Editorial
Embracing Complexity and Tensions to Advance Sustainable Managerial Practice

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Introduction: Sustainable Managerial Practice

In 2023, several progress reports were published to take stock of the mid-way progress toward the 2030 United Nations Sustainable Development Goals (SDGs) agenda. The results outlined in these reports are distressing: the assessment of the 140 targets under the SDGs shows that "only about 12% are on track; close to half, though showing progress, are moderately or severely off track, and some 30% have either seen no movement or regressed below the 2015 baseline" [United Nations, 2023]. This raises important questions: Are we doing enough to address the societal challenges we face? Have we adopted the suitable approaches, methods, and tools? Are there new approaches we can follow?

Perhaps we have been looking at this the wrong way. Research and managerial practice in corporate sustainability have focused on the instrumental logic of how social and ecological issues affect financial performance in industrialized settings ([Hahn et al., 2015]; [Van der Byl and Slawinski, 2015]). The instrumental perspective, rooted in the instrumental view of the firm, proposes that social and environmental issues are considered only to the degree that they contribute to increased firm performance [Hahn et al., 2015]. This perspective emphasizes the business case for sustainability, suggesting a causal relationship between financial performance and social and environmental activities [Gao and Bansal, 2013], thus prioritizing sustainability only when it improves financial performance and maximizes shareholder value. This means that social and ecological goals have been regarded as subordinate to financial performance.

More recent studies in corporate sustainability aim to understand tensions inherent to sustainability from the paradox perspective [Van der Byl et al., 2020]. The paradox approach, rooted in organizational paradox theory, suggests that by acknowledging the existence of and identifying and characterizing contradictory elements and tensions within the organization, new creative solutions to complex problems can be developed ([Hahn et al., 2015]; [Smith and Lewis, 2011]). Therefore, one important objective is to identify and characterize paradoxes related to sustainability tradeoffs and synergies and increase awareness of the contextual factors that determine the emergence of one over the other [Hahn et al., 2015].

Sustainability as a Paradox

Viewing sustainability from a paradox perspective is a step in the right direction. While the instrumental view implies that sustainability is a choice between society, environment,

and economy, the paradox view perceives sustainability from a holistic, systems perspective where different elements are interconnected [Van der Byl and Slawinski, 2015]. The paradox approach suggests that by acknowledging the existence of and identifying and characterizing contradictory elements and tensions within the organization, new creative solutions to complex problems can be developed ([Smith and Lewis, 2011]; [Hahn et al., 2015]). While this view shifts the focus from economic issues to a more balanced approach that places equal weight on environmental, social, and economic considerations and can enable a deeper understanding of complexities and tensions inherent to sustainability, it does not provide more explanations or strategies on how to work with contradictory elements [Van der Byl and Slawinski, 2015]. Viewing sustainability from a paradox perspective entails identifying and characterizing sources of tensions and potential outcomes and understanding the conditions under which firms can navigate between synergies and tradeoffs while giving equal priority to economic, social, and ecological issues. Sustainability tradeoffs are the product of managerial decision-making, which depends on managers' perceptions of sustainability tensions. Therefore, changing managers' thinking and framing problems can improve their decision-making process toward sustainability outcomes [Hart and Dowell, 2011].

Instrumental View Embedded in Emerging Debates on Digitalization or Circular Economy

While the instrumental view has been heavily criticized and a more paradoxical perspective embraced recently, at least in the academic community, many sustainability-related debates still indirectly follow an instrumental view, promoting a simplistic approach to achieving sustainability. For example, pursuing sustainability through digitalization or the circular economy has been hyped to emphasize positive impacts while neglecting more complex interactions and effects. This reinforces the instrumental view by emphasizing how economic value can be created while enhancing social and environmental outcomes, again bringing the win-win scenario to the forefront. Yet, digitalization and the circular economy can also lead to negative sustainability outcomes and thus require a more systems-oriented, complex perspective to understand their realized and potential impact on society, organizations, and individuals.

Much of the literature on digitalization (and Industry 4.0 technologies) emphasizes mostly positive externalities for sustainability and neglects the possible risks and negative outcomes [Flyverbom et al., 2019]. However, recent evidence on the use of digital technologies for industrial applications in Germany shows that increasing interdependencies between firms and actors within firms, coupled with information asymmetries between technology users and vendors and around legal issues (such as privacy), increase firms' and supply chains' vulnerabilities to disruptions and cyber risks, thereby increasing the likelihood of significant negative impacts during disruptions [Kessler et al., 2022]. Moreover, the use of artificial intelligence tools such as ChatGPT results in significant water and energy use, far more than a typical internet search [Euronews, 2023]. Similarly, in the case of circular economy implementation, environmental scientists refer to rebound effects, which is "a situation in which the improved efficiency of a production and consumption system is (over-)compensated by increased levels of production and/or consumption" [Schulz et al., 2024, p. 3]. When the effects of a circular system are not considered from a system-wide perspective and economic growth continues to be a central pursuit, it remains unclear whether the circular economy can lead to substantial sustainability benefits ([Schulz et al., 2024]; [Zink and Geyer, 2017]). These examples illustrate that a simplistic view of sustainability can be detrimental from a long-term system perspective due to multiple interactions at different economic, societal, and environmental levels. To make significant steps toward sustainable outcomes, we must embrace a paradoxical, complex view and acknowledge contradictions and unknown interlinkages with ambiguous outcomes.

How to Embrace a Paradoxical View in Managerial Practice?

Recent scientific evidence provides some guidance on how to embrace a more paradoxical view to advance sustainable outcomes in managerial practice. Below are several interventions and practices managers can adopt to avoid falling into the trap of instrumental logic and act as change agents to drive sustainable change from within the following.

1) *Engage in interdisciplinary conversations:* Insights and perspectives from different disciplines are needed to make sense of the messy, complex, and nonlinear world, and how it interacts with your business processes. Climate scientists can inform us about changes and interlinkages among the world's ecosystems and climate implications, biologists can raise awareness of the potential impact of lost species, political economists can inform us about the potential role of policies and regulations on economic outcomes, while engineers can design technological solutions

to address societal challenges while taking into account input from a wide range of fields. Interdisciplinary collaboration and exchange are especially needed in the case of future-oriented concepts that are not yet fully understood or applied, providing a roadmap for the future while considering systemic, beyond discipline-specific practices and insights [Langley et al., 2023].

2) *Partner with nontraditional stakeholders:* Working with nontraditional stakeholders (e.g., NGOs, multistakeholder initiatives, or social enterprises) that have more history and experience with different types of values and paradoxes is paramount. These novel forms of organizations can provide crucial input, such as knowledge, capabilities, or unique perspectives for managers, link them with disconnected stakeholders with crucial input, or provide sustainability-oriented activities and services that can help firms pursue their sustainability goals [Rosca et al., 2022]. These nontraditional partners can also serve as a source of inspiration for firms on how to do business-not-as-usual.
3) *Use technology to make better decisions for sustainability:* While technology can play a crucial role in improving sustainability outcomes, its applications in practice by most firms remain limited. For instance, the Industry 4.0 database maintained by the German government showcases digital technology applications by German companies. Regarding sustainability, most firms use technology to measure and visualize through dashboards the consumption of energy, water, and other resources [Platform Industrie 4.0, 2024]. Such insights are valuable as they can incentivize changes in behavior by employees and customers. Yet, much more potential can be leveraged for sustainability outcomes: products can be reengineered, processes and supply chains can be redesigned with sustainability outcomes in mind, and industrial and postconsumer waste can be used as input for other industries or manufacturing processes. Here, it is a key to foster interdisciplinary collaboration and try new approaches, such as human interaction with technology-enabled workspaces [Mangla et al., 2024]. All these major changes require technology input.
4) *Engage in experimentation:* Due to uncertain, messy, and unknown linkages and outcomes, firms need to engage in experimentation and trial-and-error coupled with impact measurement initiatives. Experimentation is a standard method used in the natural sciences to develop evidence that is disconnected from a given context. In contrast, in business practice, it can be used to generate innovative solutions for future competitiveness [Bocken et al., 2021]. Managers can experiment with new processes, new technologies, and business models, as well as more systemic solutions, for instance, to test the impact of a sustainable value proposition on a wide group of stakeholders, such as customers, suppliers, communities, or the environment [Bocken et al., 2021].

In This Issue of IEEE Engineering Management Review (EMR)

As usual, this issue of the EMR covers a wide range of short vignettes from industry practitioners to long, detailed research studies. Articles offer evidence-based impacts on managerial practice, whether research-based or originating from personal experience. With this combination, we have a unique positioning in the publication market.

With another combination of very short Technology Manager Notebook Articles, as well as short and regular ones, we hope to offer an interesting read. Although we have several articles this time about the two current "hot topics"—Artificial Intelligence and Digital Transformation in Engineering Management—there are many more. Covered areas are as diverse as engineering management is as a profession. They include Project Management, Smart Cities, Business Strategy, as well as Supplier and Information Management. As always, we combine evidence-based insights from research and practice, which have a strong impact on managerial practice.

Now it is your turn. We are eager to hear from you, whether regarding feedback about our journal in general, specific articles we included, or ideas you would like to pitch. If you are considering submitting an article, we recommend reading this recent editorial [Brem, 2024] beforehand. Here, key insights are summarized on which aspects should be considered.

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