against indicators related to the 17 SDGs that have been contextualized for the university context. As an example consider SDG 1, "No poverty", universities are thus evaluated based on their poverty-related research and efforts to support poor students and members of the local communities (Times Higher Education, 2023). Further, as we see in the article by Krasikov and Legner (2023) (included in this special section), companies' sustainability initiatives are often linked to one or more of the SDGs.

The IS community is familiar with the concept and practices of localization, as for years, software and systems developers have considered how local cultures and user contexts affect the design, implementation, acceptance, and use of IS and adapted their products accordingly. We must now bring this expertise to the work of sustainable social development and environmental protection because (a) there remains a knowledge gap regarding how to best implement SDGs at the local level (Tremblay et al., 2021) and (b) data, a cornerstone of the IS discipline, is a critical level for localization and the achievement of sustainable development goals (ElMassah & Mohieldin, 2020) at the local and global level. For instance, Patole (2018) uses a case study on SDG 6, "clean water and sanitation", to show how disaggregation of key performance indicators can reveal linkages between different SDGs, and lead to new, common indicators to address multiple goals and inform the development of more efficient and effective policy interventions. In another study involving seven countries, ElMassah and Mohieldin (2020) found that digital transformation increases the likelihood that governments will localize the SDGs, a process that captures advantages of both centralized and decentralized modes of governance, for example promoting national security and increased accountability, respectively.

Figure 1 illustrates our view of how, beginning from Agenda 2023, which is a global planetary framework, localization of the SDGs can occur across two axes: geographical, in terms of different regions and extent of development in different countries, and level, from global to organizational to individual.

Figure 1. Axes of Sustainability Localization

Much of the management literature has focused on corporate sustainability, with the underlying assumption that an organization's incremental improvements in environmental performance will contribute to global planetary improvements. However, this assumption is not always true (Haffar & Searcy, 2018). Sometimes, organizational changes may look like sustainability gains, but they can actually mask unsustainable performance. At the extreme are cases of greenwashing (Szabo & Webster, 2021), which can often be perpetuated through digital technologies like social media (Oppong-Tawiah & Webster, 2023). The IS discipline is perhaps not much different.

Unfortunately, many ICT4D initiatives fail (Lin et al., 2015; Venkatesh et al., 2019) and many initiatives are characterized as Green IS even when the environmental impacts are unclear or unmeasured (Trid et al., 2019). Further, national, organizational, or individual-level priorities are inconsistently aligned with global sustainability goals because of the practical challenge of translating complex, interconnected, and systems-wide objectives to the company level (Haffar & Searcy, 2018). Thus, there is a need to link sustainability-driven digital initiatives and research more closely to science-based, explicit objectives that can be measured and monitored over time. Localization and disaggregating of the indicators associated with the SDGs is one path forward. The special section was created in this light: to encourage and support multi-scalar and multi-level research on the relationship between information systems, sustainable social development, and environmental actions. By choosing to use the SDGs as an integrating framework for understanding the problem of sustainability, we hoped to induce research that included measurable sustainability outcomes and examined non-traditional IS dependent variables across a variety of localized countries, be they different countries (i.e., highly developed and developing) and levels of analysis (i.e., national to individual).

With this situating context, we turn to the main question of the special section: how? How do digital technologies contribute or detract from sustainable development efforts? How can we design, develop, and use IS to make meaningful positive change? Admittedly, this is not the first call for this type of research (for others, see Malhotra et al. (2013), Sahay et al. (2017) and Watson et al. (2021)), and the potential answers are limited mostly by our collective imagination. It calls for innovation.

Not only a lever for economic development, innovation of and with IS is expected to be a key enabler for environmental sustainability (Melville, 2010). Today, there is significant attention being given to digital innovation, which results in outcomes that are perceived as new, require some significant changes from the adopters, and are embodied in or enabled by information technology and systems (Fichman et al., 2014). There is tremendous opportunity for digital innovation and entrepreneurship for sustainable development, that is, the "discovery, creation, and exploitation of opportunities for (future) goods and services that simultaneously sustain the natural and social environment and provide economic and non-economic gain for others" (Johnson & Schaltegger, 2020, p. 1141-1142). IS innovation is a complex and multifaceted phenomenon (Costello et al., 2013), and digital innovation can take many different forms and result in new products, services, business models (Fichman et al., 2014), processes, and even ways of thinking. Such innovations do not necessarily need to be costly or on the bleeding edge of technology as the frugal approaches can lead to solutions that deliver real social benefits, particularly for marginalized populations or in less developed countries (Li et al., 2020). Another interesting pathway for sustainability innovation comes in the form of digital innovation projects that facilitate 'citizen science' (Levy & Germonprez, 2017) and empower communities to address issues of global importance (Dennehy et al., 2021). Such projects often involve processes of cocreation and mutual learning regarding requirements and tuning of digital technologies to solve real problems.

Against this backdrop, this special section continues the discussion on how the IS community, through our research and practice, can further the objectives of sustainable social development and environmental protection. Given the troubling position in which the world finds itself with respect to achieving the SDGs by 2030 (United Nations, 2022), this special section places a particular focus on action. In our call, we encouraged solution-oriented submissions that could make immediate contributions to the sustainable practices adopted by organizations, societies, and individuals. In the sections that follow we describe how the special section was cocreated through the participation of many people. Then, we present the eight articles that comprise it and discuss how they further our understanding of how digital innovation has and can contribute to sustainable social development and environmental action.

3 Cocreating the Special Section

Addressing grand challenges involves the collective efforts of many actors. Value cocreation broadly describes situations involving the collaboration between multiple stakeholders (Ranjan & Reed, 2016) to create something — a product, service, process, outcome — of meaning and consequence to those parties. In the business environment, consumers may play an active role in joint value creation with a business. In public contexts, citizens, enterprises, and governments can cocreate societal, business, and personal value. In scientific research, the production of a special issue is a cocreative process, where authors, editors, and research participants all play essential parts in achieving desired outcomes.

Two core dimensions of value cocreation are *co-production* and *value-in-use*, where co-production consists of the activities of actors working together in the design and development process, and value-in-use occurs through the process of consumption when the outcome is used in context and evolves over time (Ranjan & Reed, 2016). This special section was a co-production effort that drew on the expertise and efforts of many people, to whom we owe and offer our sincerest thanks and appreciation:

- First, there was the Editor-in-Chief, Fred Niederman, who encouraged us to take on this special section and guided and supported us with his wise counsel from ideation to production.
- Second, there was the advisory board, comprised of Yogesh Dwivedi (Swansea University), Katina Michael (Arizona State University), Shan Pan (University of New South Wales), Rick Watson (University of Georgia) and Jane Webster (Queen's University). Their comments and advice aided us in defining the special section and developing the call for papers.
- Third, behind the scenes, was David Cormier, the journal's Managing and Production Editor who managed the production of the special issue. David made sure everything in the system ran smoothly and provided us with the information we needed when we needed it.
- Fourth, this special issue could not have been realized without the Editorial Review Board (listed in Table 1), 47 outstanding scholars who gave freely of their time to review one or more papers, sometimes more than once. These scholars have expertise in diverse thematic areas of sustainability and methodologies and represent the three regions of the Association for Information Systems (AIS).
- Fifth, we have the authors who spent countless hours planning and executing their research, writing, rewriting, and editing. In particular, we are pleased to feature authors from the Commonwealth Bank of Australia and the Government of New South Wales (see Joukhadar et al., 2023) in the special issue.
- Finally, the articles in this special section rest on the participation and engagement of many organizations and individuals, among them, the Government of New South Wales (Joukhadar et al., 2023), the non-governmental organization (NGO), World Vision, in Honduras (Li et al., 2023), multiple case study organizations (Krasikov & Legner, 2023), professional sign language translators (Strobel et al., 2023), and Zimbabwean pensioners (Ncube et al., 2023). The involvement of these participants contributed not only to the value of co-production as they shared their knowledge and experiences but also value-in-use as we discuss further in Section 4.

Table 1. Editorial Review Board

Ovais Ahmed, Karlstad University	Mairead O'Connor, University of New South Wales
Sultana Lubna Alam, Deakin University	Adegboyega Ojo, Carleton University
Ransome Bawack, ICN Business School	Divinus Oppong-Tawiah, York University
Pratyush Bharati, University of Massachusetts Boston	Paidi O'Reilly, University College Cork
Sarah Cherki El Idrissi, University of Toronto Mississauga	Ilias Pappas, University of Agder
Alexander Chung, Université Laval	Brandis Phillips, North Carolina A&T State University
Kenan Degimenci, Queensland University of Technology	Nripenda P. Rana, Qatar University
Daniele Doneddu, Swansea University	Shahrzad Roohy Gohar, University of Queensland
Malshika Dias, RMIT University	Daniel Rush, Boise State University
Maud Ashong Elliot, University of Professional Studies, Accra	Ramandeep Sandhu, Oakland University
Athula Ginige, Western Sydney University	Tony Savarimuthu, University of Otago

Manjul Gupta, Florida International University	Rens Scheepers, Deakin University
Samrat Gupta, Indian Institute of Management Ahmedabad	Piotr Soja, Cracow University of Economics
Antoine Harfouche, University Paris Nanterre	Konstantina Spanaki, Audencia Business School
Laurie Hughes, Swansea University	Rehan Syed, Queensland University of Technology
Anne Ixmeier, Ludwig-Maximilians-University Munich	Mary Tate, Victoria University of Wellington
Vijaya Lakshmi, Université Laval	Alan Thorogood, MIT Centre for Information Systems Research
Dapeng Liu, University of New South Wales	Janet Toland, Victoria University of Wellington
Matti Mäntymäki, University of Turku	Jolien Ubacht, Delft University of Technology
Mohammad Merhi, Indiana University South Bend	Jane Webster, Queen's University
Alemayehu Molla, RMIT University	Hitesha Yadav, Indian Institute of Technology
Ignitia Motjolopane, North-West University	Efpraxia Zamani, University of Sheffield
Viral Nagori, Mudra Institute of Communications	Guoqing Zhao, Swansea University
Rohit Nishant, Université Laval	

Despite a relatively short time frame, we had a very positive response to our call, reflecting the fact that sustainability has become an active research area in IS. We received 16 submissions to the special section and considered two other papers submitted to the regular track at the journal that were aligned with the topic of the special section. A minimum of two members of the Editorial Board provided evaluations and developmental feedback on each of the submissions according to the reviewing standards of the journal. During this first screening, we checked for the fit of the article with the objectives of the special section and the potential for the article to be of sufficient quality for publication after one round of revision. Of the initial 18 submissions, 10 were moved forward after the first review, and the authors were given the opportunity to revise their papers. Owing to the tight deadline for the special section, we received nine revisions. A second round of reviews was completed. Of these, eight articles were accepted (with and without minor revisions) and are included in this special section.

4 Overview of Articles in the Special Section

Table 2 summarizes key elements of the articles comprising the special section. In our comments, we use the term dependent variable in a broad sense to capture the main outcome of interest investigated through the research. We elaborate on these elements in the subsections that follow.

Table 2. Summary of Articles in Special Section

Title (Reference)	Dependent variable(s)	Methodology	Action orientation
Introducing a Data Perspective to Sustainability: How Companies Develop Data Sourcing Practices for Sustainability Initiatives (Krasikov & Legner, 2023)	Data sourcing practices to support organizational environmental objectives (ecological footprints, product labeling, packaging compliance)	Case studies of five large organizations with advanced sustainability initiatives related to product and packaging	Organizations can apply the three data sourcing practices to develop and support their own sustainability initiatives
The Hierarchy of Green Information Systems Capability in Organizations to Enhance and Ensure Green Performance: An Operant Resources Perspective (Ning & Khuntia, 2023)	Organizational green performance, as measured by CO_2 emissions	OLS regression model using archival data used to test hypotheses	Two hypothetical, but real-world scenarios illustrate how organizations can leverage green IS capabilities to improve green performance in organizations

A Climate Change Vulnerability Assessment Design Framework: The Case of Small-scale Farmers in Western Honduras (Li et al., 2023)	Climate change vulnerability and resilience	Design science Development of Climate Change Vulnerability Assessment Design Framework (CCVA-DF) and a web-based visualization and knowledge platform called THRIVE	CCVA-DF can guide the development of other solutions for assessing vulnerabilities within local populations THRIVE application can be extended and modified for use in other areas and development contexts
Using AI to Improve Sustainable Agricultural Practices: A Literature Review and Research Agenda (Lakshmi & Corbett, 2023)	Sustainable agriculture outcomes	Literature review of AI applications for sustainable agriculture Development of conceptual framework on Conjoint Experiential Learning	A conjoint learning framework can guide future research on the interaction between humans and AI to increase AgriDSS capabilities, leading to sustainable agriculture outcomes
Artificial Intelligence for Sign Language Translation – A Design Science Research Study (Strobel et al., 2023)	Accessible, equal, and inclusive communication via an AI-based sign language translator	Design science Development of a machine-learning-based pipeline and sign language translator	Prototypes can be further developed and used by individuals and organizations to enable people with hearing inabilities to engage and participate in social, economic, and political activities Design knowledge (ML pipeline) can inform other work on augmentative and alternative communication systems
Improving Information Systems Sustainability by Applying Machine Learning to Detect and Reduce Data Waste (Savarimuthu et al., 2023)	Amount of data waste in internet user-generated content and their cost in terms of time (social impacts), money (economic impacts), and CO_2 emissions (environmental Impacts)	Design science Development of 13 machine learning (traditional and deep learning) models to identify data waste and a sustainability cost calculator to determine impacts	Models can used to identify data waste at source, for benchmarking and reducing data waste on the internet Once waste is identified, measures can be taken to educate data creators or to automatically eliminate data waste
Digitalising Social Protection Systems for Achieving the Sustainable Development Goals: Insights from Zimbabwe (Ncube et al., 2023)	Design, implementation, and outcomes of digitalized social protection systems	Interpretive case study on the digitalization of the social protection system in Zimbabwe	Key insights from three key stakeholder groups (pensioners, government, civil society) provide direction for other efforts at digitalizing social protection systems The research agenda provides questions and actions for future work in this area

Promoting Digital Innovation for Sustainability in the Public Sector (Joukhadar et al., 2023)	Digital innovation to improve public outcomes	Exploratory, interpretive field case study New South Wales State Government (recognized leader in digital innovation) Practical examples of digital innovations and overcoming barriers	The process model explains how insufficient innovation capabilities and core rigidities constrain responses to disruptive change A second model incorporating eight components can guide public sector organizations in adapting and aligning their organizations for digital innovation

4.1 Sustainability Dimensions and Dependent Variable(s)

4.1.1 Summary

Two main themes, broadly defined as social development and environmental action, make up the special section. As illustrated in Figure 2, the majority of articles address elements of social development on its own, or in combination with environmental action. One article by Ning and Khuntia (2023), focuses on green IS and organizations' environmental performance measured in terms of CO_2 emissions (SDG 13, climate change) while recognizing that organizational green performance can also influence other ecological concerns such as water use (SDG 6) and waste (SDG 12). Further, in their article proposing a mechanism for identifying and measuring data waste, Savarimuthu et al. (2023) use CO_2 emissions as an indicator of environmental costs while also considering financial costs and time spent as the economic and social dimensions of sustainability respectively.

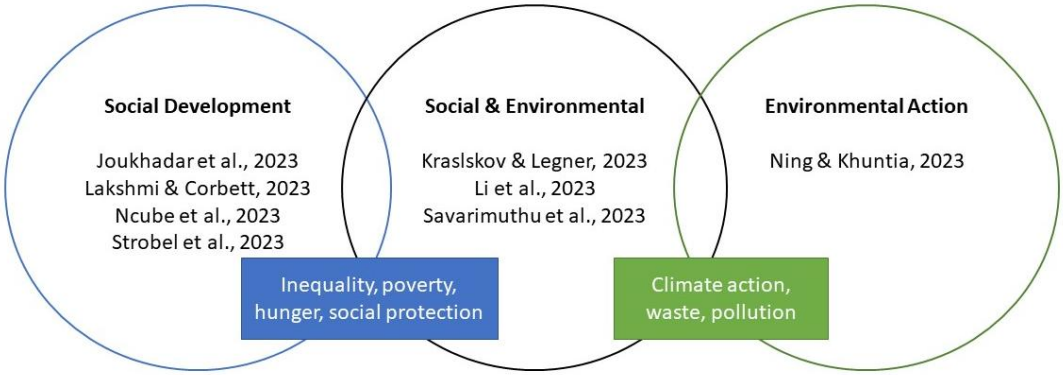

Figure 2. Articles Grouped by Sustainability Focus

When taken together, all 17 of the SDGs are considered to some extent in the papers included in this special section. In this respect, the article by Krasikov and Legner (2023) stands out. As a green IS study, it centers on environmental dimensions of sustainability and shows how product labeling and packaging sustainability efforts primarily aim to reduce waste, pollution, and CO_2 emissions, and this often in response to institutional pressures. At the same time, the case studies highlight the fact that different sustainability initiatives can influence a large number of diverse sustainability objectives.

In terms of the social dimensions of sustainability, four sustainability concerns are particularly present in the special section. Two articles tackle the challenge of poverty, the object of SDG 1. Ncube et al.'s (2023) study of social protection systems in Zimbabwe reveals the challenges and opportunities for digitalized systems to support vulnerable people and reduce the effects of poverty. Meanwhile, looking at the problem from a different angle, Li et al. (2023) suggest that poverty reduction in developing nations, such as Honduras, can be achieved by providing digital solutions that build climate change resilience and adaptive capacity for small-scale farmers.

A second sustainability objective closely related to poverty is hunger (SDG 2). Agricultural practices are a key lever for reducing hunger and two articles are situated within this context. While Li et al. (2023) tackle this challenge using a design science approach to build a framework for assessing climate change

vulnerability, Lakshmi and Corbett (2023) take a broader view. Through a systematic literature review, they identify social, systems, deployment, and ethical roadblocks to the use of AI-based agricultural decision support systems (AgriDSS) for sustainable agriculture. Then, they develop a framework for conjoint experiential learning explaining how agricultural workers can learn concurrently with AI to improve AgriDSS capabilities, leading to more sustainable agricultural outcomes.

A third dimension of social development addressed in the special section is inequality, the object of SDG 10. The work by Strobel et al. (2023) brings this issue to the fore as it presents the design and development of an AI-powered sign language translator. Given that the ability to communicate effectively with others is a key factor influencing social inclusion and equity, harnessing the capabilities of AI to facilitate communications between those with hearing impairments and other individuals, organizations, and businesses is an exciting possibility. It could also bring further benefits in terms of improved equity in health care (SDG 3), education (SDG 9), and civic engagement and participation (SDG 16). On this latter point, the micro (individual)-level intervention of Strobel et al. (2023) is nicely juxtaposed with the article by Joukhadar et al. (2023), which emphasizes the important macro (societal)-level role that government plays in all aspects of sustainability. To fulfill this role, public sector organizations must be able to overcome challenges of core rigidities and insufficient capabilities to be able to effectively respond to disruptive changes and engage in digital innovation for sustainable development in all its dimensions.

4.1.2 Implications for IS Research and Practice

We draw two main implications from these observations. First, we note that although all the SDGs were discussed to some extent in the articles, the list of dependent variables remains relatively limited and generalized. For instance, none of the articles measure (quantitatively or qualitatively) outcomes such as food security, access to education, or biodiversity. Scholarship in IS continues to see these types of outcomes as downstream effects of other, more traditional outcomes, such as innovation capacity and operational efficiency. As a result, there is still much room and need for IS research that foregrounds social and environmental sustainability outcomes as dependent variables.

Second, the articles present a clear message regarding the interconnected nature of the SDGs and sustainability itself. In practice, it is hard to address one dimension of sustainable development without influencing others. In research, such interconnectivity, while acknowledged, has not always been integrated into research designs, often because of the need to have testable models, where the effects of different factors on a given outcome can be measured and isolated. This type of reductionist approach has many drawbacks in the context of sustainability (Gasparatos et al., 2008).

The articles in the special section offer suggestions for dealing with this challenge of multifaceted dependent variables. Among them, Savarimuthu et al. (2023) developed a sustainability cost calculator that captures the economic, social, and environmental costs of data waste throughout the lifecycle from creation to use. Calculating and reporting these results separately provides greater visibility and understanding of the interactions between financial, social, and environmental well-being. However, collecting the necessary data to support comprehensive and accurate sustainability reporting is, as Krasikov and Legner (2023) state “inherently more complex than for traditional reporting.” Requirements and responsibilities for sustainability-related data are not clearly defined. Further data sourcing for sustainability requires cross-functional collaboration and involves heterogeneous sources, some of which need to be repurposed and adapted to the specific requirements (Krasikov & Legner, 2023). This complexity is compounded when several dimensions or objectives of sustainability are taken into account. Given the IS discipline’s expertise in data management, analytics, and information systems design, this area would seem to be a fruitful area for future work.

4.2 Methodological Approaches

4.2.1 Summary

The articles in the special section use qualitative, quantitative, and design science methodologies, as shown in Figure 3. Among the papers adopting a qualitative approach, three employ case studies. Ncube et al. (2023) and Joukhadar et al. (2023) conducted exploratory interpretive case studies of government initiatives, in Zimbabwe and New South Wales, Australia respectively. Following an exploratory phase involving three focus groups with representatives from 13 multinational companies, Krasikov and Legner (2023) conducted case studies of corporate sustainability initiatives using a more positivist approach. All of the case studies presented in the special section provide rich descriptions and tangible, real-life stories

of how IS was implemented and affected sustainability-related initiatives and outcomes. The fourth qualitative paper by Lakshmi and Corbett (2023) presents a scoping literature review of 121 articles on AI and sustainable agriculture published in diverse disciplines, including agriculture, computer science, engineering, and information systems, providing a foundation for theoretical reflection and development of their conceptual framework on conjoint experiential learning.

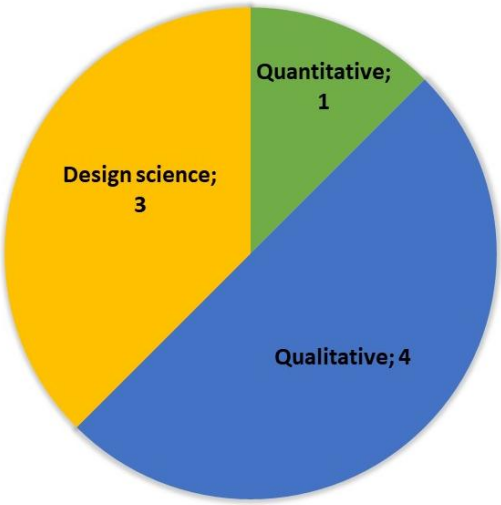

Figure 3. Articles Grouped by Methodological Approach

One quantitative theory building and testing article is included in the special section. This contribution by Ning and Khuntia (2023) drew on the operant resources perspective and builds a model explaining how basic, composite, and interconnected operant resources contribute to and inhibit organizational green performance. Using cross-sectional data from 73 North American organizations, the authors find that green IS capability (a basic operant resource) contributes to green performance, but can also lead to IS misuse, which has an opposing effect. Such an effect can be mitigated by information assurance capability (an interconnected operant resource) because the engagement of independent assurance firms serves to improve the quality of the information from the green IS. Thematically, this study has a clear link to the work of Krasikov and Legner (2023), who also discuss issues of data quality as an impediment to the effective management of environmental sustainability initiatives. Combined, the two articles demonstrate how different methodological approaches can provide complementary insights on complex sustainability issues.

Three articles develop new digital artifacts for sustainability through their implementation of design science research. Savarimuthu et al. (2023) developed an ensemble artifact comprised of two components: waste detection algorithms and a sustainability cost calculator. In this effort, thirteen machine learning models are created and evaluated, with the deep learning models achieving the highest levels of accuracy in identifying waste. This work serves as a proof-of-concept for future research and practical efforts to reduce online data waste. The project of Strobel et al. (2023) also explored the potential of AI for sustainability, focusing on its capability to recognize and decode sign language. The developed prototype, which uses transformer neural networks, shows promising results, suggesting that AI-based translation tools can level the communications playing field for those with hearing difficulty. Among the design science research articles, the offering from Li et al. (2023) is the most advanced in terms of practical usage. To address the challenges related to climate change in Honduras, a geographic information system (GIS)-based web application, was built in partnership with a team for the Honduras THRIVE project by World Vision. The application allows the team to identify levels of risk (e.g., fires, soil moisture) and calculate a vulnerability index for different locations. The information and visualizations provided by the application allow the team to improve planning, monitoring, and decision making, and contribute to increasing the resilience of small-scale farmers in the region.

4.2.2 Implications for IS Research and Practice

First, the types of research submitted and accepted to the special section were mostly in line with our expectations. Although all methodological approaches offer different advantages and insights related to

sustainability, certain of them, particularly design science research and case studies, align more naturally with an action orientation. Still, they, and all other methods also require that researchers take this perspective from the start, in the design of their research. The articles included in the special section also highlight the value of practitioner involvement in the research, not just as passive informants, but as co-producers and users of the knowledge created through the research. Situating research in the field in contexts where real efforts are being made toward sustainability leads to more relevant, nuanced, and applicable results.

Several research methodologies were not represented in the special section, but still hold relevance for sustainability studies in IS. Action research, including action design research (Sein et al., 2011) is a participatory approach that by definition attempts to make a difference by solving a real, complex problem (DeLuca & Kock, 2007). Situating IS research within living labs to collaborate is also a promising avenue that provides alternative perspectives on digital innovation for social good (Thapa et al., 2017). We also confirm the need for critical research in the area of sustainability. The study by (Ncube et al., 2023) discusses the potential, prevalence, and problem of design-reality gaps, where the features of a designed system do not match the needs of the intended users. Sometimes, projects may appear successful on the surface, even while underlying tensions and unintended negative consequences occur in the background (Lin et al., 2015). Critical studies that examine the interrelationships between macro and micro sociopolitical contexts (Lin et al., 2015) can help to uncover such situations, ensuring that the impacts of digital innovation projects are not greenwashed and truly bring positive change and benefits to the community that they are meant to serve. Finally, we would have liked to have included in the special section, one or more articles using Indigenous research methodologies. The IS community has developed within a Western science perspective with little regard for alternative knowledges, theories, and approaches. Although the benefits of integrating Indigenous and western knowledge have been known for some time (Puri, 2007), efforts to decolonize IS research and development are only now starting to gain momentum. We believe that incorporating Indigenous knowledge and methodologies, such as storytelling and conversational inquiry (Bastien & Coraiola, 2023), and involving more Indigenous Peoples and communities in IS research will lead to better, more lasting, and positive solutions for sustainability.

As a final thought related to methodological approaches, we would like to stress that an action-orientation does not imply giving up on methodological rigor or the use of theory to guide the investigations. Across the different articles included in the special sections, the authors engaged in well-designed and executed research methods for collecting, analyzing, and presenting their results. Doing research well is essential to building confidence in the outcomes of the research and arriving at models, frameworks, and artifacts that can make a difference in the real world. Similarly, while we did not emphasize the creation of new theory in this special section per se, the authors draw on established IS theories as well as theories from other domains to inform their work and, in the process, develop new theoretical insights and arguments. As a complex, multi-faceted, and dynamic challenge, sustainability requires multidimensional research – diverse theoretical perspectives and varied research methodologies that can provide more complete, profound, and nuanced understandings, leading to positive change and advancement.

4.3 Action Orientation

4.3.1 Summary

As discussed, the main motivation for the creation of this special section was to create readily applicable knowledge in an attempt to move the IS community towards sustainability action. Ultimately, we are striving for value-in-use; that is, the value that derives from people using the co-produced knowledge to take action. While the results of the research can be used by other researchers, having an impact in the real world requires engagement from other actors, or change agents. The articles in the special section point to three such agents in particular: business organizations, industry, public sector, and non-governmental organizations.

Business Organizations

Both Krasikov and Legner (2023) and Ning and Khuntia (2023) focus on environmental sustainability within organizations and how digital technologies can support these initiatives. Drawing from case studies across multiple industries, Krasikov and Legner (2023) define three data sourcing strategies that provide a foundation for reliable and trustworthy sustainability reporting. The first strategy involves sense making to identify the relevant data objects and attributes relative to the initiative. The second strategy involves data collection from internal and external sources and filling gaps in existing data as needed. The third strategy

involves data reconciliation, which results in a curated set of data that enables reliable measurement and sustainability reporting. In addition, Krasikov and Legner (2023) present a model outlining the data requirements in product and packaging initiatives. This work provides a roadmap for managers to follow when embarking on new sustainability projects. Improved data sourcing will enable better organizational decision making and reporting, leading to reduced greenwashing (Szabo & Webster, 2021) and ecological footprints.

Beyond improved data quality, Green IS deployed within organizations can also lead to improved sustainability outcomes when organizations develop green IS capabilities, management support for environmental sustainability initiatives, and information assurance capabilities (Ning & Khuntia, 2023). Taking a forward-looking and action-oriented perspective, Ning and Khuntia (2023) present two fictitious, but real-world scenarios – in manufacturing and banking – showing how the development of these capabilities could occur and their impact on the organizations. From the perspective of futures-thinking, these scenarios present possible alternative futures (Inayatullah, 2008) and serve a number of purposes. First, they can provide a model for managers to follow as they seek to improve their environmental performance using IS. Second, they demonstrate the value of futures-thinking as a complement to other methodological approaches in IS. To tackle complex sustainability problems, the research community must be able to imagine a wide range of plausible, likely, and ideal states. With consensus reached on the desired future state, backtracking can be used to secure the necessary capabilities, data, systems, and other resources to realize the end goal.

Industry

Industries are more than simple collections of organizations, they are complex social constructions involving multi-directional relationships between organizations, suppliers, customers, and other stakeholders and have unique characteristics and interests (Geels, 2014). Organizations influence the shape of industries, just as industries influence the actions of organizations. Thus, it is important to consider how industries, as actors, support sustainable transformations. Savarimuthu et al. (2023) call for the IS community and the internet content industry specifically to recognize the growing problem of data waste and to take concrete actions to reduce the amount of useless data that enters the global databases and information processing streams. While the authors draw on lean information management as a theoretical perspective to develop their work, the idea of looking critically at what data we collect aligns with Indigenous wisdom associated with the 'honorable harvest' (Kimmerer, 2015), where one takes only what (data) what one needs, harvest (data) in a way that minimizes harm, use the produce (data) respectfully and never waste what you took (Steen, 2022). The machine learning models and sustainability cost calculators developed in the research are tangible tools for assessing the harms of data waste and moving the industry toward more sustainable data harvesting practices.

The article by Lakshmi and Corbett (2023) similarly calls for transformational industry change, in this case, the agricultural sector, in order to increase sustainability outcomes. The transformation involves novel, conjoint learning through which agricultural workers' experiences and knowledge are combined with data-driven AI learning to increase agricultural decision support capabilities. Within this future-thinking model, three strategies are proposed: feedback assignment, output review, and model inspection. While farmers and agricultural workers with in-the-field experience need to be involved, they cannot effect this change alone; agricultural system developers and researchers have important parts to play in understanding and implementing conjoint experiential learning that is ethical, effective, and sustainable.

Public Sector and Non-governmental Organizations

Governments at all levels must play an active part in achieving sustainability objectives. The special issue is fortunate to have two in-depth case studies: one from a developing nation (Zimbabwe (Ncube et al., 2023)) and a developed country (Australia (Joukhadar et al., 2023)). Despite the differences in the socio-economic development of the two countries, the results of the studies highlight some similar themes and actions. Moving beyond challenges, Ncube et al. (2023) suggest that three critical building blocks for sustainability transformations in the public sector are investments in diverse resources, insurance to protect against shocks and insecurities, and innovation. Innovation requires embracing change and looking for creative solutions, which can be facilitated by robust digital systems (Ncube et al., 2023).

Joukhadar et al. (2023) continue on the theme of digital innovation in the public sector. They take an action-oriented perspective by proposing a framework of eight organizational components that must be aligned in order to support effective digital innovation. To concretize understanding of these components, the authors provide practical examples, such as the Digital Capabilities Uplift Framework and the Digital

Restart Fund. The framework and the practical examples can serve as useful guides for other public organizations.

Strobel et al. (2023) provide a different, and very tangible example of digital innovation for social development, an AI-based sign language translator. Although individuals with hearing inabilities will be the direct beneficiaries of the translator, and private sector enterprises could be involved in the further development and commercialization of this or similar types of applications, arguably, governments and NGO social protection organizations will have to take the lead to implement them and promote adoption. Appropriate digital infrastructures will need to be developed, government practices and structures could require adjustments and regulatory measures or policies might be required to ensure that the technology is accepted and used across all public and private organizations in order to achieve maximum benefits.

Finally, among the articles included in the special section, Li et al. (2023) provide the clearest example of the value-in-use of IS for sustainability research. This cocreative effort emerged from the development of the web application in partnership with the World Vision team working on the ground to improve living conditions and reduce poverty and hunger in Honduras. In this way, the research moves from proof-of-concept to proof-of-use (Nunamaker et al., 2015). With additional work, the THRIVE application can be extended and modified for use in other areas and development contexts and the Climate Change Vulnerability Framework Design Framework (CCVA-DF) can be used to guide the development of other geographic and remote sensing solutions for assessing vulnerabilities within local populations, whether by independent NGOs or government agencies.

4.3.2 Implications for IS Research and Practice

As we stated at the outset, talking about sustainability is easier than doing something about sustainability. Human societies and the planet have arrived at the current situation based on decisions made in the past. Continuing to make the same kind of choices is likely to lead us further away from the goals of sustainable development. The articles comprising the special section present a set of positive actions taken or that could be taken by businesses, industries, governments, and non-governmental organizations. It is a starting point; the set of actions is woefully incomplete. More research by the IS community is needed to investigate the role of digital technologies and innovation in addressing the grand challenges of hunger, poverty, inequity, underemployment, violence, climate change, and biodiversity loss. At the same time, the many case studies — in Zimbabwe, Australia, and international business organizations — demonstrate that digital innovation for sustainability is a continuing work in progress that does not always follow a straight path to success. Perseverance, resilience, and commitment from all actors will be required.

Value-in-use grows as users ‘consume’ the product. For us, this means how the knowledge, research agendas, and artifacts presented in this special section are experienced, adopted, enhanced, and transformed to create measurable positive impacts. The participative case studies and design research projects undertaken with partners in the field have a head start because the knowledge is already in the minds and hands of those who can use it. For others, the risk, as with the publication of all scientific research is that the articles become static, historical artifacts with little future effect. We expect, given the current institutional pressure on IS scholars to make an impact with their research (Niederman et al., 2015) and new rankings like the *Times Higher Education* Impact Rankings that the authors are publicizing their work through different mechanisms such as social media, courses, and practitioner presentations. We wonder if that is enough or if there are other, better ways. For that, we do not have a ready answer and invite the Association for Information Systems (AIS) to continue to explore innovative means for putting the knowledge of AIS members to good use.

5 Conclusion: A View to the Future

While this special section can be viewed and read simply as a collection of individual articles related to social and environmental sustainability, we hope that readers will take more away. In bringing these articles together, the special section tells a story of our discipline’s view and approach to social development challenges, such as eliminating poverty and hunger, addressing inequalities, and mitigating the causes and effects of climate change and environmental pollution. The selected papers provide examples of how IS and digital innovation can be critical enablers in addressing the SDGs, as well as providing practical contributions to real-world problems.

Despite these contributions, there is still significant room for learning how to use technologies as platforms that mediate development (Heeks, 2020). For instance, how can IS and other technologies in general be designed, developed, and embedded in local Indigenous communities without eroding local traditions and practice that affect Indigenous peoples' livelihoods, and identities (Korpela, 1996; Sillitoe, 1998)? There is compelling evidence that linking Indigenous knowledge and technology use can engage communities in localized development processes and contribute to strong partnerships between communities and global development actors (Dennehy et al., 2014; Hasan et al., 2022; Simons et al., 2020). Yet, Western societies have a chequered history of eroding Indigenous knowledge in order to achieve performance indicators that satisfy the goals of international funding agencies and often reinforce colonial practices.

The story does not end with the publication of the special section, rather, this is the launching point for further cocreation activities through co-production and value-in-use. Given that 2030 is only a few years away, an important question is forming around what will happen in the post-SDG period. Now is the time for IS researchers to engage in futures thinking. Futures thinking, an under-utilized paradigm in the IS literature, involves systematically creating multiple normative plausible futures (including those desired and those to be avoided) that emphasize values and the influential role of human agency in shaping these futures (Glenn & Gordon, 2009; List, 2006). The IS community must be engaged in setting the future agenda through excellent data sourcing and analytical capabilities to inform public and business decisions, measure and monitor progress, and work collaboratively to build solutions with long-lasting positive impacts. In so doing, we will ensure that IS research, pedagogy, and practice remain relevant in a world that will become even more complex, turbulent, and interconnected in the next decade.

To conclude, we make the call to action for IS practitioners, educators, and researchers to move beyond theoretical discourse by (i) playing a central role in making the world better through the responsible design, development, and use of digital technologies, (ii) fostering a collective spirit of leaving no one behind, and (ii) designing IS pedagogy that empowers students to address global grand challenges that include societal inequalities and environmental issues in developing and developed countries.

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