Technische Universität München
TUM School of Management

Measuring what Matters: Impact Measurement in New Sustainable Ventures

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Vollständiger Abdruck der von der TUM School of Management der Technischen Universität München zur Erlangung eines Doktors der Wirtschafts- und Sozialwissenschaften (Dr. rer. pol.) genehmigten Dissertation.

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Prüfende der Dissertation:

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Die Dissertation wurde am 25.11.2024 bei der Technischen Universität München eingereicht und durch die TUM School of Management am 15.02.2025 angenommen.

"Impact transparency will reshape capitalism. By shifting the pursuit of profit away from negligently creating problems to purposefully creating valuable solutions for the world, it will redefine success, so that its measure is not just money, but the positive impact we make during our lives."

Sir Ronald Cohen and George Serafeim on the importance of impact measurement.

ACKNOWLEDGEMENTS

Almost 6 years ago I met my supervisor Frank in a Pizzeria at an annual shareholder meeting of the sustainable venture I was working for at the time. I was still finishing up my Master's degree, but had the unrealistic dream that I could combine my two somewhat opposing desires: to continue doing academic research, i.e., starting a PhD, while also working full-time for an impact-driven startup. Little did I know that a PhD is a full-time endeavor (or, for me, a painful five-year up-and-down side hustle) and taking responsibility in a startup rarely a 40h job. Looking back, I am kind of grateful that I didn't know any better, as I probably wouldn't have started both at the same time if I hadn't underestimated the workload so drastically. However, I am not just grateful for this naivety, but for the people in my life that made finishing this thing possible.

Although it was a tough ride, I am immensely thankful to my supervisor **Frank**. You let me enroll part-time and 100% remotely despite the challenges involved. Thank you for this trust and for encouraging me to pivot my research topic after Covid-19 hit which limited my ability to continue collecting data in rural Mali. What felt like a major step back at the time helped me to find a topic that I am truly passionate about and that inspired founding my own venture. I remember how affirming and encouraging you have been when telling you that I would like to utilize some of the PhD findings by starting a business – despite the struggles that you probably foresaw when your already slowest PhD student thought about becoming an entrepreneur. Lastly, thank you for organizing research retreats in the beautiful Alps, where we combined challenging feedback sessions on paper drafts with equally challenging hikes to snowy mountain peaks. I've never heard of a supervisor who does cooler things than that. I'm proud to be an alum of the @the_iron_prof.

I thank my **co-authors**, Frank, Esther, and Leo, for helping me shape interesting research ideas and insightful data into a publishable format. Esther, we began our PhD journeys around the same time, yet you finished years earlier with more and higher quality papers. I'm continually impressed by the rapid evolution of your academic career, which I've had the privilege to witness up close – I'm sure you'll become a renowned academic. Similarly, Nele, I know you had an equally painful rollercoaster experience as an external doctoral student, but now – Stanford and Assistant Professor in Auckland?! Keep going! Thanks also to the wonderful team at the Chair of Corporate Sustainability: Mohammed, Rossella, and Carina. Although I wasn't around much, I always enjoyed our conversations and appreciated your feedback. Finally, I extend my thanks to my committee members, Sid and Nicola, for their thoughtful reviews and interest in my research.

I am grateful for my time at **Africa GreenTec** which provided the initial context and idea for this research. Thank you, Torsten, for starting this incredibly ambitious venture, and thank you to both you and Wolfgang for allowing me to pursue this PhD on the side. Though I am no longer with your company, I deeply wish for its success, as the mission to empower people in sub-Saharan Africa through solar power is too important to fail.

I am still wondering whether starting **leonardo** while far from finished with the PhD was my worst or best idea; I'm leaning towards the latter. I am grateful for co-founders who saw the value of finishing the PhD as science was always a foundational component of what we are building here. You encouraged me along the way and let me take time for writing even when 100 things were burning – which is basically the case all the time in your first two years as a startup. Thank you, Jasper and Sam, you guys are truly the best partners I could envision for this adventure. Your trust, faith and support mean the world to me. I couldn't and wouldn't do this without you. Also, I am grateful to the entire leonardo team that had my back when I was

taking time to write this dissertation rather than working on our product or closing deals: Leo, Alan, Mayan, Mo, Angelika, Khoi, Jona – Thanks! And Bolaji, Rest in Peace, your academic ambition and curiosity was inspiring and I like to believe that you would have enjoyed reading this dissertation. I wish you would still be with us.

Living through the ups and downs of this PhD, or of life in general, would not have been possible without my **family** and **community** which reminded me on the most important and most beautiful things in life every single week. Thank you, Mom: you've been a role model in perseverance, taking five hard years to complete your own PhD, and you encouraged me multiple times to keep going when I wasn't sure it was worth it. I know I don't call you often enough. I hope that changes now that I'll have a bit more time after finishing this thing! Thank you, FAM: we started in the same month I started my PhD and I remember vividly how some frustrations felt less relevant when thinking about meeting you guys the next Thursday. Jasper, Katrin, Mimi, Elli, you guys are family. Let's not stop breaking bread and drinking wine together ever. Thank you, Südprojekt for praying me through this last year of the PhD. Thank you, Deigert and Antal Clan: sharing dinners together even during tough and frustrating times by just walking downstairs as well as spending time with your kids was healing. Thank you, Julia & Tobias: who knows whether our friendship would be this deep and beautiful if I hadn't come over to Munich so often for this PhD?! No matter how research meetings went, being lovingly welcomed with a beer at your place always cheered me up. I loved our times in Trudering, but I'm even more excited for all the possibilities and adventures that await in Nußdorf – especially now, with a new Kahnert on the way as I'm typing this!

Now, **Lena**, what can I say? Which wife would be so supportive of a husband working 6-day-weeks for 5+ years? Although our characters and careers are so different, you understand and support me unconditionally. What matters to me matters to you. I know that you don't care

about two letters in front of my name, but you care about my visions and what brings me joy and excitement. The PhD was that, but it was also hard. And when it was hard, you have been so tremendously helpful in comforting me and bringing my attention back to what is most important and true. I love you.

Finally, Johann Sebastian Bach and Georg Friedrich Händel used to sign their master pieces with S.D.G. – certainly they did not refer to the **S**ustainable **D**evelopment **G**oals, which are central to this dissertation and my career, but **S**oli **D**eo **G**loria, Glory to **God** alone. Few things feel too risky and few disappointments really hurt when one feels known, accepted and loved by the creator, provider and sustainer of all things – independent of performance, including whether a PhD is ultimately finished or not. I am grateful to Jesus for this truth that truly sets free.

Jan Moellmann, 17.11.2024

sdg

ABSTRACT

Impact measurement is crucial for new sustainable ventures to assess the extent to which they contribute to sustainable development. As such, the phenomenon has received increasing attention in the literature over the past years. But despite the practical potential it holds to foster sustainable development and despite this increasing academic interest, measuring sustainability impact remains a challenge for practitioners as well as a fragmented research field. While existing research uncovered some of the reasons why sustainable ventures measure their impact (i.e., measure to prove and to improve impact) and developed manifold approaches to measure impact, it rarely applies such methods, lacks longitudinal studies that investigate impact measurement over time and overlooks empirical investigation of organizational outcomes of impact measurement to understand whether it is in fact an effective tool to prove and improve impact. Thus, this dissertation aims to generate a novel and comprehensive theoretical perspective on impact measurement in new sustainable ventures, particularly addressing those gaps.

For this purpose, three essays have been developed. Essay I provides a holistic and comprehensive understanding of the impact measurement literature through an abductive, semi-automated, Large Language Model-powered literature review. In doing so, Essay I offers emerging topics and trends as well as a future research agenda by highlighting current gaps regarding the antecedents, processes and outcomes of impact measurement. Essay II and III respond to these research gaps highlighted in Essay I. Both essays are grounded in multiple case studies with new sustainable ventures in Germany. Essay II moves beyond impact measurement as a static activity and provides a novel process perspective showing why and how new sustainable ventures move along three impact measurement pathways—*reactive, proactive*, and *agentic impact measuring*, depending on the positioning of impact in their value

proposition. Essay III provides a novel typology and theoretical framework highlighting how different impact measurement approaches can be characterized and what kind of organizational and societal outcomes they have.

In sum, this dissertation contributes to the impact measurement and the sustainable entrepreneurship literature at large by unveiling why, how and with what outcomes new sustainable ventures engage with impact measurement. Bringing together and bridging different conversations from the sustainable business model and agency literature as well, the essays provide a new perspective and stimulate novel theorizing. Additionally, a Large Language Model-powered literature review is suggested as a methodological contribution, given its significant advancement for efficiently analyzing broad, multidisciplinary research fields. Finally, this dissertation has relevant implications for policymakers, new sustainable ventures and their stakeholders and holds the potential to support sustainable entrepreneurs to contribute to sustainable development more effectively.

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LIST OF ABBREVIATIONS AND ACRONYMS

e.g.	exempli gratia
ESG	Environmental, Social, Governance
et al.	et alii
i.e.	id est
IM	Impact Measurement
LLM	Large Language Model

1. INTRODUCTION

Impact measurement (IM) is receiving increasing attention in academia (Muñoz, Gamble, & Beer, 2022; Rawhouser, Cummings, & Newbert, 2019) as it holds significant potential to advance sustainable entrepreneurship theory (Anand, Argade, Barkemeyer, & Salignac, 2021) and in practice as it holds significant potential to combat greenwashing (Lashitew, 2021) and improve impact performance (Lall, 2019). Caused by the extraordinary challenge "how to measure sustainability" (Anand et al., 2021, p.12), the academic literature to date does rarely measure social and environmental impact although it is this impact that is at the center of new sustainable ventures' mission statements and impact investors investment theses. If, however, sustainable entrepreneurship shall effectively support the achievement of sustainable development goals (Anand et al., 2021), contribute to the public good (Vedula, Doblinger, Pacheco, York, Bacq, Russo, Dean, 2022) and address the grand societal challenges of our time (George, Howard-Grenville, Joshi, & Tihanyi, 2016; Gümüsay, Claus, & Amis, 2020), sustainable entrepreneurs need IM as a management tool for creating greater impact and their stakeholders need IM to be able to distinguish credible, positive impact-generating ventures from those which might intend to be (perceived as) sustainable, but actually do harm planet and/or people. Hence, this dissertation aims to provide a better understanding of IM in new sustainable ventures by generating a novel and comprehensive theoretical perspective on the issue.

This chapter introduces the topic of IM in new sustainable ventures. It starts by providing definitional clarity on the core constructs and terms of this dissertation. Afterwards the theoretical and practical relevance of IM is illustrated. Against that background, the research objectives and questions of this dissertation are outlined. The chapter concludes with an overview of the structure of this dissertation.

1.1. IMPACT MEASUREMENT: DEFINITIONAL CLARIFICATIONS

Within this dissertation, IM refers to the activities of "capturing and communicating valued information about the effects of social interventions" (Muñoz et al., 2022). This intentionally broad definition includes and this dissertation draws from prior research on the measurement, evaluation, assessment, accounting and reporting of *social value* (e.g., Kroeger & Weber, 2014; Moss, Short, Payne, & Lumpkin, 2011; Santos, 2012), *social returns* (e.g., Emerson, 2003; Hall, Millo, & Barman, 2015; Seimens, 2016), *public value* (e.g., Meynhardt, 2009; Stoker, 2006), *social impact* (e.g., Molecke & Pinkse, 2017; Rawhouser et al., 2019; Wry & Haugh, 2018) and *social performance* (e.g., Agle & Kelley, 2001; Boulouta, 2013; Husted & de Jesus Salazar, 2006; Mair & Marti, 2006; Nason, Bacq, & Gras, 2018).

As these scholar often include the environmental dimension in what they define as "social" (Rawhouser et al., 2019) and considering that environmental effects are a societal concern, the environmental dimension is included in the scope of this definition as well. While impact in the strict and narrow sense only includes long-term, often systemic, effects that an organization has on broad outcomes on a communal or societal levels (Ebrahim & Rangan, 2014), impact is intentionally chosen as an umbrella term for any, positive and negative, intended and unintended, short-term and long-term, effects of social interventions in this dissertation as it is the most frequently used construct in academia and practice, often used as a synonym for the proliferation of terms above (Hertel, Bacq, & Lumpkin, 2020; Rawhouser et al., 2019).

Furthermore, by focusing on new sustainable ventures (Anand et al., 2021), this dissertation draws on a triple bottom line perspective and therefore purposefully integrates literature from social entrepreneurship as well as environmental entrepreneurship (Vedula et al., 2022).

1.2. THEORETICAL RELEVANCE, OPPORTUNITIES AND CONTRIBUTIONS

IM is a theoretically as well as empirically underdeveloped field (Rawhouser et al., 2019), but holds great potential to advance sustainable entrepreneurship theory as we still know very little about the outcomes of new sustainable ventures, exactly due to the challenge of the measurement of such outcomes (Anand et al., 2021; Vedula et al., 2022). While a detailed overview of the current conversations about IM in new sustainable ventures is given in Chapter 2.2.1, this chapter illustrates the theoretical relevance and opportunities of the field and how this dissertation contributes to it.

One major challenge of IM research is that it is a highly heterogeneous and multidisciplinary field with influences from the social and sustainable entrepreneurship (e.g., Trautwein, 2021), non-profit (e.g., Pringle & Conway, 2012), development studies (e.g., Cairns, 2018), environmental sciences (e.g., Zhang, Hou, Jiang, Xu, & Liu, 2021), engineering (e.g., Saad, Nazzal, & Darras, 2023) and economics (e.g., Köroğlu & Yıldırım, 2023) literature, among others. This multidisciplinary nature complicates gaining a holistic and comprehensive understanding of IM as it is difficult to bring together all of these different perspectives.

A whole body of literature investigates the reasons for (or antecedents of) engaging with IM and clusters it typically into a dichotomy of "measuring to prove" and "measuring to improve" dichotomy (Arena, Azzone, & Bengo, 2015; Lall, 2017; Kato, 2021; van Rijn, Raab, Roosma, & Achterberg, 2021). That means IM is typically conducted to either satisfy requests from external stakeholders who increasingly demand transparency and accountability from organizations (e.g., Arvidson & Lyon, 2014; Dubey, Gunasekaran, Childe, Papadopoulos, Hazen, Giannakis, Roubaud, 2017; Molecke & Pinkse, 2017; Nason et al., 2018) or to use it as a management tool for learning and decision-making (e.g., Lall, 2019; Ormiston & Seymour, 2011). A second theoretical opportunity emerged from first empirical insights (see Chapter 2.1)

that problematized this simple dichotomy and provided ground to investigate the relationship between the business model of a new sustainable venture and its approach to IM. Although there is strongly increasing interest in sustainable business models in recent years (Dembek, Lüdeke-Freund, Rosati, & Froese, 2022; Gamble, Parker, & Moroz, 2020; Neesham, Dembek, & Benkert, 2023; Pinkse, Lüdeke-Freund, Laasch, Snihur, & Bohnsack, 2023; Snihur & Markman, 2023), this literature stream has not been connected to the IM literature yet.

The majority of IM research analyzes how IM is conducted, i.e., the processes, approaches, methodologies or tools to measure impact, and usually portrays it as "bricolaged" and provisional approaches, consisting of storytelling techniques and at-hand data (e.g., André, Cho, & Laine, 2018; Molecke & Pinkse, 2017). However, the reality is more nuanced. Muñoz et al. (2022) identify four distinct IM approaches that vary in terms of their formality, i.e., their alignment with formal impact measures and methodologies. Building upon this finding, a third theoretical opportunity emerges regarding uncovering further the heterogeneous and nuanced IM landscape, i.e., how and why new sustainable ventures move beyond bricolage to measure their impact. Additionally, while these insights help to understand IM approaches at a certain moment in time at a certain stage of the entrepreneurial journey, it does not provide clarity on the processual unfolding of impact measuring over time. Acknowledging the dynamic environment, including changing business models, products and stakeholders, of a new sustainable venture (Trautwein, 2021), this process perspective holds significant potential to contribute to our understanding of IM, thus providing a fourth theoretical opportunity.

Although lots of research has looked at why organizations conduct IM (see above), little research exists about the actual outcomes, i.e., whether the hopes and ambitions in IM actually come to fruition. Some authors have looked into financial consequences (e.g., Cheng et al., 2014; Grewal, Riedl, Serafeim, 2019; Ioannou & Serafeim, 2015; Mansouri & Momtaz, 2022)

and effects regarding legitimacy and trust-building (e.g., Déjean, Gond, & Leca, 2004; Lall, 2019). A final theoretical opportunity is presented in the fact that most of these studies research the effects in a binary manner (i.e., the effects whether impact is measured at all or not), but not considering the heterogeneity of different IM approaches and the heterogeneity of different IM outcomes, including the consequences for the enacting venture and the society.

Finally, lots of what we know about IM does not come from IM research on new sustainable ventures (Fichter, Lüdeke-Freund, Schaltegger, & Schillebeeckx, 2023a) specifically, but rather on nonprofit organizations (e.g., Arvidson & Lyon, 2014; Lall, 2019) or more established and mature organizations (e.g., Khizar, Iqbal, Khalid, & Adomako, 2022) by utilizing data that is intended and available for larger corporations (e.g., KLD index, GRI reporting, data from publicly listed companies). As stakeholder requirements, contexts, motivations and capabilities are very different for ventures (Trautwein, 2021), the first theoretical opportunity is to apply and deepen IM research particularly in the context of new sustainable ventures.

Thus, while acknowledging the significant progress made in the IM literature in recent years, a holistic framework of the heterogeneous IM approaches that new sustainable ventures undertake, their antecedents, their processual unfolding, and their outcomes is currently missing and contains significant theoretical opportunities to develop meaningful IM theory and contribute to the sustainable entrepreneurship literature more broadly. Consequently, this dissertation makes several contributions to the literature.

First, the literature review in Essay I provides an overview of the IM literature by bringing together multidisciplinary perspectives and uncovering emerging topics and trends in regards to why, how and with what outcomes impact is measured. Besides the contribution of such overview and research agenda, the Large Language Model (LLM)-powered approach of Essay I is a methodological contribution (e.g., An, Narechania, Wall, & Xu, 2024; Srivastava, 2023)

as it offers a significant advancement to efficiently analyze a broad, multidisciplinary research field using hundreds of papers. Second, Essay II contributes to the literature at the intersection of IM (Muñoz et al., 2022; Rawhouser et al., 2019) and sustainable business models (Gamble et al., 2020; Dembek et al., 2022; Neesham et al., 2023; Snihur & Markman, 2023) by shedding light on how the positioning of impact in the value proposition of a new sustainable venture influences IM, broadening the "measure to prove" vs. "measure to improve" dichotomy by suggesting "measure to monetize" as a third category.

Third, Essay II and III contribute to the IM literature (Rawhouser et al., 2019) by offering a novel process perspective of impact measur*ing* (Essay II) as well as a novel and nuanced typology of heterogeneous IM approaches in new sustainable ventures (Essay III) regarding their adoption of formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches to measure their impact. Fourth, Essay II and III uncover that agency, i.e., the extent to which a venture transforms the structures in which it is embedded (McMullen, Brownell, & Adams, 2020) characterizes different IM approaches and pathways, showing that IM is not necessarily a passive process for gaining compliance with regulatory demands or stakeholder requests (Nason et al., 2018), but that it can be agentically enacted as a form of institutional work (Pacheco, York, Dean, & Sarasvathy, 2010). Finally, Essay III provides a novel theoretical framework that sheds more light on concrete organizational and societal outcomes of IM (Mansouri & Momtaz, 2022; Parker, Gamble, Moroz, & Branzei, 2019). A detailed elaboration of these contributions can be found in Chapter 5.1.

1.3. PRACTICAL RELEVANCE

Practitioners have shown a lot of interest in IM over the past decades. In fact, IM approaches stem more often from practice, e.g., think tanks, government agencies or consulting companies, than from academic journals (Ebrahim & Rangan, 2014) and are informing IM research regularly. For example, the Logic (or IOOI) model, which shows a results chain linking inputs to activities, outputs, outcomes and impact, was originally developed by the United States Agency for International Development (USAID) for the sake of program evaluations (Bickman, 1987; Rogers, 2008) and is commonly used in IM research today (e.g., Hertel et al., 2020; Wry & Haugh, 2018).

The reason why IM holds significant practical relevance is reasoned in its potential for proving and improving impact (Arena et al., 2015; Kato, 2021; Lall, 2017; van Rijn et al., 2021). First, IM can be used to prove impact in external communication, particularly to inform stakeholders such as investors (e.g., Cheng et al., 2014), regulators (e.g., Muñoz & Kimmitt, 2019), customers and the general public (e.g., Hall et al., 2015) who increasingly demand transparency and accountability regarding sustainability effects of products and organizations (Molecke & Pinkse, 2017). As such, organizations can use IM as a tool for legitimacy-building and for creating trust with stakeholders (e.g., Déjean et al., 2004; Nicholls, 2010). In times of growing "greenwashing" concerns and scandals regarding the de facto impact of, for example, carbon credit projects (e.g., Greenfield, 2023) or Corporate Social Responsibility (CSR) programs (e.g., Mu & Lee, 2023), this trust-building function of IM is of highest practical relevance.

Furthermore, as sustainability reporting becomes increasingly a topic of regulatory concerns, proving impact through IM becomes increasingly a compliance issue. For example, the Corporate Sustainability Reporting Directive (CSRD) asks companies in the EU to not only report on sustainability-related financials risks that emerge from environmental and social

issues (outside-in perspective, which is common in sustainability reporting regulation and ESG ratings), but also on the effects the organization has on people and the environment (the less common inside-out perspective, which is typical for IM). Moreover, for fundraising and investor relations, demonstrating impact is associated with lower capital constraints (e.g., Cheng et al., 2014), positive returns (e.g., Grewal et al., 2019), optimistic investment recommendations (e.g., Ioannou & Serafeim, 2015) and higher company valuations (e.g., Mansouri & Momtaz, 2022).

Second, IM can be used as a management tool to improve impact, following the common proverb "only what gets measured, gets managed". As such, IM can support strategic decision-making (e.g., Ormiston & Seymour, 2011), yield relevant learnings (e.g., Lall, 2019) and enable operational improvements (e.g., Beer & Micheli, 2018) by providing valuable insights into the impact effectiveness and efficiency of organizations, products and projects aimed at addressing social, economic, and environmental challenges.

However, IM is a complex task, for example due to high ambiguity and incomparability of impact measures and a lack of standardization (Ebrahim, Battilana, & Mair, 2014). Particularly for new sustainable ventures, it is perceived as a significant challenge due to due to their liabilities of newness, resource constraints, high uncertainty, and little historic data (Trautwein, 2021). Along the same lines, 82% of impact investors see IM as the biggest challenge in the impact investing industry (Hand, Dithrich, Sunderji, & Nova, 2020). Therefore, IM research generally and this dissertation specifically hold the practical potential to better understand how IM can be conducted in a way that moves beyond bricolage (Molecke & Pinkse, 2017) and provisional approaches (André et al., 2018) so that impact reports become less prone to ambiguous and nebulous interpretations and rather contain actionable insights for new sustainable ventures and their stakeholders.

Overall, IM can not only provide evidence for stakeholders to assess whether impact claims are true, reveal greenwashing and in that function guide resource allocation towards the most impactful endavours, but it can also help to steer organizations towards creating higher impact. Consequently, if applied well, IM holds the practical potential to position new sustainable ventures as an effective puzzle piece for solving grand challenges (Markman, Waldron, Gianiodis, & Espina, 2019) and reaching sustainable development (Anand et al., 2021).

1.4. RESEARCH OBJECTIVES AND QUESTIONS

Given the high theoretical and practical relevance, the **overarching research objective** of this dissertation is to generate a novel and comprehensive theoretical perspective on IM in new sustainable ventures. This overarching research objective is divided into three subordinated research objectives that are addressed through three respective essays (Chapter 4). The associated research questions, including an explanation how they emerged, can be found in Chapter 2.1.3.

The **first subordinate research objective** is to give an overview of the vast and multidisciplinary IM literature and to uncover emerging perspectives, topics and trends in order to provide a future research agenda. As the multidisciplinary and heterogeneous nature of the research field complicates a comprehensive understanding, this is not an easy task that could be approached through a traditional literature review in just one literature stream. This research objective is therefore addressed through a semi-automated, LLM-powered literature review, analyzing 553 relevant papers from an initial pool of 15,085 and categorizing the results among the dimensions why, how and with what outcomes impact is measured (Essay I).

The **second subordinate research objective** is to better understand why and how new sustainable ventures measure their impact over time. As a process perspective is currently missing in the IM literature, this research objective aims to uncover the unfolding of heterogeneous different IM approaches and to explore the key reasons and motivations for the different approaches. This research objective is addressed through a multiple case study with six new sustainable ventures in Germany which yielded a process model that explains how the position of impact in the value proposition of a new sustainable venture influences certain impact measuring pathways (Essay II).

The **third subordinate research objective** is to better understand the heterogeneous IM approaches and their distinct outcomes. As IM approaches are manifold, it is not sufficient to look only at the outcomes of IM in general, i.e., whether impact is measured at all or not, but to understand the nuances of different IM approaches and their consequences for the enacting venture and the society at large. This research objective is addressed through a multiple case study with three new sustainable ventures in Germany which yielded a variance model that explains how distinct IM approaches lead to distinct outcomes regarding legitimacy, impact monetization and exploitation of sustainability potential (Essay III).

Overall, this dissertation aims to develop the field of IM, and sustainable entrepreneurship more generally. Additionally, by leveraging and contributing to the IM, sustainable business model and agency literature, this dissertation aims to build bridges and to stimulate new scholarly conversations, research objectives and research methodologies, especially in regards to the use of AI and LLMs. Reaching these objectives will also produce significant practical implications for new sustainable ventures, their stakeholders and policymakers dealing with the complexity of IM specifically and sustainability reporting more generally.

1.5. STRUCTURE

Chapter 1 provided an overview of IM in new sustainable ventures, discussing its theoretical and practical relevance, and the research objectives of this dissertation. Chapter 2 builds on this by outlining the background of this dissertation, including an explanation of the trajectory toward problem formulation and the theoretical background, summarizing the current state of the IM, sustainable business model and agency literature. Chapter 3 describes the methods that were employed to answer the research questions.

At the core of this dissertation, Chapter 4 presents three essays on IM. Essay I provides a holistic and comprehensive understanding of the IM field through an abductive, semi-automated, LLM-powered literature review through which emerging topics are uncovered and a future research agenda is proposed. Essay II offers a process perspective on impact measuring and answers why and how impact measuring unfolds over time by conceptualizing three impact measuring pathways and by uncovering the role of the position of impact in the value proposition of a new sustainable venture, thus bridging the IM and sustainable business model literature. Essay III answers how different IM approaches can be characterized and what the organizational and societal outcomes of distinct IM approaches are by offering a novel typology of IM approaches and a theoretical framework that sheds light on the consequences of distinct IM approaches regarding legitimacy, impact monetization and exploitation of the sustainability potential of a new sustainable venture.

Following the presentation of these essays, Chapter 5 discusses their main findings, theoretical contributions, practical implications, limitations and future research directions. Chapter 6 concludes this dissertation with final reflections.

2. BACKGROUND

This chapter explains the background of this dissertation. It starts by introducing a trajectory toward problem formulation to explain how the research questions were generated and why they are relevant. Afterwards a theoretical background is given to summarize the foundational concepts, theories, and previous research that is relevant for this dissertation and its research objectives.

2.1. TRAJECTORY TOWARD PROBLEM FORMULATION

Interesting entrepreneurship research must be relevant to practice (Frank & Landström, 2016). Thus, I perceived being an external doctoral student fully involved in an entrepreneurial ecosystem (first working for a startup and later founding my own) as a strength to conducting interesting entrepreneurship research. This chapter outlines how my exposure to entrepreneurship in practice led to framing relevant research questions in three steps: First, experiencing the practical challenge of IM; second, problematizing IM literature; third, deriving relevant IM research questions.

2.1.1. Step 1: Experiencing the practical challenge of impact measurement

The dissertation started taking form when I was working for a new sustainable venture that provides electricity access to households and businesses in rural areas in sub-Saharan Africa through solar-powered mini grids. Classifying as a "true" sustainable venture by addressing the entire triple bottom line (Belz & Binder, 2017) of economic (e.g., increasing productivity locally and operating as a for-profit venture), social (e.g., improving access to education, healthcare and gender equality) and environmental (e.g., replacing CO_2-heavy diesel generators through solar power) goals gave me an interesting research context in which relevant research questions could emerge.

At first, I studied the impact of reliable, affordable and sustainable electricity on micro entrepreneurship, i.e., I was intrigued to understand the economic, social and environmental impact of electricity access on local entrepreneurs who typically work in a strongly resource-constraint setting, often operating as necessity entrepreneurs (Dencker, Bacq, Gruber, & Haas, 2021) in the context of informal entrepreneurship (Salvi, Belz, & Bacq, 2023). Consequently, I collected data in October 2019 in Mali at three different sites where access to electricity was provided by conducting more than 20 semi-structured interviews. However, not being able to visit the field due to the Covid-19 pandemic forced me to take a step back and ask myself: what is the most relevant and interesting research topic I could envision?

As a result, I noticed that the more abstract question of how to measure impact generally (rather than the impact of electricity on micro entrepreneurs specifically) was an unresolved challenge in my work for the company, other partners in the same ecosystem as well as our investors who demanded more transparency and better impact reporting. Thus, in a true entrepreneurial pivot, I changed my research focus in Spring 2021 to shed more light on questions regarding the how, what and why of IM in new sustainable ventures.

2.1.2. Step 2: Problematizing impact measurement literature

After having identified a research topic that I knew would make a relevant contribution in practice, I engaged with the literature. IM has received increasing attention over the last years (e.g., Muñoz et al., 2022; Rawhouser et al., 2019), confirming my impression regarding the relevance of the phenomenon as a tool to tackle grand societal challenges of our time (George et al., 2016; Gümüsay et al., 2020) and to advance sustainable entrepreneurship theory (Anand et al., 2021; Vedula et al., 2022).

Rather than just trying to spot research gaps, my focus was on problematizing the literature. Problematizing the academic literature is a methodology that holds the potential for more impactful research questions and contributions as it goes beyond spotting research gaps in existing theories and rather challenging their findings and underlying assumptions (Alvesson & Sandberg, 2011). As such, problematizing serves to mitigate the inherent risks of gap spotting as it is often associated with the emergence of unsubstantiated arguments and the limited scope of theoretical advancements (Shepherd & Wiklund, 2020).

In this dissertation, the problematizing process of challenging previous findings and assumptions started when reading about two common narratives that did not correspond with my perception of reality, i.e., of my experience working for and measuring the impact of a new sustainable venture. First, that new sustainable ventures "bricolage" their IM through provisional approaches that utilize at-hand data and storytelling (e.g., André et al., 2018; Molecke & Pinkse, 2017). Second, that engaging with IM is mostly driven by either explicit stakeholder requests and largely for accountability purposes (e.g., Amel-Zadeh & Serafeim, 2018; Nason et al., 2018) or intrinsically developed for organizational learning and impact management (e.g., Lall, 2019). Instead, I perceived in practice that many new sustainable ventures, including the one I was working for, were intentionally starting to move beyond bricolage, applying increasingly formal, thought-through and robust IM approaches. Furthermore, most of them were neither doing it because they were forced to do so by their stakeholders nor because they needed it for internal learning and operational management, but rather because they anticipated that the topic holds a lot of potential for exploiting IM-related financial opportunities in the future. Thus, intuitively and increasingly empirically, I sensed that the current IM literature is missing something, which was the starting point for deriving relevant research questions.

2.1.3. Step 3: Deriving relevant impact measurement research questions

As a final step, and as a result of experiencing the challenge of IM in practice as well as engaging with and problematizing the existing IM literature, I derived relevant research questions. The research questions are addressing the antecedents, process and outcomes of IM (see Figure 1) to reach a holistic understanding of IM and are emerging directly from the two problematized narratives as shown above.

IM is a highly heterogeneous and multidisciplinary field with influences from the social and sustainable entrepreneurship (e.g., Trautwein, 2021), non-profit (e.g., Pringle & Conway, 2012), development studies (e.g., Cairns, 2018), environmental sciences (e.g., Zhang, Hou, Jiang, Xu, & Liu, 2021), engineering (e.g., Saad, Nazzal, & Darras, 2023) and economics (e.g., Köroğlu & Yıldırım, 2023) literature, among others. This multidisciplinary nature complicates gaining a holistic and comprehensive understanding of IM as it is difficult to capture, consolidate and apply all of these different perspectives. Thus, to provide a better overview of the field, the first research question is a meta question to ground this dissertation strongly in the existing literature:

RQ0: What are emerging perspectives, topics and trends in IM research?

Essay I answers this research question through a semi-automated, LLM-powered literature review that gives an overview of the multidisciplinary IM landscape and provides a future research agenda in regards to why, how and with what outcomes impact is measured. This conceptualization regarding the reasons for, processes and effects of IM gives structure to this dissertation as the following research questions are formulated along these dimensions.

Problematizing the literature that speaks of IM mostly as an accountability practice (e.g., Amel-Zadeh & Serafeim, 2018) that is shaped by explicit stakeholder requests (e.g., Nason et al.,

2018) or intrinsically developed for learning and management (e.g., Grieco, Michelini, Iasevoli, 2015; Lall, 2019), the next research question evolves around the "why" of IM. Uncovering why new sustainable venture engage with IM adds to the literature that so far distinguished roughly between "measure to prove" (accountability) and "measure to improve" (Arena et al., 2015; Kato, 2021; Lall, 2017; van Rijn et al., 2021), which seemed to be insufficient based on my experience, intuition and first empirical data collected in open interviews when entering the field. Thus, to uncover further motives of new sustainable ventures to measure their impact, RQ1 is

RQ1: Why do new sustainable ventures engage with IM?

Essay II answers this research question by showing how the business model of a new sustainable venture, and the positioning of impact in the value proposition specifically, is a strong determining factor of the IM approach chosen and, thus, suggests to add "measure to monetize" as a third dimensions to the dichotomy of "measure to prove" and "measure to improve".

Problematizing the literature that portrays IM in new sustainable ventures as a "bricolaged" activity (Molecke & Pinkse, 2017) that consists mostly of provisional approaches (André et al., 2018), the next research question evolves around the "how" of IM. Particularly for new sustainable ventures with quickly evolving business models (Trautwein, 2021), the question is not only how IM is done, but also how it might change over time. Acknowledging the progress made in the literature related to IM from a static perspective (e.g., Rawhouser et al., 2019), little is known about IM from a dynamic process perspective (impact measur*ing*). Thus, to understand how IM approaches unfold over time, the next research question of this dissertation is

RQ2: How does impact measuring unfold over time in new sustainable ventures?

Essay II answers this research question by demonstrating how new sustainable ventures take different pathways, depending on the positioning of impact in their value proposition, in developing their IM approaches. Particularly, different levels of agency are adopted and heterogeneous IM approaches, regarding the degree a new sustainable venture adopts formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches, evolve in the process as a result.

The heterogeneity in IM approaches as a result of the process is particularly interesting as it adds more nuances to the literature that often just assesses whether new sustainable ventures conduct IM at all or not in a simplistic dichotomy (e.g., Kato, 2021; van Rijn et al., 2021). Drawing a more nuanced picture, Muñoz et al. (2022) distinguish between four distinct IM approaches, particularly regarding their level of formality. Inspired by these findings and to uncover the heterogeneity of different IM approaches further, the next research question of this dissertation is

RQ3: How can different IM approaches be characterized?

Essay III answers this research question by providing a novel typology of IM approaches based on their level of formality and agency, which we coin *IM as fragmented frame*, *IM as aggregation* and *IM as bridge*.

Finally, the uncovered heterogeneity provokes a further question regarding the different outcomes of those different IM approaches. While some research is providing answers to the antecedents regarding why new sustainable ventures engage in IM (see research question 1 above), little is known about the de facto outcomes (Vedula et al. 2022). The only exception are the financial consequences of IM generally (e.g., Cheng et al., 2014; Grewal et al., 2019;

Ioannou & Serafeim, 2015; Parker et al., 2019), but not specifically concerning different IM approaches and their outcomes for the new sustainable venture and the society and environment where they operate. Thus, to understand such outcomes, the last research question of this dissertation is

RQ4: What are the outcomes of different IM approaches?

Essay III answers this research question by offering a new theoretical framework of IM as agentic activity toward sustainable development. This framework highlights how distinct IM approaches lead to different outcomes in terms of legitimacy, impact monetization and exploitation of sustainability potential.

As typical for qualitative, inductive research (Eisenhardt, 1989), these research questions have been iterated and refined further while being in the field collecting data as well as while engaging with the data during its analysis. The meta research question 0 is answered in Essay I. Research question 1 and 2 have are addressed in Essay II while research question 3 and 4 are answered in Essay III. Due to the similar nature of research question 2 and 3, there is an overlap in Essay II and Essay III. While Essay II focuses on the antecedents and the process of IM, and thereby uncovers the heterogeneous approaches, Essay III focuses on these heterogeneous approaches and their outcomes. Figure 1 summarizes how this dissertation addresses these research questions along the entire IM journey in a new sustainable venture to understand the antecedents, process and outcomes of IM in a holistic way.

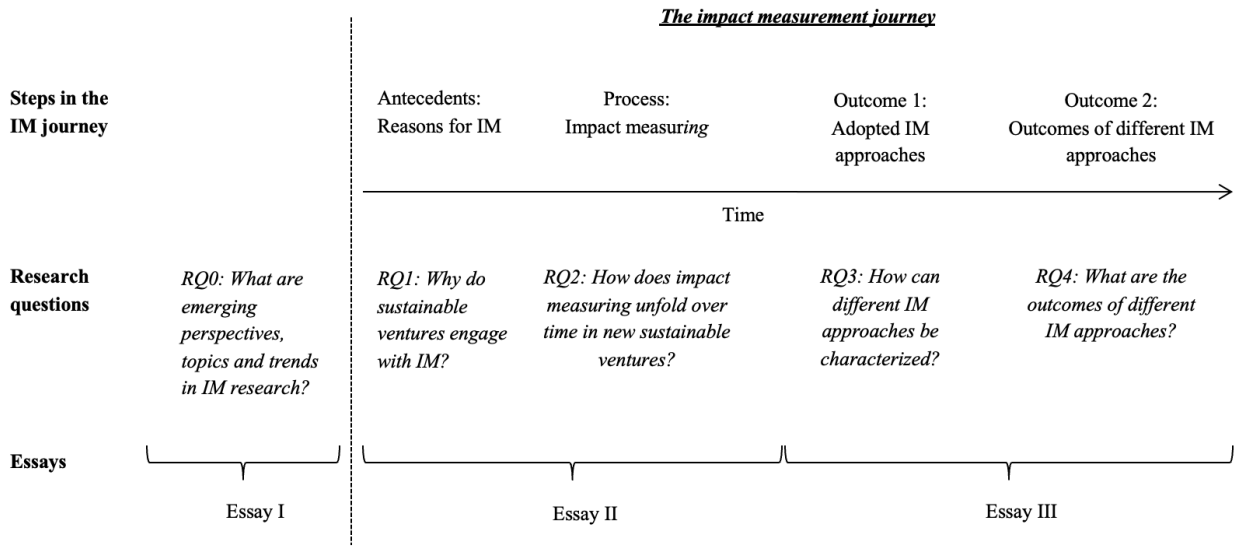

Figure 1: Research Questions along the Impact Measurement Journey of a New Sustainable Venture

2.2. THEORETICAL BACKGROUND

In pursuit of the overarching research objective and to address the specific research questions outlined above, this chapter explains the theoretical background of this dissertation. For this purpose, foundational concepts, theories and previous research are elaborated to showcase the current status of and ongoing conversations in the IM literature. A deeper dive into the IM literature is given in Essay I through an extensive, multidisciplinary literature review. Additionally, a theoretical background is given for the literature around sustainable business models and agency as these emerged as substantial constructs in Essay II and Essay III to understand how and why new sustainable ventures adopt IM.

2.2.1. Impact measurement

In this dissertation, IM refers to the activities of "capturing and communicating valued information about the effects of social interventions" (Muñoz et al., 2022). Recently there has been an increasing scholarly interest in IM (Fichter et al., 2023). This increasing interest spans how IM can provide evidence of the fulfillment of impact claims in new sustainable ventures (Anand et al., 2021), how it may help assess concrete social and sustainable outcomes (Vedula et al., 2022), and thus whether and how sustainable entrepreneurship is a solution to grand challenges (Markman et al., 2019). Despite its high relevance for theory and practice, the literature on IM is still fragmented (Saebi, Foss, & Linder, 2019) and the field theoretically and empirically underdeveloped (Rawhouser et al., 2019). More specifically, an overall framework of different IM approaches that new sustainable ventures undertake, their antecedents and their outcomes for the venture itself and the broader society could help to develop meaningful IM theory in novel directions and lead to actionable tools for practitioners and business organizations.

IM is undertaken by new ventures as well as established organizations to understand if and how certain business activities lead to economic, environmental or social effects (Micheli & Mari, 2014; Muñoz et al., 2022). Despite the generally increasing academic interest in IM, most studies look at larger organizations (Khizar et al., 2022;) and rely on measurement approaches and data that is intended for corporates, not ventures (e.g., KLD index, GRI reporting, data from publicly listed companies). In contrast, new sustainable ventures operate in a different context and are subjected to other types of sustainability reporting requirements, different intrinsic motives, different stakeholders requests, have different resource limitations, little to no historic data as well as quickly evolving business models and products (Trautwein, 2021). Therefore, new sustainable ventures' reasons for engaging with IM, the IM approaches they adopt and the respective outcomes of such approaches may differ significantly from those adopted by larger organizations, but have so far received limited attention in the literature.

Regarding **why** new sustainable ventures measure their impact, the literature follows a "measure to prove" and "measure to improve" dichotomy (Arena et al., 2015; Kato, 2021; Lall, 2017; van Rijn et al., 2021). "Measure to prove" suggests that external pressure from stakeholders such as investors (e.g., Cheng et al., 2014), regulators (e.g., Muñoz & Kimmitt, 2019), and the general public (e.g., Hall et al., 2015) who increasingly demand transparency and accountability from organizations is the primary reason for IM (Arvidson & Lyon, 2014; Dubey, Gunasekaran, Childe, Papadopoulos, Hazen, Giannakis, Roubaud, 2017; Molecke & Pinkse, 2017). This literature therefore focuses on explicit requests and feedback from stakeholders as the primary antecedent for IM (e.g., Nason et al., 2018). "Measure to improve" suggests that IM can serve as a tool for strategic decision-making (e.g., Ormiston & Seymour, 2011), learnings (e.g., Lall, 2019) and operational improvements (e.g., Keevers, Treleaven, Sykes, & Darcy, 2012) by providing valuable insights into the effectiveness and efficiency of new sustainable ventures and thus provides the primary reason why to measure impact. Muñoz

et al. (2022) bring coherence into these two dimensions by demonstrating how different institutional pressures (such as government or investor pressure) as well as organizational capacity (such as strategic or operational value of IM) are configural antecedents that explain the emergence of distinct IM approaches.

Regarding **how** new sustainable ventures measure their impact, most scholars agree that measuring sustainability outcomes and impacts is a significant challenge (Anand et al., 2021), especially for new ventures due to their liability of newness, high resource limitations, high uncertainty and little historic data (Trautwein, 2021). Additionally, high ambiguity and incomparability due to a multitude of methods and measures with limited standardization (Ebrahim et al., 2014) and high uncertainty in the causal chain linking activities to attributable impact (Rawhouser et al., 2019) make IM a difficult process to navigate for new sustainable ventures. Consequently, new sustainable ventures often embrace provisional and performative IM (André et al., 2018). These metrics entail adaptable assessments utilizing at-hand data, storytelling and improvisational strategies. While these methods facilitate initial measurement, these "bricolaged" approaches may inadvertently foster ambiguity surrounding the genuine impact generated and potentially prompt stakeholders towards imprecise and vague interpretations of impact (Molecke & Pinkse, 2017).

In their influential literature review on IM, Rawhouser et al. (2019) have commenced the task of bringing coherence to the burgeoning discourses by organizing IM into a typology based on "the stage in the social impact process (activity vs. outcome) and the generalizability of the application (multisector vs. single sector)" (p. 87). Using configurational comparative analysis, Muñoz et al. (2022) uncover four approaches to IM that vary in terms of alignment with formal IM methodologies, depending on distinct organizational and institutional antecedents. Previous studies have also demonstrated that IM approaches may vary across different venture stages

(Hwang & Powell, 2009; Moroz & Gamble, 2021) due to varying demands for IM from various stakeholders at different stages along the venture life cycle. It is therefore surprising that very little research exists that approaches IM from a process perspective, observing how (and why) impact measur*ing* evolves over time.

Finally, regarding the **outcomes** of IM, the literature has so far focused on the financial consequences of IM. For instance, Parker et al. (2019) present evidence of a short-term growth deceleration, particularly evident among nascent ventures subsequent to obtaining B Corp certification, a recognized form of formal IM with external validation. Other scholarly works illustrate the linkage between demonstrating sustainability impact and various financial outcomes, including notably reduced capital constraints (Cheng et al., 2014) , positive financial returns (Grewal et al., 2019), favorable investment recommendations (Ioannou & Serafeim, 2015), and enhanced valuations (Mansouri & Momtaz, 2022). Despite this, some literature has studied the effects of IM on legitimacy, which is "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed systems of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574) and as an instrument to build trust (Déjean et al., 2004; Lall, 2019). However, the majority of such studies looks on the outcomes on IM generally in a binary fashion (whether impact is measured and communicated at all or not) and not specifically concerning distinct outcomes for different IM approaches.

Overall, despite the significant progress made in the IM literature in the last decade, a more fine-grained theoretical understanding and empirical underpinning of the different types of IM approaches undertaken by new sustainable ventures, their antecedents, their processual unfolding over time, and their concrete, measurable outcomes for the broader society is still missing to date. This dissertations contributes first and foremost to the IM literature by

providing a coherent overview and a future research agenda of the heterogeneous research field (Essay I), a process perspective on impact measuring (Essay II) as well as a typology and theoretical framework (Essay III) that together provide a holistic understanding of the antecedents, process and outcomes of different IM approaches.

2.2.2. Sustainable business models

In Essays II and III, sustainable business models, or the position of impact in the value proposition specifically, emerged as a key construct to understand why IM develops in a certain way (Essay II) as well as to conceptualize different outcomes of different IM approaches (Essay III). Sustainable business models are attracting increasing recognition in theory and practice (e.g., Dembek et al., 2022; Gamble et al., 2020; Pinkse et al., 2023; Snihur & Markman, 2023). Business modeling refers to planning and strategically developing business activities to create value (Zott, Amit, & Massa, 2011). Thus, at the heart of a business model is a value proposition in the form of a product or service that stakeholders, particularly customers, of that business value over existing solutions (McDonald & Eisenhardt, 2020).

In new sustainable ventures, sustainable business modeling is the process that founders and managers follow to produce a sustainable business model that "creates, delivers, and captures economic, social and environmental value" (Preghenella & Battistella, 2021, p. 2). Thus, for a new sustainable venture, the value proposition integrates social and environmental impact (Neesham et al., 2023). However, scholars have pointed out that only if stakeholders perceive a specific new sustainable venture's social or environmental impact as beneficial and appropriate, the impact will become part of the value proposition (Dembek et al., 2022). Consequently, there is a spectrum to which extent impact is a recognized part of the value proposition of a new sustainable venture and its business model.

Beyond this, some research has explored the relationship between the value proposition and the revenue model in new sustainable ventures (e.g., Ebrahim et al., 2014; Gamble et al., 2020). Ebrahim and colleagues (2014) refer to social and environmental impact as either integrated in or differentiated from the revenue model. In other words, the authors highlight that impact may be integrated in or separable from the way a venture makes revenues. Gamble and colleagues (2020) propose a more nuanced continuum and add a third, partially integrated, type between the two extreme points proposed by Ebrahim and colleagues (2014).

Overall, the role and position of impact in a sustainable business model is crucial for strategy considerations (Puglieri et al., 2022), access to finance (Mansouri & Momtaz, 2022) and impact generation (Dembek et al., 2022). This dissertation contributes to the sustainable business model literature by demonstrating how the position of impact in the value proposition of a new sustainable venture has important implications for impact measuring as it affects why and how a venture measures impact (Essay II). Additionally, and conversely, Essay III shows how certain IM approaches affect the business model and the extent to which impact becomes part of the value proposition that can be communicated to stakeholders.

2.2.3. Entrepreneurial agency and institutional entrepreneurship

In two essays, agency emerged as a key feature to understand the process of impact measuring (Essay II) and the heterogeneity of different IM approaches (Essay III). Entrepreneurial agency refers to entrepreneurship as structural transformation, i.e., entrepreneurs are characterized as agents transforming social structures via entrepreneurial action (McMullen et al., 2020). Thus, agency encapsulates the capacity of individuals or groups to exercise autonomy, initiative, and purposeful action in the pursuit of entrepreneurial endeavors to transform the structures in which a venture is embedded (Battilana, Leca, & Boxenbaum, 2009; McMullen et al., 2020).

As such, entrepreneurial agency is closely linked to institutional entrepreneurship which explains how individual actors contribute to institutional change (DiMaggio, 1988). Here, entrepreneurs are described as change agents and the concept of agency elucidates the pivotal role of individuals or groups in effecting change within established institutional structures (Battilana et al., 2009). By performing institutional work (Lawrence, Suddaby, & Leca, 2011), entrepreneurs act purposefully, unconventionally and autonomously, exercising influence to creating, shaping, maintaining, and disrupting institutions rules to address perceived inefficiencies, contradictions, or opportunities within the existing institutional environment (Garud, Hardy, & Maguire, 2007; Hardy & Maguire, 2008; Pacheco, York, Dean, & Sarasvathy, 2010). Central to the notion of agency in institutional entrepreneurship is the idea of proactive action aimed at instituting change (Battilana et al., 2009). As such, being agentic is not being reactive to institutional constraints and pressures but involves creative and innovative responses to institutional voids, contradictions, path dependencies or simply the status quo (Garud & Karnøe, 2001).

This dissertation unveils that agency plays a significant role in IM. Impact measuring unfolds differently according to the extent to which new sustainable ventures engage with IM to transform current structures and practices (Essay II) as it can be proactively enacted as a form of institutional work (not only as a form of reactive compliance with stakeholder requests) and as such provides a helpful dimension in a novel typology to classify heterogenous IM approaches (Essay III).

3. METHODS

The research methods utilized in this dissertation are meticulously crafted to answer the outlined research questions. Given the explorative nature of the research objectives, this dissertation adopts a qualitative research design in an inductive approach (Edmondson & McManus, 2007). Besides a literature review in Essay I, Essay II and II follow the tenets of grounded theory (Glaser & Strauss, 1967) by conducting multiple case studies (Eisenhardt, 1989) to understand the dynamics of new sustainable ventures and their IM approaches as a contemporary phenomenon within a real-world context (Yin, 2018). Specifically, Essay II is based on a multiple case study with six new sustainable ventures that are observed in a longitudinal research project over two years to develop a process model (Langley, Smallman, Tsoukas, & Van de Ven, 2013) showing how and why impact measuring unfolds over time. Essay III is based on a multiple case study with three new sustainable ventures and shows the outcomes of different IM approaches on organizational and societal levels in a variance model. In this chapter, the specific research settings, research designs and approaches to data collection and data analysis applied within each essay are delineated. Table 1 summarizes the research methods of all essays. More details can be found in the essays in Chapter 4.

Table 1: Overview of Research Methods

Essay	Research questions	Research setting	Research design	Data collection and sources	Data analysis and research model
I	What are emerging perspectives, topics and trends in IM research?	n/a	Literature review	553 relevant papers from an initial pool of 15,085	Semi-automated, LLM-powered systematic literature
II	How and why does impact measuring unfold over time in new sustainable ventures?	New sustainable ventures in Germany	Multiple case study with 6 cases	39 semi-structured, open interviews; 263 pages of internal documents; 1700 pages of publicly available information	Process model

III	How can different IM approaches be characterized and what are the outcomes of these different IM approaches?	New sustainable ventures in Germany, particularly Berlin	Multiple case study with 3 cases	27 semi-structured, open interviews; 250 pages of internal documents; 665 pages of publicly available information	Variance model

3.1. RESEARCH SETTING

The context of Essay II and III is Germany, particularly Berlin, its vibrant capital with a burgeoning start-up scene dedicated to sustainable development. Germany's sustainable entrepreneurial ecosystem encompasses numerous facets including: a multitude of new sustainable ventures established annually, knowledge and innovation clusters such as Climate KIC, Impact Hubs, and associations such as Social Entrepreneurship Network Germany, and impact investing initiatives like the Federal Initiative Impact Investing. Germany offers favorable conditions for sustainable ventures, with 35% of its startups in 2022 categorized as new sustainable ventures according to the "Green Startup Monitor" (Fichter, Olteanu, Hirschfeld, Walk, & Gilde, 2023). The German government, following the ratification of the Sustainable Development Goals, prioritizes innovation and entrepreneurship for sustainable transformation, exemplified by policies, supporting grants, funding programs, incubators, accelerators, research and development tax incentives, and government-backed loan programs. The market demand for sustainable products and services, coupled with investor interest, is significant, attracting business angels, venture capital firms, and impact investors, with a total volume of impact investments reaching 38,9 billion Euros in 2022 (Bernard-Rau, Busch, Kaiser, & Weber, 2022). This conducive environment fosters new sustainable ventures and encourages the adoption of IM, and thus positions Germany as a suitable research context for both essays.

3.2. RESEARCH DESIGNS

Essay I follows an abductive scientific reasoning as the LLM-powered, semi-automated literature review is led by hypotheses that can be semi-automatically tested by the LLM through finding supporting and contradicting information in the 553 analyzed papers. This type of literature review therefore requires some form of prior domain knowledge to be able to formulate meaningful hypotheses that can guide the analysis and has the limitation of not being able to find surprising trends or emerging themes inductively.

Given the explorative nature of the research objectives, Essays II and III follow inductive scientific reasoning by utilizing qualitative data in multiple case study research designs. Essay II and III are based on a multiple case study (Eisenhardt, 1989). This research design is selected to allow the development of new theories distinguished by rigorous standards and empirical validity (Eisenhardt, 2021). In both essays, one case, i.e., one empirical instance of the phenomenon under investigation (Yin, 2018), is one particular new sustainable venture in Germany. While both essays share the same research design, there are distinct differences in applying the research methodology in the two essays.

Essay II employs a process study design (Langley, 1999; Langley 2009; Langley et al., 2013), involving repeated observations of the new sustainable ventures and their IM approaches over two years to answer the research questions how and why new sustainable ventures engage in impact measur*ing* over time. This essay demonstrates the value of a time-based lens and time-conscious research methodologies for entrepreneurship research (Lévesque & Stephan, 2020) by showing how the unit of analysis, i.e., the IM approach of a new sustainable venture, are influenced, shaped and changed in the dynamic context of entrepreneurship.

Furthermore, Essay II follows a two-step sampling approach, transitioning from purposeful sampling to theoretical sampling (Patton, 2014). Initially, purposeful sampling was conducted by selecting three information-rich cases of new sustainable ventures in Germany: SocialRenovation, GreenMobility, and PlasticCompensation[1]. These ventures fulfilled the sampling criteria of being less than eight years old, explicitly addressing at least one Sustainable Development Goal, and having initiated some form of IM already. Additionally, the three selected new sustainable ventures sought money from impact investors at the outset of our prospective study, an incentive to introduce and develop IM and thus an interesting moment to start observing their IM. Subsequently, guided by emerging theoretical insights, theoretical sampling was adopted to confirm or disconfirm the initial findings and to support constant comparison as a theory-sharpening analysis process (Eisenhardt, 1989; Patton, 2014). This led to selecting three additional cases, i.e., DigitalCare, BioPackaging, and WasteCollection.

Essay III is a variance study (Van de Ven, 2007) to answer the research questions how different IM approaches can be characterized and what the outcomes of these different IM approaches are. The theoretical sampling (Patton, 2014) criteria were delineated as follows: Firstly, new sustainable ventures which explicitly addressed at least one Sustainable Development Goals were sought. Secondly, selection encompassed new sustainable ventures actively soliciting funding from impact investors, under the premise that such endeavors necessitate substantiated evidence pertaining to their sustainable impact, i.e., incentivize IM. Thirdly, the sampling needed to yield diverse IM approaches, including variations in technology utilization, public

[1] For anonymity reasons, all venture names have been changed by the author.

reporting practices, and the utilization of qualitative versus quantitative indicators to allow for the examination of the variance of IM approaches and their respective outcomes, aligning with the research question. Initial data collection commenced with a compelling and elucidative case demonstrating a high degree of IM formality, followed by the sampling of additional ventures exhibiting varying levels of IM formality. In total, the sample comprised three new sustainable ventures. Table 2 describes the selected cases for both essays (ventures 1 to 3 are part of both Essays).

Table 2: Case Descriptions

Case	Case description
SocialRenovation	SocialRenovation offers barrier-free renovations of bathrooms for care-depended people in Germany (e.g., by converting the bathtub into a shower).
GreenMobility	GreenMobility provides sustainable e-cargo bikes for logistics in urban areas.
PlasticCompensation	PlasticCompensation offers a service to offset the plastic footprint of individuals and businesses by collecting plastic waste with partners in the Global South.
DigitalCare	DigitalCare provides intelligent continence solutions based on digital sensors and an app for caretakers.
BioPackaging	BioPacking produces and sells sustainable packaging made of grains.
WasteCollection	WasteCollection offers the service of plastic offsets by collecting ocean-bound plastics.

3.3. DATA COLLECTION

For **Essay I**, Relevant articles are identified through the Web of Science core collection as well as EBSCO's Business Source Complete on the fields title, abstract and author keywords. As these two are the two most utilized databases for systematic literature reviews in management research (Hiebl, 2023), a best practice is followed and a minimum level of quality ensured.

To capture the breadth and depth of IM research the following search terms are used:

(Social OR Environmental OR Sustainab OR Non-financial)*
AND (Impact OR Value OR Performance)
AND (Measur OR Account* OR Report* OR Monitor* OR Evaluat*)*
AND (ventur OR startup OR entrepreneur* OR enterpris* OR non-profit OR NGO).*

Using these criteria, 15,085 papers (5,457 from Web of Science, 9,628 from EBSCO) were identified. A large sample was intentionally selected to demonstrate the value of the semi-automated and LLM-powered approach that allows for a quick assessment of the breadth of a field through a large sample rather than an in-depth assessment of a smaller sample as typical for other literature reviews. After duplicate removal and an LLM-based relevance screening, 553 papers are selected for the final review.

For both essays that are based on multiple case studies (Essay II and III), primary data was collected by using the following data sources: Interviews, internal documents, and publicly available data. First, open, semi-structured interviews were conducted with the (co-)founders on the past, present, and future of IM in their new sustainable ventures, asking them about key events, triggers, approaches, and outcomes relating to IM. Additionally, interviews were conducted with employees, investors, customers, sales partners, and consultants to broaden and deepen our understanding of the phenomenon. Second, internal documents, such as pitch decks for investors, sales decks, business plans, cooperation contracts, company and product presentations, and impact calculations were analyzed. Third, publicly available information on

IM was collected via the websites, social media channels (such as LinkedIn and Instagram), newspaper articles and press releases of the new sustainable ventures. These data sources have been triangulated to achieve an in-depth, contextually rich, and holistic understanding of IM in the six new sustainable ventures and to ensure methodological rigor and internal validity of this dissertation.

For **Essay II**, empirical data was collected over a period of two years (September 2021 to October 2023). Following Davidsson and Gruenhagen (2020), prospective and retrospective data collection were combined to understand the development of impact measuring over time beyond the two year period of data collection. Following the guidelines outlined by Van de Ven (2007) for constructing process theory, an initiation and ending point of the empirical investigation have been set. Specifically, the inquiry commenced by examining the juncture at which the selected new sustainable ventures began demonstrating a degree of awareness regarding their impact. This initial phase yielded a notable revelation: the prominence of impact positioning within their value propositions at the onset of their journey toward IM, and the consequential implications thereof. Ultimately, the end point of the empirical investigation was defined by the development of tangible impact metrics within each new sustainable venture, a choice informed by the attainment of theoretical saturation (Eisenhardt, 2021). In between these start and ending points, data was collected via publicly available information continuously and via interviews and internal documents regularly. By interweaving data collection and data analysis (Miles, Huberman, & Saldaña, 2018), follow-up data collections were informed by the emerging findings and theoretical insights, enabling more focused data collections for the different empirical constructs of interest.

In total, 39 interviews were conducted, each one lasting between 15 and 120 minutes (30 minutes on average). Each interview was recorded and transcribed verbatim, culminating in a

comprehensive transcript spanning 268 single-spaced pages in Arial font size 12. Additionally, 263 pages of internal documents relating to IM and 1700 pages of publicly available information on IM were collected.

For **Essay III**, 27 interviews were conducted, and 250 pages of internal and 665 pages of publicly available information on IM were collected. Given the variance study design of this essay, the data focuses on the differences in IM approaches and the respective outcomes. Thus, data collection was focused on one particular point in time to understand the current IM approaches and the respective outcomes.

3.4. DATA ANALYSIS

Essay I is a semi-automated, LLM-powered systematic literature review that utilizes OpenAI's ChatGPT while keeping a human expert in the loop, thereby combining the scalability of the LLM with the orchestration and control of a human researcher. For automation, OpenAI's API is leveraged, specifically the embedding model *text-embedding-3-large* for knowledge retrieval and the chat completion model *gpt-4o-2024-08-06* (GPT-4o) for text classification, knowledge retrieval and question answering. An overview of the field is provided through the analysis of (1) explicit variables already present in the database (year, journal) and (2) implicit variables extracted from the text using the chat completion model (research method, non-profit vs. for-profit, antecedents vs. process vs. outcomes of IM). The LLM classified 83.3% papers correctly in sample tests (with 18 labeled papers). During these tests and iterations, GPT-4o performed slightly better when analyzing title and abstract only and not the full paper, probably because the vast information of the full paper leads to diluting what is most distinct and relevant about the paper itself which is typically best captured and highlighted in the abstract. To uncover emerging perspectives, topics and trends a hypothesis-led approach was taken. First, a qualitative search by processing all abstracts at the same time is performed. In a second step, each paper is classified individually regarding its support for or contradiction of each hypothesis. The entire approach, including all iterations, costs $51.50 and took roughly two full-time weeks. All code is written in Python and developed using VS Code with GitHub Copilot as the integrated development environment (IDE).

As Essay II and III follow a multiple case study design, an open and iterative approach, guided by the emerging insights (Glaser & Strauss, 1967), was employed in both essays. First, a comprehensive within-case analysis was undertaken following the guidelines proposed by Eisenhardt (1989). Second, a systematic cross-case analysis Eisenhardt (1989) was carried out

to identify prevalent patterns, similarities, and distinctions concerning the new sustainable ventures, their IM approaches, and the outcomes thereof.

Through several rounds of inductive coding in MAXQDA, the analysis transitioned from informant-based first-order codes to more abstract themes and categories (Gioia, Corley, & Hamilton, 2013), as depicted in the respective data structures of both essays (see Chapter 4). Subsequent iterative cycles of theorizing, triangulating and problematizing existing literature, and visualizing the relationships between the identified codes, themes, and aggregated dimensions were facilitated through data displays, concept-evidence, and cross-case analysis tables (Cloutier & Ravasi, 2021). While all of the above steps were similar for Essay II and Essay III, the final analysis yielded different results in terms of the models that were developed. Such model development was in itself part of the data analysis process as iterating between data, tables and different versions of models sharpened the theory-building process.

For **Essay II**, the data analysis yielded a process model to answer the research question how and why new sustainable ventures engage in impact measur*ing* over time. Within process models, the primacy of time ordering is crucial as the units of observation and analysis partake in events that can undergo temporal variations (Van de Ven, 2007). Thus, a summary and a chronological list of events and activities (Cloutier & Ravasi, 2021) that had relevance for IM were developed for each case, following a visual mapping strategy (Langley, 1999). Furthermore, temporal bracketing, which involves the decomposition of the time scale into successive periods, was employed to analyze the empirical data from a process perspective (Langley, 1999). The process study design also enabled to interlink data collection and data analysis (Miles et al., 2018). Thus, findings from the data analysis were informing subsequent data collections, yielding more focused and highly relevant data for the emerging constructs. The process model of Essay II explains how the positioning of impact in the value proposition

influences how a new sustainable venture determines the impact measuring pathway that is chosen, i.e., how and why a new sustainable venture develops its IM approaches over time.

Essay III employs a variance model to answer the research questions how different IM approaches can be characterized and what the outcomes of these different IM approaches are. Variance models rely on fixed entities distinguished by variable attributes, with their variability potentially explicable through immediate causation (Van de Ven, 2007). Thus, the variance model of Essay III explains how the different IM approaches, in terms of their formality and agency levels, cause different outcomes on organizational and societal levels, i.e., consequences in terms of legitimacy, impact monetization and exploitation of sustainability potential.

4. ESSAYS ON THE ANTECEDENTS, PROCESS AND OUTCOMES OF IMPACT MEASUREMENT

At the core of this dissertation are three essays on the antecedents, process and outcomes of IM in new sustainable ventures. Essay I is an abductive, semi-automated, LLM-powered literature review, analyzing 553 relevant papers from an initial pool of 15,085 in order to make sense of the multidisciplinary nature of impact measurement research, drawing articles from fields such as entrepreneurship, development studies, environmental sciences, and economics. It proves an overview of the impact measurement literature and highlights the need for more applied impact measurement research, longitudinal studies that investigate impact measurement over time, and empirical investigations into the organizational outcomes of impact measurement. These research gaps are consecutively addressed in Essay II and III. Additionally, it demonstrates the potential of AI generally and LLMs specifically for efficiently analyzing broad, multidisciplinary research fields.

Essay II is a prospective multiple case process study that explores how and why impact measuring unfolds over time, contributing to the IM literature that so far researched IM as a rather static activity. It uncovers three distinct impact measuring pathways, namely *reactive, proactive*, and *agentic impact measuring*, depending on the positioning of impact in the value proposition of the new sustainable venture. In doing so, Essay II bridges and contributes to the IM and sustainable business model literature while also highlighting the role of agency through a novel process perspective on impact measuring.

Essay III is based on a multiple case study yielding a variance model that explains how different IM approaches can be characterized and what kind organizational and societal outcomes they have. Thus, Essay III follows up the heterogeneity of IM approaches that were uncovered

through a process lens in Essay II and focuses on this heterogeneity by providing a typology and framework of distinct IM approaches, namely *IM as fragmented frame*, *IM as aggregation* and *IM as bridge*, and their outcomes in terms of legitimacy, impact monetization and exploitation of sustainability potential. Both essays entail important theoretical contributions at the juncture of IM, sustainable business models, agency, and sustainable entrepreneurship at large as well as relevant implications for practitioners.

Essay II and III have been presented at international conferences and have greatly benefitted from feedback by the international entrepreneurship research community. Essay II is soon to be submitted to Business Strategy and the Environment. A previous working draft has been accepted and presented at the 14th International Symposium on Process Organization Studies (PROS) in June 2023 in Chania, Crete, Greece. Essay III has been presented at the 2023 Academy of Management Annual Meeting in August 2023 in Boston, Massachusetts, USA. Table 3 provides an overview of the three essays, their authors and their status.

Table 3: Overview of Three Essays on Impact Measurement in New Sustainable Ventures

Essay	Title	Authors	Status
I	Impact Measurement: A Large Language Model – Powered Multidisciplinary Literature Review	Jan Moellmann, Leo Ganesh Holzhauer	To be submitted to an entrepreneurship journal in 2025.
II	Impact Measuring in New Sustainable Ventures: A Process Perspective	Jan Moellmann, Esther Salvi, Frank-Martin Belz	To be submitted to Business Strategy and the Environment in 2024. Previous version accepted and presented at the 14th International Symposium on Process Organization Studies (PROS) in June 2023 in Chania, Crete, Greece.
III	Impact Measurement as Agentic Activity toward Sustainable Development	Jan Moellmann, Esther Salvi, Frank-Martin Belz	Accepted and Presented at the Academy of Management Annual Meeting in August 2023 in Boston, Massachusetts, USA.

4.1. ESSAY I – IMPACT MEASUREMENT: A LARGE LANGUAGE MODEL – POWERED MULTIDISCIPLINARY LITERATURE REVIEW

Abstract: Impact measurement is a theoretically and practically relevant field to understand, manage and communicate social and environmental effects of organizations. Despite its relevance, it remains incoherent and theoretically underdeveloped due to its multidisciplinary nature, drawing from fields such as entrepreneurship, development studies, environmental sciences, and economics. To provide a holistic and comprehensive understanding of the field, we conduct an abductive, semi-automated, Large Language Model-powered literature review, analyzing 553 relevant papers from an initial pool of 15,085. Our findings provide an overview of the impact measurement literature, uncover emerging topics, and propose a future research agenda to address key gaps. Specifically, we highlight the need for more applied impact measurement research, longitudinal studies that investigate impact measurement over time, and empirical investigations into the organizational outcomes of impact measurement. Additionally, we demonstrate that our Large Language Model-powered methodology is a significant advancement for efficiently analyzing broad, multidisciplinary research fields.

Key words: Impact measurement, literature review, large language models

Authors: Jan Moellmann, Leo Ganesh Holzhauer

Status: To be submitted to an entrepreneurship journal in 2025.

INTRODUCTION

Impact measurement (IM) refers to the activities of "capturing and communicating valued information about the effects of social interventions" (Muñoz, Gamble, & Beer, 2022). IM is receiving increasing attention in academia (Muñoz et al., 2022; Rawhouser, Cummings, & Newbert, 2019) as it holds significant potential to advance sustainable entrepreneurship theory (Anand, Argade, Barkemeyer, & Salignac, 2021; Johnson & Schaltegger, 2020) and in practice as it holds significant potential to combat greenwashing (Lashitew, 2021) and improve impact performance (Lall, 2019). Recent publications in practitioner-focused outlets underline this importance as 83% of impact investors perceive IM to be the major challenge in impact investing (Hand, Dithrich, Sunderji, & Nova, 2020) and 62% of social enterprises in Germany do already conduct some kind of IM while 29% plan to do so in the future (Kiefl et al., 2024).

Despite this academic and practical relevance, IM is a theoretically as well as empirically underdeveloped field (Rawhouser et al., 2019). One major challenge is that it is a highly heterogeneous and multidisciplinary field with influences from the social and sustainable entrepreneurship (e.g., Trautwein, 2021), non-profit (e.g., Pringle & Conway, 2012), development studies (e.g., Cairns, 2018), environmental sciences (e.g., Zhang, Hou, Jiang, Xu, & Liu, 2021), engineering (e.g., Saad, Nazzal, & Darras, 2023) and economics (e.g., Köroğlu & Yıldırım, 2023) literature, among others. This multidisciplinary nature complicates gaining a holistic and comprehensive understanding of IM as it is difficult to bring together all of these different perspectives.

Hence, our research goal is to give an overview of the vast and multidisciplinary IM literature and to uncover emerging perspectives, topics and trends in order to provide a future research agenda. We do so by conducting an abductive (i.e., hypothesis-led), semi-automated, Large

Language Model (LLM)-powered literature review based on 15,085 papers from different domains and by analyzing the 553 most relevant papers after an automated relevance screening.

In doing so, our study has two major contributions. First, our overview of the IM literature (Rawhouser et al., 2019) brings together multidisciplinary perspectives and uncovers emerging topics and trends in regards to why, how and with what outcomes impact is measured. Based on this, we suggest a future research agenda, particularly to address major gaps as current research tends to (1) focus on developing IM methodologies rather than applying them; (2) lack longitudinal approaches that would help to understand long-term impacts as well as nuances in implementing and changing IM approaches over time; and (3) overlook empirical investigation of organizational outcomes of IM to understand whether IM is in fact an effective tool to prove and improve impact. Second, our innovative approach to use an LLM to perform a semi-automated systematic literature review is a methodological contribution (e.g., An, Narechania, Wall, & Xu, 2024; Srivastava, 2023) as it offers a significant advancement to efficiently analyze a broad, multidisciplinary research field using hundreds of papers.

METHODS

We conduct a semi-automated, LLM-powered systematic literature review by using OpenAI's ChatGPT while keeping a human expert in the loop, thereby combining the scalability of the LLM with the orchestration and control of a human researcher. LLMs hold the potential to analyze vast amounts of free text efficiently through question answering and information extraction. They are effective at learning from a few provided examples without the need of crafting extensive data sets (Brown, 2020). As such, they provide an opportunity to make identifying relevant papers as well as analyzing them easier and quicker (An et al., 2024; Srivastava, 2023). We generally follow the sample selection process by Hiebl (2023):

identification, screening and disclosure of the review sample. For the sake of rigor and replicability (Tranfield, Denyer, & Smart, 2003), we describe each phase in detail below.

For automation, we leverage OpenAI's API, specifically the embedding model *text-embedding-3-large* for knowledge retrieval and the chat completion model *gpt-4o-2024-08-06* (GPT-4o) for text classification, knowledge retrieval and question answering. Integrating the API was necessary for automation, since the interaction with ChatGPT via the interface is a sequential process with manual interaction after every step (e.g., every single classified paper). Embeddings are words represented as numbers, in a space with hundreds or even thousands of dimensions, building the backbone of all LLM operations and also being of interest for similarity analysis based on word arithmetic like a famous example of "king – man + woman = queen" (Mikolov, Sutskever, Chen, Corrado, & Dean, 2013). With GPT-4o, we first test a strategy using only prompt engineering without providing specific examples (Brown, 2020), as well as an extension to a so-called few-shot prompting strategy, providing carefully crafted selected examples to teach the model. Furthermore, we iterated over the temperature hyperparameter which influences the randomness of the output of the LLM with a range of 0 (deterministic) to 1 (most variability). In our experiments, we kept it in a range below 0.5 or even setting it to 0.0 to control for hallucinations, which are a typical problem of LLMs.

The entire approach, including all iterations, costs $51.50 and took roughly two full-time weeks. All code is written in Python and developed using VS Code with GitHub Copilot as the integrated development environment (IDE).

IDENTIFICATION

Relevant articles are identified through the Web of Science core collection as well as EBSCO's Business Source Complete on the fields title, abstract and author keywords. As these two are

the two most utilized databases for systematic literature reviews in management research (Hiebl, 2023), a best practice is followed and a minimum level of quality ensured.

To capture the breadth and depth of IM research we do not include a start or end date (search conducted in June 2024), include all research fields and use the following search terms:

(Social OR Environmental OR Sustainab OR Non-financial)*

AND (Impact OR Value OR Performance)

AND (Measur OR Account* OR Report* OR Monitor* OR Evaluat*)*

AND (ventur OR startup OR entrepreneur* OR enterpris* OR non-profit OR NGO).*

We purposefully include non-profit literature, knowing that it has often been studied in a separate literature stream although "monitoring & evaluation" practices in the non-profit world are similar to "impact measurement" practices in the for-profit world. While acknowledging that the "social enterprise" literature often bridges the two perspectives, we assume that the two fields can still learn a lot from each other and that it might be interesting to understand differences and similarities.

Using these criteria, we identify 15,085 papers (5,457 from Web of Science, 9,628 from EBSCO). We intentionally select a large sample to demonstrate the value of our semi-automated and LLM-powered approach that allows for a quick assessment of the breadth of a field through a large sample rather than an in-depth assessment of a smaller sample as typical for other literature reviews.

SCREENING

After the database search, we run a first rule-based screening of the titles to exclude all exact duplicates. However, due to the concatenation of the results of two databases with different

encoding and submission standards, we were confronted with duplicate pairs, where titles, abstracts, authors, and journals do not exactly match, even considering lower-cased and lemmatized transformations of the raw text. To avoid hard coding every single case, we considered the embedding vectors of the remaining 13,097 titles. Using cosine similarity as the similarity metric, we evaluated all $\sum_{i=1}^{13,097-1} i = 85,746,060$ pair-wise similarity values and integrated a threshold $\theta_{dup} = 0.7$ as a first heuristics for a title pair to be considered a duplicate pair. To avoid the removal of titles representing similar but distinct papers, we further constrained the definition of a duplicate pair by evaluating for an identical word sequence present in both entries of the pair with a sliding window size of $k = 5$; i.e., a minimum of the exact same five words in a row. This reduced the number of papers to 12,565.

Relevant articles are selected for the review sample through a process of screening on the title and abstract of the paper by constructing a "relevance score". This score is constructed by aggregating the results of an embedding-based similarity analysis analog to the duplicate removal process, only this time between each search term and the title as well as the abstract of each paper. While the search engines of the utilized databases (i.e., Web of Science, EBSCO) would only check for the exact search terms in the identification phase, the similarity analysis helps that texts with a high similarity in the embedding space influence the relevance score as well (e.g., "assessment" is similar to "evaluation", but only the latter was an explicit search term). This is due to the fact that in an embedding space semantic proximity inversely correlates with the distance. The closer two words are in terms of the used distance metric, the more similar is their meaning. The aggregated relevance score then is the weighted average of the relevance scores for the different terms, further advancing the search strategy compared to the search engines of the utilized databases by enabling more granular control over it. We experiment with the weights in nine iterations and test the results by checking the first, i.e., most relevant, papers, search for key papers that we deem highly relevant for a literature review

on IM (e.g., Rawhouser, Cummings, & Newbert, 2019) and sample one in every ten papers for the first 1000 papers to better understand the components of the score. Based on the results, we add terms that have not been in the initial search terms and include terms with negative weights to punish irrelevant topics (e.g., "economic impact", "business impact", "corporate", "publicly listed"). We define a cut-off value at 600 papers as more and more papers become significantly less relevant around that threshold. While reading and assessing 12,565 titles and abstracts would probably take us between 25 and 50 full-time weeks, the LLM-powered approach, incl. all iterations, took us roughly one full-time week, a clear indication of the efficiency of our approach.

Finally, we discover that the approach seems to yield a high recall (i.e., those with a low score are in fact not relevant) with a lower, but acceptable precision (i.e., not every paper with a high score is in fact relevant). Thus, we perform a manual screening process and exclude papers without any reference to IM. We still keep the sample rather broad by not adding more specific exclusion criteria as the contribution of our method is the ability to analyze a large sample quickly. In this process, we removed another 48 papers and added one relevant and unintentionally removed paper (during duplicate removal) back in, leading to a final review sample of 553 papers (see Table 1).

Process step	**Number of papers**
Total sample from Web of Science and EBSCO	15,085
After excluding duplicates	12,565
After automated screening for relevance	600
After manual screening for relevance = final review sample	553

Table 4: Process steps for identifying and screening the review sample, Essay I

ANALYSIS

Our goal is to give an overview of the research field while also uncovering emerging perspectives, topics and trends. We provide an overview of the field through the analysis of (1) explicit variables already present in the database (year, journal) and (2) implicit variables extracted from the text using the chat completion model (research method, non-profit vs. for-profit, antecedents vs. process vs. outcomes of IM). While minimal zero-shot prompting yields mixed results, a few-shot prompting strategy with more elaborate definitions of the variables and their categorical values results in good performance in our third iteration. The LLM classified 83.3% papers correctly in sample tests (with 18 labeled papers). During these tests and iterations, we also discover that GPT-4o performs slightly better when analyzing title and abstract only and not the full paper, probably because the vast information of the full paper leads to diluting what is most distinct and relevant about the paper itself which is typically best captured and highlighted in the abstract. Based on the results with the small sample and because the purpose and contribution of our method is to understand the breadth of a field efficiently by conducting a systematic literature review on a large sample rapidly whereas downloading 553 papers takes significant time, we decide to perform the entire analysis on title and abstract only.

To accomplish the second part of our goal to uncover emerging perspectives, topics and trends is more difficult as even after several iterations with GPT-4o, the generated outputs do not reach the level of meaningful insight and accuracy desired. Instead, the provided topics are rather general and abstract and tend towards the search terms. Thus, a purely inductive approach is difficult to execute. A core twist is to instead write clearly defined hypotheses that GPT-4o can test by finding supporting and contradicting information in the papers. This type of abductive, i.e., hypothesis-led, literature review therefore requires some form of prior

domain knowledge to be able to formulate meaningful hypotheses that can guide the analysis and has the limitation of not being able to find surprising trends or emerging themes inductively.

Our approach is two-folded. First, we perform a qualitative search by processing all abstracts at the same time. We do this with the top 100 papers in the first iteration and then with three batches of up to 200 papers in the second iteration. Due to the limited context length of 128,000 tokens of GPT-4o, we are restricted in the number of papers we can analyze at the same time. Since processing a batch of this size is useful to extract the overall tendencies present in the literature but does not enable robust quantitative evaluation, in a second step, we classify each paper individually regarding its support for or contradiction of each hypothesis.

The disclosure of the review sample (Hiebl, 2023) is provided in the annex (Table 13), incl. the results of the screening (relevance score) and analysis (classifications and hypothesis testing) phases. In order to be transparent and to help the reader to understand the quality and accuracy of our LLM-powered approach, we do not correct mistakes of the final LLM output. Instead, we transparently share discovered weaknesses and limitations in the results and discussion chapters below.

RESULTS

Our results give an overview of the IM literature through summary statistics that show how the multidisciplinary field developed, in which journals papers have been published and what kind of methods have been used. Afterwards, we uncover emerging perspectives, topics and trends by elaborating why, how and with what outcomes impact is measured.

SUMMARY STATISTICS

Figures 2 to 4 summarize the sample's main characteristics. The first paper in the sample is from 1974 (Kennedy & Dreger, 1974). From 1974 until 2006, less than 10% of the papers in the sample were published. Research attention increased strongly afterwards with another steep increase from 2014 onwards (Figure 2). The drop in 2024 is due to the fact that the paper identification phase stopped by the end of June 2024. Extrapolating the number for the full year, we would see yet another increase in published papers.

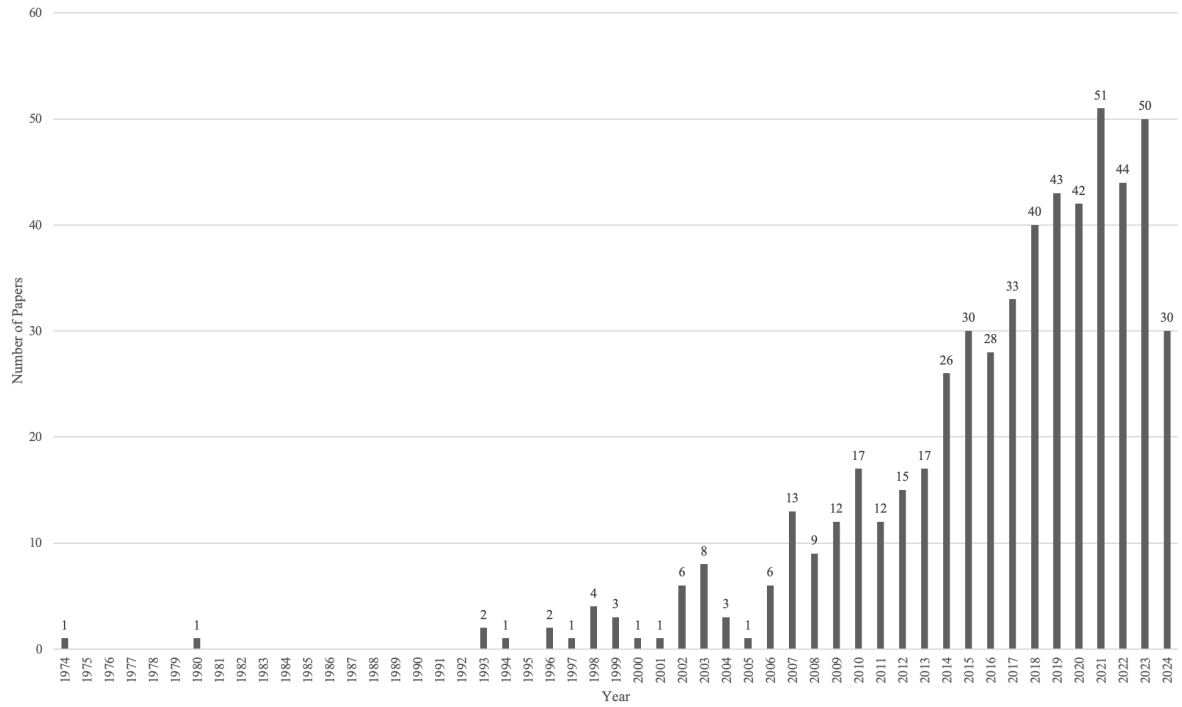

Figure 2: Number of Papers over Time, Essay I

Figure 3 displays the different journals that published three or more papers on IM. Additionally, there are 394 papers in 351 unique journals that published one or two papers in the sample. The diverse set of journals confirms that the phenomenon is investigated in different research fields and disciplines, e.g., environmental sciences, sociology, development studies, economics or entrepreneurship. *Sustainability* (44 papers) and *Journal of Cleaner Production* (21 papers)

are by far the most common journal outlets. Both journals are rather transdisciplinary and generic in nature, further showing that IM is a highly heterogeneous topic. Very few papers are published in entrepreneurship journals, except *Journal of Social Entrepreneurship* (7 papers), *Journal of Business Venturing* (3 Papers) and *Entrepreneurship Theory & Practice* (2 papers). This is a surprising finding given that ventur*, startup, entrepreneur* and enterpris* were explicit part of the search terms (see above).

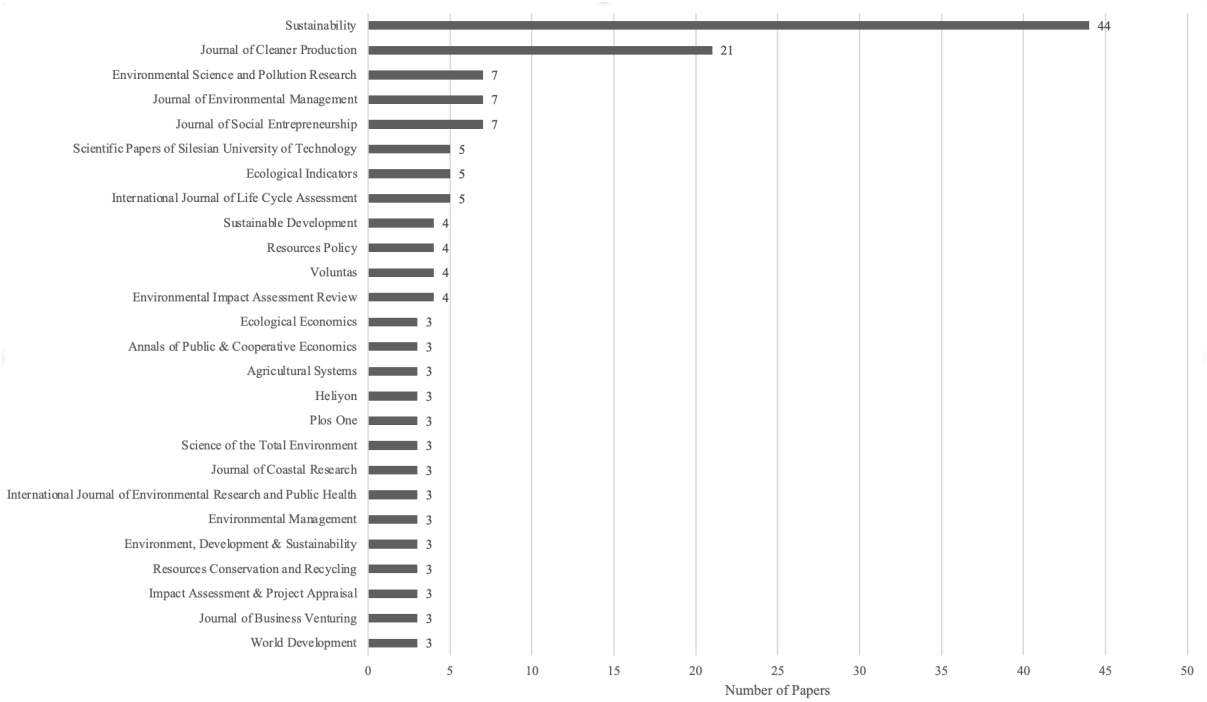

Figure 3: Number of Papers per Journal (excl. 394 Papers in Journals with less than Three Papers), Essay I

Figure 4 shows the different types of study utilized by the authors of the papers in the sample. The majority (74%) of the papers are empirical. Among the empirical papers, quantitative methods are the most commonly used approach (40%), followed by mixed-methods (21%) and qualitative research (12%). Quantitative approaches do sometimes concretely measure the impact of a certain project or company (e.g., Liu, 2014), but more often assess why or how certain IM methods are used (e.g., Lall, 2017). Many qualitative papers use case studies (e.g., Lee, Papadopoulou, Asbjoernsson, Hulthen, & Evertsson, 2022), incl. data collection via

interviews, focus group discussions and field observations. Conceptual papers (27%) usually introduce or compare frameworks or methods for IM without necessarily applying it (e.g., Parent, Cucuzzella, & Reveret, 2010).

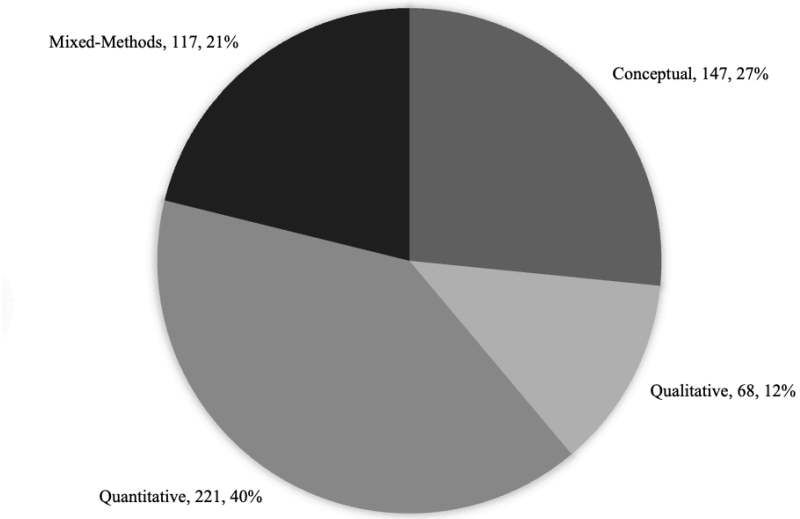

Figure 4: Overview of Types of Study, Essay I

HYPOTHESIS TESTING

As described in the methods section above, we moved from open-ended questions to abductively testing hypotheses as this approach delivered more nuanced and more meaningful results. These hypotheses are clustered into three categories: (1) "why to measure" contains hypotheses regarding the reasons for (or antecedents of) engaging with IM; (2) "how to measure" contains hypotheses regarding the processes, approaches, methodologies or tools to measure impact; (3) "outcomes" contains hypotheses regarding organizational consequences or effects of IM.

Why to measure

The first hypothesis evolves around the reasons for (or antecedents of) engaging with IM.

HI: Papers that discuss reasons for impact measurement, the "Why", are either talking about "measure to prove", i.e., pressures to prove the impact to stakeholders, or "measure to improve", i.e., measuring in order to learn, monitor and manage impact, incl. Influence on decision-making.

We found 51 papers supporting the hypotheses, 0 contradictions and 502 non applicable papers (Figure 5).

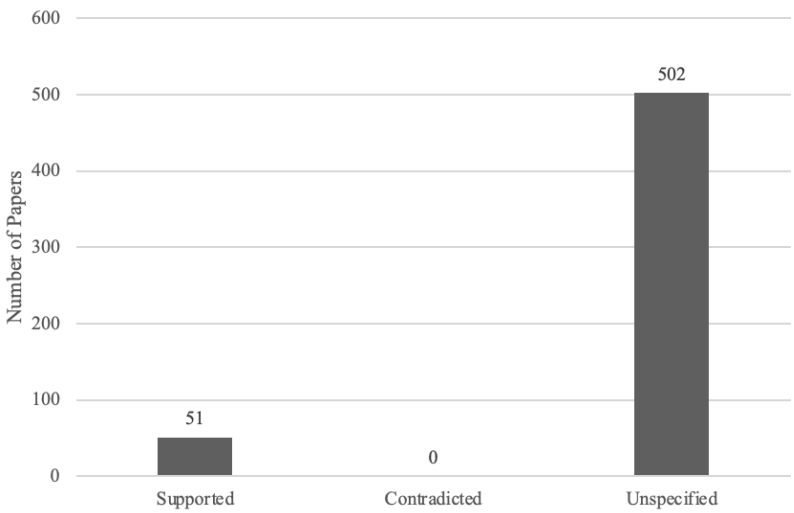

Figure 5: Result for HI, Essay I

The papers in the sample provide substantial evidence supporting the hypothesis that IM serves both to prove and to improve organizational performance. Several papers discuss the reasons for IM, emphasizing the need to demonstrate impact to stakeholders and enhance organizational processes. For example, Ebrahim & Rangan (2014) as well as Arshad and colleagues (2015) highlight the pressure on organizations, particularly non-profits, to prove their impact and demonstrate accountability to stakeholders, which aligns with the 'measure to

prove' aspect while also discussing improving social impact, aligning with the 'measure to improve' concept. Further examples include Zeng et al. (2023), which discusses measuring policy effects on green innovation to prove impact and Millar & Hall (2013), who use Social Return on Investment (SROI) to capture value for stakeholders.

In contrast, Haddy et al. (2021) focus on evaluating welfare initiatives to improve equid welfare, and Åstebro & Hoos (2021) use randomized control trials to enhance entrepreneurship training programs, both aligning with “measure to improve”. Bianco & Tobin (2024) discuss using impact evaluations to improve implementation and promote learning in conservation initiatives. Costa & Andreaus (2021) highlight the use of participatory action research to define desired outcomes and improve performance measurement systems.

Finally, van Rijn and colleagues (2021) explicitly test and validate the dichotomy of “measuring to prove” and “measuring to improve”. They find validation for both with “measuring to improve” being a stronger predictor for measuring social impact than the “measuring to prove” factor.

These examples indicate that the HI is well-supported by the papers in the sample, highlighting the dual purpose of IM in various contexts. A combined topic exploration and reduction with the LLM focused on reasons why organizations conduct IM yielded the following categories, further validating the measure to prove vs. measure to improve dichotomy (Table 5):

Table 5: Categories regarding the reasons for conducting impact measurement, Essay I

Measure to prove	**Measure to improve**
Accountability (demonstrate accountability)	Success (organizational success, fulfillment of mission)
Communication (communicate organizational impacts)	Learning: (learning opportunities for improvement)

Legitimacy (demonstrate legitimacy)
Rationalization (growing rationalization)

How to measure

The second set of hypotheses evolves around the processes, approaches, methodologies or tools to measure impact. Generally, we find a strong emphasis on the "how to measure" with most papers in the sample falling into this category rather than assessing the reasons for or organizational outcomes of IM.

HII: Most papers discuss different impact measurement approaches instead of actually measuring the impact of an organization or project. This means that most papers are discussing or developing different methodologies, approaches or tools for impact measurement, but only few papers are actually applying them.

We found 163 papers supporting the hypotheses, 63 contradictions and 327 non applicable papers (Figure 6).

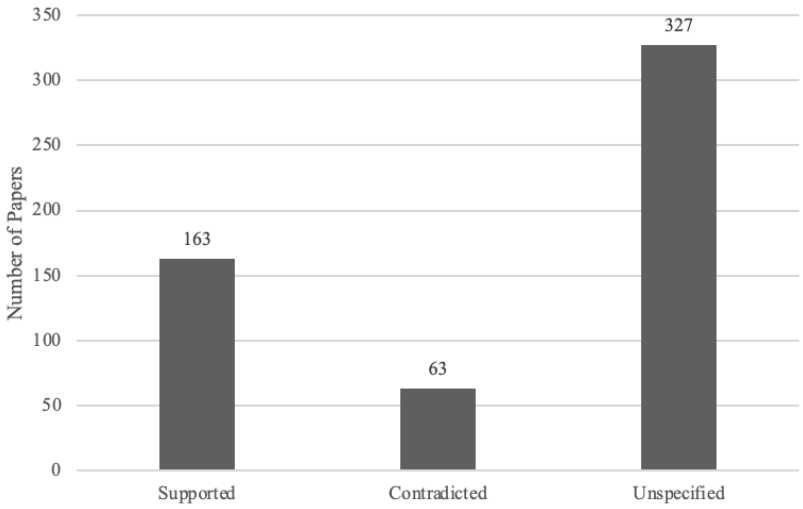

Figure 6: Result for HII, Essay I

The papers in the sample have a strong emphasis on the discussion and development of various methodologies, approaches, and tools for IM across different contexts and sectors. Many papers focus on conceptual frameworks, evaluation models, and methodological proposals for assessing impact, such as life cycle assessments, social return on investment, balanced scorecards, and environmental impact assessments. While some papers do apply these methodologies to specific case studies or empirical data, the overarching theme is the exploration and refinement of measurement techniques rather than the direct application of these methods to measure impact in practice. For instance, Hussain and colleagues (2018) and Jung and colleagues (2013) are focused on designing new measurement instruments and evaluation methods. Another example is Muñoz and colleagues (2022) who use configurational comparative methods to understand the heterogeneity of different kind of IM approaches as well as to explain the antecedents that lead to these different approaches.

However, there are a few papers contradicting the hypothesis by applying different methodologies to measure the actual impact of organizations or projects. For example, Xavier and colleagues (2008) measure the outcomes of a rural women entrepreneurship project in India by using narrative analysis and path analysis models to examine the impact of the project on the rural women. A particular contradiction are numerous (22) papers that apply Life Cycle Assessments (LCA) to measure environmental impacts (e.g., Song, Wang, Li, & Zeng, 2012; Wang, Lu, Gao, Wang, & Zhang, 2019; Zhang, Li, Peng, & Peng, 2020). In order to measure social impact, authors predominantly utilize qualitative methods such as interviews, focus groups, and participatory approaches to measure social impact (e.g., Astawa, Sudana, Murni, & Sanjaya, 2019; Costa & Andreaus, 2021). Fewer papers make use of quantitative methods to assess social impact, particularly by using statistical tests to draw insights from survey data, e.g. to assess the impact of a particular social enterprise on their employees (Wildmannova,

2020) or of a water filter and cookstove program in Rwanda (Barstow, Nagel, Clasen, & Thomas, 2016).

Overall, HII finds more support than contradictions in the sample. Most papers are more focused on discussing and developing IM methodologies rather than applying them. However, there are noteworthy exceptions, contradicting HII. A deeper analysis of the processes, approaches, methodologies or tools to measure impact yielded the following categories (Table 6):

Table 6: Categories regarding the processes, approaches, methodologies or tools to measure impact, Essay I

Category	**Examples from the sample**
Life Cycle Assessment (LCA)	'Social Life Cycle Assessment', 'life cycle thinking', 'life cycle assessment', 'life cycle impact assessment', 'LCA-based tools', 'life cycle sustainability assessment', 'SimaPro 8.1', 'CML 2001 method', 'GaBi 8.0 software', 'ReCiPe method', 'openLCA', 'CML baseline', 'ELCD', 'Agribalyse', 'LCIA', 'Ecoinvent 2.2', 'life cycle inventory'
Analytic methods	'analytic hierarchy process', 'Delphi Method', 'entropy weight method', 'analytic network process', 'fuzzy comprehensive evaluation method', 'fuzzy AHP', 'Monte Carlo simulation', 'principal component analysis', 'statistical benchmarking approach', 'analytical network process', 'fuzzy logic', 'fuzzy inference model', 'fuzzy inference system'
Interviews and surveys	'survey', 'interview', 'semi-structured interviews', 'questionnaire surveys', 'focus groups', 'structured interview', 'household surveys', 'expert interviews', 'online survey', 'field visits', 'focus group interviews', 'in-depth interviews', 'workshops', 'guest interviews', 'household interviews'
Impact models	'cause-and-effect models', 'pressure-state-response model', 'impact matrix', 'matrix of the Common Good Balance Sheet', 'DPSIR framework', 'multi-agent utility theory', 'spatial autocorrelation analysis', 'multiple-constituency theory', 'impact logic', 'theory of change'
Decision-making frameworks	'multi-criteria decision-making', 'multi-criteria decision analysis', 'multi-criteria participatory method', 'fuzzy set theory', 'decision support system', 'multi-objective evaluation model', 'multiple criteria decision making', 'analytic hierarchy process method'
Participatory approaches	'participatory evaluation tool', 'participatory action research', 'participatory resource mapping', 'participatory research model', 'social impact value chain', 'participatory research monitoring techniques', 'multiple case analysis', 'community scorecards'

Environmental assessments	'environmental impact assessment', 'ecotoxicological approach', 'global principal component analysis', 'environmental indicators', 'EIA analysis', 'ecological footprint analysis', 'ecological footprint', 'emergy analysis', 'eco-efficiency potential assessment method'
Social impact evaluations	'social return on investment', 'impact evaluation', 'social LCA', 'social impact assessment', 'multidimensional poverty measures', 'social impact bonds', 'sustainable value added', 'environmental health impact assessment'

HIII: A common theme is the challenge of little standardization in impact measurement approaches and indicators. This is particularly the case of those papers that measure social impact. Common ways of handling this challenge are stakeholder engagement and the development of tailored frameworks.

We found 66 papers supporting the hypotheses, 0 contradictions and 487 non applicable papers (Figure 7).

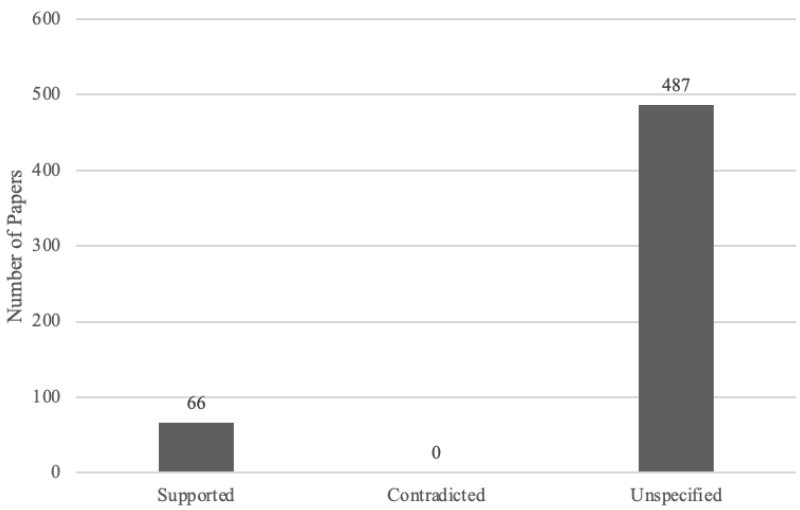

Figure 7: Result for HIII, Essay I

The papers in the sample highlight the challenge of a lack of standardization in IM, particularly in the context of social impact, leading to a variety of approaches being used. Many studies discuss the difficulties associated with measuring social impact due to the absence of standardized metrics (e.g., Ayorinde et al., 2024) and emphasize the need for tailored

frameworks and stakeholder engagement (e.g., Dufour, 2019) to address these issues. For example, Costa & Pesci (2016) criticize the "golden standard approach" according to which social enterprises have to find one standardized metric to social IM and advocate for a stakeholder-based approach for the selection of impact metrics among the growing number of options. Vo and colleagues (2016) discuss variations in evaluative practices for social impact investing and the influence of analysts' backgrounds on these practices, indicating a lack of standardization. Similarly, Addy and colleagues (2019) point out the absence of universally accepted tools for evaluating social and environmental rewards, reinforcing the hypothesis. Perrini and colleagues (2021) also highlight the high fragmentation in social IM methodologies, underscoring the confusion in selecting appropriate methods and the importance of customized frameworks. Overall, these papers collectively underscore the challenges in standardizing IM and the need for stakeholder engagement to navigate this complexity in order to effectively measure social impact, confirming HIII.

HIV: Although longitudinal approaches are recommended, papers that measure impact or discuss impact measurement approaches rarely have a longitudinal study design or process models, i.e., they do not measure impact over time and also do not look at impact measurement in organizations over time.

We found 26 papers supporting the hypotheses, 0 contradictions and 527 non applicable papers (Figure 8).

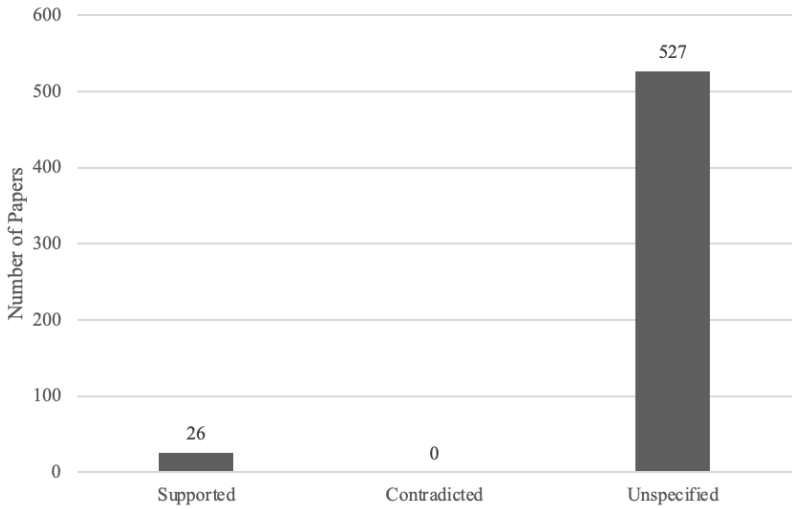

Figure 8: Result for HIV, Essay I

The papers in the sample reveal a significant and notable lack of longitudinal study designs and process models that measure impact over time. Many papers discuss methodologies, frameworks, and tools for impact assessment without explicitly mentioning the use of longitudinal approaches to track changes over extended periods. For instance, papers like Parent et al. (2010) and Bianco & Tobin (2024) focus on conceptual frameworks and methodologies but do not indicate a longitudinal approach. Similarly, Dufour (2019) and Molecke & Pinkse (2017) discuss IM in different contexts, but do not incorporate longitudinal designs. Consequently, we know little about the process of implementing, applying and utilizing different IM frameworks and methodologies over time. This pattern is also consistent across those papers that actually perform IM such as Liao (2020) or Dube et al. (2020), indicating that the focus is often on immediate or short-term impacts.

However, some studies like Misha et al. (2022), who evaluate an integrated microfinance, health services and legal aid program over 4 years in Bangladesh through household panel data and employing a difference-in-difference approach, or Bishop (2018), who assess social, economic, and environmental impacts of a portable palm oil expeller from 1984 to 2014, do employ longitudinal methods to assess impacts over time. These are exceptions rather than the

norm. Here, the limitations of the LLM become apparent as it was able to identify these exceptions, but does not classify and count them as a contradiction. Overall, the majority of papers in the sample are either cross-sectional or use other methodologies that do not track changes over time, supporting hypothesis HIV.

HV: Papers that specifically talk about impact measurement in non-profits typically measure social impact more effortfully based on primary data from surveys, interviews and experiments while papers in a for-profit (venture) context measure social impact through more provisional and less sophisticated approaches and proxy data.

We found 16 papers supporting the hypotheses, 0 contradictions and 537 non applicable papers (Figure 9). Generally, the sample consists of 288 papers (52%) specifically addressing for-profit organizations, 69 (13%) non-profit organizations, and 196 (35%) being applicable to both contexts.

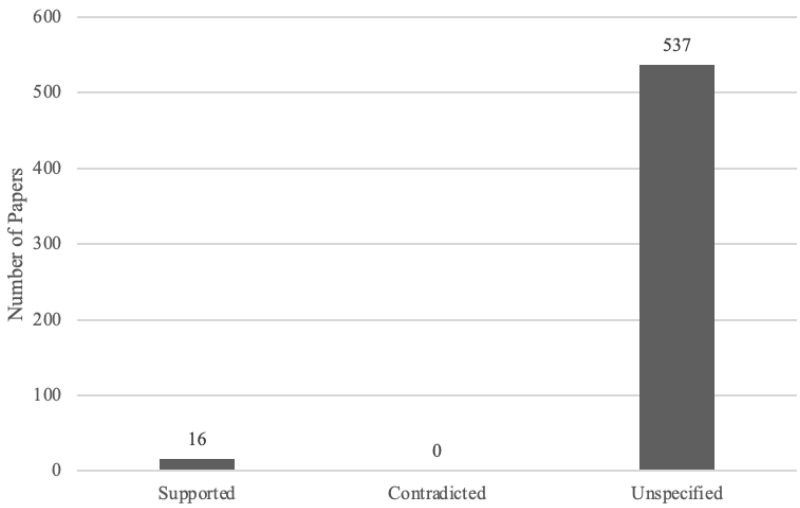

Figure 9: Result for HV, Essay I

The hypothesis tends to be supported by papers in the sample. However, 16 papers among 553 are not a strong support. Some papers focusing on non-profit organizations emphasize the use of rigorous, primary data collection methods such as surveys, interviews, and mixed-methods

approaches to measure social impact. For example, studies like Haddy et al. (2021) highlight the use of qualitative and mixed-methods in non-profit contexts to assess social outcomes. Similarly, Mason & Galloway (2021) employ a quasi-experimental design to evaluate educational interventions in Sierra Leone, again showing a detailed and primary data-driven approach.

In contrast, the papers focusing on for-profit contexts indicate less rigorous approaches. For example, Millar & Hall (2013) examine social enterprises and discuss the use of Social Return on Investment (SROI), which, despite being a recognized tool, is noted to be underused and undervalued due to practical and ideological barriers. Also, André and colleagues (2018) describe a for-profit social venture using provisional and performative metrics, suggesting that for-profit organizations often rely on less sophisticated methods for IM compared to their non-profit counterparts.

However, our sample does not provide a clear consensus on whether non-profit studies consistently measure social impact more effortfully than for-profit studies. Some for-profit studies employ sophisticated methodologies like life cycle assessments (e.g., Gess, Lorenz, Tolsdorf, & Albrecht, 2021; Rybaczewska-błażejowska, 2020) and emergy-based assessment evaluations (e.g., Pan et al., 2016; Zhang et al., 2010), suggesting that while there are trends, there isn't a strict divide in the methodological rigor between non-profit and for-profit contexts. Again, the LLM was not able to classify and count these exceptions as contradictions. Overall, the papers in the sample tend to support hypothesis V while indicating a more nuanced view.

Outcomes

The last hypothesis evolves around the organizational consequences or effects of IM.

HVI: Many papers discuss the reasons why to conduct impact measurement (e.g., in order to learn and improve impact or in order to prove and demonstrate their impact), but very few are empirically assessing the actual organizational outcomes of doing impact measurement.

We found 22 papers supporting the hypotheses, 0 contradictions and 531 non applicable papers (Figure 10).

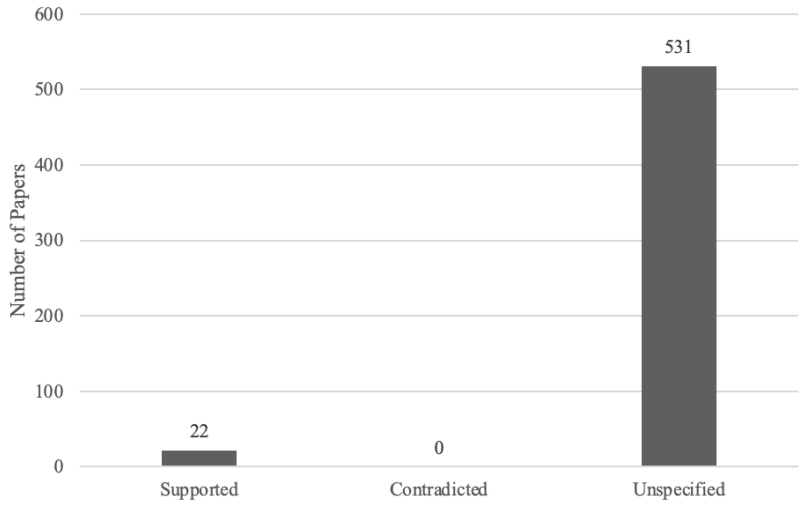

Figure 10: Result for HVI, Essay I

The distinction between the reasons why to conduct IM and the actual outcomes is difficult as the expected outcomes are the reasons why an organization starts to engage with IM. The papers in the sample, though not many, tend to support the hypothesis that while many papers look at the antecedents of or motivations behind IM (see HI) and even more at IM frameworks, tools and methodologies (see HII), there is a notable lack of empirical assessments of the actual organizational outcomes of IM, i.e., no one is answering the question whether IM really lives up to its potential and promise. For instance, Ormiston (2019) draws on practice theory to

understand the purposes of IM, but does not explore the outcomes of these measurements. Similarly, Liston-Heyes & Liu (2021) document the uptake of social IM as well as the reasons for this uptake such as context, the nature of the impact and stakeholders' involvement without assessing its impact on organizational outcomes. This pattern is consistent across many papers, indicating a significant gap in the empirical assessment of the outcomes of IM practices.

A few exceptions are identified, like Åstebro & Hoos (2021) who provide some empirical evidence demonstrating the effects of a social entrepreneurship training program on entrepreneurial activities, but it remains an exception in offering a comprehensive assessment of organizational outcomes. However, another weakness of the LLM is identified here as it is spotting and classifying other (i.e., non-organizational) outcomes as organizational outcomes, i.e., the exceptions that are identified are measuring outcomes as a form of IM (see HII) rather than assessing what kind of outcomes an organization experiences after conducting IM (what we mean with organizational outcomes). Just as above, although exceptions have been identified, they are not classified and counted as contradictions. Also, a few papers in the sample that in fact do assess organizational outcomes in terms of financial consequences have not been identified.

Despite these exceptions and the limitation of the LLM, the majority of the literature concentrates on studying the motivation or reasons for IM (HI) or on the process how to measure by developing frameworks and methodologies (HII) without providing empirical assessments of their actual impact on organizations, supporting HVI.

DISCUSSION

Our research goal is to give an overview of the vast and multidisciplinary IM literature and to uncover emerging perspectives, topics and trends in order to provide a future research agenda. Our results shed light on the reasons for IM, IM methodologies and approaches as well as the outcomes of IM. Table 7 summarizes these results and provides a future research agenda. After outlining this agenda, we conclude this paper by explaining limitations, highlighting our theoretical contribution and practical implications.

Table 7: Summary of Results and Future Research Agenda, Essay I

Hypothesis	Supported/ contradicted	Emerging perspectives	Future research agenda
HI: Measure to prove and measure to improve	Supported	• IM serves a dual purpose: proving, i.e., communicating and demonstrating impact to external stakeholders, and improving, i.e., using the results for learning and decision-making.	• What is the balance between "measure to prove" and "measure to improve" in different organizational contexts? • What factors influence whether an organization conducts IM to prove or to improve? • Are there any reasons for IM beyond proving and improving impact? • How do different motivations for IM influence the choice of certain IM approaches? • How are stakeholders involved in IM when it is used to prove impact?
HII: Researching impact measurement vs. measuring impact	Supported	• IM research deals more with discussing and developing IM methodologies rather than applying them. • To assess environmental impact, most authors utilize LCAs. • To assess social impact, most authors utilize qualitative approaches, e.g., interviews and focus group discussions.	• More concrete, hands-on applications to measure the impact of particular projects, products and organizations.
HIII: Standardization challenge in impact measurement	Supported	• A lack of standardized metrics and approaches is a key challenge in IM. • Tailoring frameworks and stakeholder-based participatory approaches are suggested as a solution.	• What other challenges persist that hinder organizations to measure their impact? • What are reasons for and against standardizing IM? • What are other approaches to solve the standardization challenge (e.g., the role of technology)

HIV: Impact measurement over time	Supported	• There is a lack in longitudinal approaches and process models in IM. • This holds particular true for those papers that discuss different frameworks, methodologies and approaches. • A few papers that actually measure impact do so over time.	• How do organizations implement and apply IM approaches over time? • What are the long-term impacts of certain projects, products and organizations?
HV: Impact measurement in for-profit and non-profit contexts	Supported	• In the non-profit context, IM tends to be more sophisticated. • In the for-profit context, IM tends to be more provisional, with exceptions being LCAs and emergy-based assessments.	• Apply research designs and methods from non-profit context to for-profit context (cross-sector learning).
HVI: Outcomes of impact measurement	Supported	• There is a lack in papers assessing organizational outcomes of IM. • Many papers address why and how to measure phases.	• What are the organizational outcomes of IM? • How do different kind of IM approaches lead to different organizational outcomes? • How can IM be utilized to inform decision-making and to monitor and manage impact?

FUTURE RESEARCH AGENDA

Building on our results, we draw a forward-looking research agenda for IM along the identified phases of reasons for IM ("why to measure"), approaches and tools ("how to measure"), and IM's organizational effects (outcomes). In particular, we spot three major gaps regarding (1) the actual application of IM methodologies; (2) longitudinal approaches and process models to understand long-term impacts and the IM implementation and refinement processes in organizations; and (3) the organizational outcomes of IM.

Regarding "why to measure", i.e., the reasons for and motivations of IM, our analysis shows that IM serves a dual purpose: proving and improving impact. Future research can uncover the balance between "measure to prove" and "measure to improve", particularly in different organizational contexts such as non-profits, for-profit ventures and traditional corporations. It

would also be interesting to understand what kind of factors are influencing the motivations for IM at different stages of a venture's life cycle, i.e., does the motivation shift from measuring to prove in order to convince stakeholders at the beginning to measuring to improve impact later on? Or does the motivation shift from measuring to improve as a venture has noble intentions at the beginning, but starts to compromise as mission-drift takes place that focuses the organization more on external accountability? Future research could also shed light on other reasons beyond proving and improving impact as an antecedent to IM. For example, does the business model and the integration of impact in it provide another explanation for the selection of a certain IM approach? As IM approaches are highly heterogeneous, it would be interesting to understand how different motivations influence the choice of certain IM methodologies. Finally, when IM is used to prove impact, how are stakeholders involved in the process of choosing IM approaches and, more importantly, in the IM itself? Answering these questions will help to widen the dichotomy of "measure to prove" vs. "measure to improve" in order to understand further nuances of IM motivations.

Regarding "how to measure", i.e., the processes, approaches, methodologies or tools to measure impact, our analysis demonstrates that IM research deals more with discussing and developing IM methodologies rather than applying them. Naturally, one implication is that we need more hands-on applications of IM methodologies to measure the de facto impact of projects, products and organizations. On the other hand, we discourage further theoretical and conceptual research to develop new IM methodologies as the major challenge is not that we have too few valid approaches, but rather that we have too many that make selection of a proper one as well as standardization difficult and therefore hinder comparability. At the same time, future research could challenge whether standardization is always required or desired or whether there are reasons against standardization in IM. For example, what are contexts in which an organization should be encouraged to tailor their IM approach vs. use a standardized

approach to reduce fragmentation and confusion while providing meaningful insights for the organizations and its stakeholders? Our analysis also introduces stakeholder-based participatory approaches as a potential solution to the standardization challenge. Future research could explore such approaches further as well as other potential solutions, incl. the role of technology in harmonizing different IM approaches. Finally, besides the standardization challenge, it is worth asking what other challenges persist that hinder organizations as well as researchers to apply IM methodologies more frequently.

Furthermore, the analysis shows a lack of longitudinal approaches, i.e., IM is rarely investigated over time. Regarding research that aims to measure impact, more longitudinal research designs are encouraged in order to understand the long-term impacts of projects, products and organizations as those can be drastically different from short-term effects. Regarding research that investigates IM approaches, methodologies or tools, it would be insightful to understand how those might change over time as well, i.e., how do the utilized IM approaches change over a venture's life cycle? Such research will uncover IM implementation challenges as well as further nuances in different IM approaches as those might not only differ due to different contexts (e.g., sector and geography) and motivations, but also due to different stages over time. Finally, we discover that research in the non-profit context tends to be a bit more sophisticated when it comes to measuring social impact. The non-profit context seems to do proper IM already for decades, but usually calls it monitoring and evaluation instead. It is important that the for-profit and impact investing sector does not reinvent the wheel, but rather takes best practices from the non-profit world and applies them to their own context. This potential for cross-sector learning is worth further exploration.

Regarding IM outcomes, i.e., the organizational consequences or effects of IM, we discover a lack of papers assessing the organizational outcomes after implementing IM. Consequently,

we recommend to further explore organizational outcomes of IM empirically, particularly in regards to the question whether and how IM actually leads to higher impact performance when used to "improve" impact, i.e., for decision-making, monitoring, managing impact. Also, it would be interesting to further understand whether and how IM actually improves stakeholder relationships, engagement and fundraising when used to "prove" impact. Future research could also explore how different kind of IM approaches (e.g., in terms of effort, standardization, formality, etc.) lead to different kind of outcomes in order to utilize IM efficiently and effectively. Answering these questions will be crucial to understand whether IM is living up to its potential and promise to prove and improve impact.

LIMITATIONS

This research has two important set of limitations. First, in the identification phase we purposefully do not include "impact investing", "CSR", and "ESG" in our search terms although we strive for a broad range and despite certainly interesting overlaps and fruitful perspectives between these fields. Second, our semi-automated and LLM-powered approach comes with strong benefits (see contribution below), but also significant limitations. For transparency, reproducibility and in the hope that some researchers build upon and improve our approach, these limitations are further explained in detail here.

The first technical limitation is about the general limitations of LLMs, particularly in regards to hallucinations, i.e., the LLM can generate responses that are either factually incorrect, nonsensical, or disconnected from the input prompt. We mitigated this risk through prompt engineering and a very low temperature parameter, i.e., the model output was forced to use only tokens that are part of the model input (i.e., the provided papers). However, while this is an effective mitigation and management strategy, it cannot entirely guarantee that hallucinations are completely prevented.

Another technical limitation is that we use hypotheses rather than open-ended questions to understand emerging perspectives, topics and trends in the research field as the purely inductive approach does not yield meaningful insights. When extracting topics from a large input of up to 100,000 tokens, GPT-4o does not provide the level of detail and tends towards the search terms as described in the methods section above. Thus, our approach needs certain domain knowledge to phrase hypotheses to be useful. A side effect is that the "out-of-the-box" thinking and surprising findings are less likely as the focus is strongly on the provided hypotheses. However, this abductive, hypothesis-led approach combines the strengths of a human expert and LLMs and thus comes with its own set of benefits regarding researcher-led guidance as well as efficiency.

Furthermore, we acknowledge that running the analysis on title and abstract only is another limitation as the full manuscripts certainly contain more relevant information. We purposefully chose title and abstract only in order to provide a very quick assessment method and because our sample tests indicate that the model output does not improve with full text due to limited context length of 128,000 tokens for GPT-4o, which results in too many batches with too few papers each. To overcome this challenge, a tailor-made retrieval-augmented-generation (RAG) pipeline is a promising approach for further experiments with full text manuscripts.

In general, we recognize that GPT-4o's classifications do not work perfectly. Examples have been mentioned in HIV, HV and HVI where GPT-4o was able to identify exceptions in its analysis and reasoning but does not classify and count them as contradictions to the hypothesis. Therefore, the quantitative assessment whether a hypothesis is supported or not, is not entirely trustworthy. Additionally, given the large sample, surprisingly few applicable papers are found as almost always more than 90% are classified as "unspecified" (see Figures 5 to 10). While this output is certainly better than GPT-4o making something up under uncertainty

("hallucinations"), it further questions the accuracy of classifications in our approach. Some of these issues can be mitigated and resolved through better prompting and improved hypothesis formulation. For example, we are relying to a certain extent on GPT-4o's "understanding" of terms like "hypothesis", "supported", "contradicted" and "not applicable" or "neutral" without defining and describing them further. Also, hypotheses should better define relative terms such as "most", "many" or "common" or avoid them entirely when each hypothesis is tested paper by paper (rather than a batch of papers simultaneously).

In response to these limitations, we strongly recommend to validate the quality of the LLM output by manually labelling the papers in the entire sample and comparing it to the classification of the model. As such a process contradicts our research goal (to analyze the breadth of a research field quickly), we did not yet perform such a labelling besides our sample tests when iterating our definitions and prompts. However, it is needed to judge the quality and accuracy and therefore credibility of our approach.

THEORETICAL CONTRIBUTION

Our literature review has two major contributions. First, it provides an overview of the IM literature by conducting the first extensive IM literature review since Rawhouser et al. (2019), but based on eight times as many papers from different research fields. We shed light on the current status of the IM literature, bring together multidisciplinary perspectives – such as those from social and sustainable entrepreneurship (e.g., Trautwein, 2021), non-profit (e.g., Pringle & Conway, 2012), development studies (e.g., Cairns, 2018), economics (e.g., Köroğlu & Yıldırım, 2023) and environmental sciences (Zhang et al., 2021), among others –and uncover emerging topics and trends in regards to why, how and with what outcomes impact is measured. We also provide a future research agenda and spot three major gaps as current research (1) focuses on developing IM methodologies rather than applying them; (2) lacks longitudinal

approaches that would help to understand long-term impacts as well as nuances in implementing and changing IM approaches over time; and (3) lacks empirical investigation of organizational outcomes of IM to understand whether IM is effective to prove and improve impact.

Second, our abductive, semi-automated, LLM-powered literature review represents a significant methodological advancement (An et al., 2024; Srivastava, 2023) to efficiently analyze a broad, multidisciplinary research field using hundreds of papers – far surpassing the scope and efficiency of traditional, non-automated systematic literature reviews. Though acknowledging that our approach might not be the best method for an in-depth assessment of the literature, its value proposition is validated in the time it took to identify, screen and analyze relevant articles from an initial sample of more than 15,000 papers. While this exercise could easily fill one to two years of a full-time researcher, we were able to conclude this research project within two full-time weeks, demonstrating an efficiency gain of up to 98%.

PRACTICAL IMPLICATIONS

Our study offers valuable insights for practitioners, as IM is highly relevant to policymakers, organizations, and their stakeholders. By exploring the diverse motivations behind the "measure to prove" and "measure to improve" classifications identified in this paper, organizations may gain fresh perspectives and renewed motivation to assess their impact. The findings also present examples of IM methodologies and approaches that can help organizations select the most appropriate tools. Stakeholders such as investors and donors, typically engaged at the end of the IM process when reviewing impact reports, can enhance their understanding of IM processes and challenges by reading this literature review, allowing them to better support the organizations they are involved with. Additionally, policymakers

may find the classifications and insights valuable, particularly as impact and sustainability reporting becomes increasingly important from a regulatory standpoint.

Finally, and more broadly, this research makes a significant contribution to both society and the environment. A data-driven approach that enables evidence-based decision-making and strategic resource allocation is essential for addressing the world's most pressing challenges in the 21st century and achieving the Sustainable Development Goals. IM serves as the key mechanism for collecting and utilizing this data, underscoring its critical importance for researchers and practitioners alike.

4.2. ESSAY II – IMPACT MEASURING IN NEW SUSTAINABLE VENTURES: A PROCESS PERSPECTIVE

Abstract: Impact measurement is crucial for new sustainable ventures to assess the extent to which they bring about sustainable development. Moving beyond impact measurement as a static activity, we develop a prospective multiple case process study to explore how and why impact measur*ing* unfolds over time. From our analysis emerges that new sustainable ventures move along three pathways—*reactive, proactive*, and *agentic impact measuring*, depending on the positioning of impact in their value proposition. Thus, we propose a novel process perspective on impact measuring, unveiling the role of agency along distinct impact measuring pathways.

Key words: Impact measurement, new sustainable ventures, process perspective

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Status: To be submitted to Business, Strategy and the Environment by end of 2024. Previous version presented at the 14th International Symposium on Process Organization Studies (PROS) in June 2023 in Chania, Crete, Greece.

INTRODUCTION

"I want to have an impact!" is a typical claim by founders of new sustainable ventures[2], pursuing the triple bottom line of economic, environmental, and social goals (Belz & Binder, 2017). An increasing number of studies started to shed light on the transition from such impact claims and well-written mission statements to concrete impact through impact measurement (IM) approaches in new sustainable ventures (e.g., Muñoz et al., 2022; Rawhouser et al., 2019). These studies illustrate that IM is a powerful tool to assess, monitor, and manage the concrete impact produced by new sustainable ventures (e.g., Beer & Micheli, 2018; van Rijn, Raab, Roosma, & Achterberg, 2021) and to tackle the grand societal challenges of our time (George et al., 2016; Gümüsay et al., 2020). Beyond its high practical relevance, scholars have recently highlighted the potential of understanding IM through empirical investigation to advance sustainable entrepreneurship theory (Anand et al., 2021; Vedula et al., 2022).

Some of these scholars argue that new sustainable ventures, generally characterized by limited resources and fast-evolving business models (Trautwein, 2021), tend to employ "bricolage" approaches to IM consisting of storytelling techniques and at hand data to show their impact to relevant stakeholders (e.g., Molecke & Pinkse, 2017). In other words, such ventures are characterized by liabilities of newness, which pose constraints on the amount of resources available and lead to provisional IM approaches (André et al., 2018). Besides and beyond these bricolage and provisional IM approached, the reality is much more nuanced. Using configurational comparative analysis, Muñoz et al. (2022) identify four approaches to IM that

[2] By focusing on new sustainable ventures, we draw on a triple bottom line perspective (Johnson & Schaltegger, 2020). Hereby, we purposefully integrate literature from social entrepreneurship, including social impact measurement, as well as literature from environmental entrepreneurship.

vary in terms of alignment with formal impact measures and methodologies, depending on distinct organizational and institutional antecedents. In so doing, this study helps us deepen our understanding of how IM approaches may vary across new sustainable ventures in a similar stage of the entrepreneurial journey.

Notwithstanding the progress of knowledge related to IM from a static perspective (e.g., Fichter et al., 2023a; Muñoz et al., 2022; Rawhouser et al., 2019), we still know surprisingly little about impact measuring, i.e., the process of "capturing and communicating valued information about the effects of social interventions" (Muñoz et al., 2022), from a process perspective. Therefore, we develop a process study (Langley et al., 2013) to provide novel empirically based knowledge on *how and why impact measuring unfolds over time*. Employing a multiple case study design (Eisenhardt, 1989), we conducted 39 interviews with founders and key stakeholders of six new sustainable ventures in Germany, and collected further information and documents within an interval of 2 years. Three distinctive impact measuring pathways emerged from our iterative data collection and analysis, including a *reactive,* a *proactive*, and an *agentic impact measuring pathway.* The new sustainable ventures moving along the three pathways differ regarding the positioning of impact in their value proposition, i.e., *impact as marginal*, *impact as relevant*, and *impact as core*, as well as regarding how they enact agency over time and by the types of IM approaches are adopted in the process.

This study makes three main contributions to the literature. First, we contribute to the literature at the intersection of IM (Muñoz et al., 2022;) and sustainable business models (Gamble et al., 2020; Dembek et al., 2022; Neesham et al., 2023; Snihur & Markman, 2023) by shedding light on how the positioning of impact in the value proposition of a new sustainable venture matters greatly for impact measuring. In so doing, we address Pinkse & colleague's (2023) recent call for further research at the intersection of impact and sustainable business models. Additionally,

we highlight that the extent to which impact is anchored in the value proposition provides a helpful construct to characterize sustainable business models and new sustainable ventures, as well as to understand how impact measuring may unfold differently over time.

Second, we contribute to the IM literature (Rawhouser et al., 2019) by developing a novel process perspective of impact measur*ing*, consisting of three distinct impact measuring pathways along which new sustainable ventures move over time by engaging in distinct impact measuring phases. The pathways are anchored in the different positions of impact in the sustainable business model and differ in the level of agency enacted as well as in the degree a new sustainable venture adopts formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches to measure their impact.

Third, we unveil that agency, i.e., the extent to which a venture transforms the structures in which it is embedded (McMullen et al., 2020), plays a relevant role in impact measuring. More specifically, our study highlights that impact measuring unfolds differently according to the extent to which new sustainable ventures engage with IM to transform current structures and practices (Battilana et al., 2009; Su et al., 2017; McMullen et al., 2020). Thus, our findings show that IM does not always represent a form of reactive compliance with regulatory demands or stakeholder requests (Nason et al., 2018). Instead, impact measuring can be agentically enacted as a form of institutional work (Pacheco et al., 2010).

BACKGROUND

IM is undertaken by new ventures as well as established organizations to understand if and how certain business activities lead to a change in economic, environmental, or social spheres (Kroeger & Weber, 2014; Micheli & Mari, 2014; Muñoz et al., 2022). We have recently witnessed an increasing scholarly interest in IM (Fichter et al., 2023; Rawhouser et al., 2019).

This increasing interest spans how IM can provide evidence of the fulfillment of impact claims in new sustainable ventures (Anand et al., 2021), how it may help assess concrete social and sustainable outcomes (Vedula et al., 2022), and thus whether and how sustainable entrepreneurship is a solution to grand challenges (Markman et al., 2019).

Despite the high relevance of IM, many studies show that its implementation takes time and effort. Some papers highlight the high ambiguity and incomparability of impact measures due to a multitude of methods, which frequently lack standardization (Ebrahim et al., 2014) and due to the uncertainty in the causal chain linking activities to attributable impact (Rawhouser et al., 2019). In particular, new ventures face challenges when engaging in impact measuring due to their liabilities of newness, resource constraints, high uncertainty, and little historic data (Trautwein, 2021). This is why new sustainable ventures tend to adopt provisional impact measures (André et al., 2018), i.e., flexibly measuring impact with temporarily requested and available data, storytelling techniques, and bricolage approaches. These approaches are easy for new sustainable ventures to adopt, but may "de facto" lead to the emergence of ambiguity regarding the actual impact created and may induce stakeholders in approximative and nebulous impact interpretations (Molecke & Pinkse, 2017).

Beyond these bricolage approaches, Muñoz et al. (2022) draw a more nuanced picture of IM, which varies in terms of alignment with formal standards and recognized IM methodologies. Other articles have shown that IM may differ across venture stages (Hwang & Powell, 2009; Moroz & Gamble, 2021), as each stage witnesses variations in IM demand from regulators and politicians (Muñoz & Kimmitt, 2019), employees (Beer & Micheli, 2017) as well as customers and investors (Cheng, Ioannou, & Serafeim, 2014; Mansouri & Momtaz, 2022). Therefore, it is surprising that little literature shows how and why impact measuring evolves over time. This is particularly true for new ventures as most studies look at larger organizations (Khizar et al.,

2022; Rawhouser et al., 2019), e.g., by using publicly available ESG ratings and data of publicly listed companies. In contrast, new sustainable ventures operate in a different context and are subjected to other types of sustainability reporting requirements, different intrinsic motives, and extrinsic requests (Trautwein, 2021). Therefore, their approaches to impact measuring may differ significantly from those adopted by larger organizations.

Consequently, in this study, we aim at unpacking *how* new sustainable ventures engage in impact measuring over time. Such process perspective holds the potential to uncover not only the dynamic events unfolding over time during the impact measuring journey, how such events may differ across new sustainable ventures, and how stakeholders may interact with various IM approaches, but also the triggers of the impact measuring journey, i.e., *why* different IM approaches may evolve. In the following, we describe our methodology.

METHOD

To explore how new sustainable ventures engage in impact measuring over time and why they do so, we adopted an inductive approach. Following the tenets of grounded theory (Glaser & Strauss, 1967), we developed a multiple case study (Eisenhardt, 1989; Yin, 2018) to investigate how new sustainable ventures measure impact over time and why.

RESEARCH SETTING

The context of our study is Germany, which provides favorable conditions for new sustainable ventures. According to the "Green Startup Monitor" 35% of all German startups in 2022 may be categorized as new sustainable ventures (Fichter et al., 2023b). Since the ratification of the Sustainable Development Goals on a national level, the German government has put a special emphasis on sustainable transformation, by implementing policies and initiatives to support new sustainable ventures through grants, funding programs, incubators, accelerators, research,

development tax incentives, and government-backed loan programs. In general, new sustainable products and services are in high demand in Germany. In addition, impact investing, which expects positive social and environmental impacts alongside financial returns, has grown to 38,9 billion Euros in Germany in 2022 (Bernard-Rau et al., 2022). For these reasons, new sustainable ventures in Germany are increasingly engaging with impact measuring challenges and opportunities, which makes Germany a fruitful context for our study.

SAMPLING APPROACH

In our multiple case study, we followed a two-step sampling approach, moving from purposeful sampling to theoretical sampling (Patton, 2014). In the first step, we employed purposeful sampling, by selecting three information-rich cases of new sustainable ventures in Germany. We followed prior research on new venture creation and included ventures that: 1) were eight years old or less (e.g., Fauchart & Gruber, 2011; McDougall, Covin, Robinson, & Herron, 1994), 2) explicitly addressed a Sustainable Development Goal, and 3) started with impact measuring. More specifically, we chose SocialRenovation, GreenMobility, and PlasticCompensation.[3] SocialRenovation offers barrier-free renovations of bathrooms for care-depended people in Germany (e.g., by converting the bathtub into a shower). GreenMobility provides sustainable e-cargo bikes for logistics in urban areas. PlasticCompensation offers a service to offset the plastic footprint of individuals and businesses by collecting plastic waste with partners in the Global South. At the outset of our prospective study, the three selected new sustainable ventures sought money from impact investors, an incentive to introduce and develop IM.

[3] For anonymity reasons, all venture and personal names in this paper have been changed by the authors.

In the second step, we employed a theoretical sampling approach based on our emerging theoretical insights (Eisenhardt, 1989; Glaser & Strauss, 1967; Patton, 2014). One of the initial findings from the first three cases was that the positioning of impact in the value proposition, which we call as *marginal, relevant,* or *core*, is crucial for introducing and developing IM in new sustainable ventures. This became the basis for subsequent theoretical sampling. To confirm or disconfirm our initial findings and to support constant comparison as a theory-sharpening analysis process (Eisenhardt, 1989; Patton, 2014), we selected three additional cases of new sustainable ventures in Germany, where impact plays either a *relevant* or *core* role in the value proposition. More specifically, we chose DigitalCare, BioPackaging, and WasteCollection as information-rich cases to delve deeper into how impact measuring unfolds over time. DigitalCare provides intelligent continence solutions based on digital sensors and an app for caretakers. BioPacking produces and sells sustainable packaging. WasteCollection offers the service of plastic offsets by collecting ocean-bound plastics. Table 8 provides an overview of the six selected cases and data collected.

Table 8: Case Descriptions and Data Collected, Essay II

Case	Case description	Data collected
Social Renovation	Barrier-free renovations for care-depended people	• 6 interviews (2x founder & CEO, 1x COO, 1x business angel, 1x strategic partner, 1x investor) • 62 pages of internal documents (Pitchdeck, business plan, cooperation contracts) • 178 pages of publicly available information (press releases of investment rounds and partnerships, homepage, social media)
Green Mobility	Sustainable e-cargobikes	• 11 interviews (3x CEO, 3x employees, 1x consultant, 2x investors, 1x customer, 1x sales partner) • 40 pages of internal documents (Pitchdeck, salesdeck, company presentations, calculations about impact) • 210 pages of publicly available information (press releases about investment rounds and partnerships, homepage, social media)

Plastic Compensation	Collection and processing of plastic waste through plastic credit system	• 10 interviews (4x co-founder & CEO, 2x co-founder & CPO, 1x co-founder & CTO, 1x co-founder & CMO, 1x employee, 1x business angel) • 148 pages of internal documents (Business plan, pitchdecks, marketing and sales documents, internal photos) • 277 pages of publicly available information (press releases about investment rounds and partnerships, homepage, social media, crowdfunding webpage)
Digital Care	Intelligent incontinence solutions	• 4 interviews (1x CEO, 1x COO, 1x external researcher involved in IM, 1x customer) • 190 pages of publicly available information (homepage, social media, press releases, articles)
Bio Packaging	Sustainable packaging made of grains	• 3 interviews (1x founder & CEO, 1x customer, 1x investor) • 13 pages of internal documents (Pitchdeck) • 183 pages of publicly available information (homepage, social media, press releases, articles)
Waste Collection	Collection and processing of ocean-bound plastic through a plastic credit system	• 5 interviews (1x founder & CEO, 1x Head of Impact, 1x Entrepreneur in Residence, 2x customer) • 662 pages of publicly available information (homepage, social media, press releases, articles)

DATA COLLECTION

To explore how new sustainable ventures engage in impact measuring over time and why they do so, we collected empirical data during a time period of two years, from September 2021 until October 2023. Drawing on the guidelines for developing process theory by Van de Ven (2007), we defined a starting and end point for our empirical inquiry. More specifically, we started our investigation by considering the moment in which the selected new sustainable ventures started showing at least some degree of impact awareness. This allowed our first interesting finding to emerge, i.e., how salient the positioning of impact was in their value proposition at the beginning of the impact measuring journey and how this could lead to relevant consequences in terms of impact measuring. Finally, we established the production of concrete impact measures in each new sustainable venture as end point of our empirical inquiry, as this allowed us to reach theoretical saturation (Eisenhardt, 2021).

As proposed by Davidsson and Gruenhagen (2020), we combined prospective and retrospective data collection. To (re-)construct the process of impact measuring in the six selected cases, we relied on interviews, internal documents, and publicly available data. First, we conducted open, semi-structured interviews with the (co-)founders on the past, present, and future of impact measuring in their new sustainable venture. We prompted them and asked about key events, triggers, approaches, and outcomes relating to IM. We also interviewed employees, investors, customers, sales partners, and consultants to broaden and deepen our understanding on how impact measuring evolved in each new sustainable venture. In sum, we conducted 39 open, semi-structured interviews, which lasted 30 minutes on average. All interviews were recorded and transcribed verbatim, resulting in 268 single spaced pages of transcript (Arial, font 12).

Second, to achieve an in-depth, contextually rich, and holistic understanding of impact measuring, we triangulated the interview data with internal documents, such as pitch decks for investors, sales decks, business plans, cooperation contracts, company and product presentations, and impact calculations. In total, we collected 263 pages of internal documents related to impact measuring.

Finally, we collected 1700 pages of publicly available information on IM, provided and communicated by the new sustainable ventures via their homepages, social media such as LinkedIn, and press releases relating to investment rounds, and partnerships. The data triangulation ensured methodological rigor and enhanced the internal validity of our study.

DATA ANALYSIS

In our analysis, we employed an open and iterative approach guided by our emerging insights (Glaser & Strauss, 1967). In the first step, we conducted a thorough within-case analysis as

suggested by Eisenhardt (1989). We developed a summary and a chronological list of events, activities, and milestones (Cloutier & Ravasi, 2021) relating impact measuring for each case, following a visual mapping strategy (Langley, 1999). Furthermore, we employed temporal bracketing, i.e., the decomposition of the time scale into successive periods, to analyze the empirical data from a process perspective (Langley, 1999).

In the second step, we conducted a systematic cross-case analysis (Eisenhardt, 1989) to search for common patterns, similarities, and differences relating to how the new sustainable venture engage in measuring impact over time. One of the first insights was that the emerging IM approaches varied significantly across the new sustainable ventures depending on the positioning of impact in their value proposition. Following up this interesting insight, we analyzed how different IM approaches evolved over time. This led to the emergence of three impact measuring pathways characterized by different levels of agency enacted by the new sustainable ventures and different ways of measuring impact.

The data analysis was interwoven with data collection from the very beginning to generate more focused follow-up data collections in an iterative way (Miles et al., 2018). Through several rounds of inductive coding in MAXQDA, we moved from informant-based first-order codes to more abstract themes and categories (Gioia et al., 2013) as visualized in our data structure in Table 9. Based on this data structure, we engaged in iterative cycles of theorizing, triangulating with existing literature and visualizing the relationships between the identified codes, themes and aggregated dimensions by means of data displays (Cloutier & Ravasi, 2021). In the following section, we highlight our findings.

Table 9: Data Structure, Essay II

First order categories	Second order themes	Aggregate dimensions
A. Impact as minimal part of the value proposition B. Impact as negligible for customers	1. Impact as marginal	I. Positioning of impact in the value proposition
C. Impact as integral part of the value proposition D. Impact as added value for customer	2. Impact as relevant	
E. Impact as dominant part of the value proposition F. Impact as the service for customer	3. Impact as core	
G. Being unaware of potential impact monetization opportunities H. Prioritizing non-impact related monetization opportunities	4. Neglecting impact monetization opportunities	II. Reactive impact measuring pathway
I. Receiving explicit impact measurement requests from investors J. Working on impact measurement only after being triggered by investors	5. Conforming to impact measurement demand	
K. Using data at hand for impact measurement L. Using qualitative data for impact measurement	6. Bricolaging ad-hoc impact measurement	
M. Discovering an opportunity to raise funding through impact N. Discovering an opportunity to increase sales through impact	7. Discovering impact monetization opportunities	III. Proactive impact measuring pathway
O. Not receiving impact measurement demand from investors and customers in the present P. Expecting impact measurement demand from investors and customers in the future	8. Foreseeing impact measurement demand	
Q. Advancing impact measurement through external parties R. Integrating holistic and robust impact metrics	9. Leveraging advanced impact measurement	
S. Creating an opportunity to sell impact through compensation schemes T. Creating an opportunity to raise funding through impact	10. Creating impact monetization opportunities	IV. Agentic impact measuring pathway
U. Exceeding impact measurement expectations from investors and customers V. Influencing impact measurement demand from investors and customers through radical transparency	11. Shaping impact measurement demand	
W. Creating momentum for impact measurement by conducting novel impact verification X. Establishing impact measurement toward broader impact creation along the value chain	12. Institutionalizing novel impact measurement	

FINDINGS

Interestingly, we find that the positioning of impact in the value proposition plays a relevant role for impact measuring, as it influences why and how new sustainable ventures capture and communicate impact over time. Depending on the positioning of impact in the value

proposition, our analysis suggests that new sustainable ventures move along three distinct impact measuring pathways, which we call *reactive impact measuring*, *proactive impact measuring* and *agentic impact measuring* (Figure 11). These three pathways differ in relation to 1) how new sustainable ventures engage with impact monetization opportunities, i.e., the set of external circumstances that relate to the capacity to generate monetary value from impact; 2) how they approach IM demand; and 3) how they pursue different IM approaches over time. This chapter illustrates our empirical findings. Besides the main illustrative quotes presented in the text below, further representative data can be found in the supplementary material in the annex (Table 14).

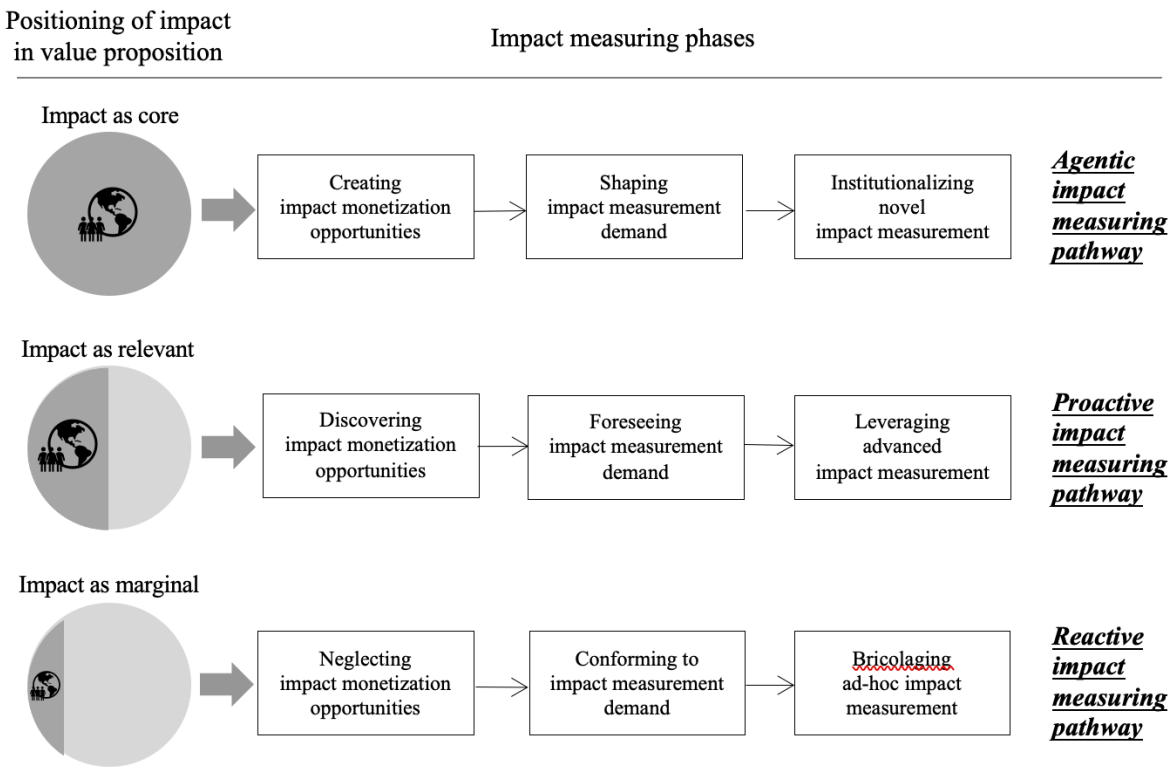

Figure 11: A Process Perspective on Impact Measuring: From the Positioning of Impact in the Value Proposition towards Impact Measuring Phases, Essay II

POSITIONING OF IMPACT IN THE VALUE PROPOSITION

We observe that the positioning of impact in the value proposition differs when comparing the new sustainable ventures in our sample. More specifically, three distinct types of impact positioning emerge from our analysis, i.e., *impact* as *marginal*, *relevant* and *core*.

Impact as marginal

Among the new sustainable ventures in our sample, SocialRenovation attributes the lowest importance to impact. In other words, we find that *(A.[4]) impact is a minimal part of the value proposition*. As the quote below shows, SocialRenovation's core value proposition is the renovated bathroom and the easy process around the renovation. Thus, the core value proposition is independent of impact:

"Our value promise to you: Services from consultation to the remodeled bathroom" (SocialRenovation, online source).

We observe that for SocialRenovation the consultation and renovation service is in itself the value proposition, as it is for numerous traditional renovation companies. While the value proposition puts emphasis on the traditional service offered, there is no specific emphasis on the impact created, as the impact component is not perceived as a competitive advantage over conventional offerings, and therefore not a real added value. In the quote below the co-founder and CEO of SocialRenovation explains that, even when starting the company, the central idea was not to create impact, but to create a smart, pragmatic solution to a customer problem:

"It had to be a company that runs online, but also one that does something more meaningful than just e-commerce or, say, lifestyle products. At some point, when we tweaked the idea

[4] The letters in parenthesis refer to the first order categories reported in Table 9

together in a 'funpreneur competition', my co-founder and I knew we just wanted to do something that solved practical problems" (SocialRenovation, co-founder & CEO, online source).

Similarly, we observe that *(B.) impact is negligible for customers,* as it does not provide a unique selling point. The value that SocialRenovations customers perceive as relevant is not the one associated with impact, but rather the operational efficiency, as dozens of customer reviews like the one below testifies:

"The employees work quickly, very precisely, with high quality and without any reworking" (SocialRenovation, customer, online source).

Impact as relevant

GreenMobility, DigitalCare and BioPackaging attribute some relevance to impact. In other words, we find *(C.) impact as integral part of the value proposition,* as the value proposition integrates and attributes equal relevance to impact and non-impact related value. This dual nature of the value proposition is evident in the way these ventures communicate their product offering, typically by showing how the embedded impact component of the value proposition provides a competitive advantage over an alternative conventional offering. For example, GreenMobility's core value proposition integrates non-impact related value, such as the ability to transport freight, as well as impact-related value, which consists in a less carbon-intensive alternative to small delivery vans. Their CEO describes this dual nature of the value proposition and how impact becomes a differentiator against alternative offerings.

"We have the product itself and we have the CO_2 reduction impact that we can advertise. This is why we believe we have the right to be seen as an impact company because we offer a massive alternative to something that causes 3-4 times as many emissions as our solution" (GreenMobility, CEO, interview).

Also, BioPackaging integrates non-impact related value in terms of packaging material that protects freight against damages. At the same time, the venture places impact as integral part of the value proposition, by putting emphasis on the role of sustainable packaging:

"Packaging with Reason. […] With our solution, we are turning agricultural waste into a reasonable organic alternative to plastic packaging" (BioPackaging, internal document).

Correspondingly, from our analysis also emerges that *(D.) impact is an added value for the customers* of GreenMobility, DigitalCare and BioPackaging. In other words, impact is perceived as part of the relevant added value created by the new sustainable ventures, particularly when compared to conventional alternative offerings:

"We are testing the product because we see the opportunity for an environmentally friendly alternative to conventional delivery vehicles" (GreenMobility, customer, online source).

Non-impact related value, however, is still perceived as relevant as well, speaking to the dual nature of the value proposition. For DigitalCare, for example, the impact value added is that patients can sleep longer without interruptions through their caregivers. Nevertheless, it is important that the product itself, the incontinence solution, works effectively:

"The [social] value proposition was also a driving force for us. But then you always have to look at whether the product also delivers what it promises" (DigitalCare, customer, interview).

Impact as core

From our analysis emerges that PlasticCompensation and WasteCollection attribute the highest importance to impact. We find that in these ventures *(E.) impact is the dominant part of the value proposition*. In other words, the core value proposition does not contain non-impact related value. For example, we witness the dominance of impact in the venture's

communication where impact itself is positioned as the value created. This is illustrated by PlasticCompensation during its funding round:

"Unique selling proposition: One-click impact" (PlasticCompensation, internal document).

Similarly, the co-founder of WasteCollection sees impact, in terms of the collected plastic waste, at the core of the value proposition:

"That the plastic waste is actually collected is the number one core value proposition" (WasteCollection, co-founder & CEO).

In the analysis, we also find that *(F.) impact is the service for the customer*, as the customer perceives impact as the main service, and does not consider any value besides or beyond the generated impact as relevant. For example, customers purchase plastic credits, which guarantee that one kilogram of plastic is removed and recycled in the Global South. This plastic removal is the impact component, the perceived value, and the service that customers pay for:

"We are a customer of WasteCollection since 2021 in order to have an impact" (Waste Collection, customer, interview).

Thus, *impact as core* demonstrates an interesting extreme positioning of impact, where impact itself becomes the service customers purchase. One of the co-founders of PlasticCompensation pointedly described this as follows:

"At the end of the day, what we provide is impact as a service" (PlasticCompensation, co-founder & CMO, interview).

IMPACT MEASURING PATHWAYS

Our data shows that the positioning of impact in the value proposition influences how new sustainable ventures engage in impact measuring over time. Depending on the type of impact positioning, our analysis shows that new sustainable ventures engage in three distinct impact measuring journeys, which we call *reactive impact measuring*, *proactive impact measuring,* and *agentic impact measuring pathways*.

Reactive impact measuring pathway

The *reactive impact measuring pathway* is followed by new sustainable ventures that position *impact as marginal* in their value proposition. We find that such ventures undergo the following impact measuring phases in a passive, conformative manner: *neglecting impact monetization opportunities, conforming to impact measurement demand,* and *bricolaging ad-hoc impact measurement*.

Neglecting impact monetization opportunities. With impact playing only a marginal role in the value proposition, we observe that new sustainable ventures undergoing the *reactive impact measuring pathway* tend to neglect impact monetization opportunities, which we define as external circumstances that relate to generating a monetary value for the created impact. Those ventures that position *impact as marginal* in their value proposition tend to *(G.) be unaware of impact monetization opportunities.* For example, one of the co-founders of SocialRenovation told us that he was not aware of the concept of impact investing and its potential for raising money:

"It was [only later] that we learned that there are so called "impact start-ups" in general and there is even an impact investor scene" (SocialRenovation, co-founder & CEO, interview).

This fits to the description of one of SocialRenovation's business angels who told us that it was him who made the co-founders aware of the impact entrepreneurship scene before the co-founders were thinking about impact and its formal relation to and opportunities for their business in the first place:

"More and more companies today are aware of a societal or ecological challenge that they want to address actively because they want to do something with impact. Here it was different. […] They just started a company and I told them they were an impact company" (SocialRenovation, business angel, interview).

Instead, we observe that SocialRenovation tends to *(H.) prioritize non-impact related monetization opportunities.* This became obvious when the founder described his daily business and how impact does not influence his core activities of fundraising, liquidity management and sales:

"I always have cash or customers or something like that on my plate when things get stressful" (SocialRenovation, co-founder & CEO, interview).

Thus, the founder succinctly concludes:

"Impact is kind of a cool topic, but in the daily business it falls behind" (SocialRenovation, co-founder & CEO, interview).

Conforming to impact measurement demand. From our analysis emerges that the second phase along the *reactive impact measuring pathway* is triggered by an explicit request from investors, or other key stakeholders, for impact information, such as impact data or reports. In other words, we find that *(I.) receiving explicit impact measurement requests from investors* provides the external trigger to engage with IM. In the case of SocialRenovation, it was an early private investor who requested the new venture to measure and report on their social impact for the first time:

"What I requested is that they commit to at least one impact indicator" (SocialRenovation, business angel, interview).

That external requests were received reactively and found the venture unprepared. This happened not only at the start, when raising money from business angels, but also in a later funding round when trying to raise money from institutional investors, as the business angel describes:

"Some institutional investors said: 'We will only invest if you can prove to us with a model how your impact journey will continue and report that exactly like you report the rest of the financial numbers in your business plan. So make a model and convince us that this model is valid'" (SocialRenovation, business angel, interview).

Consecutively, we find that ventures following the *reactive impact measuring pathway* start *(J.) working on impact measurement only after being triggered by investors.* For instance, the co-founder of SocialRenovation explains that it was the request from the business angel quoted above that made the venture consider measuring their impact in the first place:

"We were triggered by our mentor and shareholder, who was involved in the area of impact measurement. He triggered us to do this and always asked questions regarding impact" (SocialRenovation, co-founder & CEO, interview).

The passive and reactive nature of this pathway is further demonstrated when the co-founder elaborates on how the engagement with IM happens only subsequently to external pressure:

"I usually deal with IM only when it's really good for external reasons: e.g., there's a partnership right now and they want to see it that way" (SocialRenovation, co-founder & CEO, interview).

Bricolaging ad-hoc impact measurement. In the third phase, those new sustainable ventures positioning *impact as marginal* in their value proposition start bricolaging their IM. We find

that they follow ad-hoc approaches by *(K.) using data at hand for impact measurement*, i.e., they employ and recycle data that is available and easy to access. This data is not collected purposefully for IM, but is already available as a side product of other activities (e.g., marketing campaigns or operational performance metrics). For instance, after being triggered by the business angel mentioned above, SocialRenovation decided to show the scale of its impact in terms of "number of customer projects", an already available operational performance indicator. In other words, SocialRenovation recycled the pre-existing indicator "number of customer projects", and adapted it by arbitrarily multiplying it by five, as a proxy indicator of the number of years of home-living prolongment for each customer after their renovation:

"The number of renovations that we have made, multiplied by 5 years, is our core impact indicator. Which brings us to the point that we say: we have already enabled more than 10,000 years of independent living at home, which for us already carries an enormous impact" (SocialRenovation, COO, interview).

Whether this assumption of five years is correct and whether this effect can be exclusively attributed to SocialRenovation is not further investigated, and no formal data has been collected in this respect.

We also find that this bricolaged impact measuring occurs via *(L.) using qualitative data for impact measurement*. This approach consists mainly in employing quotes or pictures to capture and communicate impact through a story-telling approach. From our analysis emerges that the marketing team at SocialRenovation started using customer stories to communicate the impact of the venture by selecting and framing customer stories in an opportunistic manner:

"Otherwise, these are more qualitative topics that the team and we pick up spontaneously from time to time, so that we realize 'hey look, this is one of our user stories, he can now live at home longer' or 'this and this is his individual story and that was his problem and now it's solved'" (SocialRenovation, co-founder & CEO, interview).

An example is the following customer story that demonstrates the qualitative nature of the bricolaged approach and that does not provide much insight or proof into the generated impact:

"When Mrs. R. moved into her apartment in Berlin more than 30 years ago, she knew she had found her dream home. She has already spent many happy decades here. But at some point, the previously beneficial bath caused her difficulties. [...] Since Mrs. Rudeck has been able to shower again, she feels really comfortable in her own four walls" (SocialRenovation, online source).

Overall, the *reactive impact measuring pathway* is highly conformative in nature and results in capturing and communicating impact in a scattered and fragmented way, e.g., through at hand data, self-defined indicators, and measures not validated by third parties.

Proactive impact measuring pathway

From our analysis emerges that those new sustainable ventures that position *impact as relevant* in their value proposition tend to engage in the *proactive impact measuring pathway*. As impact is an important part in the value proposition, so is the measurement of impact. Thus, such ventures engage in IM more proactively by undergoing the following phases: *discovering an impact monetization opportunity*, *foreseeing impact measurement demand*, and *leveraging advanced impact measurement*. We describe each phase below.

Discovering impact monetization opportunities. The *proactive impact measuring pathway* starts with discovering at least one opportunity to monetize impact that is relevant for the business. While such opportunities are neglected in the *reactive impact measuring pathway*, we find that those ventures undergoing the *proactive impact measuring pathway* engage in *(M.) discovering an opportunity to raise funding through impact.*

For example, GreenMobility discovered that they could use their impact to gain better access to capital through approaching impact investors when planning a new financing round. As

traditional ways of funding were not available to the venture, they became aware that impact investors were their best chance to raise money. Their consultant describes it as follows and connects this opportunity already to the relevance of IM:

"But the bank doesn't give loans to start-ups. So, our approach was to talk to impact investors who say: 'yes, we have a nice return on a certain risk profile, but we also support the countable impact of a company.' […] And in this context, I was the one who said 'If we approach impact investors, of course, what is your impact model?'" (GreenMobility, consultant, interview).

Similarly, DigitalCare discovered that information about the generated impact of the venture could help in the acquisition of a grant, as their COO describes:

"The impact measurement concept was created for and was part of the grant application" (DigitalCare, COO, interview).

At the same time, new sustainable ventures may engage in *(N.) discovering an opportunity to increase sales through impact*. In other words, the ventures may discover an impact monetization opportunity that consists of integrating impact in their marketing or by establishing partnerships that serve as new sales channels. For example, BioPackaging discovered that measuring impact is an indispensable element when closing the deal with their target customers:

"With customers [...] if you could somehow present them that we save CO_2 compared to the previous alternative, then they would also make a checkbox" (BioPackaging, co-founder & CEO, interview).

Similarly, the DigitalCare team discovered that they might have a chance that their product gets reimbursed by health insurance companies, leading to much higher sales as their customers would get the product significantly reduced in price or even for free. However, they also discovered that it is crucial to demonstrate the impact to exploit this opportunity:

"It is extremely important for our solution to enable adequate impact measurement with corresponding endpoints in order to make it reimbursable, i.e., reimbursability by health insurers or long-term care insurers is absolutely fundamental for us, because in the end, of course, the best case scenario is that we digitize our customer and they pay nothing for it" (DigitalCare, CEO, interview).

Foreseeing impact measurement demand. During this second phase, we find that new sustainable ventures tend to adopt a forward-looking approach by envisioning future IM demand. More specifically, we find that the ventures are *(O.) not receiving impact measurement demand from investors and customers in the present*, and yet they start working on IM, as the exemplary quote of GreenMobility's CEO demonstrates:

"No one has ever asked me 'how much CO_2 do I save with your vehicle now?'" (GreenMobility, CEO, interview).

Instead, the topic is proactively pushed onto stakeholders:

"No there are no external IM expectations, we honestly carried that rather proactively into the investor circle." (DigitalCare, COO, interview).

This is based on the forward-looking attitude of the ventures as they are *(P.) expecting impact measurement demand from investors and customers in the future*, even if such demand is not explicitly verbalized yet. These expectations particularly refer to foreseeing IM demand from stakeholders that are typically connected to the impact monetization opportunity that was discovered in the previous phase as the venture anticipates that fulfilling the expected demand will be crucial to exploit such opportunity.

For example, GreenMobility expected high IM demand from the impact investors that were to be approached in the financing round. When preparing the round, and before interacting with such investors himself, the CEO described his expectations as follows:

“For hardware, it is much more difficult to find the right investors. And the ones who are interested will say ‘okay, I'm an impact investor, it's important to me because I see the impact and I'm also a bit excited about it, I want to give my money for it, so I also want to understand what do I get for it?’” (GreenMobility, CEO, interview).

In the same vein, BioPackaging expected that the requests for IM would materialize in the future. Particularly, the CEO foresees demand from impact venture capital funds that the company wants to attract during their next funding round:

"I think it's precisely those who know very little about [impact measurement] are the ones who will demand it first" (BioPackaging, co-founder & CEO, interview).

Thus, rather than passively waiting, those ventures *“stimulate the imagination” (DigitalCare, COO, interview)* of their stakeholders with impact data that are not yet requested.

Leveraging advanced impact measurement. In the final phase of the *proactive impact measuring pathway*, we find that the new sustainable ventures start moving beyond bricolage and leveraging advanced IM. They do so by *(Q.) advancing impact measurement through external parties*, which support with expertise and increase the credibility of the IM approach. For example, BioPackaging engaged researchers to bring increased expertise and credibility for IM:

"That's why we had various bachelor's and master's theses at the beginning to assess our impact. We also had some of the studies being challenged by institutes afterwards" (BioPackaging, co-founder & CEO, interview).

Involving third parties does not only help to bring in expertise and increase capacity for the topic, but also delivers much needed credibility through independent assessments, as is particularly evident in DigitalCare’s case:

"One can simply say with a clear conscience that we have surveyed people without DigitalCare telling us what we should survey. And that's how it was done with these questionnaires, that is all developed by us and they are also used and evaluated by us" (DigitalCare, external researcher, interview).

With the support by external parties, we find that the new sustainable ventures can promptly engage in *(R.) integrating holistic and robust impact metrics*. Thus, the evolving holistic IM includes several dimensions and makes use of robust, reliable and acknowledged methodologies to calculate impact indicators. For example, GreenMobility started to capture impact through a highly standardized metric ("tonnes of CO_2") that is associated with acknowledged and well comparable frameworks. Together with external consultants that helped to conduct a semi-formal life cycle analysis, the venture calculated the CO_2 contribution of their products by considering each component, its materials, its expected lifetime (according to test bench drives), and the CO_2 impact of such materials. Rather than just focusing on one part of the value chain, GreenMobility measured these emissions across the entire supply chain, focusing on *"figures, data and facts" (GreenMobility, employee, interview)*.

DigitalCare engaged in a full randomized control trial and a mixed-methods approach over two years to measure impact in a rigorous way while integrating metrics from different dimensions to assess social impact (e.g., sleep quality of patients) as well as environmental impact (e.g., reduction of plastic waste).

"We tried to define the metrics from different dimensions: [...] How does sleep quality change? Are there improvements over time? We have the number of falls as a metric. We also have a few other things that are patient-related, but a lot of it ultimately comes down to the nursing staff themselves" (DigitalCare, CEO, interview).

Overall, the *proactive impact measuring pathway* is highly forward-looking in nature and results in capturing and communicating impact in an increasingly formal, coherent, standardized, holistic and robust manner.

Agentic impact measuring pathway

The *agentic impact measuring pathway* is undertaken by new sustainable ventures that position *impact as core* in their value proposition. The central positioning of impact causes the new sustainable ventures to agentically shape their impact measuring by profoundly altering their IM structures because *"if your purpose is impact, you have to make sure that the key performance indicator is also impact" (PlasticCompensation, co-founder and CMO, interview").* From our data analysis emerges that such ventures undertake the following phases*: creating impact monetization opportunities*, *shaping impact measurement demand*, and *institutionalizing novel impact measurement*, which we describe in the following.

Creating impact monetization opportunities. The *agentic impact measuring pathway* starts with creating at least one opportunity to monetize impact. We observe that those new sustainable ventures positioning *impact as core* engage in *(S.) creating an opportunity to sell impact through compensation schemes*. In the case of PlasticCompensation and WasteCollection, plastic credits are used to give companies and individuals the chance to buy the generated impact without delivering a product or service besides this impact offering.

"PlasticCompensation offers plastic compensation for companies and consumers. For every kilogram of plastic that enters circulation, PlasticCompensation ensures that one kilogram of plastic waste is also collected and recycled in countries of the Global South" (PlasticCompensation, internal document).

Similarly, WasteCollection created an opportunity to monetize the impact directly by studying the concept of carbon credits while being aware of the plastic crisis in South-East Asia:

"The idea was, you can actually apply the concept of carbon credits to waste and say: there are those who produce this waste and […] at least they'll pay for it so that it doesn't end up in the environment. And that's why we created the platform" (WasteCollection, co-founder & CEO, interview).

We find that new sustainable ventures undertaking this pathway also engage in *(T.) creating an opportunity to raise funding through impact*, by agentically improving their conditions to get access to capital through the generated impact. For example, PlasticCompensation created a crowdfunding campaign through which crowdfunders could buy the impact (in terms of collected and recycled plastic waste) through plastic credits:

"Plastic neutrality for three months [for 8€]: On average an individual in Germany generates 16.25 kg of plastic waste in a quarter. Recover and recycle an equivalent volume of plastic waste from the environment that would otherwise end up in our water bodies or in landfills" (PlasticCompensation, online source).

Consequently, just as impact is core in the value proposition of the venture, impact was also the main communication aspect in the crowdfunding campaign, demonstrating how impact is used to create this fundraising opportunity:

"The purpose of our crowdfunding is to recover and recycle 90-160 metric tons of low value plastic in India" (PlasticCompensation, online source).

Shaping impact measurement demand. In the second phase, we find that the new sustainable ventures start shaping the IM demand by *(U.) exceeding impact measurement expectations from investors and customers*. For example, PlasticCompensation reflects on the expectations for IM from their investors and the engagement in impact measuring of their co-founders who willingly go beyond explicit expectations:

"At the moment, the business angels have low expectations in terms of impact measurement. I would say that the co-founders are pretty much the only ones who are setting the guidelines at the moment" (PlasticCompensation, co-founder & CTO, interview).

Similarly, WasteCollection willingly exceeds customer expectations regarding impact reports to build trust with the buyers of their plastic credits:

"But that customers ask for more impact information only happens in 1 out of 100 customer meetings, but in 99 of the other meetings it is good if you can say that you have already done it anyway, because it simply builds trust" (WasteCollection, co-founder & CEO, interview).

We find that this "exceeding IM expectations" is connected to the engagement in *(V.) influencing impact measurement demand from investors and customers through radical transparency.* For example, one of the co-founders of PlasticCompensation reports:

"We use technology to be as transparent as possible. And we want to provide and enable as much insight as possible into our processes and workflows" (PlasticCompensation, co-founder & CEO, interview).

Through this transparency, stakeholders receive more information than what they ask for and get insights that shape how they think about impact and the measurement of it. Interestingly, we find that the commitment to radical transparency through IM happens in the early days of business model creation and as a direct result of creating the impact monetization opportunity in the previous phase as IM is seen as an *"integral part" (PlasticCompensation, co-founder & CEO, interview)* of the business idea:

"Software we built from day 1 and this transparency theme in the collection was there from day 1" (WasteCollection, co-founder & CEO, interview).

Institutionalizing novel impact measurement. In the final phase, we observe that the new sustainable ventures walking along the *agentic impact measuring pathway* develop novel IM approaches consisting of innovative, technology-enabled, impact verification tools. In other words, such ventures engage in *(W.) creating momentum for impact measurement by conducting novel impact verification*.

Our data shows that new sustainable ventures along this pathway consider novel IM approaches that often involve technology that supports the impact data collection as well as the impact

verification process. For example, PlasticCompensation creates traction for IM by employing blockchain tools for storing and sharing impact data in a transparent, decentralized, and immutable manner:

"This data is also stored on a blockchain, i.e., it is somehow decentralized and can no longer be changed as soon as you scan it" (PlasticCompensation, co-founder & CTO, interview).

WasteCollection developed their own *"track-and-trace software" (WasteCollection, co-founder & CEO, interview)* that helps their customers to understand exactly where and when impact, that they have paid for, is created. The venture even hired a data scientist that uses machine learning methods to validate the received data points and thus verify the impact in a technology-driven approach:

"Impact verification is actually the part where we invest the most. We also have a data scientist who puts every single data point in the chain […] and our algorithm checks whether all of our social and safety are applied" (WasteCollection, co-founder & CEO, interview).

From our inductive coding emerges that the new sustainable ventures walking along this pathway engage also in *(X.) establishing impact measurement toward broader impact creation along the value chain*. By shaping the IM approaches of their partners, suppliers and customers, we witness that these venture agentically foster novel IM practices, to obtain broader impact creation also from their external stakeholders.

WasteCollection provides their IM tool to local partners in South-East Asia directly:

"What we're providing to waste managers is not only money for the collection of waste, but also a whole track and trace software app basically. So their whole operations can take place over WasteCollection, they track their operations to be more effective to make sure that every step is documented properly" (WasteCollection, entrepreneur in residence, interview).

This does not only support these partners to be more effective in their operations, but even to receive further resources to scale up their impact, as the following quote illustrates:

"One of our biggest local partners has now received funding from an impact fund because they were able to prove through our impact measurement technology that they create positive social impact and were able to build up trust with the investor through that" (WasteCollection, co-founder & CEO, interview).

Another example of how new sustainable ventures positioning *impact as core* of their value proposition can establish IM toward broader impact creation is observed in the way through which such new sustainable ventures facilitate others, particularly their customers, to create a positive impact. This is symbolized by the following statement in PlasticCompensation's sales deck:

"Be the brand that leaves a clean legacy instead of plastic waste behind!" (PlasticCompensation, internal document).

Overall, we observe that new sustainable ventures engaging in the *agentic impact measuring pathway* are creating impact beyond their own boundaries and agentically institutionalizing novel IM tools, including highly sophisticated, validated, technology-enabled, systematic and context-specific measurement instruments and verification approaches.

DISCUSSION

To understand why and how impact measuring unfolds over time, we employed a multiple case study design and collected data from six new sustainable ventures in Germany over two years. Based on our empirical analysis, we built a novel process perspective of impact measuring, including three distinct impact measuring pathways (Figure 11). In this section, we discuss our findings against the background of the literature, outlining our contributions.

THEORETICAL CONTRIBUTIONS

Our article entails three main theoretical contributions relating to 1) the positioning of impact in the value proposition and its relationship with impact measuring; 2) a novel process perspective of impact measuring consisting of three distinct pathways; and 3) the role of agency in impact measuring.

The positioning of impact in the value proposition and its relevance for impact measuring

Our findings build a bridge between the IM (e.g., Muñoz et al., 2022; Rawhouser et al., 2019) and the sustainable business model literature (e.g., Dembek et al., 2022; Gamble et al., 2020; Neesham et al., 2023; Pinkse et al., 2023; Snihur & Markman, 2023) by introducing three positionings of impact in the value proposition, i.e., *impact as marginal, impact as relevant* and *impact as core*, and by demonstrating how these help to explain how new sustainable ventures engage in impact measuring. As it is yet unclear to what extent different sustainable business models are delivering the impact they promise (Pinkse et al., 2023) because these topics have been studied separately in two different literature streams so far, our study offers an opportunity to understand the relevant relationship between sustainable business models, their outcomes and impact, and the measurement thereof (Anand et al., 2021; Vedula et al., 2022).

In particular, we distinguish among three types of impact positioning according to how central impact is anchored in the communicated value proposition of a sustainable new venture and how relevant it is for customers. These three types of impact positioning include: 1) *impact as marginal*, i.e., impact is only a minimal part of the value proposition and perceived as negligible by customers; 2) *impact as relevant*, which reflects impact as an integral part of the

value proposition and perceived as added value by customers; and 3) *impact as core*, which relates to positioning impact as the dominant part of the value proposition, and as the main service purchased by customers. These three types of impact positioning describe the extent to which impact is integrated in the value proposition and thus help characterize sustainable business models and new sustainable venture types more generally.

Drawing on existing concepts about the integration of impact and revenue logics (e.g., Ebrahim et al., 2014; Gamble et al., 2020), we propose these three types of impact positioning that emerged as discrete empirical instances from our analysis. While the integration or differentiation of impact and revenue model is undoubtedly interesting, we find that it is the integration and positioning of impact in the value proposition specifically that matters in the relationship between sustainable business models and impact measuring. Thus, we point toward a nuanced understanding of how the positioning of impact may lead to various impact measuring pathways over time. We observe that the closer impact is positioned at the center of the value proposition, when moving from *impact as marginal* to *impact as core*, the more agentically the sustainable new venture will move along its impact measuring pathway, and the more advanced, novel and sophisticated IM approaches will be produced during the impact measuring journey.

Impact measuring: A novel process perspective

Taking stock of current knowledge about IM as a rather static activity (e.g., Fichter et al., 2023a; Muñoz et al., 2022; Rawhouser et al., 2019), this study proposes a novel process perspective of impact measuring (Figure 11), consisting of three pathways, including a *reactive*, *proactive*, and an *agentic impact measuring pathway.* These pathways differ in the level of agency enacted by the new sustainable ventures over time as well as in terms of the IM approaches that evolve within the process regarding the degree to which a new sustainable

venture adopts formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches to capture and communicate the impact it generates.

The *reactive impact measuring pathway* is followed by new sustainable ventures that position *impact as marginal* in their value proposition. In the first phase of this pathway, new sustainable ventures engage in *neglecting impact monetization opportunities*, i.e., they are not aware of opportunities to generate a monetary value for the impact created. In the second phase, the new sustainable ventures receive explicit requests from stakeholders and, as a consequence, they engage in *conforming to impact measurement demand*. In the final phase, the new sustainable ventures start *bricolaging ad-hoc impact measurement*. These rather informal IM approaches include collecting and presenting impact data in a scattered and fragmented way, e.g., through at hand data, slogans, interpretations, self-defined indicators and measures not validated by third parties. In other words, new sustainable ventures "make do" impact measures to communicate their impact to stakeholders, such as business angels, while attempting to reactively conform with their explicit requests. Overall, the *reactive impact measuring pathway* is undertaken passively by new sustainable ventures displaying *impact as marginal* in the value proposition and may lead to interpretive flexibility (Nicholls, 2009), as well as ambiguity and vagueness around the real impact created by the new sustainable venture (Cornelissen, Durand, Fiss, Lammers, & Vaara, 2015; Giroux, 2006; Meyer & Höllerer, 2016).

The *proactive impact measuring pathway* is undertaken by new sustainable ventures that position *impact as relevant*. Driven by a relatively more central positioning of impact in the value proposition, new sustainable ventures engage proactively in *discovering impact monetization opportunities,* which leads to *foreseeing impact measurement demand*, before any explicit demand is expressed by stakeholders. Compared to the *reactive impact measuring pathway*, new sustainable ventures walking along this pathway are more proactive and future-

minded. They start anticipating impact measures before they encounter any explicit requests. Therefore, in the final phase, new sustainable ventures are able to engage in *leveraging advanced impact measurement*, by moving beyond bricolage (Molecke & Pinkse, 2017) and beyond provisional IM (André et al., 2018). In other words, such ventures overcome status-quo impact measures by making intentional and pro-active efforts to include holistic and robust measures, enabled by third parties. The proactive design, organization, and implementation of advanced impact measures draws on increasingly formalized IM approaches (Muñoz et al., 2022) and reduces ambiguity and vagueness.

Finally, the *agentic impact measuring pathway* applies to new sustainable ventures positioning *impact as core* of their value proposition. The pathway starts when new sustainable ventures leverage their impact for *creating impact monetization opportunities*. Contrary to the *proactive impact measuring pathway*, *IM* demand from stakeholders is not only foreseen, but agentically shaped by the new sustainable ventures walking along the *agentic impact measuring pathway*. In other words, such ventures engage in *shaping impact measurement demand* by purposefully exceeding IM expectations from investors and customers, and by engaging in radically transparent IM approaches. As a result, new sustainable ventures start *institutionalizing novel impact measurement*, by producing highly formal, standardized, externally verified approaches. Such approaches are enabled by technology to increase the efficiency and transparency in the impact measuring process and are utilized to extend impact beyond the boundaries of the venture. The *agentic impact measuring pathway* starts in the early days of venture creation as the business model is closely connected to trustworthily communicating impact. In this agentic pathway, founders and managers of new sustainable ventures intentionally go beyond stakeholder expectations, create momentum for impact measuring inside and outside their organizations, and proactively shape novel impact measures to capture and communicate their impact more effectively (Beer & Micheli, 2018; Hall et al., 2015), to

reach broader audiences (Chenhall et al., 2017; Micheli & Mari, 2014), and to proactively build political bridges (Crilly, Ni, & Jiang, 2016).

The role of agency in impact measuring

Adding upon the multiplicity and heterogeneity of IM (Muñoz et al., 2022; Rawhouser et al., 2019), we explain how new sustainable ventures engage in different impact measuring activities over time and why they do so by uncovering the role of agency. In other words, an entrepreneurial agency perspective may explain how new sustainable ventures engage in impact measuring to transform pre-existing IM structures (McMullen et al., 2020). Our study highlights that impact measuring unfolds differently along the three impact measuring pathways according to the agency level adopted in the impact measuring process (Battilana et al., 2009; Su et al., 2017).

In contrast to the *reactive impact measuring pathway*, the *agentic impact measuring pathway*, and to a certain extent also the *proactive impact measuring pathway*, do not represent a form of reactive compliance with stakeholders' requests (e.g., Nason et al., 2018) or a way to conform with normative and institutional pressures (e.g., Dubey et al., 2017), which so far is the primary reason in the literature to explain why organizations engage in IM. Instead, these two pathways are permeated by some levels of entrepreneurial agency (McMullen et al., 2020), which is leveraged by the new sustainable ventures to create and institutionalize IM by engaging stakeholders and by guiding impact measuring beyond what is immediately and explicitly demanded. In this process, the stakeholder demand is changed and shaped, not just foreseen. This agency dimension is different from intrinsic motivation (e.g., Lall, 2019; Lisi, 2018) as it explains why impact measuring unfolds in relation to foreseen or actively shaped stakeholder demand. In other words, we observe how new sustainable ventures positioning *impact as core* in their value proposition move along the *agentic impact measuring pathway*

by transcending their subordination to external pressure and demands. Thus, their impact measuring is not shaped by external IM demand. Instead, the new sustainable ventures are shaping external IM demand agentically.

Overall, new sustainable ventures on the *agentic impact measuring pathway* do not passively accept the IM norms, but create and disrupt the status quo by developing novel and innovative impact measures, which purposefully move beyond bricolage (Molecke & Pinkse, 2017). Moreover, these new sustainable ventures leverage institutional work (Lawrence et al., 2011) by embedding novel impact measures in their core business practices and culture. Consecutively, they create momentum for the newly institutionalized IM approaches by transmitting them to their customers, suppliers, and partners. Hereby, they create a broader impact along the value chain by transforming pre-existing IM approaches and structures (McMullen et al., 2020).

LIMITATIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

Our study entails some limitations. First, our process perspective is built on rich qualitative data, which allowed us to identify the three distinctive pathways along which impact measuring unfolds in new sustainable ventures, including their distinct origins, and phases. Nevertheless, we are aware of the contextual limitations of our study since we have considered exclusively new sustainable ventures based in Germany. We recognize that different contexts may lead to different perceptions of impact and of impact measuring. Thus, an investigation of how impact measuring unfolds in other settings could enrich our process perspective, by unraveling alternative pathways or by integrating different phases in the proposed pathways. We particularly encourage to further explore the influence of regulatory requirements on impact measuring. IM, and sustainability reporting generally, becomes increasingly a topic of regulatory compliance. Our model particularly applies to new sustainable ventures as the

emerging sustainability measurement and reporting standards do not apply to young and small companies. Therefore, new sustainable ventures offered us a particularly interesting case to study why and how an organization introduces IM without being legally required to do so. For more mature and larger organizations, which operate with more resources in different contexts with regulatory requirements, our model will need further refinement. Thus, we encourage future research to investigate how impact measuring may unfold within alternative time and space (Welter & Baker, 2021), and to develop testable constructs to verify our assumptions.

Second, new sustainable ventures may remodel their business model by pivoting, especially in the early stages of venture creation (Burnell, Stevenson, & Fisher, 2023). This could influence the positioning of impact in the value proposition, leading to iterative shifts in terms of impact positioning and loops in the impact measuring pathways. For example, new sustainable ventures positioning *impact as relevant* could discover the potential of issuing carbon certificates, which could become their primary revenue driver. This may lead to a shift in the impact positioning from *impact as relevant* to *impact as core*, implying that impact itself will be perceived as the service sold to customers. Due to the rapid growth of carbon credit markets, more and more business models that have impact as the core value proposition evolve in this ecosystem (Corbett & Montgomery, 2017). In such instances, we would expect that the new sustainable venture shifting from one impact positioning to another may adapt its impact measuring and jump from one pathway to another. We encourage further process research to understand how impact measuring may change due to business remodeling and pivoting.

Third, we speculate that the positioning of impact in the value proposition of a sustainable business model has the potential to inform and explain other processes and phenomena besides and beyond impact measuring in the sustainable entrepreneurship literature, such as developing venture ideas (Muñoz & Dimov, 2015), marketing products on social-benefit markets (Corbett

& Montgomery, 2017), access to funding (Mansouri & Momtaz, 2022), type of investors targeted (Block, Hirschmann, & Fisch, 2021), pricing (Flatten, Engelen, Möller, & Brettel, 2015) or pivoting (Burnell et al., 2023).

Finally, while we explored the why and how of impact measuring, we encourage further research to look at its consequences. For example, what are the consequences for legitimacy, fundraising and sales when new sustainable ventures move along distinct impact measuring pathways? And what outcomes do we observe in terms of fulfilling the sustainability potential of a new sustainable venture when different IM approaches are employed, i.e., does impact become more manageable and scalable once a venture undertakes agentic and advanced forms of impact measuring? We believe these questions provide fruitful avenues to interesting and practically relevant research.

PRACTICAL IMPLICATIONS AND CONCLUDING REMARKS

This study entails relevant implications for practitioners, especially for new sustainable ventures. Our findings regarding the positioning of impact in the value proposition might stimulate entrepreneurs to reflect on their business models and inspire pivots to move impact toward the center of their value proposition to generate additional value and revenues through impact creation. Also, the three impact measuring pathways emerging from our study provide guidance to new sustainable ventures about how to effectively and promptly develop their impact measuring processes over time, considering internal and external requirements and expectations. Finally, we hope our study will stimulate interesting research on impact measuring across time and space.

4.3. ESSAY III – IMPACT MEASUREMENT AS AGENTIC ACTIVITY TOWARD SUSTAINABLE DEVELOPMENT

Abstract: Despite the promise entrepreneurship holds to foster sustainable development, surprisingly little is known about the actual outcomes and impacts of sustainable ventures. Through an explorative case study design conducted in Germany, we shed light on how different impact measurement (hereafter: IM) activities are characterized, and what kind of outcomes they have on organizational and societal levels. From our inductive coding a novel typology of IM activities emerged based on their level of agency and formaliy, including *IM as fragmented frame*, *IM as aggregation* and *IM as bridge*. Drawing on this typology, we propose a new theoretical framework of IM as agentic activity toward sustainable development. This framework highlights how distinct IM activities lead to different consequences in terms of legitimacy, impact monetization and exploitation of sustainability potential. Taking these outcomes together, we characterize three distinct sustainable venture types based on the role impact plays in their context and business model as the result of the different IM activities: *impact as bonus, impact as added value, impact as a service*. Our findings entail important theoretical contributions at the juncture of IM, sustainable entrepreneurship, and agency, as well as guidelines for practitioners.

Key words: Impact measurement, sustainable entrepreneurship, formality, agency, legitimacy

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Status: Presented at 2023 Academy of Management Annual Meeting in August 2023 in Boston, Massachusetts, USA.

INTRODUCTION

In recent decades, sustainable entrepreneurship has witnessed an increasing recognition as a tool to tackle the most pressing grand societal challenges of our planet (Vedula et al., 2022). Nevertheless, to fulfill its potential and truly reach sustainable development, it is crucial for new sustainable ventures to wisely manage and constantly enhance their economic, societal and environmental impact (Maas & Liket, 2011; Rawhouser et al., 2019). To do so, sustainable ventures may leverage their impact measurement (IM) activities, which play a central role considering that what gets measured can also be managed.

Despite the potential of sustainable entrepreneurship to lead the transition toward a better future, the literature on IM is still in its infancy (Anand et al., 2021; Rawhouser et al., 2019; Wry & Haugh, 2018). Notwithstanding the multitude of different IM approaches (Maas & Liket, 2011; Rawhouser et al., 2019), prior studies have highlighted how sustainable ventures often neglect formal approaches and rather use at-hand data in "bricolaged" IM activities (Molecke & Pinkse, 2017). In a most recent study, Muñoz, Gamble, & Beer (2022) draw a more nuanced picture by providing a new configurational overview of IM activities with different formality levels. However, an overall theoretical framework of IM activities and their outcomes is still missing, which calls for further research (Vedula et al. 2022). Consequently, we are asking the following research questions: *How can different IM activities be characterized? What are the outcomes of different IM activities?*

To address these questions, we built an explorative, multiple case study (Eisenhardt, 1989) and conducted over 27 interviews with founders of three new sustainable ventures in Germany, as well as with investors and other stakeholders. Our iterative data collection and analysis yielded interesting results. We answer our first research question by introducing three types of IM activities: *IM as fragmented frame, IM as aggregation* and *IM as bridge*. These types of IM

activities differ in terms of their formality, i.e., the extent to which a sustainable venture utilizes formal standards, frameworks and methodologies as well as external impact verification. Furthermore, the distinct types of IM activities differ also in terms of agency, i.e., the extent to which the IM activities are developed proactively (in contrast to reactively) by a sustainable venture to interact with and engage stakeholders. Our second research question is answered by observing distinct outcomes for these different IM activities in regards to the legitimacy of IM activities, impact monetization and the exploitation of sustainability potential. Based on these outcomes, we characterize three distinct venture types considering the role impact plays in their context and business model: *impact as bonus, impact as added value, impact as a service*. We summarize these findings into a new theoretical framework of IM as agentic activity toward sustainable development.

Through this novel typology and promising theoretical framework, this paper sheds light on dimensions and nuances of different IM activities in new sustainable ventures (e.g., Muñoz et al., 2022) and their concrete organizational and societal outcomes (e.g., Mansouri & Momtaz, 2022; Parker et al., 2019). In doing so, our study contributes to the IM literature (e.g., Rawhouser et al., 2019), while bridging conversations relating legitimacy (e.g., Fisher, Kuratko, Bloodgood, & Hornsby, 2017), agency (Lawrence et al., 2011) and business model innovations in sustainable entrepreneurship (e.g., Corbett & Montgomery, 2017; Gamble et al., 2020).

BACKGROUND

IMPACT MEASUREMENT: WHAT IT IS, AND WHY IT IS SO HARD TO THEORIZE ABOUT IT

IM refers to the activities of "capturing and communicating valued information about the effects of social interventions" (Muñoz et al., 2022). Such activities are undertaken by new as well as more established ventures to understand if and how a certain intervention or business process leads to a change in the economic, environmental or social sphere (Kroeger & Weber, 2014; Micheli & Mari, 2014; Muñoz et al., 2022). In recent years, we have witnessed an increasing scholarly interest toward IM as such activities may help to assess the extent to which an organization produces concrete social and sustainable outcomes (Anand et al., 2021; Vedula et al., 2022), and have high practical implications for business organizations (Ebrahim & Rangan, 2014).

Despite the high theoretical and practical relevance of IM activities for tackling complex, multidimensional and interrelated societal challenges and reaching the transition toward sustainable development (Saebi et al., 2019; Stevens, Moray, & Bruneel, 2015), the literature on IM is still fragmented. More specifically, an overall framework of different IM activities that ventures undertake and their consequences for the enacting venture and the broader society could help to develop meaningful IM theory in novel directions and lead to actionable tools for practitioners and business organizations. Rawhouser, Cummings, & Newbert (2019) have started providing coherence among the burgeoning conversations on IM and organizing them in a typology according to "the stage in the social impact process (activity vs. outcome) and the generalizability of the application (multisector vs. single sector)" (p. 87). This conceptualization provides a first roadmap toward a comprehensive understanding of IM and its role to reach sustainable development. However, a more fine-grained theoretical

understanding of the types of IM activities undertaken by new ventures and their concrete, measurable outcomes for the broader society is still missing to date.

The reason why theorizing about IM is so hard is that a multiplicity of approaches to IM exists across contexts, industries and cultures (Muñoz et al., 2022; Rawhouser et al., 2019), each of these approaches is adopted by business organizations either reactively to adapt toward increasing normative pressure (Arvidson & Lyon, 2014; Dubey et al., 2017; Molecke & Pinkse, 2017) or proactively to produce higher societal impact toward rigorous and measurable action frameworks (Beer & Micheli, 2018; Keevers et al., 2012). Different approaches are enacted distinctively by different types of organizations, depending on the type of institutional pressure and organizational capacity (Muñoz et al., 2022). In particular, new ventures face the greatest challenges when engaging in IM activities due to their liability of newness, high resource limitations, high uncertainty and little historic data (Trautwein, 2021). Some papers highlight other types of challenges for new sustainable ventures engaging in IM activities, such as high ambiguity and incomparability due to a multitude of methods and measures with limited standardization (Ebrahim et al., 2014) and high uncertainty in the causal chain linking activities to attributable impact (Rawhouser et al., 2019). This is why new sustainable ventures often engage in provisional and performative IM activities (André et al., 2018) and "bricolaged" approaches through at-hand data that does not comply with formal measures or methodologies and leaves their stakeholders to interpret the impact for themselves (Molecke & Pinkse, 2017).

Beyond these bricolaged approaches, Muñoz et al. (2022) provide a new configurational overview of IM activities by introducing the concept of "IM formalization" ranging from lower to higher levels of IM formalization for new ventures aiming at engaging increasing numbers of stakeholders "through transparent reporting to reduce capital constraints" (Munoz et al. 2022, p. 301). Drawing on this study, we investigate different IM activities of new sustainable

ventures in regards to their formality as well as the consequences of such different activities for the organization, its stakeholders and the broader society.

THE OUTCOMES OF IMPACT MEASUREMENT

IM activities are typically utilized to meet accountability expectations (Molecke & Pinkse, 2017) and to increase legitimacy and trust (Lall, 2019; Nicholls, 2009; Nicholls, 2010). This relates particularly to communicating impact to funders to secure resources (Arvidson & Lyon, 2014; Thomson, 2010). For example, Déjean, Gond, & Leca (2004) find that measurement of socially responsible investments helped to better communicate, gain legitimacy and build higher trust with stakeholders. IM activities are also conducive to better forms of social organization governance (Mair, Mayer, & Lutz, 2015), improved operational performance (Beer & Micheli, 2018; Ormiston & Seymour, 2011), and increased employees intrinsic motivation (Beer & Micheli, 2017). In line with the theme of the Academy of Management Annual Meeting 2023, IM activities allow to communicate if the goals and the mission employees signed up for are reached (Beer, Micheli, & Besharov, 2022), how and to what extent, creating higher organizational legitimacy for internal stakeholders, i.e., reaching the aim to put "the Worker Front and Center", as well as for external stakeholders.

Despite the promise of IM activities to create broader organizational legitimacy, "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed systems of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574), most of the literature focuses on the financial consequences of IM. For instance, Parker, Gamble, Moroz, & Branzei (2019) show a short-term growth slowdown, particularly for younger companies after the acquisition of a B corp certification as a recognized form of formal IM with external validation. Some other papers show how demonstrating sustainability impact is associated with significantly lower capital constraints (Cheng et al., 2014), positive

returns (Grewal et al., 2019), optimistic investment recommendations (Ioannou & Serafeim, 2015) and higher company valuations (Mansouri & Momtaz, 2022). However, the majority of such studies looks at more established and larger organizations, e.g., by using publicly available ESG ratings and financial returns of publicly listed companies. In contrast to that, new sustainable ventures operate in a very different context, and are subjected to other types of regulatory sustainability reporting requirements, as well as to different intrinsic motives and extrinsic challenges (Trautwein, 2021). Therefore, it is likely that their IM activities and outcomes are significantly different compared to those adopted by larger organizations.

The studies above show increasing interest for the concrete outcomes of IM activities for organizational performance and perceived legitimacy, but the outcomes of distinct IM activities for new sustainable ventures remain hidden. In our study, we explore how new sustainable ventures adopt distinctive measurement approaches to reach various types of organizational outcomes, and beyond the organization, broader types of outcomes for the society and the environment where they operate. In the following, we describe our methodology.

METHOD

RESEARCH SETTING

The context of our study is the main capital of Germany, which has a vibrant start-up scene oriented towards sustainable development. The sustainable start-up scene in Berlin and its entrepreneurial ecosystem consists of: a large number of new sustainable ventures, which are founded in Berlin each year; knowledge and innovation clusters (e.g., Climate KIC); impact hubs (e.g., Impact Hub Berlin); sustainable networks and associations (e.g., Social Entrepreneurship Network Germany); and impact investing (e.g., Federal Initiative Impact Investing), among others.

RESEARCH DESIGN

Given the explorative nature of our research question, we adopted a qualitative research approach. More specifically, we conducted a multiple case study for theory building (Eisenhardt, 1989; Eisenhardt, 2021). Our theoretical sampling was based on the following criteria: First, we looked for new sustainable ventures, which we defined as publicly addressing at least one Sustainable Development Goal as announced by the United Nations. Second, we selected new sustainable ventures that actively seek funding from impact investors. We assumed that if they seek funding from impact investors, they have to show proof of evidence relating their sustainable impact. Third, we looked for new sustainable ventures with different IM approaches (e.g., in terms of use of technology, public reporting and the use of qualitative vs. quantitative indicators) in order to observe variance in IM activities and their outcomes as our twofold research question suggests. We started our data collection with a particularly interesting and illustrative case showing high levels of IM formality. Then we sampled additional ventures showing lower levels of IM formality. In total, we sampled three new sustainable ventures (Table 10).

Table 10: Case Descriptions and Data Collected, Essay III

Case	Case description	Data collected
Social Renovation	SocialRenovation helps elderly and care-depended people to stay longer in their home by organizing the complete process for barrier-free renovations, including generating a quote and choosing the right products, taking care of logistics, installation and handling all communication and paperwork with landlords, subsidy applications and insurances.	• 6 interviews (2x founder & CEO, 1x COO, 1x business angel, 1x strategic partner, 1x investor) • 62 pages of internal documents (Pitchdeck, business plan, cooperation contracts) • Publicly available information (press releases of investment rounds and partnerships, homepage, social media)

Green Mobility	GreenMobility develops, sells and leases sustainable mobility solutions, particularly an e-cargobike that combines the benefits of a car and a bike.	• 11 interviews (3x CEO, 3x employees, 1x consultant, 2x investors, 1x customer, 1x sales partner) • 40 pages of internal documents (Pitchdeck, salesdeck, company presentations, calculations about impact) • Publicly available information (press releases about investment rounds and partnerships, homepage, social media)
Plastic Compensation	PlasticCompensation offers plastic waste compensation by selling plastic credits to individuals and businesses which are generated in the Global South through their "impact partners" (waste management organizations) that collect and recycle plastic waste under fair work conditions.	• 10 interviews (4x founder & CEO, 2x co-founder & CPO, 1x co-founder & CTO, 1x co-founder & CMO, 1x employee, 1x business angel) • 148 pages of internal documents (Business plan, pitchdecks, marketing and sales documents, internal photos) • Publicly available information (press releases about investment rounds and partnerships, homepage, social media, crowdfunding webpage)

DATA COLLECTION

Data collection ran from August 2021 to October 2022. Altogether we conducted 27 semi-structured interviews (between 15 and 75 min) with the founders of these ventures as well as employees, investors, customers, sales partners and consultants. This data was triangulated with information from the ventures' homepages, social media channels, investor and sales decks, company and product presentations, impact calculations, company reports, business plans, cooperation contracts, press releases, online articles and financial models (Table 10) to achieve an in-depth, contextually rich and holistic understanding of the phenomenon and to guarantee methodological rigor. In total, we analyzed 27 interviews, 250 pages of internal documents and all publicly available information on the ventures' homepages and social media channels.

DATA ANALYSIS

The data analysis was interwoven with data collection from the very beginning in order to generate more focused follow-up data collection in an iterative way (Miles et al., 2018). Through several rounds of inductive coding in MAXQDA, we moved from informant based first order codes to more abstract themes and dimensions (Gioia et al., 2013) as visualized in our data structure in Table 11. Concept-evidence and cross-case analysis tables (Cloutier & Ravasi, 2021) facilitated within and across case analysis to discover patterns in the emerging themes and dimensions.

Table 11: Data Structure, Essay III

First-order codes	Second-order themes	Aggregated categories
• Impact measurement is based on "at-hand" data (bricolage), e.g., operational metrics • Impact is captured through self-defined indicators that are not aligned to acknowledged standards and frameworks • Impact is not externally verified by a third party • Venture passively conforms to explicit requests from key stakeholders in regards to impact measurement, e.g., business angels	*Impact measurement as fragmented frame*	Impact Measurement as "Agentic" Activity
• Impact measurement activities require intentional effort by involving consultants and assigning specific people to these activities • Impact is captured through standardized indicators and based on acknowledged methodologies • Impact is somewhat externally verified • Venture anticipates stakeholder expectations in regards to impact measurement and develops activities accordingly	*Impact measurement as aggregation*	
• Impact measurement activities involve outside experts and technological expertise • Impact is captured through an increasing number of standardized indicators and based on acknowledged methodologies • Impact is externally verified by a third party • Venture proactively develops impact measurement to exceed anticipated stakeholder expectations and makes it a strategic priority from the very beginning	*Impact measurement as bridge*	
• Some stakeholders challenge, question and disapprove impact measurement activities; others ignore it • Impact is used in communication to strengthen partnerships, but not part of the value proposition of the core product and the venture	*Impact as bonus*	Impact Measurement Outcomes

• Sustainability impact is not systematically monitored and managed and thus the venture's sustainability potential only limitly exploited	
• Stakeholder do not disapprove, but "silently approve" impact measurement activities • Impact is embedded in the products and venture's value proposition and thus a key element of acquiring investors and customers • Strategic, e.g., product design, and operational decisions, e.g., supplier selection, take sustainability impact into account based on actionable metrics	*Impact as added value*
• Stakeholders deem impact measurement important and approve the impact measurement activities of the venture • Impact itself is the product that is being sold (e.g., through certificates) and thus at the core of the business model • Sustainability impact is systematically monitored and managed and scaled beyond the boundaries of the venture itself through multiplier effects, e.g., through raising awareness for sustainability.	*Impact as a service*

FINDINGS

In this chapter, we illustrate our empirical findings by means of representative quotes. First, we introduce three types of IM activities that emerge from our empirical analysis. Then, we display the emerging outcomes of those IM activities relating legitimacy, impact monetization and the exploitation of sustainability potential.

IMPACT MEASUREMENT ACTIVITIES

From our inductive coding, three distinct IM activities emerge. We call them *IM as fragmented frame*, *IM as aggregation* and *IM as bridge*. These distinct activities differ in regards to their degree of formality and agency. With formality, we refer to the degree a sustainable venture uses formal standards, frameworks or methodologies to measure and report its impact, including the external validation and verification of those IM and the level of transparency granted into and through those measurements. With agency, we refer to the degree that the venture utilizes IM to proactively interact with and engage stakeholders. Low levels of agency mean a rather reactive interaction in which the venture develops its IM only based on explicit

requests from stakeholders. High levels of agency are reached when the venture proactively develops its IM to influence stakeholders.

IM as fragmented frame

From our explorative analysis emerges that IM activities can entail low formality and agency levels. We label this type of IM activity *IM as fragmented frame* given that it consists in capturing and communicating impact through a scattered, simply articulated and and ad-hoc disseminated frame. SocialRenovation exemplifies this type of IM activitiy. This new sustainable venture helps elderly and care-depended people to stay longer in their home by organizing the complete process for barrier-free renovations. SocialRenovation captures impact through a simple and self-defined metric ("number of years with increased life quality that customers can enjoy in their own home") that is not aligned to formal standards, frameworks and methodologies. They communicate impact through this simple and self-defined metric on its homepage, on an impact investing platform and in communication materials like pitch decks and company presentations. They are particularly targeting impact investors and strategic sales partnerships with their impact communication.

Overall, SocialRenovation adopts a **low level of formality** in its IM activities, leveraging bricolaged "make do" IM with at-hand data rather than investing resources to come up with advanced formal measurements. More specifically, SocialRenovation simply assumes that every customer can stay five more years in its apartment due to the renovation done by SocialRenovation:

"[We] measure our social impact on the basis of the number of our renovations alone, since each renovation in itself has a social impact. […] That is, the number of renovations that we have made so far, times 5 years, is the total number, which now brings us to the point that we say: we have already enabled more than 10,000 years of independent living at home, which for us already carries an enormous impact" (SocialRenovation, COO).

Hence, SocialRenovation uses at hand data (operational metric "number of renovations") and simply multiplies it by five. Whether this assumption of five years is correct and whether this effect can be exclusively attributed to SocialRenovation is not further questioned and no formal data collected in this regard. Also, no external parties support in validating and verifying these impact numbers.

Moreover, SocialRenovation shows a **low level of agency** in their IM activities, meaning that the venture reactively conforms to explicit requests from key stakeholders when it comes to developing its IM. In fact, SocialRenovation developed their IM after explicit requests from an impact-driven business angel who invested early in the venture. SocialRenovation's founder and CEO describes how this business angel demanded some form of IM early on and how this was the main reason to think about IM in the first place:

"Specifically, I think we were triggered by a mentor and also a shareholder, who was very intensively involved with [IM] himself and triggered us to do it or always asked us things" (SocialRenovation, founder & CEO).

This business angel confirms this role in the development of SocialRenovation's IM:

"And what I actually demanded is that they commit to at least writing down this KPI construct, or let's say this theory of change that they want to bring about with it, and also sign that that is part of their DNA. […] And that is also the reason why they then did [come up with an impact metric] – and I said: "only those who count and measure can also manage and whether this is now only a good business idea or whether this is also really an impactful business idea that also keeps me on board as an investor, [needs to be proven through an impact metric]"" (SocialRenovation, business angel).

IM as aggregation

We label an IM activity with increased formality and agency levels *IM as aggregation* since increasingly formal IM approaches are organized, clustered and aggregated to capture and

communicate impact in an increasingly proactive way, anticipating stakeholder expectations. Among our cases, GreenMobility emerges as employing *impact measurement as aggregation*. GreenMobility develops, sells and leases an e-cargobike that combines the benefits of a car and a bike. GreenMobility captures impact through a more formal IM methodology and increasingly standardized, not self-defined, metric ("tonnes of CO2") that is associated with acknowledged frameworks and thus well comparable. GreenMobility communicates impact in an aggregated way on their homepage and on an impact investing platform. Their communication materials like pitch and sales decks and company presentations use impact as a theme and are mainly targeting impact investors.

Overall, GreenMobility utilizes an **increased level of formality** in their IM, which required investing resources, e.g., by actively involving consultants, to go beyond a bricolaged approach. They conducted a semi-formal life cycle analysis to calculate the CO2 contribution of their products by taking into account each component, its materials, its expected lifetime (according to test bench drives) and the CO2 impact of such materials. A consultant, who supported in the process of developing GreenMobility's IM, reports:

"You just have to know exactly: So how do I get a model in the first place? Where do I get the data? So, what does an average car consume? How much does it cost to produce? How much does your car cost to produce? What is the difference of the greenhouse gas footprint of the production? How long does such a vehicle drive? How many kilometers does it drive on average? What is the greenhouse gas footprint for you? We still have to include batteries and so on. So, we have built a relatively complex model together several, Excel sheets, which finally lead to a number" (GreenMobility, consultant).

This increasingly formal CO2 impact number is not only used to be aware of the negative impact of their production and logistic processes ("footprint"), but also to argue the positive impact created during the use phase ("handprint") by calculating the CO2 reduction potential under the assumption that four GreenMobilitys replace three cars. By involving a consultant,

these assumptions and calculations were to some extent validated through an external party. However, the venture is not regularly updating its data base and not validating key assumptions (such as the replacement of three cars by four GreenMobilitys).

GreenMobility´s IM activity is further characterized by an **increased level of agency**, shown through a higher proactivity in developing their IM to interact with, engage and convince stakeholders. The venture developed its IM activity quite proactively when they were preparing their next funding round. While there were no explicit requests, GreenMobility invested in their IM activity as they were anticipating high expectations from the impact investors they were targeting as the following quote from their CEO shows:

"[For hardware] it is much more difficult to find the right investors. And the ones who [invest] say "okay, I'm an impact investor, it's important to me because I see [the impact], because I'm also a bit excited about it.... yes, I want to give my money for it." […] Yeah, there's more and more of these ESG investors and all of them are a little bit into [IM]" (GreenMobility, CEO).

Since impact investors could require such IM, GreenMobility acted proactively and even built an "impact model", i.e., a quantitative, increasingly formalized approach to measure the venture impact. From other stakeholders such as customers, GreenMobility does not anticipate high expectations and neither receives any explicit requests for impact metrics:

"No [customer] has ever asked me "how much CO2 do I save with your vehicle now?" […] "It doesn't matter who I'm talking to now […] none of them - and they are also massive fleet customers in terms of perspective - says "what exactly is the impact here?" No one!" (GreenMobility, CEO).

Overall, GreenMobility did not passively conform to explicit stakeholder requests, but rather anticipated investor expectations in regards to IM and consequently developed the IM accordingly. Thus, the IM activities are not passively shaped by the context and current

stakeholders but rather become an agentic tool for reaching out to not yet approached stakeholders.

IM as bridge

This third type of IM activity is characterized by high formality and agency levels. In other words, the IM activity tends to be used as a bridge to reach all stakeholders of the venture, in a proactive way. Among our cases, PlasticCompensation exemplifies this type of activity. PlasticCompensation offers plastic waste compensation by selling plastic credits which are generated in the Global South through their "impact partners" (waste management organizations) to individuals and businesses. PlasticCompensation captures impact by an increased number of standardized indicators that stem from formal methodologies and are associated with acknowledged frameworks and thus well comparable. PlasticCompensation communicates impact on their homepage, on an impact investing platform and in communication materials like pitch decks and company presentations. Additionally, their customers can directly access data that is stored a blockchain on their impact dashboards. Their impact communication is targeting basically all stakeholders as the venture has a strong conviction that impact is at the core of their work:

"From the very beginning, if your purpose is impact, you have to make sure that the KPI is also impact" (PlasticCompensation, co-founder & CMO).

Overall, PlasticCompensation utilizes a **high level of formality** in their IM by systematically using a higher variety of standardized indicators from formal methodologies and acknowledged frameworks, considering third party impact verification and implementing a technological solution that increases efficiency and transparency. PlasticCompensation's highly technological way of capturing and communicating impact required significant effort of the

CTO and involvement of technological experts. For example, they partnered with a waste management organization almost one year before the company got registered to receive a lot of expertise in regards to IM and reporting generally as well as the technical implementation specifically. Besides “tonnes of plastic collected” and “tonnes of plastic recycled” as main impact metrics, which are standard indicators in their sector, PlasticCompensation is working on metrics to better understand the socioeconomic effects of their interventions, particularly in regards to the quality of life of the waste workers in the Global South:

“We also get information on: who are the people involved in this project, the number of people so that that's how we get to know: Okay, this project fairly employed seven workers on ground, waste workers on ground. […] We've been talking and like brainstorming on this idea of how do we make sure that we reach out to those people who are being impacted to us all this and ask them "did this make a difference in your life or no?"” (PlasticCompensation, co-founder & CMO).

Moreover, external impact verification through the standard setter “Verra” (a formal and verry acknowledged institution in the field of sustainability standards) and its third-party validation and verification bodies was part of the business plan early on:

“All our partners must be certified under the Verra Plastic Standard and are periodically audited to monitor the social and environmental effectiveness of their operations” (PlasticCompensation, pitch deck).

Finally, the impact data is captured, stored and transmitted digitally on a blockchain:

“There is a weighing ticket at the first weighing point, there is a transport ticket, and so on and so forth, so delivery bills and so on. And all of that is recorded with this app, with this tracker, and stored in a blockchain database, which is also publicly viewable” (PlasticCompensation, founder & CEO).

As this way of handling the impact data is not manipulable, this formal approach is a very transparent and secure way of capturing impact as their CTO confirms:

"this data is also stored on a blockchain, i.e., it is somehow decentralized and can no longer be changed, so to speak, as soon as you scan it" (PlasticCompensation, co-founder & CTO).

Their IM is further characterized by a **high level of agency**, demonstrated in being highly proactive in their IM development to interact with, engage and convince stakeholders. This way, stakeholder expectations in regards to IM are anticipated through agentic behavior, and even willingly exceeded because formal IM is considered a unique selling point (USP) and is consequently made a strategic priority of the venture. PlasticCompensation developed its IM activities proactively even before the venture was operational, i.e., before it was registered and before any revenues were made. They saw IM as a foundation for the business and started thinking about it early on without and before any explicit requests from investors or other stakeholders, thus showing their proactive, agentic approach:

"The measurement of [impact] went hand in hand with [the initial business idea]" (PlasticCompensation, founder & CEO).

"But for IM it was pretty clear from the beginning that we now want to use the latest technologies" (PlasticCompensation, co-founder & CTO).

Overall, impact data is considered as *"our core, i.e., what's most valuable" (PlasticCompensation, co-founder & CPO)*. With this integral role that IM plays for the PlasticCompensation team, they were very agentic in developing it early on, without any explicit stakeholder requests and even further than the anticipated stakeholder expectations. As the following quote shows, specific requests are very rare.

"This is pure assumption, and we are like... we have three different segments of customers as well at this point. And we have to try and test. To what degree each customer also wants this impact report" (PlasticCompensation, co-founder & CMO).

Even when they talk to customers, these customers themselves do not really know what to demand from PlasticCompensation:

"But even there: rather so even they anticipate that. So I go there and want to know what they want and even they don't know 100% yet what they want" (PlasticCompensation, co-founder & CPO).

Hence, after having several conversations with potential customers, the CEO concludes:

"Out of 12 partners, only one asked how we plan to measure and report impact" (PlasticCompensation, founder & CEO).

Thus, rather than passively conforming to any expectations, PlasticCompensation developed their IM proactively based on their expectation that it will increase trust with stakeholders in the future.

OUTCOMES OF IMPACT MEASUREMENT ACTIVITIES

Our analysis further suggests distinct outcomes emerging from the above-described IM activities. We observe interesting outcomes across three categories: legitimacy of IM activities, impact monetization and exploitation of sustainability potential. With legitimacy we refer to the degree to which a venture's IM activity is aligned with and accepted by the venture's stakeholders. With impact monetization we refer to the degree that a venture generates a monetary value for the impact it creates. With exploitation of sustainability potential, we refer to the degree to which a venture optimizes its business towards sustainability impact. When these categories are considered together, impact emerges as playing three distinctive roles in the context and business model of each venture and thus three distinct venture types emerge: *impact as bonus*, *impact as added value*, *impact as a service*. We introduce them below.

Outcomes of impact measurement as fragmented frame: impact as bonus

The main outcome of *IM as fragmented frame* activities relates to *impact as bonus*, which consists in reaching low levels of legitimacy of the venture's IM activities, low impact monetization and low levels of exploiting their underlying sustainability potential. In *impact as bonus* ventures, impact, and consequently IM, does not play a key role in the context of the venture and its business model; it is just a bonus. Our representative case SocialRenovation was not even aware of its impact until their business angel explained it to them: *"They just started a company and I told them they were an impact company*" (SocialRenovation, business angel).

IM as fragmented frame produces only **low levels of legitimacy** for those IM activities. This is typically expressed by some stakeholders actively questioning and explicitly disapproving the IM activities and demanding more in regards to IM and other stakeholders who do not care much about IM activities at all and, therefore, do neither approve nor disapprove those activities because they do not even know about them. Although SocialRenovation passively conformed to some of their stakeholders' requests when coming up with their approach to IM, they still face further requests that they are currently not fulfilling. Not only is this a further example of their low agency, it also leads to dissatisfaction of those stakeholders who consequently consider the legitimacy of SocialRenovation's IM as low. The following quote of one of their business angels shows how he is demanding more information on one specific impact metric, but how the venture does not respond to those requests:

"[these effects] are not yet counted. […] That is actually a second order KPI and my great wish would be that maybe this year, at the latest, maybe next year, but actually more likely this year, to implement that" (SocialRenovation, business angel).

Similarly, he and also another institutional investor is missing more information on the greenhouse gas footprint of the venture, which is another example of how SocialRenovation's IM activities are considered incomplete by key stakeholders:

"What greenhouse gas footprint is generated in the supply chain? But that's exactly what I would have liked to have recorded, for example, what the delta would have been. But they have not done that yet. […] "what is your carbon footprint and how do you manage it?" is even a question that comes less from me and more from larger institutional investors" (SocialRenovation, business angel).

Other key stakeholders, such as customers, neither actively approve nor disapprove SocialRenovation's IM because they do not really care about it:

"Funnily enough, one would actually like to think that the customer is also involved, but for him this measurement of our impact is not really relevant" (SocialRenovation, COO).

At *impact as bonus* ventures, impact is used to strengthen partnerships, but only **little or no impact monetization** takes place. This is because the impact itself is not embedded in the product, i.e., it is not an explicit part of the value proposition. For SocialRenovation, the product they are selling are the renovations itself. There is no premium over other renovation products because of the associated impact with that particular renovation. SocialRenovation's impact is primarily used to establish new and strengthen existing partnerships through which the impact is monetized to a low degree, i.e., SocialRenovation generates low monetary value for its impact:

"What of course helps me enormously in my day-to-day work, also with this measurement, is that we position ourselves quite differently from a classic, very strongly profit-oriented company, even if the aim is to build up more and more partners. Our focus is always on driving this social impact forward. That also makes it much, much easier to enter into potential collaborations" (SocialRenovation, COO).

Additionally, some impact monetization took place by acquiring one impact investor as an early-stage business angel. However, the majority of the company's shares are held by venture capitalist and pension funds which have a more traditional approach to investing. Thus, we argue that SocialRenovation has low levels of impact monetization in terms of how the created impact is "sold" to investors as well as customers or partners.

As an *impact as bonus* venture, SocialRenovation **exploits its sustainability potential only to a little extent**, i.e., it does only marginally fulfil its potential to achieve sustainability impact through its IM activities. This is because no ongoing formal monitoring takes place and thus the sustainability impact cannot be accurately managed, e.g., by making strategic and operational decisions based on impact metrics. By calculating their most important sustainability metric "number of years with increased life quality that customers can enjoy in their own home" just based on a constant factor, the exploitation of their sustainability potential cannot be as well understood as if they would more formally and regularly track how long their customers can actually stay longer in their homes. They cannot understand, for example, whether certain renovations have more impact than others by increasing the number of years their customers can stay in their home. Overall, SocialRenovation is not exploiting its sustainability potential strongly because neither is the impact monitored regularly nor are the metrics suitable to take informed decisions to improve SocialRenovations sustainability performance.

Outcomes of impact measurement as aggregation: impact as added value

The main outcome of *IM as aggregation* activities relates to *impact as added value*, which consists in reaching increased levels of legitimacy of the venture's IM activities, increased impact monetization and increased exploitation of the underlying sustainability potential. In *impact as added value* ventures, impact does play a key role in the context of the venture and

its business model; it is a real added value and is as such part of the venture's value proposition when compared to the competition. As the quote below shows, GreenMobility has sustainability impact deeply engrained in their mission and business model as we will explain the sections below:

"And so you have to decide: what do you really want? Do you really want to just greenwash or do you want to work honestly on sustainability? And I think that's where we are very clearly positioned" (GreenMobility, employee).

IM as aggregation produces **increased levels of legitimacy** for those IM activities. This is typically expressed by few or no stakeholders explicitly disapproving IM activities, but also not many explicitly approving these activities as these stakeholders are either not aware of the IM activities or they assess them as less relevant. GreenMobility did neither receive harsh disapproval nor a lot of approval from their stakeholders for their IM activities. One of their customers, generally approves the current IM activities, but for the future he envisions that GreenMobility can shed even more light onto other impact metrics, e.g., child labor in the supply chain, in order to protect their customers from scandals. Thus, for the current status, the IM activities are considered legitimate, but at the same time an expectation is raised that it might not be sufficient for the future:

"In sustainability and all these issues, it's all useless if we don't have the backup of the data. […] So, if there should come out, let's say, a scandal "GreenMobility uses child labor" or whatever should come out, of course we don't need that. So we do expect [more transparency on impact]" (GreenMobility, customer).

Overall, their stakeholders seem to silently approve of GreenMobility's IM activities as there are no explicit requests to do more. At the same time, these measurements are also not considered as the most relevant thing which means that also little explicit approval takes place. Another investor of GreenMobility summarizes the general perception well:

"To be honest: everyone understands even without numbers that it is good to replace a diesel van with an electric bicycle. And the meaning behind the figures is still quite difficult to grasp for a lot of people. So what is how much CO_2?" (GreenMobility, investor).

Consequently, GreenMobilitys IM activities are approved to that extend that they are not further questioned. The same investor states that *"the right measurements can really convince us" (GreenMobility, investor)*. Since they invested, they apparently considered GreenMobilitys IM as rather legitimate.

At *impact as added value* ventures, impact is embedded in the product's value proposition. Additionally, impact investors are the main target investors for these kinds of ventures. Thus, **increased impact monetization** is observable. For GreenMobility, the CO2-emission reduction is clearly part of the value proposition and thus communicated strongly:

"So, what can we promote? We have the product and we have the change that we can promote with our product. And that's why we believe as a company we have a right to be seen as an impact company here, because we offer a massive alternative to something that today even with the e-car still costs 3x as much or 4x as much CO2 emissions as if they do it by bike" (GreenMobility, CEO).

Their typical comparison is to a minivan which offers a similar value proposition in terms of transporting goods, but one of GreenMobility's repeatedly communicated advantages is being *"emission-free, environmentally-friendly and CO2-efficient" (GreenMobility, company presentation)*. Consequently, this impact is "sold" to GreenMobility's customers who might care about these impact attributes:

"Above all the sustainability commissioners are the customers. And not the normal procurement department. At some point, we found out that we don't have to charge the procurement department, which is always looking for the last cent. And that they are not the buyers who would buy our theme or our product. It's the sustainability department, independent of the procurement department" (GreenMobility, investor).

Additionally, GreenMobility closed a funding round in May 2022 with an impact investor who confirms that *"[impact] is the heart and soul of our investment fund" (GreenMobility, investor)*. Consequently, this investment can be considered as impact monetization as well since this money would have not been available to them if GreenMobility would not be a sustainable venture.

At *impact as added value* ventures, the **sustainability potential is increasingly exploited**. Typically, this is enabled through metrics that are more actionable than the ones in *impact as bonus* ventures and can thus inform strategic and operational decisions. Based on their impact metrics described above, GreenMobility is aware of the negative footprint that is required to produce one unit in terms of the associated CO2-emissions. Rather than just focusing on one part of the value chain, GreenMobility is measuring these emissions across the entire supply chain. Consequently, these metrics are not only used to convince investors and customers, but also to further improve the environmental performance during production and logistics:

"I think it's more about trying to increase the [CO2] reductions. Yes, so of course if I measure more precisely, then I can also achieve something" (GreenMobility, CEO).

Concretely, the metrics affect GreenMobility's purchasing decisions to build an even more sustainable vehicle:

"And, of course, we put that in comparison to alternative materials. […] I already choose very consciously which materials we use here" (GreenMobility, employee).

Thus, we argue that *impact as added value* ventures increasingly exploit their sustainability potential just as GreenMobility:

"We want to build a vehicle that is not only good on paper, but is also good in reality" (GreenMobility, employee).

Outcomes of impact measurement as bridge: impact as a service

The main outcome of *IM as bridge* activities relates to *impact as a service*, which consists in reaching high levels of legitimacy for the venture's IM activities, high impact monetization and high exploitation of the underlying sustainability potential. In *impact as a service* ventures, impact, and consequently IM, plays a decisive and strategic role in the context of the venture and its business model; it is at the core of the business model as impact itself is the product or service that is being offered:

"At the end of the day, what we are providing is impact, right? … as a service. Be it to any of the stakeholders: be it to our customers, direct customers, businesses, or to the people we partner up with" (PlasticCompensation, co-founder & CMO).

IM as bridge produces **high levels of legitimacy** for those IM activities. This is typically expressed by the fact that almost all stakeholders deem IM as important and also approve the IM activities of that venture. PlasticCompensation's IM activity is assessed as highly legitimate because they are considered the experts in their field. Consequently, customers trust PlasticCompensation a lot and do not even make use of the formal and detailed impact reporting the company offers as the CPO describes in the following quote. It depicts how PlasticCompensation moves beyond their stakeholder requests in a very agentic way (see above) and in doing so creates high legitimacy for their IM activities.

"Lisa, why would I go in [the reporting dashboard] and see if Snea really washes the plastic? So, I might look at it 1-2 times and then [never again]. You don't need to tell me now where my money went. I feel good that my money has gone there and there" (PlasticCompensation, customer).

In general, PlasticCompensation's way of measuring and communicating their impact creates trust which is a sign of how these activities are assessed as legitimate by their stakeholders. As

the CMO reports, the link between trust (which is an expression of legitimacy) and PlasticCompensation's approach to IM is in the created transparency through *IM as bridge*:

"Also, with the people like who are trusting us with their money: so we take a big responsibility of also getting money or funding from individuals and brands so... credibility, transparency and impact, these are the core of our services" (PlasticCompensation, CMO).

Furthermore, PlasticCompensation's investors seem to assess IM as important and also fully approve of PlasticCompensation's activities and thus consider them legitimate. Similar to customers, PlasticCompensation agentically seems to move beyond the explicit stakeholder expectations (see above) and by doing so creating a very legitimate IM approach. One of their business angels considers IM as *"very important" (PlasticCompensation, business angel)* and fully approves of PlasticCompensations approach while stating that exactly this is why he believes in PlasticCompensation's work in general, which points towards the increased legitimacy for the entire company, not just their IM activities, through transparent IM:

"So it couldn't be more measurable, where you can really say "okay, we now have this in 50 online stores and 8 million purchases have been made so far and X tons of plastic have been recycled accordingly or compensated for, so to speak" and that is of course, yes, that is very simple and directly measurable. And not only for me as an investor, but also for the end customer. And to have this direct effect is I think one thing why I also believe in it" (PlasticCompensation, business angel).

At *impact as a service* ventures, impact itself is the product that is being sold. That is, the basic value proposition is that a positive sustainability impact gets created. Typically, the business model is based on selling some kind of impact certificates or credits, e.g., carbon credits in compensation mechanisms. Additionally, impact investors are the main target investor for *impact as a service* ventures. Consequently, these ventures have **high levels of impact monetization**. PlasticCompensations business model is entirely based on selling plastic credits. Thus, the value proposition they are offering to their customers is that plastic gets

collected and recycled in the Global South. Customers can claim this impact for themselves based on the plastic credits they receive. Different to SocialRenovation or GreenMobility, there is no other product with its own value proposition (like a renovation or a cargo-bike) with associated impact. Impact itself is the provided product or service as the quote at the beginning of the section pointedly expresses. This kind of business model requires a lot of transparency which is why we see a strong connection between *IM as bridge* and *impact as a service* ventures:

"So you have to offer [the customer] something, that you are really there on the spot or that you somehow secure that this really, ... that what happens with the money promises also really happens. I'm very pleased with the [IM] app - from the product side - our Max is also very pleased. We will get really good data" (PlasticCompensation, co-founder & CPO).

This connection explains why PlasticCompensation sees IM as a strategic priority, which produces concrete outcomes on the business model by incorporating IM at its core and monetizing from it. Additionally, PlasticCompensation receives a monetary value for their created impact by exclusively targeting impact investors. One of their investors described in detail how impact was an absolute prerequisite for his investment and consequently that this investment is not about maximizing a financial return, but rather about enabling impact:

"And exactly, that was an absolute prerequisite, that I have to believe that they have an impact on exactly this goal (plastic removal). […] But it has de facto much less of an ROI focus for me than perhaps for other business angles. Even if both investments are completely gone in the end, the money, it's also completely fine in the end" (PlasticCompensation, business angel).

Consequently, PlasticCompensation does not only monetize impact through selling plastic credits to their customers, but also at the financing side by acquiring impact investors who would not invest if it would not be for the associated impact.

At *impact as a service* ventures, the **sustainability potential is highly exploited**. Typically, this is enabled through actionable metrics, ongoing monitoring and multiplier effects through which the sustainability impact is scaled beyond the boundaries of the venture itself. PlasticCompensation collects data at every instance of their value chain. This ongoing real-time monitoring enables them to track and resolve potential problems and to exploit the full sustainability potential:

"So on a daily basis, [we] track how much waste was collected, how much waste was sorted and then how much waste actually ended up at the recyclers. So from the source of collection to source of where the recycled material would go, you have all the information" (PlasticCompensation, co-founder & CMO).

Finally, from our inductive coding emerges that the high sustainability potential reached at PlasticCompensation is combined with a multiplier-effect, meaning that beyond just generating a positive sustainability impact through their services, the venture enables other private individuals and businesses to have a positive impact through their plastic compensation mechanism. Additionally, PlasticCompensation is working on increasing the sustainability awareness of their customers, which increases these multiplier effects. In their initial business plan they say:

"Awareness raising will be a central aspect of PlasticCompensation's public relations work, e.g., with campaigns for simple plastic reduction in everyday life" (PlasticCompensation, business plan).

Their social media accounts are a vivid proof that they followed through with this plan. Informative posts ranging from *"Leave the car – Embrace the planet"* to *"Bamboo toothbrushs" (PlasticCompensation, Instagram)* try to educate and motivate their audience to adopt a more sustainable lifestyle beyond just compensating their plastic footprint through PlasticCompensation's service.

DISCUSSION

Our research aim was to explore different IM activities and how distinct IM activities influence organizational outcomes of new ventures as well as outcomes for the broader society. To address this, we employed a multiple case study design and collected data in new ventures characterized by different IM activities in Germany. Drawing on our empirical findings, we build a novel typology of IM activities based on their level of agency and formality and propose a new theoretical framework of IM as agentic activity toward sustainable development (Figure 12).

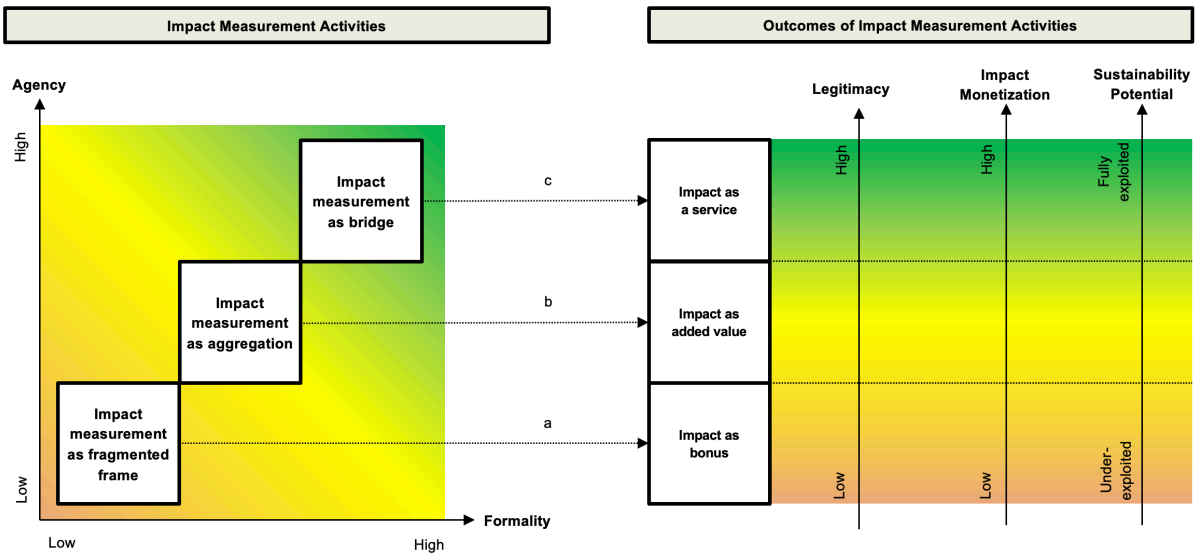

Figure 12: A Novel Theoretical Framework of Impact Measurement as Agentic Activity toward Sustainable Development, Essay III

A NOVEL TYPOLOGY OF IMPACT MEASUREMENT ACTIVITIES

Drawing on the cross-case analysis presented in the previous section, it seems that the agency and formality levels of IM activities are associated. More specifically, an analysis mapping the agency of IM activities and the level of formality reveals that, generally, the more agentic the IM approach, the more formal it is. The level of formality (from low to high) of IM activities

represents the extent to which new sustainable ventures adopt standardized, written, rigorous and replicable approaches to capture and communicate the economic, social and environmental impact they produce. Whereas, the level of agency relates to the extent to which IM activities are adopted reactively to conform with external pressure or circumstances (low level of agency) or more proactively and intentionally to interact with and engage stakeholders (high level of agency). These two dimensions of agency and formality emerge inductively from the cross-case comparison and allow the identification of three types of IM activities, including *IM as fragmented frame*, *IM as aggregation*, and *IM as bridge* (Figure 12, left side).

IM as *fragmented frame* tends to be less formalized and is enacted due to external pressures from stakeholders or normative circumstances, whereas *IM as aggregation* and *IM as bridge* represent increasingly formalized and agentic IM activities. In the case of *IM as fragmented frame,* the founders of new sustainable ventures tend to utilize bricolage, i.e., leveraging "make do" IM activities (Molecke & Pinkse, 2017), disseminating their impact in a scattered and fragmented way, e.g., through at-hand data, slogans, interpretations, self-defined indicators and measures not validated by third parties. These "make do" activities and ad hoc indicators provide a fragmented frame for new sustainable ventures to communicate their impact to key stakeholders (e.g., business angels) while attempting to reactively conform to their explicit requests. This passive role may be reflected in less explicit impact references in the new sustainable enterprise goals and missions (Battilana & Dorado, 2010; Ebrahim et al., 2014), and may lead to interpretive flexibility (Nicholls, 2009), as well as more ambiguity and vagueness (Cornelissen et al., 2015; Giroux, 2006; Meyer & Höllerer, 2016).

IM as aggregation represents the activity of measuring impact through increased formality and agency. Founders start organizing, ordering, clustering, and aggregating various impact measures and drawing on increasingly formalized measurement approaches. These efforts

toward aggregation of disparate and fragmented IM activities to organize them in a more coherent and aggregated framework do not only respond to external normative and regulative pressure (Muñoz et al., 2022). Instead, we observe that founders and managers intentionally and agentically engage, at least to a certain extent, in IM aggregation activities to proactively reach not only current, but also potential future stakeholders.

IM as bridge emerges as the most formalized IM activity, which involves a variety of highly standardized, quantitative indicators, as well as context-specific, validated measurement instruments, typically enabled by involving technological partners and external experts. This highly formalized measurement activity is undertaken by proactively making impact and its measurement the core of the business and considering it a strategic priority and USP, while also involving and bridging long-distance stakeholders, including those that are not yet involved in the venture. In this highly agentic approach, founders and managers of new sustainable ventures intentionally go beyond anticipated stakeholder expectations and proactively shape IM strategies to capture and communicate their impact more effectively (Beer & Micheli, 2018; Hall et al., 2015), to reach broader audiences (Chenhall et al., 2017; Micheli & Mari, 2014), and to proactively build political bridges (Crilly et al., 2016).

A THEORETICAL FRAMEWORK OF IMPACT MEASUREMENT AS AGENTIC ACTIVITY TOWARD SUSTAINABLE DEVELOPMENT

The proposed typology of IM activities above entails relevant implications for current conversations relating agency (e.g., Battilana & Dorado, 2010; Ebrahim et al., 2014) and formality (e.g., Muñoz et al., 2022) of IM activities, especially in new sustainable ventures (e.g., Vedula et al., 2022). Drawing on the proposed typology, in this section we advance our theorizing and propose a novel theoretical framework of IM as agentic activity toward sustainable development (Figure 12).

First, we propose that *IM as fragmented frame, IM as aggregation and IM as bridge* lead to different **venture types** in terms of the positioning of impact within the context and business model of new sustainable ventures, including *impact as a bonus, impact as added value* and *impact as a service* (Figure 12, arrows a, b, and c, respectively). This distinctive centrality and relevance of impact due to different IM activities ranges from impact as decentralized bonus feature for communicating with a handful of stakeholders who might care about it (*impact as bonus*) to impact, and its measurement, as "condition sine qua non" the service can be offered to the customers (*impact as a service*) and has important implications in terms of legitimacy, impact monetization and exploitation of sustainability potential.

Second, we theorize that when the level of formality and agency of IM activities increases, the **legitimacy of IM activities** increases as well. *IM as fragmented frame*, revolving around informal and reactive IM practices, fosters frictions regarding IM in the organization and beyond in the communication of impact with stakeholders (Molecke & Pinkse, 2017). This situation leads to low legitimacy of IM activities for internal and external stakeholders (Fisher et al., 2017) because of high ambiguity and vagueness (Cornelissen et al., 2015; Giroux, 2006; Meyer & Höllerer, 2016) of the highly informal and fragmented impact measures adopted. Informal and passive fragmented frame measurement activities may lead to delegitimizing formal assessment methodologies (Molecke & Pinkse, 2017), while creating misinterpretations and uncertainty for employees around organizational scopes and concrete sustainability impact (Beer et al., 2022). When the formality and agency of IM activities increases and *IM as aggregation* and *as bridge* are enacted, the legitimacy of IM activities increases because impact ambiguity and frictions in the organization and beyond are reduced due to the adoption of the more formal, more rigorous and less fragmented impact measures. This, in turn, leads to increasingly higher impact clarity and transparency (Muñoz et al., 2022) and increasingly legitimate IM activities for a broader number of stakeholders (Fisher et al., 2017), higher levels

of fulfillment for employees understanding and aligning their value systems to those of their organization (Beer et al., 2022), and higher levels of trust in the organizational strategy and activities from investors (Mansouri & Momtaz, 2022) and other stakeholders (Déjean et al., 2004) as goals, mission and outcomes of the new sustainable ventures are perceived as aligned, actionable and concrete.

Third, we observe that moving from *IM as fragmented frame* towards *IM as bridge*, **impact monetization** increases. When *IM as fragmented frame* is in place, new sustainable ventures are able to monetize their impact only to a very limited extent. In other words, they have low capacity of converting their impact outcomes into financial capital, e.g., through acquiring impact-driven VC and business angel investments. The reason why *IM as fragmented frame* leads to low impact monetization is based on impact not playing a central role in the business model of the venture as impact itself is not embedded in the product, i.e., it is not an explicit part of the value proposition, and thus revenue model and impact are not integrated (Gamble et al., 2020). Additionally, not having impact at the core combined with low legitimacy of *IM as fragmented frame* might keep highly impact-oriented investors from investing in such ventures as they strive to align their capital with *measurable* impact (Hehenberger, Mair, & Metz, 2019; Ormiston, Charlton, Donald, & Seymour, 2015). Whereas, *IM as aggregation* leads new sustainable ventures to increased impact monetization as impact is positioned as part of the value proposition and thus indirectly monetized with each product sale (Dohrmann, Raith, & Siebold, 2015; Gamble et al., 2020). Finally, when *IM as bridge* is in place, new sustainable ventures are able to monetize their impact to the maximum extent through the central role that impact has in the business model: revenue model and impact are fully integrated (Gamble et al., 2020) as impact is the major or sole value proposition (Dohrmann et al., 2015). Here, impact itself becomes the product that is sold on "social-benefit markets" (Corbett & Montgomery, 2017) as is the case for compensation models like carbon, or in the

case of PlasticCompensation plastic, credits. Such business models require high levels of trust between the venture and their customers, particularly regarding how, where and to what extent impact is actually created (Calandra, Secinaro, Massaro, Dal Mas, & Bagnoli, 2022) and attract impact investors. We argue that new sustainable ventures adopting *IM as bridge* can build this trust based on credibility that is reasoned in transparency through formal and agentic IM.

Lastly, the IM activity affects the **exploitation of sustainability potential**, i.e., the realization of a limited portion of economic, social and environmental potential (Vedula et al., 2022), which is mainly reasoned in having actionable data that is required for effectively optimizing sustainability performance (Singh & El-Kassar, 2019). The marginalized consideration of IM in the fragmented frame approach and the decentralized positioning of impact as just a bonus feature lead to overlooking and underexploiting the sustainability potential. Instead, *IM as aggregation* tends to produce a more accentuated exploitation of sustainability potential as actionable metrics can be utilized to base strategic and operational decisions not just on financial, but also sustainability criteria and thus manage and optimize the sustainability. Beyond this, *IM as bridge* tends to lead to the broadest exploitation of sustainability potential as the ongoing monitoring and actionable metrics enable real-time impact management. Impact is so deeply anchored in the venture that the impact becomes a bridge to stakeholders and produces a multiplier effects instrumental to scale impact beyond the boundaries of the venture itself, e.g., through compensation or information campaigns.

THEORETICAL CONTRIBUTIONS

This study makes two main theoretical contributions to the literature on IM. First, it builds a new typology of IM activities based on their levels of agency and formality. Notwithstanding the number of dimensions used in previous literature to describe IM activities (e.g., Maas & Liket, 2011; Rawhouser et al., 2019; Trautwein 2021), these two dimensions emerged from our

inductive analysis as the most relevant and comprehensive ones to understand how new sustainable ventures leverage their IM activities to reach various types of outcomes. While previous literature has started to highlight distinct IM approaches by looking at their formality levels (Muñoz et al., 2022), our qualitative study sheds light on how formality and agency of IM activities co-shape distinctive types of IM activities. The agency dimension becomes fundamental to understand how sustainable ventures may proactively engage in IM activities through institutional work (Lawrence et al., 2011), aggregating their IM practices, bridging broader audiences, and fulfilling their sustainability potential. Our study highlights that IM activities may be adopted agentically (Battilana et al., 2009; Su et al., 2017). Thus, they do not necessarily represent a form of reactive compliance with stakeholders requests (e.g., Nason et al., 2018) or a way to conform with normative and institutional pressures (e.g., Dubey et al., 2017). Instead, they are also proactively enacted (Pacheco et al., 2010) to anticipate stakeholder requests and intentionally guide impact beyond what is immediately and explicitly demanded.

Second, this study contributes to previous scholarly conversations on IM outcomes by providing a new theoretical framework of IM as agentic activity toward sustainable development. Leveraging increasingly formalized and agentic IM activities, new sustainable ventures may acquire legitimacy (Déjean et al., 2004; Fisher et al., 2017), increase transparency and trust (Ebrahim & Rangan, 2014), and become increasingly capable to monetize their impact by integrating it more and more into their value proposition and overall business model (Corbett & Montgomery, 2017; Dohrmann et al., 2015; Gamble et al., 2020). Furthermore, increasingly formalized and agentic IM activities enable new sustainable ventures to fulfill their sustainability potential (Vedula et al., 2022) through actionable metrics that enable data-driven sustainability optimization (Singh & El-Kassar, 2019). By focusing on the outcomes of IM activities, the proposed theoretical framework helps to understand how IM activities can be best adopted by new sustainable ventures to fulfill their promise to contribute towards

sustainable development (Vedula et al., 2022), adding a consequential layer to the numerous studies investigating IM antecedents (e.g., Dubey et al., 2017; Lall, 2019; Muñoz et al., 2022).

LIMITATIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

Our study is not without limitations. First, our theoretical framework of IM as agentic activity toward sustainable development is built on rich qualitative information, leading to distinct IM activities and outcomes. We recognize that agency and formality vary in intensity along a continuum, *IM as fragmented frame, IM as aggregation and IM as bridge* emerged as static dimensions along this continuum. While, the level of low, increased and high formality and agency are emerging inductively from our coding process, their boundaries suffer from a certain arbitrarity. Future studies may draw on our findings to quantify and test different levels of agency and formality of distinct IM activities.

Second, albeit three static IM activities emerged from our variance study, we recognize that new sustainable ventures may adopt various IM activities along their business journey, alternate them over time. Thus, we motivate researchers to conduct longitudinal studies to provide process models that might explain why, how and with what consequences new sustainable ventures position and move along the IM formality and agency continuums, crossing time boundaries. Third, our typology of IM activities includes three combinations of agency and formality levels and implies a positive relationship between the two dimensions. This may be the typical situation in the German start-up ecosystem. Nevertheless, less common IM activities characterized by a negative correlation between the dimension of agency and formality could exist, e.g., ventures that imitate the formal IM activities of others (“copy cats”) due to high normative pressure, and thus have high formality level, but little agency. We encourage future research to explore these alternative types of IM activities in the same context of this study, as well as in different contexts.

PRACTICAL IMPLICATIONS AND CONCLUDING REMARKS

This study entails relevant implications for practitioners, especially for new sustainable ventures, which could learn from our findings and understand how to use IM activities wisely by being more proactive and formal in capturing and communicating impact, to create higher legitimacy, to unlock financial resources and to facilitate the transition toward sustainable development. We highlight that increasingly formal and agentic IM activities yield information that can be used for data-driven sustainability optimization, and for the enhancement of what is central to any sustainable venture's mission: impact creation. In other words, venturing toward more agentic and increasingly formal IM activities could help sustainable ventures position impact at the core of their business model and reach measurable outcomes toward sustainable development more concretely.

5. DISCUSSION

This dissertation proposes new theoretical perspectives on IM, its antecedents, its processual unfolding over time and its outcomes. Commencing with a thorough illustration of the findings and theoretical contributions delineated in each essay, this chapter proceeds to undertake a comprehensive examination of the major limitations and avenues for future research. The chapter ends with practical implications by providing actionable insights that emerge from the findings.

5.1. THEORETICAL CONTRIBUTIONS

This chapter elaborates the theoretical contributions of this dissertation. Essay I, II and III all contribute to the IM literature (e.g., Molecke & Pinkse, 2017; Muñoz et al., 2022; Rawhouser et al., 2019) while Essay II and III also contribute to the sustainable business model literature (e.g., Dembek et al., 2022; Gamble et al., 2020; Neesham et al., 2023; Snihur & Markman, 2023) and conversations around agency (e.g., Garud et al., 2007; McMullen et al., 2020) and institutional entrepreneurship (e.g., Battilana et al., 2009; DiMaggio, 1988). Moreover, Essay I's innovative approach to use an LLM to perform a semi-automated systematic literature review is a methodological contribution (e.g., An et al., 2024; Srivastava, 2023) as it offers an opportunity to efficiently study a broad and multidisciplinary research field. Finally and more generally, this dissertation contributes to the sustainable entrepreneurship literature as the outcomes of new sustainable ventures and the measurement thereof is a key challenge in this field (Anand et al., 2021; Vedula et al., 2022). Table 12 provides an overview of the core findings and theoretical contributions of this dissertation.

Table 12: Overview of Theoretical Contributions

Theme	Theoretical contributions and findings	Essay
Uncovering emerging topics and trends in IM research	• Bringing together multidisciplinary perspectives and uncovering emerging topics and trends in regards to why, how and with what outcomes impact is measured (Rawhouser et al., 2019). • Suggesting a future research agenda, particularly to address major gaps as current research tends to (1) focus on developing IM methodologies rather than applying them; (2) lack longitudinal approaches that would help to understand long-term impacts as well as nuances in implementing and changing IM approaches over time; and (3) overlook empirical investigation of organizational outcomes of IM to understand whether IM is in fact an effective tool to prove and improve impact.	I
An LLM-powered literature review	• Developing an innovative approach to use an LLM to perform a semi-automated systematic literature review (e.g., An et al., 2024; Srivastava, 2023) that offers a significant advancement to efficiently analyze a broad, multidisciplinary research field using hundreds of papers.	I
The position of impact in a sustainable business model and its relevance for impact measurement	• Shedding light on how the positioning of impact in the value proposition of a new sustainable venture matters greatly for impact measuring (Gamble et al., 2020; Pinkse et al.,2023). • Providing the extent to which impact is anchored in the value proposition as a helpful construct to characterize sustainable business models and new sustainable ventures more generally (Dembek et al., 2022; Neesham et al., 2023; Snihur & Markman, 2023). • Distinct IM approaches lead to distinct levels of relevance and centrality of impact in the sustainable business model (Gamble et al., 2020), ranging from impact as a decentralized bonus feature for communicating with a handful of stakeholders who might care about it (*impact as bonus*) to impact, and its measurement, as "condition sine qua non" the service can be offered to the customers (*impact as a service*).	II +III
Impact measuring: a process perspective	• Novel process perspective on impact measur*ing*, i.e., how and why IM unfolds over time (Muñoz et al., 2022; Rawhouser et al., 2019). • Uncovering three distinct impact measuring pathways along which new sustainable ventures move over time by engaging in distinct impact measuring phases. The pathways are anchored in the different positions of impact in the sustainable business model and differ in the level of agency enacted as well as in the degree a new sustainable venture adopts formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches to measure their impact (Molecke & Pinkse, 2017).	II

The role of agency in impact measurement	• Unveiling that agency (McMullen et al., 2020) plays a relevant role in IM by highlighting that impact measuring unfolds differently according to the extent to which new sustainable ventures engage with IM to transform current structures and practices (Battilana et al., 2009; Su et al., 2017; McMullen et al., 2020). • Novel typology of IM approaches that shows how distinct types of IM approaches differ in terms of formality and agency, i.e., the extent to which the IM approaches are developed proactively (in contrast to reactively) by a sustainable venture to interact with and engage stakeholders. • IM approaches do not necessarily represent a form of reactive compliance with stakeholders requests (Nason et al., 2018) or a way to conform with normative and institutional pressures (Dubey et al., 2017). Instead, they can be proactively enacted as a form of institutional work (Pacheco et al., 2010).	II + III
Outcomes of impact measurement	• Novel theoretical framework that shows distinct outcomes for different IM approaches in regards to the legitimacy of IM approaches (Déjean et al., 2004; Fisher et al., 2017), impact monetization (Corbett & Montgomery, 2017; Dohrmann et al., 2015) and the exploitation of the sustainability potential of a new sustainable venture (Singh & El-Kassar, 2019).	III

5.1.1. Uncovering emerging topics and trends in IM research

This dissertation provides an overview of the IM literature by conducting the first extensive IM literature review (Essay I) since Rawhouser et al. (2019), but based on eight times as many papers from different research fields. Answering research question 0 of this dissertation (see Chapter 2.1.3), i.e., what are emerging perspectives, topics and trends in IM research, Essay I sheds light on the current status of the IM literature, brings together multidisciplinary perspectives – such as those from social and sustainable entrepreneurship (e.g., Trautwein, 2021), non-profit (e.g., Pringle & Conway, 2012), development studies (e.g., Cairns, 2018), economics (e.g., Köroğlu & Yıldırım, 2023) and environmental sciences (Zhang et al., 2021), among others – and uncovers emerging themes in regards to why, how and with what outcomes impact is measured.

Based on this analysis of the current status of the IM literature, Essay I provides a future research agenda, particularly in regards to three major gaps as current research (1) focuses on

developing IM methodologies rather than applying them; (2) lacks longitudinal approaches that would help to understand long-term impacts as well as nuances in implementing and changing IM approaches over time; and (3) lacks empirical investigation of organizational outcomes of IM to understand whether IM is effective to prove and improve impact. Essay II and II address these gaps, as outlined below.

5.1.2. An LLM-powered literature review

This dissertation contributes to the literature methodologically as the abductive, semi-automated, LLM-powered literature review (Essay I) represents a significant methodological advancement (An et al., 2024; Srivastava, 2023) to efficiently analyze a broad, multidisciplinary research field using hundreds of papers – far surpassing the scope and efficiency of traditional, non-automated systematic literature reviews. While acknowledging that this approach might not be the best fit for an in-depth assessment of the literature, its value proposition is validated in the time it took to identify, screen and analyze relevant articles from an initial sample of more than 15,000 papers. While this exercise could easily fill one to two years of a full-time researcher, data collection and analysis of Essay I was concluded essentially within two full-time weeks, demonstrating an efficiency gain of up to 98%.

5.1.3. The position of impact in a sustainable business model and its relevance for impact measurement

This dissertation contributes to the literature at the intersection of IM (Molecke & Pinkse, 2017; Muñoz et al., 2022; Rawhouser et al., 2019) and sustainable business models (Dembek et al., 2022; Gamble et al., 2020; Neesham et al., 2023; Pinkse et al., 2023; Snihur & Markman, 2023) by introducing three positionings of impact in the value proposition, i.e., *impact as marginal*,

impact as relevant and *impact as core*, and by demonstrating how this construct helps to understand the emergence of different impact measuring pathways (see Chapter 5.1.2).

Answering research question 1 of this dissertation (see Chapter 2.1.3), i.e., why new sustainable ventures engage with IM, Essay II builds a bridge between the two streams, addressing Pinkse and colleagues' (2023) recent call for further research at the intersection of impact and sustainable business models. First, by demonstrating the positioning of impact in the value proposition as a strong determinant for how and why impact measuring unfolds, Essay II contributes to the IM literature (Muñoz et al., 2022; Rawhouser et al., 2019) by providing "measure to monetize" as a third dimension to the "measure to prove" and "measure to improve" dichotomy (Arena et al., 2015; Kato, 2021; Lall, 2017; van Rijn et al., 2021) that is currently used to explain why new sustainable ventures engage with IM.

Second, Essay II and Essay III contribute to the sustainable business model literature (Dembek et al., 2022; Gamble et al., 2020; Neesham et al., 2023; Pinkse et al., 2023; Snihur & Markman, 2023) by offering the extent to which impact is anchored in the value proposition as a helpful construct to characterize sustainable business models and new sustainable ventures more generally. In particular, Essay I distinguishes among three types of impact positionings, namely 1) *impact as marginal*, where impact is only a minimal part of the value proposition and perceived as negligible by customers; 2) *impact as relevant*, which reflects impact as an integral part of the value proposition and perceived as added value by customers; and 3*) impact as core*, which relates to positioning impact as the dominant part of the value proposition, and as the main service purchased by customers. Particularly, these findings draw from and contribute to existing knowledge regarding the integration of impact and revenue logics (e.g., Ebrahim et al., 2014; Gamble et al., 2020).

Third, acknowledging the progress made regarding the integration or differentiation of impact and revenue logics (e.g., Ebrahim et al., 2014; Gamble et al., 2020), Essay II finds that it is the positioning of impact in the value proposition specifically that is crucial to explain the relationship between sustainable business models and impact measuring, thus contributing to both literature streams by pointing toward a nuanced understand how the positioning of impact leads to various impact measuring pathways over time. In particular, Essay II demonstrates that the closer impact is positioned at the center of the value proposition, the more agentically the new sustainable venture will move along its impact measuring pathway, and the more advanced, novel and sophisticated IM approaches will be produced during the impact measuring journey.

Overall, the extent to which various sustainable business models deliver their promised impact remains uncertain (Pinkse et al., 2023). This uncertainty persists due to the separation of sustainable business models and impact into two distinct literature streams. Thus, this dissertation offers an opportunity to understand the relevant relationship between sustainable business models, their outcomes and impact, and the measurement thereof (Anand et al., 2021; Vedula et al., 2022).

5.1.4. Impact measuring: a process perspective

This dissertation contributes to the IM literature (Molecke & Pinkse, 2017; Muñoz et al., 2022; Rawhouser et al., 2019) by offering a novel process perspective of impact measur*ing*, consisting of three distinct impact measuring pathways along which new sustainable ventures move over time by engaging in distinct impact measuring phases. Answering research question 2 of this dissertation (see Chapter 2.1.3), i.e., how impact measuring unfolds over time, Essay II adds to the current knowledge about IM from a rather static perspective (e.g., Fichter et al., 2023a; Muñoz et al., 2022; Rawhouser et al., 2019). The three pathways that are observed, i.e.,

the *reactive*, *proactive*, and *agentic impact measuring pathway*, are anchored in different positionings of impact in the value proposition of a new sustainable venture and differ in the level of agency enacted as well as in the degree a new sustainable venture adopts formal, standardized, written, rigorous, replicable, externally validated and technology-driven approaches to measure their impact.

More specifically, the *reactive impact measuring pathway* is followed by new sustainable ventures that position impact as marginal in their value proposition and yields rather informal IM approaches, including collecting and presenting impact data in a bricolaged "make do" fashion (Molecke & Pinkse, 2017), e.g., through at hand data, self-defined indicators and story-telling approaches, to reactively conform with explicit stakeholder requests. Overall, this way of measuring impact may lead to interpretive flexibility (Nicholls, 2009), as well as ambiguity and vagueness around the real impact created by the new sustainable venture (Cornelissen, et al., 2015; Giroux, 2006; Meyer & Höllerer, 2016) and thus leaves the stakeholders of such ventures to interpret the data and reports for themselves (Molecke & Pinkse, 2017).

The *proactive impact measuring pathway* is followed by new sustainable ventures that position impact as relevant in their value proposition. Compared to the reactive impact measuring pathway, a more proactive and future-minded approach is observed here as new sustainable ventures anticipate requests and leverage advanced IM. In so doing, they move beyond bricolage (Molecke & Pinkse, 2017) and provisional IM (André et al., 2018) by making intentional efforts to include holistic and robust measures, enabled by third parties. The proactively organized IM approaches draw on increasingly formalized IM approaches (Muñoz et al., 2022) and reduces ambiguity and vagueness.

Finally, the *agentic impact measuring pathway* is followed by new sustainable ventures that position impact as core in their value proposition. Here, IM demand from stakeholders is not

only foreseen, but intentionally and agentically shaped by purposefully exceeding IM expectations from stakeholders. As a result, these new sustainable ventures create momentum by crafting highly formalized, tech-enabled, standardized, externally verified IM approaches. Through this, a certain institutionalization of novel IM approaches takes place by utilizing IM to extend impact beyond their own boundaries through effective impact communication (Hall et al., 2015) while reaching broader audiences (Chenhall et al., 2017; Micheli & Mari, 2014) and building political bridges (Crilly et al., 2016).

5.1.5. The role of agency in impact measurement

This dissertation contributes to ongoing conversations around entrepreneurial agency (McMullen et al., 2020) and institutional entrepreneurship (Battilana et al., 2009; DiMaggio, 1988; Lawrence et al., 2011) by unveiling that agency plays a relevant role for IM. Answering research question 2 of this dissertation (see Chapter 2.1.3), i.e., how impact measuring unfolds over time, Essay II shows that impact measuring unfolds differently over time according to the extent to which new sustainable ventures engage with IM to transform pre-exisiting structures and practices (Battilana et al., 2009; McMullen et al., 2020; Su et al., 2017). Answering research question 3 of this dissertation (see Chapter 2.1.3), i.e., how different IM approaches can be characterized, Essay III provides a novel typology of IM approaches based on their level of formality (Muñoz et al., 2022) and agency (McMullen et al., 2020).

More specifically, Essay II explains how impact measuring unfolds differently along the three impact measuring pathways (see Chapter 5.1.4) according to the agency level adopted in the impact measuring process (McMullen et al., 2020). It is shown that developing IM does not always represent a form of reactive compliance with stakeholder requests (e.g., Nason et al., 2018) or a way to conform with normative and regulatory pressures (e.g., Dubey et al., 2017). Rather, the unfolding IM can be permeated by some levels of entrepreneurial agency

(McMullen et al., 2020) and be enacted as a form of institutional work (Lawrence et al., 2011)). In other words, some new sustainable ventures do not passively accept IM norms, but rather disrupt the status quo by creating and institutionalizing IM while transcending, anticipating, changing and shaping IM expectations from stakeholders beyond what is immediately and explicitly demanded (Battilana et al., 2009). Leveraging institutional work (Lawrence et al., 2011), novel IM is not only embedded in core practices and organizational culture, but also transmitted to customers, suppliers, and partners. Hereby, these new sustainable ventures become change agents (Battilana et al., 2009) and create broader impact along the value chain by transforming pre-existing IM approaches and structures (McMullen et al., 2020).

Furthermore, Essay III shows that agency offers an interesting dimension to characterize heterogeneous IM approaches, adding further nuances to existing classifications (e.g., Molecke & Pinkse, 2017; Rawhouser et al., 2019). Acknowledging and building upon previous literature that has started to highlight distinct IM approaches by looking at their formality levels (e.g., Muñoz et al., 2022), this dissertation sheds light on how formality and agency co-shape distinctive types of IM approaches. More specifically, the novel typology of IM approaches that is developed in Essay III uncovers that, generally, the more agentic the IM approach, the more formal, i.e., the more standardized, written, rigorous, verified and replicable, it is. These two dimensions allow the identification of three types of IM approaches, including *IM as fragmented frame*, *IM as aggregation*, and *IM as bridge*. While *IM* as *fragmented frame* tends to be less formalized and is enacted due to external pressures from stakeholders or normative circumstances, *IM as aggregation* and *IM as bridge* represent increasingly formalized and agentic IM approaches. Particularly, *IM as bridge*, is an interesting phenomenon as new sustainable ventures purposefully move beyond bricolage (Molecke & Pinkse, 2017) by developing novel and innovative IM approaches in an agentic fashion, involving a variety of

highly standardized, quantitative indicators, as well as context-specific, validated measurement instruments, typically enabled by involving technology partners and external experts.

5.1.6. Outcomes of impact measurement

Finally, this dissertation contributes to the IM literature (Molecke & Pinkse, 2017; Muñoz et al., 2022; Rawhouser et al., 2019) by conceptualizing concrete organizational and societal outcomes of different IM approaches (Mansouri & Momtaz, 2022). Answering research question 4 of this dissertation (see Chapter 2.1.3), i.e., what the outcomes of different IM approaches are, Essay II offers a new theoretical framework that highlights how distinct IM approaches lead to different outcomes in terms of legitimacy, impact monetization and exploitation of sustainability potential. Thus, by focusing on the outcomes of distinct IM approaches, the proposed theoretical framework adds a consequential layer to studies investigating IM antecedents (e.g., Dubey et al., 2017; Lall, 2019; Muñoz et al., 2022).

Building upon the novel typology of IM approaches (see Chapter 5.1.5), leveraging increasingly formalized and agentic IM approaches, new sustainable ventures may acquire higher legitimacy (Déjean et al., 2004; Fisher et al., 2017) for their IM approaches, increase transparency and trust with stakeholders (Ebrahim & Rangan, 2014), and have higher capacity to convert impact outcomes into monetary value by integrating it more and more into the products they are selling (*impact as a service*) and the value proposition they are offering (Corbett & Montgomery, 2017; Dohrmann et al., 2015; Gamble et al., 2020). Furthermore, increasingly formalized and agentic IM approaches enable new sustainable ventures to exploit their sustainability potential through actionable metrics that enable data-driven sustainability optimization (Singh & El-Kassar, 2019). Thus, the developed theoretical framework provides an interesting foundation to further assess whether new sustainable ventures create the impact

they claim and contribute towards sustainable development (Anand et al., 2021; Vedula et al., 2022).

5.2. RESEARCH LIMITATIONS AND FUTURE RESEARCH

This dissertation and its essays entail limitations. In this chapter, these limitations are outlined, including mitigation strategies employed to mitigate them and future research opportunities that arise from them.

First, in Essay I's literature review, the identification phase does not include "impact investing", "CSR", and "ESG" in the search terms despite the goal of having broad range and despite certainly interesting overlaps and fruitful perspectives between these fields. As the expectations, processes and outcomes of impact investors and corporates might be very different, future research could use a similar methodology as developed in Essay I to uncover emerging trends, perspectives and topics in these fields as well.

There are a number of technical limitations in the semi-automated and LLM-powered approach to conduct a literature review that were for the sake of transparency and reproducibility described in detail in Essay I. These evolve around the general limitations of LLMs (e.g., hallucinations), using hypotheses rather than inductively uncovering emerging themes, running the analysis on title and abstract only and imperfect classifications. Future research could validate the quality of our approach by manually labelling the papers in the entire sample and comparing it to the classification of the model. As the generative AI space, and LLMs particularly, are currently developing rapidly, it will be interesting to try similar, updated approaches with advanced models in the future.

Regarding Essays II and III, their models and contributions are built on rich qualitative information. As always with qualitative research, this enabled interesting findings to emerge inductively and to elaborate on existing theory while proposing new constructs and phenomena on the one hand, while suffering from a limited generalizability on the other hand. Future

quantitative research could test the models that are developed within this dissertation, its underlying assumptions and its implicit hypotheses. Particularly, it will be interesting to validate the extent to which the positioning of impact in the value proposition determines different impact measuring pathways, unfolding IM approaches regarding their formality and agency levels and outcomes of these heterogeneous approaches.

Furthermore, the case selection and research setting of Essay II and III have contextual limitations as both essays are based on new sustainable ventures in Germany. New contexts can result in varied perceptions regarding impact and its measurement. Exploring how IM evolves in various environments could enhance our understanding, revealing different pathways or incorporating diverse stages into the suggested pathways that were uncovered in Essay II. Particularly, it would be interesting to examine the impact of regulatory demands on IM as sustainability reporting is increasingly becoming a matter of regulatory compliance. The proposed models are particularly pertinent for new sustainable ventures as the evolving regulatory standards are typically not applicable to small-scale companies. Therefore, new sustainable ventures offered a particularly interesting case and context to study why and how an organization introduces IM without being legally required to do so. For larger, more established organizations operating across diverse regulatory landscapes and with more resources, the uncovered findings and developed models will necessitate further refinement. It will be particularly interesting to research and elaborate how new sustainable ventures use IM differently compared to established companies. Generally, it is encouraged that future research explores how, why and with what consequences IM evolves within alternative time and space (Welter & Baker, 2021).

Another limitation is that all established constructs in Essay II and III (three positions of impact in the value proposition, three impact measuring pathways, three distinct IM approaches,

distinct levels of agency, formality, legitimacy, impact monetization and sustainability potential exploitation) vary in intensity along a continuum in reality. While the certain approaches and levels emerged inductively during data analysis, their boundaries suffer from a certain arbitrarity. Future research may want to uncover even further nuances and develop testable constructs for further quantitative research.

Additionally, new sustainable ventures may change their business model by pivoting, especially in the early stages (Burnell et al., 2023). This could influence the positioning of impact in the value proposition that emerged as a core construct in Essay II, leading to iterative shifts in terms of impact positioning and loops in the impact measuring pathways. For example, new sustainable ventures could discover the opportunity to issue carbon credits, which may lead to a shift in the impact positioning from *impact as relevant* to *impact as core*, implying that impact itself will be perceived as the service sold to customers. Due to the rapid growth of carbon credit markets, more and more business models that have impact as the core value proposition evolve on so called social-benefit markets (Corbett & Montgomery, 2017). In such instances, the process model proposed in Essay II would suggest that shifting from one impact positioning to another may also change the impact measuring pathway that the venture takes. Thus, further process research to understand how impact measuring may change due to business remodeling and pivoting is encouraged, including extending the temporal scope beyond the two years that were the basis for this dissertation. On a related note, the positioning of impact in the value proposition emerged as a particular interesting construct in itself. Future research can elaborate to which extent this construct has the potential to inform and explain other processes and phenomena besides and beyond IM in the sustainable entrepreneurship literature, such as developing venture ideas (Muñoz & Dimov, 2015), marketing products on social-benefit markets (Corbett & Montgomery, 2017), access to funding (Mansouri & Momtaz, 2022), type of investors targeted (Block et al., 2021), or pricing (Flatten et al., 2015).

Finally, the typology developed in Essay III includes three distinct combinations of agency and formality and uncovers a positive relationship between the two. Nevertheless, a negative correlation might exist, e.g., ventures that imitate formal IM approaches of others ("copy cats") due to high normative pressure, and thus have high formality levels, but little agency. Therefore, future research can explore alternative combinations of IM approaches, i.e., up to 6 further combinations of agency and formality if using the proposed typology in Essay III.

In general, this dissertation focused on sustainable ventures and their perspectives, reasons for, processes and outcomes of IM. Future research could unpack the role of stakeholders of sustainable ventures further, particularly the role of impact investors. It would be interesting to analyze and compare their perspective of IM (e.g., through a literature review that is focused on that stream of literature or empirical research) against the perspective of the ventures who are at least partially investing in their IM capabilities due to (expecting) investor demand for impact reports (see Essay II). Concrete research questions could evolve around the influence of impact investors on IM pathways that emerged from this dissertation or to what extent IM signals venture quality or legitimacy to impact investors in their investment and due diligence processes? Furthermore, impact investors are receiving investments from their limited partners as well, i.e., they face their own impact management, accountability and legitimacy challenges when being confronted with IM expectations. Hence, future research could further unpack how impact investor themselves use IM to ensure accountability and how their own IM processes are interlinked with the organizations they invest in. Finally, there is a trend for more in-depth IM that moves beyond simple counting of outputs and focuses more on evaluating actual outcomes of investments. Future research could shed further light on how outcome measurements are to be done efficiently and, considering the effort and cost involved in such advanced measurement processes, who takes over the responsibility and cost for it, i.e., does the impact investor, their limited partner or even the venture itself pay for and execute the IM

processes and what are effective ways to collaborate, align priorities and expectations and share responsibility in IM between these different parties?

Beyond concrete limitations, Essay I provides a forward-looking research agenda for IM along the identified phases of reasons for IM ("why to measure"), approaches and tools ("how to measure"), and IM's organizational effects (outcomes). While some of identified gaps and suggested future research has already been taken up by this dissertation (Essay II and III), there remains potential for further analysis. For example, it would be interesting to understand what kind of factors are influencing the motivations for IM at different stages of a venture's life cycle, i.e., does the motivation shift from measuring to prove in order to convince stakeholders at the beginning to measuring to improve impact later on? Or does the motivation shift from measuring to improve as a venture has noble intentions at the beginning, but starts to compromise as mission-drift takes place that focuses the organization more on external accountability? Essay I also demonstrates that previous IM research deals more with discussing and developing IM methodologies rather than applying them. Naturally, one implication is that we need more hands-on applications of IM methodologies to measure the de facto impact of projects, products and organizations. Lastly, regarding IM outcomes, future research should build upon Essay III, particularly in regards to the question whether and how IM actually leads to higher impact performance when used to "improve" impact, i.e., for decision-making, monitoring, managing impact. Also, it would be interesting to further understand whether and how IM actually improves stakeholder relationships, engagement and fundraising when used to "prove" impact. Answering these questions will be crucial to understand whether IM is living up to its potential and promise to prove and improve impact.

5.3. PRACTICAL IMPLICATIONS

Interesting entrepreneurship research must be relevant to practice (Frank & Landström, 2016). Particularly as an external doctoral student being fully immersed in an entrepreneurial ecosystem, the practical implications of this dissertation were always of utmost importance and relevance. By uncovering the antecedents, process, and outcomes of heterogeneous IM approaches in new sustainable ventures, the research findings offer actionable insights for practitioners, particularly policymakers, impact investors and new sustainable ventures navigating the complex IM landscape.

First, this dissertation carries significant implications for **policymakers** tasked with fostering a conducive environment for new sustainable ventures and IM specifically as well as sustainable business practices and sustainability reporting generally. By understanding the reasons why new sustainable ventures engage with IM as well as the process of impact measuring, the insights from the two essays offer policymakers valuable insights into crafting informed regulations, frameworks and incentives that promote more accountability and transparency into the sustainability effects of new sustainable ventures through IM while also acknowledging their limited resources and the effort involved in such processes. Furthermore, policymakers can draw from the proposed typology of heterogeneous IM approaches to appreciate the diversity of highly applicable, customized IM approaches that are needed to accurately measure social and environmental impact while balancing it with a certain ambition for standardization and comparability in emerging sustainability reporting standards.

Second, this dissertation can help **impact investors** and other stakeholders of new sustainable ventures to better understand what they can expect and demand from new sustainable ventures and their impact reports. Ideally, IM provides the basis for investors, and other stakeholders, to assess sustainability performance of a new sustainable venture and its products in order to

make informed, comprehensive, risk-mitigating and impact-maximizing decisions. However, the findings of this dissertation also demonstrate that not every venture will provide in-depth impact insights through advanced IM approaches that are needed to make such informed decisions as the approaches chosen depend on the business model and the venture stage.

Finally, and most importantly, this dissertation entails crucial relevant implications for **new sustainable ventures**. The findingsregarding the positioning of impact in the value proposition might stimulate entrepreneurs to reflect on their business models and inspire pivots to move impact toward the center of their value proposition to generate additional value and revenues through impact creation. Additionally, a better understanding of the impact measuring pathways and the heterogenous IM approaches can inspire and guide new sustainable venture in effectively and stage-appropriately develop IM approaches over time. Sustainable entrepreneurs can also learn from the outcomes of different IM approaches and understand how to use IM wisely as utilizing more agentic and formal IM might yield higher legitimacy with stakeholders, unlock additional financial resources through impact monetization and facilitate the transition toward sustainable development through data-driven sustainability optimization. As such, this dissertation carries the potential to push forward IM as a tool to enhance not only transparency and accountability in impact reporting, but also sustainability impact itself through impact management. Ultimately, this research contributes to a better understanding how new sustainable ventures can adopt IM approaches to fulfill their promise to contribute towards sustainable development through measurable outcomes. As the leonardo. impact GmbH which aims to make meaningful impact data accessible through technology is the fruit of this doctoral research, the most concrete practical implication remains me becoming a sustainable entrepreneur myself, trying to enable other sustainable entrepreneurs to scale their impact through data.

6. CONCLUSION

The overarching research objective of this dissertation was to generate a novel and comprehensive theoretical perspective on IM in new sustainable ventures. More specifically, this dissertation aimed to answer research questions around the antecedents, process and outcomes of heterogeneous IM approaches in new sustainable ventures. To answer these research questions, a theoretical background has been outlined, summarizing current conversations in the IM literature, and three essays have been developed.

Essay I answers the research question what emerging perspectives, topics and trends in IM research are based on an abductive, semi-automated, LLM-powered literature review. Essay I highlights the need for more applied IM research, longitudinal studies that investigate impact measurement over time, and empirical investigations into the organizational outcomes of impact measurement. Thus, Essay I contributes to the IM literature by providing a holistic and comprehensive understanding of the field and a future research agenda. It also holds a methodological contribution as the LLM-powered literature review provides a significant advancement for analyzing broad, multidisciplinary research fields highly efficiently.

Essay II answers the research questions how and why impact measuring unfolds over time in new sustainable ventures based on a multiple case study with six new sustainable ventures in Germany. Moving beyond IM as a static activity, Essay II provides a novel process model that shows how new sustainable ventures move along three pathways—*reactive, proactive*, and *agentic impact measuring*, depending on the positioning of impact in their value proposition. Thus, Essay II contributes to and bridges the IM and sustainable business model literature while also unveiling the role of agency in impact measuring.

Essay III answers the research questions how different IM approaches can be characterized and what the outcomes of these different approaches are. Based on a multiple case study with three new sustainable ventures in Germany, Essay III provides a novel typology of IM approaches regarding their level of agency and formality, including *IM as fragmented frame*, *IM as aggregation* and *IM as bridge*. Drawing on this typology, a new theoretical framework of IM as agentic activity toward sustainable development is proposed that highlights how distinct IM approaches lead to different consequences in terms of legitimacy, impact monetization and exploitation of sustainability potential. Essay III thus contributes to the IM literature and emphasizes, just as Essay II, that agency is an important construct to better understand IM by showing that for some new sustainable ventures IM does not represent a form of reactive compliance with regulatory demands or stakeholder requests, but rather a form of institutional work through which innovative and transformative IM approaches are developed.

In conclusion, the three essays presented in this dissertation have advanced our understanding of IM in new sustainable ventures and contribute to the IM, sustainable business model and agency literature as well as to the sustainable entrepreneurship literature at large as we still know very little about the actual outcomes and impact of sustainable entrepreneurs. Based on those findings and contributions, interesting and relevant avenues for future research were drawn. Finally, this dissertation has important practical implications for policymakers, impact investors and new sustainable ventures as a better understanding of IM is the first step towards navigating the complex IM landscape that is shaped by increasingly demanding regulatory and societal expectations for transparency and increasingly ambitious new sustainable ventures. My hope is that this dissertation not only advances IM theory, but also supports those new sustainable ventures who genuinely want to contribute to sustainable development to actually do so by having the right IM approaches and tools to convince stakeholders and to manage and scale their impact.

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ANNEX

Table 13: Papers that have been used for the literature review, Essay I

Authors	Title	Journal	Year	Method	Organization type	HI	HII	HIII	HIV	HV	HVI
'Adamo, Idiano; Gastaldi, Massimo; Ioppolo, Giuseppe; Morone, Piergiuseppe	An analysis of Sustainable Development Goals in Italian cities: Performance measurements and policy implications	LAND USE POLICY	2022	Mixed-Methods	Both	Supported	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Abalakov, A. D.; Bazarova, N. B.	Assessment of man-made impact of mining on the environment of the Baikal-Mongolian region	INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE IN COMMEMORATION OF CORR. MEM., RAS, A.N. ANTIPOV GEOGRAPHICAL FOUNDATIONS AND ECOLOGICAL PRINCIPLES OF THE REGIONAL POLICY OF NATURE MANAGEMENT	2019	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Abdullah, Al-Noor 1 alnoorabdulla18@gmail.com; Rahman, Sanzidur 1,2 srahman@plymouth.ac.uk	Social Impacts of a Mega-Dam Project as Perceived by Local, Resettled and Displaced Communities: A Case Study of Merowe Dam, Sudan.	Economies	2021	Mixed-Methods	Both	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Achina-Obeng, Rebecca 1; Aram, Simon Appah 1,2,3 Samaran05@yahoo.com	Informal artisanal and small-scale gold mining (ASGM) in Ghana: Assessing environmental impacts, reasons for engagement, and mitigation strategies.	Resources Policy	2022	Qualitative	For-Profit	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Addy, Chris; Chorengel, Maya; Collins, Mariah; Etzel, Michael	calculating the value of impact investing An evidence-based way to estimate social and environmental returns	HARVARD BUSINESS REVIEW	2019	Conceptual	Both	Neutral	Neutral	Supported	Not applicable	Neutral	Neutral
Ahearn, Elizabeth-Rose 1,2 e.ahearn@uq.edu.au; Mai, Catherine 1,3	The nature of measurement across the hybridised social sector: A systematic review of reviews.	Australian Journal of Public Administration	2023	Conceptual	Both	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Ahimbisibwe, Beine Peter; Morton, John F.; Feleke, Shiferaw; Alene, Arega; Abdoulaye, Tahirou; Wellard, Kate; Mungatana, Eric; Bua, Anton; Asfaw, Solomon; Manyong, Victor	Household welfare impacts of an agricultural innovation platform in Uganda	FOOD AND ENERGY SECURITY	2020	Quantitative	Both	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable

Aizawa, M; Asaoka, K; Usami, C; Shimizutani, T; Yanagibashi, Y; Takahashi, S; Mano, T	Quantitative environmental evaluation of Japanese electrical home appliances using eco-efficiency potential assessment method	2003 3RD INTERNATIONAL SYMPOSIUM ON ENVIRONMENTALLY CONSCIOUS DESIGN AND INVERSE MANUFACTURING - ECODESIGN '03	2003	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Akperov, Imran G.; Arapova, Elizabeth A.; Batishcheva, Galina A.; Lukyanova, Galina, V	Assessment of the Stability of the Agricultural Production of the Region on the Basis of the Matrix of Data Aggregation Schemes, as Well as Financial, Social and Environmental Performance	10TH INTERNATIONAL CONFERENCE ON THEORY AND APPLICATION OF SOFT COMPUTING, COMPUTING WITH WORDS AND PERCEPTIONS - ICSCCW-2019	2020	Quantitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Ali, Yousaf 1 yousafkhan@giki.edu.pk; Younus, Ahsan 1 u2015052@giki.edu.pk; Khan, Amin Ullah 1 amin.llh@gmail.com; Pervez, Hamza 1 gem1892@giki.edu.pk	Impact of Lean, Six Sigma and environmental sustainability on the performance of SMEs.	International Journal of Productivity & Performance Management	2021	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Almeyda, Angelica M. 1,2,3 aalmeyda@stanford.edu; Broadbent, Eben N. 2,4; Wyman, Miriam S. 5; Durham, William H. 1,3	Ecotourism impacts in the Nicoya Peninsula, Costa Rica.	International Journal of Tourism Research	2010	Mixed-Methods	For-Profit	Neutral	Contradicted	Not applicable	Neutral	Not applicable	Neutral
Aluko, Timothy Olaniyi 1 toa@timnet.co.za; Ntsalaze, Lungile 2	Effectiveness measurement framework for a grant programme – The case of cooperative grant scheme (CIS).	Development Southern Africa	2022	Qualitative	Both	Neutral	Contradicted	Neutral	Supported	Neutral	Supported
Ammenberg, Jonas; Hjelm, Olof; Quotes, Pull	The Connection Between Environmental Management Systems and Continual Environmental Performance Improvements	Corporate Environmental Strategy	2002	Mixed-Methods	For-Profit	Not applicable	Not applicable	Not applicable	Supported	Not applicable	Not applicable
Amrina, E.; Yusof, S. M.	Key Performance Indicators for Sustainable Manufacturing Evaluation in Automotive Companies	2011 IEEE INTERNATIONAL CONFERENCE ON INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT (IEEM)	2011	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
An, Jing; Tao, Aitian; Yang, He; Tian, Ang	Sustainability Assessment of the Rare-Earth-Oxide Production Process and Comparison of Environmental Performance Improvements Based on Emergy Analysis	SUSTAINABILITY	2021	Mixed-Methods	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Andermann, Anne; Pang, Tikki; Newton, John N.; Davis, Adrian; Panisset, Ulysses	Evidence for Health I: Producing evidence for improving health and reducing inequities	HEALTH RESEARCH POLICY AND SYSTEMS	2016	Mixed-Methods	Both	Supported	Not applicable	Neutral	Not applicable	Not applicable	Neutral

André, Kévin 1 kevin.andre@essec.edu ; Cho, Charles H. 2 ccho@schulich.yorku.ca; Laine, Matias 3 matias.laine@staff.uta.fi	Reference points for measuring social performance: Case study of a social business venture.	Journal of Business Venturing	2018	Qualitative	For-Profit	Supported	Supported	Supported	Supported	Supported	Neutral
Antunes, Mariana; Dias, Alvaro; Goncalves, Francisco; Sousa, Bruno; Pereira, Leandro	Measuring Sustainable Tourism Lifestyle Entrepreneurship Orientation to Improve Tourist Experience	SUSTAINABILITY	2023	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Appau, Williams Miller 1 wappau@ubids.edu.gh; Attakora-Amaniampong, Elvis 2 aattakora@ubids.edu.gh ; Anugwo, Iruka Chijindu 3 IrukaA@dut.ac.za	Indoor environmental quality and energy use intensity: an empirical post-occupancy evaluation test of on-campus university student housing in Ghana.	Property Management	2024	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Arena, Marika; Azzone, Giovanni; Bengo, Irene	Performance Measurement for Social Enterprises	VOLUNTAS	2015	Conceptual	Both	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Arenas, Cindy Natalia; Bello, Ana Patricia; Molina, Nicolas Fernando; Botero, Jaime Leon; Betancur, Mariluz	A Social Life Cycle Assessment as a Key to Territorial Development: A Study of the Hydrangea Crop in Colombia	SUSTAINABILITY	2024	Qualitative	For-Profit	Not applicable	Supported	Neutral	Not applicable	Not applicable	Neutral
Argiolas, Alessia 1 alessia.argiolas@tum.de; Rawhouser, Hans 1,2 hans.rawhouser@unlv.edu; Sydow, Alisa 3 asydow@escp.eu	Social entrepreneurs concerned about Impact Drift. Evidence from contexts of persistent and pervasive need.	Journal of Business Venturing	2024	Qualitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Neutral	Neutral
Astawa, I. P.; Sudana, I. M.; Murni, N. G. N. S.; Sanjaya, I. G. N.	Social performance measurement through local culture in microfinance institutions	BUSINESS INNOVATION AND DEVELOPMENT IN EMERGING ECONOMIES	2019	Qualitative	For-Profit	Neutral	Neutral	Supported	Not applicable	Neutral	Neutral
Åstebro, Thomas 1 astebro@hec.fr; Hoos, Florian 1	Impact measurement based on repeated randomized control trials: The case of a training program to encourage social entrepreneurship.	Strategic Entrepreneurship Journal	2021	Quantitative	Both	Supported	Contradicted	Neutral	Supported	Not applicable	Supported
Atienza-Sahuquillo, Carlos; Barba-Sanchez, Virginia	DESIGN OF A MEASUREMENT MODEL FOR ENVIRONMENTAL PERFORMANCE: APPLICATION TO THE FOOD SECTOR	ENVIRONMENTAL ENGINEERING AND MANAGEMENT JOURNAL	2014	Mixed-Methods	For-Profit	Supported	Contradicted	Not applicable	Supported	Not applicable	Not applicable
Aung, Thiri Shwesin 1 thiri@pkusz.edu.cn; Shengji, Luan 1; Condon, Sharon 2	Evaluation of the environmental impact assessment (EIA) of Chinese EIA in Myanmar: Myitsone Dam, the Lappadaung Copper Mine and the Sino-Myanmar oil and gas pipelines.	Impact Assessment & Project Appraisal	2019	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

Ayorinde, Abimbola; Grove, Amy; Ghosh, Iman; Harlock, Jenny; Meehan, Edward; Tyldesley-Marshall, Natalie; Briggs, Adam; Clarke, Aileen; Al-Khudairy, Lena	What is the best way to evaluate social prescribing? A qualitative feasibility assessment for a national impact evaluation study in England	JOURNAL OF HEALTH SERVICES RESEARCH & POLICY	2024	Qualitative	Both	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
Azad, Md A. S.; Ancev, Tihomir	Measuring environmental efficiency of agricultural water use: A Luenberger environmental indicator	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2014	Quantitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Azad, Md A.S. 1 maza6668@uni.sydney.edu.au; Ancev, Tihomir 2	Using ecological indices to measure economic and environmental performance of irrigated agriculture	Ecological Economics	2010	Quantitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Bagnoli, Luca; Megali, Cecilia	Measuring Performance in Social Enterprises	NONPROFIT AND VOLUNTARY SECTOR QUARTERLY	2011	Mixed-Methods	For-Profit	Neutral	Supported	Supported	Not applicable	Neutral	Neutral
Bamattre, R. 1; Schowengerdt, B. 1; Nikoi, A. 1; DeJaeghere, J. 1	Time matters: the potential and pitfalls of using mixed methods approaches in longitudinal program evaluation.	International Journal of Social Research Methodology	2019	Mixed-Methods	Both	Neutral	Neutral	Neutral	Supported	Neutral	Neutral
Barber, A. J.; Manhire, J. T.; Gasso-Tortajada, V.; Oudshoorn, E.; Sorensen, C.; Moller, H.	Benchmarking energy and water efficiency in New Zealand wine production: eco-verification and incentivising improvement using the New Zealand Sustainability Dashboard	XXIX INTERNATIONAL HORTICULTURAL CONGRESS ON HORTICULTURE: SUSTAINING LIVES, LIVELIHOODS AND LANDSCAPES (IHC2014): INTERNATIONAL SYMPOSIA ON WATER, ECO-EFFICIENCY AND TRANSFORMATION OF ORGANIC WASTE IN HORTICULTURAL PRODUCTION	2016	Mixed-Methods	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Barinaga, Ester 1 ester.barinaga@fek.lu.se	From Evaluation to Valorising: Three Moments in the Making of Social Impact Value.	Journal of Social Entrepreneurship	2023	Conceptual	Both	Neutral	Supported	Supported	Neutral	Neutral	Supported
Barlow, R; Ellis, NJS; Mason, WK	A practical framework to evaluate and report combined natural resource and production outcomes of agricultural research to livestock producers	AUSTRALIAN JOURNAL OF EXPERIMENTAL AGRICULTURE	2003	Mixed-Methods	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Barraket, Jo 1; Yousefpour, Nina 1	Evaluation and Social Impact Measurement Amongst Small to Medium Social Enterprises: Process, Purpose and Value.	Australian Journal of Public Administration	2013	Qualitative	For-Profit	Supported	Supported	Neutral	Neutral	Neutral	Supported
Barreto-Villanueva, Adan	The progress of statistics and its usefulness in development assessment	PAPELES DE POBLACION	2012	Conceptual	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Barstow, Christina K.; Nagel, Corey L.; Clasen, Thomas F.; Thomas, Evan A.	Process evaluation and assessment of use of a large scale water filter and cookstove program in Rwanda	BMC PUBLIC HEALTH	2016	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral

Bartual Sanfeliu, C.; Cervello Royo, R.; Moya Clemente, I.	Measuring performance of social and non-profit Microfinance Institutions (MFIs): An application of multicriterion methodology	MATHEMATICAL AND COMPUTER MODELLING	2013	Quantitative	Both	Not applicable	Supported	Neutral	Not applicable	Neutral	Neutral
Baselice, Antonio; Prosperi, Maurizio; Lopolito, Antonio	A Conceptual Framework for the Evaluation of Social Agriculture: An Application to a Project Aimed at the Employability of Young People NEET	SUSTAINABILITY	2021	Conceptual	Both	Neutral	Supported	Supported	Neutral	Neutral	Neutral
Bashynska, Iryna; Malynovska, Yuliia; Kolinko, Nataliia; Bielialov, Taliat; Jarvis, Marina; Kovalska, Krystyna; Saiensus, Mariia	Performance Assessment of Sustainable Leadership of Enterprise's Circular Economy-Driven Innovative Activities	SUSTAINABILITY	2024	Mixed-Methods	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Batte, MT; Bacon, KJ; Hopkins, JW	Measures of economic and environmental performance for alternative agricultural production systems	JOURNAL OF PRODUCTION AGRICULTURE	1998	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Beckley, T; Parkins, J; Stedman, R	Indicators of forest-dependent community sustainability: The evolution of research	FORESTRY CHRONICLE	2002	Mixed-Methods	Both	Not applicable	Neutral	Neutral	Neutral	Not applicable	Neutral
Bell, Stephen A. 1; Aggleton, Peter 2	INTEGRATING ETHNOGRAPHIC PRINCIPLES IN NGO MONITORING AND IMPACT EVALUATION.	Journal of International Development	2012	Qualitative	Non-Profit	Supported	Neutral	Neutral	Not applicable	Supported	Neutral
Bellantuono, Nicola; Pontrandolfo, Pierpaolo; Scozzi, Barbara	Capturing the Stakeholders' View in Sustainability Reporting: A Novel Approach	SUSTAINABILITY	2016	Quantitative	For-Profit	Not applicable	Neutral	Supported	Not applicable	Not applicable	Not applicable
Beltran, Angelica Mendoza; Chiantore, Mariachiara; Pecorino, Danilo; Corner, Richard A.; Ferreira, Joao G.; Co, Roberto; Fanciulli, Luca; Guinee, Jeroen B.	Accounting for inventory data and methodological choice uncertainty in a comparative life cycle assessment: the case of integrated multi-trophic aquaculture in an offshore Mediterranean enterprise	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT	2018	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Ben Amara, Dhekra; Chen, Hong	Investigating the effect of multidimensional network capability and eco-innovation orientation for sustainable performance	CLEAN TECHNOLOGIES AND ENVIRONMENTAL POLICY	2020	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ben Rhouma, Amel	SUSTAINABLE VALUE IN EUROPE: SUSTAINABILITY PERFORMANCE OF THE CZECH REPUBLIC VERSUS THE EUROPE OF FIFTEEN	E & M EKONOMIE A MANAGEMENT	2010	Quantitative	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral

Benge, J.; Barber, A.; McCusker, K.; Le Quellec, I.; Manhire, J.; Hunt, L.; Moller, H.; Rosin, C.; MacLeod, C. J.	The New Zealand sustainability dashboard: connecting growers, industry, consumers, regulators and policy makers to drive sustainable horticulture	XXIX INT HORTICULTURAL CONGRESS ON HORTICULTURE: SUSTAINING LIVES, LIVELIHOODS AND LANDSCAPES: XVII INT SYMP ON HORTICULTURAL ECONOMICS AND MANAGEMENT AND V INT SYMP ON IMPROVING THE PERFORMANCE OF SUPPLY CHAINS IN THE TRANSITIONAL ECONOMIES	2015	Conceptual	Both	Supported	Neutral	Neutral	Not applicable	Not applicable	Neutral
Benjumea Arias, Martha Luz 1; Arango-Botero, Diana 2 dianaarangob@itm.edu.co	Evaluating the Impact of Social Entrepreneurship: A Multi-criteria Approach.	Periodica Polytechnica: Social & Management Sciences	2019	Mixed-Methods	Both	Neutral	Supported	Supported	Neutral	Neutral	Neutral
Benneworth, Paul; Olmos-Penuela, Julia	An openness framework for ex ante evaluation of societal impact of research	RESEARCH EVALUATION	2022	Conceptual	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Bergin-Seers, Suzanne 1 sue.bergin@vu.edu.au; Jago, Leo 2 leo.jago@vu.edu.au	Performance measurement in small motels in Australia.	Tourism & Hospitality Research	2007	Qualitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Berry, Clio; Othman, Ellisha; Tan, Jun Chuen; Gee, Brioney; Byrne, Rory Edward; Hodgekins, Joanne; Michelson, Daniel; Ng, Alvin Lai Oon; Marsh, Nigel V.; Coker, Sian; Fowler, David	Assessing social recovery of vulnerable youth in global mental health settings: a pilot study of clinical research tools in Malaysia	BMC PSYCHIATRY	2019	Mixed-Methods	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Bessat, Cecile; Zonon, Noel Adannou; D'Acremont, Valerie	Large-scale implementation of electronic Integrated Management of Childhood Illness (eIMCI) at the primary care level in Burkina Faso: a qualitative study on health worker perception of its medical content, usability and impact on antibiotic prescription and resistance	BMC PUBLIC HEALTH	2019	Qualitative	Non-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Bezhentseva, T., V; Aleksandrova, N. N.; Matyus, E. G.	Formation of system of indicators for evaluation of environmental activities	INTERNATIONAL CONFERENCE ON CONSTRUCTION, ARCHITECTURE AND TECHNOSPHERE SAFETY (ICCATS 2018)	2018	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Bianco, Gino B.; Tobin, Danny	Harnessing impact evaluation to build evidence in upstream conservation initiatives	BIOLOGICAL CONSERVATION	2024	Conceptual	Non-Profit	Supported	Supported	Neutral	Neutral	Not applicable	Neutral
Bishop, Catherine P. 1 cbishop4@une.edu	Ex post evaluation of technology diffusion in the African palm oil sector: The Caltech expeller in Cameroon, Benin, and Liberia.	World Development	2018	Mixed-Methods	Both	Neutral	Contradicted	Neutral	Supported	Not applicable	Neutral

Blockeel, Johan; Chuluunbaatar, Delgermaa; Holley, Aiden; Sulaiman, Rasheed; Djamen, Patrice; Grovermann, Christian	Taking a snapshot of Extension and Advisory Systems performance and outcomes: insights on a semi-quantitative evaluation approach	JOURNAL OF AGRICULTURAL EDUCATION & EXTENSION	2023	Quantitative	Non-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Bloom, Paul N. 1; Chatterji, Aaron K. 2	Scaling Social Entrepreneurial Impact.	California Management Review	2009	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Boix, Marianne; Montastruc, Ludovic; Ramos, Manuel; Gentilhomme, Olivier; Domenech, Serge	Benefits analysis of optimal design of eco-industrial parks through life cycle indicators	27TH EUROPEAN SYMPOSIUM ON COMPUTER AIDED PROCESS ENGINEERING, PT B	2017	Quantitative	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Neutral
Bolong, Nurmin; Saad, Ismail	Evaluating the Influence and Modification for Environment and Sustainability Learning Outcome in Environmental Engineering Course During COVID-19 Pandemic	INTERNATIONAL JOURNAL OF ENGINEERING EDUCATION	2022	Mixed-Methods	Both	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Bombardelli, Olga	Formative Learning Evaluation of university students as success factor	1ST INTERNATIONAL CONFERENCE ON HIGHER EDUCATION ADVANCES (HEAD'15)	2015	Mixed-Methods	Both	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Borgert, Thomas 1 tborgert@swin.edu.au; Donovan, Jerome D 1; Topple, Cheree 1; Masli, Eryadi K 1	Determining what is important for sustainability: scoping processes of sustainability assessments.	Impact Assessment & Project Appraisal	2019	Qualitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Borgert, Thomas 1 tborgert@swin.edu.au; Donovan, Jerome D. 1; Topple, Cheree 1; Masli, Eryadi K. 1	Impact analysis in the assessment of corporate sustainability by foreign multinationals operating in emerging markets: Evidence from manufacturing in Indonesia.	Journal of Cleaner Production	2020	Qualitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Neutral	Neutral
Brau, James; Hiatt, Shon; Woodworth, Warner	Evaluating impacts of microfinance institutions using Guatemalan data	MANAGERIAL FINANCE	2009	Mixed-Methods	Non-Profit	Neutral	Contradicted	Neutral	Neutral	Supported	Neutral
Breysse, Jill; Jacobs, David E.; Weber, William; Dixon, Sherry; Kawecki, Carol; Aceti, Susan; Lopez, Jorge	Health Outcomes and Green Renovation of Affordable Housing	PUBLIC HEALTH REPORTS	2011	Quantitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Britto, P. C.; Jaeger, D.; Hoffmann, S.; Robert, R. C. G.; Fantini, A. C.; Vibrans, A. C.	Productivity assessment of timber harvesting techniques for supporting sustainable forest management of secondary Atlantic Forest in southern Brazil	ANNALS OF FOREST RESEARCH	2017	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Bruma, Ioan Sebastian; Ulman, Simona-Roxana; Cautisanu, Cristina; Tanasa, Lucian; Hoha, Gabriel Vasile	Sustainability in the Case of Small Vegetable Farmers: A Matrix Approach	SUSTAINABILITY	2021	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

Brzozowska, Anna; Bubel, Dagmara; Pabian, Aleksander	Implementation of technical and information systems in environmental management	20TH INTERNATIONAL SCIENTIFIC CONFERENCE - ECONOMICS AND MANAGEMENT 2015 (ICEM-2015)	2015	Conceptual	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Buckley, Ralf 1 R.Buckley@griffith.edu.au	Evaluating the net effects of ecotourism on the environment: a framework, first assessment and future research.	Journal of Sustainable Tourism	2009	Conceptual	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Bugeza, James; Kankya, Clovice; Muleme, James; Akandinda, Ann; Sserugga, Joseph; Nantima, Noelina; Okori, Edward; Odoch, Terence	Participatory evaluation of delivery of animal health care services by community animal health workers in Karamoja region of Uganda	PLOS ONE	2017	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Bulderberga, Zane; Rivza, Baiba	NATURAL RESOURCE SIGNIFICANCE IN RURAL DEVELOPMENT EVALUATION: THE CASE OF LATVIA	ECOLOGY, ECONOMICS, EDUCATION AND LEGISLATION CONFERENCE PROCEEDINGS, SGEM 2016, VOL III	2016	Quantitative	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Burmatova, Olga	Strategy for sustainable development of the region: environmental scenarios	6TH CENTRAL EUROPEAN CONFERENCE IN REGIONAL SCIENCE: ENGINES OF URBAN AND REGIONAL DEVELOPMENT	2017	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Butnariu, Anca; Avasilcai, Silvia	Research on the possibility to apply Ecological Footprint as environmental performance indicator for the textile industry	CHALLENGES AND INNOVATIONS IN MANAGEMENT AND LEADERSHIP 12TH INTERNATIONAL SYMPOSIUM IN MANAGEMENT	2014	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Neutral	Not applicable	Neutral
Caduff, G	Increase in industrial environmental performance by integrated enterprise modeling	6TH MEETING OF THE WG TOOLS FOR SIMULATION AND MODELLING IN ENVIRONMENTAL APPLICATIONS	1996	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Cai, Tianxing	Risk Assessment for Environmentally Sustainable Business Planning and Optimization Based on the Identification of Regional Meteorology Pattern	PROCEEDINGS OF 2014 2ND INTERNATIONAL SYMPOSIUM ON COMPUTATIONAL AND BUSINESS INTELLIGENCE (ISCBI)	2014	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Cairns, Maryann R. 1 mcairns@smu.edu	Metering water: Analyzing the concurrent pressures of conservation, sustainability, health impact, and equity in use.	World Development	2018	Mixed-Methods	Non-Profit	Neutral	Neutral	Not applicable	Supported	Not applicable	Neutral
Calixto, E.; La Rovere, Emilio Lebre	Environmental reliability as a requirement for defining environmental impact limits in critical areas	SAFETY, RELIABILITY AND RISK ANALYSIS: THEORY, METHODS AND APPLICATIONS, VOLS 1-4	2009	Conceptual	For-Profit	Not applicable	Neutral	Neutral	Supported	Not applicable	Neutral
Carlos-Hernandez, S.; Diaz-Jimenez, L.	Strategy based on life cycle assessment for telemetric monitoring of an aquaponics system	INDUSTRIAL CROPS AND PRODUCTS	2022	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable

Cavicchi, Caterina; Vagnoni, Emidia	The role of performance measurement in assessing the contribution of circular economy to the sustainability of a wine value chain	BRITISH FOOD JOURNAL	2022	Qualitative	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Chamier-Gliszczynski, Norbert; Bohdal, Tadeusz	Urban Mobility Assessment Indicators in the Perspective of the Environment Protection	ROCZNIK OCHRONA SRODOWISKA	2016	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Chang-Lin Yang 1 051125@mail.fju.edu.tw; Preechalert, Sarina 2 sarinaprc@msme.au.edu; Phunnarungsi, Visit 2 visitphn@msme.au.edu; Kai-Ping Huang 3 129741@mail.fju.edu.tw	CONSTRUCTING INTEGRATED PERFORMANCE ASSESSMENT SYSTEM FOR SOCIAL ENTERPRISES.	International Journal of Organizational Innovation	2022	Conceptual	For-Profit	Neutral	Supported	Supported	Not applicable	Not applicable	Neutral
Chen, Kuen-Suan; Huang, Tsun-Hung; Chiou, Kuo-Ching; Kao, Wen-Yang	Fuzzy Evaluation Model for Products with Multifunctional Quality Characteristics: Case Study on Eco-Friendly Yarn	MATHEMATICS	2024	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Chen, WM; Warren, KA; Duan, N	Incorporating cleaner production analysis into environmental impact assessment in China	ENVIRONMENTAL IMPACT ASSESSMENT REVIEW	1999	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Chen, Yihui; Li, Minjie	Evaluation of influencing factors on tea production based on random forest regression and mean impact value	AGRICULTURAL ECONOMICS-ZEMEDELSKA EKONOMIKA	2019	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Cheshire, A. C.	Towards the development of regional environmental monitoring systems to ensure sustainable development of the aquaculture industry	JOURNAL OF COASTAL RESEARCH	2006	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Chima, S. C.; Nkwanyana, N. M.; Esterhuizen, T. M.	Impact of a short biostatistics course on knowledge and performance of postgraduate scholars: Implications for training of African doctors and biomedical researchers	NIGERIAN JOURNAL OF CLINICAL PRACTICE	2015	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Chmelik, Erin 1; Musteen, Martina 1 mmusteen@mail.sdsu.edu; Ahsan, Mujtaba 1	Measures of Performance in the Context of International Social Ventures: An Exploratory Study.	Journal of Social Entrepreneurship	2016	Qualitative	Both	Neutral	Neutral	Supported	Not applicable	Neutral	Neutral
Chowdhury, Ahmed Mushtaque Raza 1; Jenkins, Andrew 2; Nandita, Marziana Mahfuz 3	Measuring the effects of interventions in BRAC, and how this has driven 'development'.	Journal of Development Effectiveness	2014	Mixed-Methods	Non-Profit	Supported	Contradicted	Supported	Neutral	Supported	Supported

Chu, Pin-yu; Huang, Tong-yi; Huang, Ning-wan	Measuring Performance of eGovernment to the Disabled: Theory and Practice in Taiwan	PROCEEDINGS OF THE 11TH EUROPEAN CONFERENCE ON EGOVERNMENT	2011	Quantitative	Non-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Neutral
Chung, K. -C.; Chang, L. -C.	A Sustainability Strategy Assessment Framework Model for Medical Tourism Supply Chain in Asia	JOURNAL OF TESTING AND EVALUATION	2018	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ciccarino, Irene D.M 1,2 irenecciccarino@gmail.com; Rodrigues, Susana Cristina Serrano Fernandes 1 susana.rodrigues@ipleiria.pt; Ferreira Da Silva, Jorge 2 jorge1319@gmail.com	Social value appraisal: cutting the Gordian knot.	Innovation & Management Review	2024	Mixed-Methods	Both	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Contini, Giuditta 1 giuditta.contini@unimore.it; Peruzzini, Margherita 1; Bulgarelli, Stefano 2; Bosi, Gildo 2	Developing key performance indicators for monitoring sustainability in the ceramic industry: The role of digitalization and industry 4.0 technologies.	Journal of Cleaner Production	2023	Conceptual	For-Profit	Supported	Supported	Supported	Neutral	Not applicable	Neutral
Costa, Ericka 1 ericka.costa@unitn.it; Andreaus, Michele 1 michele.andreaus@unitn.it	Social impact and performance measurement systems in an Italian social enterprise: a participatory action research project.	Journal of Public Budgeting, Accounting & Financial Management	2021	Qualitative	Both	Supported	Supported	Supported	Supported	Supported	Supported
Costa, Ericka 1; Pesci, Caterina 1	Social impact measurement: why do stakeholders matter?	Sustainability Accounting, Management & Policy Journal	2016	Conceptual	For-Profit	Supported	Supported	Supported	Not applicable	Neutral	Neutral
COUPRIE, Sonia 1 sonia.couprie@orange.fr; GODEK-BRUNEL, Magdalena 2 mgodek@esce.fr; SIBIŃSKA, Anna 3 anna.sibinska@uni.lodz.pl	A GLOBAL PERFORMANCE INDEX OF INTERNATIONAL HUMANITARIAN NGOS. A PROPOSAL FOR A MEASUREMENT INSTRUMENT.	Scientific Papers of Silesian University of Technology. Organization & Management / Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie	2024	Conceptual	Non-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Cuellar-Galvez, David; Aranda-Camacho, Yesid; Mosquera-Vasquez, Teresa	A Model to Promote Sustainable Social Change Based on the Scaling up of a High-Impact Technical Innovation	SUSTAINABILITY	2018	Conceptual	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Cui, Weijia; Lin, Xueqin; Wang, Dai; Mi, Ying	Urban Industrial Carbon Efficiency Measurement and Influencing Factors Analysis in China	LAND	2023	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Dada, Ali; Staake, Thorsten; Fleisch, Elgar	Reducing Environmental Impact in Procurement by Integrating Material Parameters in Information Systems: The Example of Apple Sourcing	AMCIS 2010 PROCEEDINGS	2010	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Dajin Yu	Research on environmental performance evaluation of MSMEs based on ANP	Sixth Wuhan International Conference on E-Business, Vols 1-4: MANAGEMENT CHALLENGES IN A GLOBAL WORLD	2007	Mixed-Methods	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Neutral
Darby, Lauren 1 lauren.darby@groundwork.org.uk; Jenkins, Heledd 2	Applying sustainability indicators to the social enterprise business model.	International Journal of Social Economics	2006	Mixed-Methods	For-Profit	Neutral	Supported	Supported	Not applicable	Neutral	Neutral
Das, Ankita; Konietzko, Jan; Bocken, Nancy	How do companies measure and forecast environmental impacts when experimenting with circular business models?	SUSTAINABLE PRODUCTION AND CONSUMPTION	2022	Mixed-Methods	For-Profit	Neutral	Supported	Neutral	Supported	Not applicable	Neutral
De Bernardi, Paola; Bertello, Alberto; Venuti, Francesco	Online and On-Site Interactions within Alternative Food Networks: Sustainability Impact of Knowledge-Sharing Practices	SUSTAINABILITY	2019	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
de Felice, Annunziata 1 tdef@libero.it	Measuring the social capabilities and the implication on innovation.	Journal of Economic Studies	2014	Mixed-Methods	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
De Leon, Simon V.	The Social Return on Investment Methodology as A Tool for Valuation and Impact Assessment for Libraries: A Case Study	JOURNAL OF THE AUSTRALIAN LIBRARY AND INFORMATION ASSOCIATION	2021	Mixed-Methods	Both	Neutral	Contradicted	Supported	Not applicable	Not applicable	Neutral
De Luca, Anna Irene; Iofrida, Nathalie; Strano, Alfio; Falcone, Giacomo; Gulisano, Giovanni	Social Life Cycle Assessment and Participatory Approaches: A Methodological Proposal Applied to Citrus Farming in Southern Italy	INTEGRATED ENVIRONMENTAL ASSESSMENT AND MANAGEMENT	2015	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Not applicable	Not applicable
deBruyn, LAL	The status of soil macrofauna as indicators of soil health to monitor the sustainability of Australian agricultural soils	ECOLOGICAL ECONOMICS	1997	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Dedeke, Adenekan 1	Framework for Assessing the Integration of Ethics in the Design of Impact Investment Ventures.	Business & Professional Ethics Journal	2022	Conceptual	Both	Not applicable	Neutral	Neutral	Not applicable	Neutral	Neutral
Dedina, Daniel; Sanova, Petra; Laputkova, Adriana	EVALUATION OF CZECH FRUIT PRODUCERS' ENVIRONMENTAL DISCREPANCIES	AGRARIAN PERSPECTIVES XXVI: COMPETITIVENESS OF EUROPEAN AGRICULTURE AND FOOD SECTORS	2017	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
DEMIAN, Mihai 1 mihai.demian@edu.ucv.ro; GRECU, Luminița 2 luminita.grecu@edu.ucv.ro; DEMIAN, Gabriela 1 gabriela.demian@edu.ucv.ro	ASSESSING THE DEGREE TO WHICH A PULP AND PAPER ENTERPRISE MEETS THE REQUIREMENTS OF SUSTAINABLE DEVELOPMENT.	Review of Management & Economic Engineering	2022	Conceptual	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Not applicable

Dey, Prasanta Kumar; Yang, Guo-liang; Malesios, Chrysovalantis; De, Debashree; Evangelinos, Konstantinos	Performance Management of Supply Chain Sustainability in Small and Medium-Sized Enterprises Using a Combined Structural Equation Modelling and Data Envelopment Analysis	COMPUTATIONAL ECONOMICS	2021	Mixed-Methods	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Dhiaulhaq, Ahmad 1,2 ahmad.dhiaulhaq@wri.org; Hepp, Catherine M. 1 heppcm@gmail.com; Adjoffoin, Laetitia M. 3 laetitiamusi7@gmail.com; Ehowe, Corine 3 corineehowe@gmail.com; Assembe-Mvondo, Samuel 1 s.assembe@cgiar.org; Wong, Grace Y. 1,4 grace.wong@chikyu.ac.jp	Environmental justice and human well-being bundles in protected areas: An assessment in Campo Ma'an landscape, Cameroon.	Forest Policy & Economics	2024	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Dietz, Lou Ann; Brown, Marcia; Swaminathan, Vinaya	Increasing the Impact of Conservation Projects	AMERICAN JOURNAL OF PRIMATOLOGY	2010	Conceptual	Non-Profit	Supported	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Dimitriou, Dimitrios; Karagkouni, Aristi	Assortment of Airports' Sustainability Strategy: A Comprehensiveness Analysis Framework	SUSTAINABILITY	2022	Conceptual	For-Profit	Neutral	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
DIRSCHL, HJ; NOVAKOWSKI, NS; SADAR, MH	EVOLUTION OF ENVIRONMENTAL-IMPACT ASSESSMENT AS APPLIED TO WATERSHED MODIFICATION PROJECTS IN CANADA	ENVIRONMENTAL MANAGEMENT	1993	Conceptual	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Dmitrieva, Natalya; Sandrakova, Irina; Chistyakova, Galina; Gabinskaya, Olga	Environment Status: Official Assessment vs Perception by the Population	VTH INTERNATIONAL INNOVATIVE MINING SYMPOSIUM	2020	Mixed-Methods	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Domingues, Ana Rita; Mazhar, Muhammad Usman; Bull, Richard	Environmental performance measurement in arts and cultural organisations: Exploring factors influencing organisational changes	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2023	Qualitative	Non-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Dong, Feng 1,2 dongfeng2008@126.com; Zhang, Yuanqing 1; Zhang, Xiaoyun 1; Hu, Mengyue 1; Gao, YuJin 1; Zhu, Jiao 1	Exploring ecological civilization performance and its determinants in emerging industrialized countries: A new evaluation system in the case of China.	Journal of Cleaner Production	2021	Quantitative	Both	Not applicable	Supported	Neutral	Not applicable	Not applicable	Not applicable
Dong, Jun; Chi, Yong; Zou, Daoan; Fu, Chao; Huang, Qunxing; Ni, Mingjiang	Energy-environment-economy assessment of waste management systems from a life cycle perspective: Model development and case study	APPLIED ENERGY	2014	Mixed-Methods	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Dong, Na; Fu, Yanting; Xiong, Feng; Li, Lujie; Ao, Yibin; Martek, Igor	Sustainable Construction Project Management (SCPM) Evaluation-A Case Study of the Guangzhou Metro Line-7, PR China	SUSTAINABILITY	2019	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
dos Santos Rodrigues, Vanessa Isabel; Candiota Tubino, Rejane Maria; Malafatti, Celia Fraga; Berwanger, Jorge Augusto	Development of an instrument to improve the monitoring of licensed industrial activities and to promote continuous improvement	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2019	Conceptual	For-Profit	Supported	Supported	Neutral	Not applicable	Not applicable	Neutral
dos Santos, Márcio Ricardo Costa 1 mrcosta@doutor.com.br; Rodrigues, Geraldo Stachetti 2	SOCIO-ENVIRONMENTALANDSUSTAINABILITY ASSESSMENT FORTECHNOLOGY INNOVATIONSAT PECTENS PRODUCTION IN BRAZIL.	Journal of Technology Management & Innovation	2008	Mixed-Methods	For-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Neutral
Dube, Laurette; McRae, Cameron; Wu, Yun-Hsuan; Ghosh, Samik; Allen, Summer; Ross, Daniel; Ray, Saibal; Joshi, Pramod K.; McDermott, John; Jha, Srivardhini; Moore, Spencer	Impact of the eKutir ICT-enabled social enterprise and its distributed microentrepreneur strategy on fruit and vegetable consumption: A quasi-experimental study in rural and urban communities in Odisha, India	FOOD POLICY	2020	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Dufour, Bryan	Social impact measurement: What can impact investment practices and the policy evaluation paradigm learn from each other?	RESEARCH IN INTERNATIONAL BUSINESS AND FINANCE	2019	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Not applicable	Neutral
Dufour, Bryan 1 bryan.dufour@gmail.com; Petrella, Francesca 1 francesca.petrella@univ-amu.fr; Richez-Battesti, Nadine 1 nadine.richez-battesti@univ-amu.fr	Understanding social impact assessment through Public Value Theory: A comparative analysis on WISEs in France and Denmark.	Annals of Public & Cooperative Economics	2022	Conceptual	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Dumont, Guillaume	Evaluating the Credibility of Entrepreneurs' Impact Promises in Early-Stage Impact Investing	ENTREPRENEURSHIP THEORY AND PRACTICE	2024	Qualitative	For-Profit	Neutral	Not applicable	Neutral	Not applicable	Not applicable	Neutral
Eberhard, Rachel; Coggan, Anthea; Jarvis, Diane; Hamman, Evan; Taylor, Bruce; Baresi, Umberto; Vella, Karen; Dean, Angela J.; Deane, Felicity; Helmstedt, Kate; Mayfield, Helen	Understanding the effectiveness of policy instruments to encourage adoption of farming practices to improve water quality for the Great Barrier Reef	MARINE POLLUTION BULLETIN	2021	Conceptual	Both	Neutral	Neutral	Not applicable	Neutral	Not applicable	Not applicable
Ebrahim, Alnoor 1 aebrahim@hbs.edu; Rangan, V. Kasturi 2 vrangan@hbs.edu	What Impact?	California Management Review	2014	Conceptual	Both	Supported	Supported	Supported	Neutral	Neutral	Neutral

Edward, Anbrasi; Osei-Bonsu, Kojo; Branchini, Casey; Yarghal, Temor Shah; Arwal, Said Habib; Naeem, Ahmad Jan	Enhancing governance and health system accountability for people centered healthcare: an exploratory study of community scorecards in Afghanistan	BMC HEALTH SERVICES RESEARCH	2015	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Ekici, Birol; Celik, Mehmet	Regulatory impact analysis:: Analysis procedure and implementation	AMME IDARESI DERGISI	2007	Conceptual	Both	Supported	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Ekmekcioglu, Omer	Discovering the Perception Differences of Stakeholders on the Sustainable and Innovative Stormwater Management Practices	WATER RESOURCES MANAGEMENT	2024	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Etana, Dula; Snelder, Denyse J. R. M.; van Wesenbeeck, Cornelia F. A.; Buning, Tjard de Cock	The Impact of Adaptation to Climate Change and Variability on the Livelihood of Smallholder Farmers in Central Ethiopia	SUSTAINABILITY	2021	Quantitative	Both	Not applicable	Contradicted	Neutral	Not applicable	Not applicable	Not applicable
Fairbrass, Alison J.; Moretti, Victor; Quaresma, Elvander; Ribeiro, Celma; Roque, Fabio de Oliveira; Oller, Claudio; Tomei, Julia	Indicator-based natural capital reporting to inform decision-making in the Brazilian Pantanal	CONSERVATION SCIENCE AND PRACTICE	2024	Quantitative	Both	Supported	Supported	Neutral	Not applicable	Not applicable	Not applicable
Faktor, Kara l.; Payan, Denise d.; Ramirez, Alejandro j.; May, Folasade p.	Impact and Sustainability of Foreign Medical Aid: A Qualitative Study with Honduran Healthcare Providers	ANNALS OF GLOBAL HEALTH	2023	Qualitative	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Fan, Wenji	Research on Low-Carbon Logistics Environmental Impact Evaluation Model	LISS 2014	2015	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Fechete, Flavia; Nedelcu, Anisor	Performance Management Assessment Model for Sustainable Development	SUSTAINABILITY	2019	Conceptual	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Feil, Alexandre Andre; do Amaral, Caroline Constantin; Schreiber, Dusan; Maehler, Alisson Eduardo	Sustainability performance of small and medium dairy enterprises in Brazil	SUSTAINABLE PRODUCTION AND CONSUMPTION	2023	Quantitative	For-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Not applicable
Folchi, R	Environmental impact statement for mining with explosives: A quantitative method	PROCEEDINGS OF THE TWENTY-NINTH ANNUAL CONFERENCE ON EXPLOSIVES AND BLASTING TECHNIQUE, VOL 2	2003	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Franciosi, Chiara 1 cfranciosi@unisa.it; Voisin, Alexandre 2; Miranda, Salvatore 1; Riemma, Stefano 1; Iung, Benoit 2	Measuring maintenance impacts on sustainability of manufacturing industries: from a systematic literature review to a framework proposal.	Journal of Cleaner Production	2020	Conceptual	For-Profit	Neutral	Supported	Supported	Neutral	Not applicable	Neutral

Fura, Barbara	Improving ISO 14001 Environmental Management Systems	POLISH JOURNAL OF ENVIRONMENTAL STUDIES	2013	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Gala, Libor; Basl, Josef	ERP INNOVATION BASED ON REQUIREMENTS OF SOCIAL RESPONSIBILITY MEASUREMENT AND EVALUATION	CONFENIS-2013: 7TH INTERNATIONAL CONFERENCE ON RESEARCH AND PRACTICAL ISSUES OF ENTERPRISE INFORMATION SYSTEMS	2013	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Garcia, Veronica; Margallo, Maria; Aldaco, Ruben; Urtiaga, Ane; Irabien, Angel	Environmental Sustainability Assessment of an Innovative Cr (III) Passivation Process	ACS SUSTAINABLE CHEMISTRY & ENGINEERING	2013	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Gavrilidis, Athanasios Alexandru; Nita, Andreea; Rozylowicz, Laurentiu	Past local industrial disasters and involvement of NGOs stimulate public participation in transboundary Environmental Impact Assessment	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2022	Mixed-Methods	Non-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
GAZDA, Andrzej 1 agazda@prz.edu.pl; SIWIEC, Dominika 1 d.siwiec@prz.edu.pl; PACANA, Andrzej 1 app@prz.edu.pl	ANALYSIS OF PRO-ENVIRONMENTAL AWARENESS AND APPROACH TO MAKING DECISIONS IN THE CONTEXT OF SUSTAINABILITY.	Scientific Papers of Silesian University of Technology. Organization & Management / Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie	2022	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Gazzola, Patrizia 1 patrizia.gazzola@uninsubria.it; Amelio, Stefano 1 stefano.amelio@uninsubria.it; Papagiannis, Fragkoulis 2 F.Papagiannis@ljmu.ac.uk; Michaelides, Zenon 3 z.michaelides@mmu.ac.uk	Sustainability reporting practices and their social impact to NGO funding in Italy.	Critical Perspectives on Accounting	2021	Quantitative	Non-Profit	Neutral	Neutral	Neutral	Not applicable	Neutral	Supported
Georgiadis, T.; Nardino, M.; Cremonini, L.; Carbone, C.; Zanini, G.; Ciancarella, L.; Piersanti, A.; Villani, M.	URBESS - nature based assessment tool for smart and sustainable urban planning	INTERNATIONAL SYMPOSIUM ON GREENER CITIES FOR MORE EFFICIENT ECOSYSTEM SERVICES IN A CLIMATE CHANGING WORLD	2018	Mixed-Methods	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Gess, Andreas; Lorenz, Manuel; Tolsdorf, Anna; Albrecht, Stefan	Environmental Impacts of Renewable Insulation Materials	SUSTAINABILITY	2021	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ghita, Simona Ioana; Saseanu, Andreea Simona; Gogonea, Rodica-Manuela; Huidumac-Petrescu, Catalin-Emilian	Perspectives of Ecological Footprint in European Context under the Impact of Information Society and Sustainable Development	SUSTAINABILITY	2018	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Gionfriddo, Gianluca; Piccaluga, Andrea	Startups' contribution to SDGs: A tailored framework for assessing social impact	JOURNAL OF MANAGEMENT & ORGANIZATION	2024	Mixed-Methods	For-Profit	Neutral	Supported	Supported	Not applicable	Neutral	Neutral

Glodzinski, Eryk	Project assessment framework: multidimensional efficiency approach applicable for project-driven organizations	CENTERIS 2018 - INTERNATIONAL CONFERENCE ON ENTERPRISE INFORMATION SYSTEMS / PROJMAN 2018 - INTERNATIONAL CONFERENCE ON PROJECT MANAGEMENT / HCIST 2018 - INTERNATIONAL CONFERENCE ON HEALTH AND SOCIAL CARE INFORMATION SYSTEMS AND TECHNOLOGIES, CENTERI	2018	Conceptual	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Gonçalves Vieira, Valéria 1 goncalvesvieira.valeria@gmail.com; Macário de Oliveira, Verônica 1 veronicamacario@gmail.com; Chim Miki, Adriana Fumi 1 adriana.chimmiki@gmail.com	Social Entrepreneurship Measurement Framework for Developing Countries.	RAC: Revista de Administração Contemporânea	2023	Conceptual	Both	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
González, B; Adenso-Díaz, B; González-Torre, PL	A fuzzy logic approach for the impact assessment in LCA	RESOURCES CONSERVATION AND RECYCLING	2002	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Gottlieb, Laura; Ackerman, Sara; Wing, Holly; Adler, Nancy	Evaluation Activities and Influences at the Intersection of Medical and Social Services	JOURNAL OF HEALTH CARE FOR THE POOR AND UNDERSERVED	2017	Qualitative	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Graafland, Johan 1 J.J.Graafland@uvt.nl; Smid, Hugo 2	Environmental Impacts of SMEs and the Effects of Formal Management Tools: Evidence from EU's Largest Survey.	Corporate Social Responsibility & Environmental Management	2016	Quantitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Grigashkina, Svetlana; Grigashkin, Maksim; Miller, Andrew	Assessment of the Environmental Impact of Noxious Emissions by Energy Enterprises into the Atmosphere of the Mining Region	IIIRD INTERNATIONAL INNOVATIVE MINING SYMPOSIUM	2018	Conceptual	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Groot, J. C. J.; Jellema, A.; Rossing, W. A. H.	Exploring Trade-offs Among Environmental Services to Support Landscape Planning	MODSIM 2007: INTERNATIONAL CONGRESS ON MODELLING AND SIMULATION: LAND, WATER AND ENVIRONMENTAL MANAGEMENT: INTEGRATED SYSTEMS FOR SUSTAINABILITY	2007	Conceptual	Non-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Guenther, Edeltraud; Kaulich, Susann	Environmental performance measurement using the EPM-KOMPAS approach as one step towards sustainability - The assessment method in the EPM-KOMPAS approach as a guide for SMEs towards better environmental performance	SUSTAINABILITY ACCOUNTING AND REPORTING	2006	Conceptual	For-Profit	Supported	Supported	Not applicable	Neutral	Not applicable	Neutral
Guo, Hongxu; Xie, Zihan; Wu, Rong	Evaluating Green Innovation Efficiency and Its Socioeconomic Factors Using a Slack-Based Measure with Environmental Undesirable Outputs	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	2021	Quantitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Neutral

Gupta, A	Geoindicators for tropical urbanization	ENVIRONMENTAL GEOLOGY	2002	Conceptual	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Gutierrez-Lopez, E; Gomez-Balandra, MA; Marquez-Bravo, L; Arreguin-Cortes, F	Advances and perspectives of institutional capacity building in environmental impact and water quality	INGENIERIA HIDRAULICA EN MEXICO	1998	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ha, Le Thanh	Scrutinizing the nexus between green innovations and the sustainability of environmental system: novel insights from European database	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2023	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Haddy, Emily; Burden, Faith; Antonio Fernando-Martinez, Jose; Legaria-Ramirez, Dafne; Raw, Zoe; Brown, Julia; Kaminski, Juliane; Proops, Leanne	Evaluation of long-term welfare initiatives on working equid welfare and social transmission of knowledge in Mexico	PLOS ONE	2021	Mixed-Methods	Non-Profit	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Hao, Zhibiao; Wang, Yongsong	Evaluation of socio-economic-ecological environmental benefits of urban renewal projects based on the coupling coordination degree	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2023	Mixed-Methods	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Hasan, Mohammad 1; Khan, Fateh Mohd 1	Framework for Environmental Assessment of Small and Medium Enterprises.	Amity Global Business Review	2017	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
He, Chao	Performance evaluation model and algorithm of green supply chain management based on sustainable computing	ECOLOGICAL CHEMISTRY AND ENGINEERING S-CHEMIA I INZYNIERIA EKOLOGICZNA S	2021	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Herva, M.; Franco, A.; Ferreiro, S.; Alvarez, A.; Roca, E.	An approach for the application of the Ecological Footprint as environmental indicator in the textile sector	JOURNAL OF HAZARDOUS MATERIALS	2008	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Hiddink, J. G.; Jennings, S.; Kaiser, M. J.	Indicators of the ecological impact of bottom-trawl disturbance on seabed communities	ECOSYSTEMS	2006	Quantitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Hifni, Syaiful 1; Sayudi, Akhmad 1; Wijaya, Rano 1	Integrated Reporting For Regional Investment and Achievement of Sustainable Development Goals.	Journal of Finance & Banking Review (JFBR)	2022	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Hoko, Zvikomborero; Hertle, Jochen	An evaluation of the sustainability of a rural water rehabilitation project in Zimbabwe	PHYSICS AND CHEMISTRY OF THE EARTH	2006	Mixed-Methods	Non-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Neutral

Hou, Huping; Ding, Zhongyi; Zhang, Shaoliang; Chen, Zanxu; Wang, Xueqing; Sun, Aibo; An, Shi; Xiong, Jinting	Targeting the Influences of Under-Lake Coal Mining Based on the Value of Wetland Ecosystem Services: What and How?	LAND	2022	Mixed-Methods	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Howgrave-Graham, Alan 1 alan.howgrave-graham@sci.monash.edu.au; van Berkel, Rene 2 rvanberk@bigpond.net.au	Assessment of cleaner production uptake: method development and trial with small businesses in Western Australia	Journal of Cleaner Production	2007	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Hu, Fang 1 fanghu@gxu.edu.cn; Tang, Thomas Li-Ping 1,2 Thomas.Tang@mtsu.edu; Chen, Yuanpeng 1 chenyuanpeng2023@163.com; Li, Yubo 1 lzlybst@126.com	Sustainable tourism in China: Visualization of low-carbon transitions at three tourist attractions across three occasions.	Socio-Economic Planning Sciences	2024	Quantitative	Both	Neutral	Neutral	Not applicable	Supported	Not applicable	Not applicable
Huang Yicong; Zhou Lin; Yao Meifang	Thermal Power Plant Environmental Performance Evaluation Based on Data Envelopment Analysis	2018 INTERNATIONAL CONFERENCE OF GREEN BUILDINGS AND ENVIRONMENTAL MANAGEMENT (GBEM 2018)	2018	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Huang, A.; Badurdeen, F.	METRICS-BASED HIERARCHICAL APPROACH FOR SUSTAINABLE MANUFACTURING SYSTEMS PERFORMANCE EVALUATION	24TH INTERNATIONAL CONFERENCE ON PRODUCTION RESEARCH (ICPR)	2017	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Huang, Aihua; Badurdeen, Fazleena	Sustainable Manufacturing Performance Evaluation: Integrating Product and Process Metrics for Systems Level Assessment	14TH GLOBAL CONFERENCE ON SUSTAINABLE MANUFACTURING, GCSM 2016	2017	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Huang, Beijia; Zhao, Juan; Chai, Jingyang; Xue, Bing; Zhao, Feng; Wang, Xiangyu	Environmental influence assessment of China's multi-crystalline silicon (multi-Si) photovoltaic modules considering recycling process	SOLAR ENERGY	2017	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Huang, Yuan-sheng; Shi, Xiu-fen; Yuan, Li-ming	Environmental Influence Assessment of Thermal Power Plant Based on Entropy and Fuzzy Optimal Model	ADVANCED MEASUREMENT AND TEST, PARTS 1 AND 2	2010	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Hussain, Tajammal; Edgeman, Rick; Eskildsen, Jacob; Shoukry, Alaa Mohamed; Gani, Showkat	Sustainable Enterprise Excellence: Attribute-Based Assessment Protocol	SUSTAINABILITY	2018	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Ibrahim, Yousif M. 1 yousifmonadhil58@gmail.com; Hami, Norsiah 2 norsiahami@uum.edu	A Scale for Measuring Sustainable Manufacturing Practices and Sustainability Performance: Validity and Reliability.	Quality Innovation Prosperity / Kvalita Inovácia Prosperita	2020	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral

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Ingram, V.; Van Der Werf, E.; Kikulwe, E.; Wesseler, J. H. H.	Evaluating the impacts of plantations and associated forestry operations in Africa-methods and indicators	INTERNATIONAL FORESTRY REVIEW	2016	Mixed-Methods	Both	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
Ishii-Eiteman, MJ; Ardhianie, N	Community monitoring of integrated pest management versus conventional pesticide use in a World Bank Project in Indonesia	INTERNATIONAL JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL HEALTH	2002	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Iyer, Vijayan Gurumurthy	Strategic Environmental Assessment (SEA) Process for Green Materials and Environmental Engineering Systems towards Sustainable Development-Business Excellence Achievements	2018 4TH INTERNATIONAL CONFERENCE ON GREEN MATERIALS AND ENVIRONMENTAL ENGINEERING (GMEE 2018)	2018	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Neutral	Not applicable	Not applicable
Jamous, Naoum; Schroedl, Holger; Turowski, Klaus	Light-Weight Composite Environmental Performance Indicators (LWC-EPI) Solution: A Systematic Approach towards Users Requirements	PROCEEDINGS OF THE 46TH ANNUAL HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES	2013	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Jasiulewicz-Kaczmarek, Malgorzata; Zywica, Patryk	THE CONCEPT OF MAINTENANCE SUSTAINABILITY PERFORMANCE ASSESSMENT BY INTEGRATING BALANCED SCORECARD WITH NON-ADDITIVE FUZZY INTEGRAL	EKSPLOATACJA I NIEZAWODNOSC-MAINTENANCE AND RELIABILITY	2018	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Jawjit, Warit 1,2 jwarit@gmail.com; Pavasant, Prasert 3 prasert.p@chula.ac.th; Kroeze, Carolien 4,5 carolien.kroeze@wur.nl	Evaluating environmental performance of concentrated latex production in Thailand.	Journal of Cleaner Production	2015	Quantitative	For-Profit	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Ji, Xiang; Qian, Weiran; Tian, Zejun; Li, Yi; Wang, Laili	Quantification and evaluation of chemical footprint of woollen textiles	INDUSTRIA TEXTILA	2021	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Jiaduo, Erti; Kibria, Md. Golam; Aspy, Nazhat Nury; Ullah, Ehsan; Hossain, Md. Emran	The Impact of Agricultural Employment and Technological Innovation on the Environment: Evidence from BRICS Nations Considering a Novel Environmental Sustainability Indicator	SUSTAINABILITY	2023	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Jiang, Yefeng; Chen, Songchao; Hu, Bifeng; Zhou, Yin; Liang, Zongzheng; Jia, Xiaolin; Huang, Mingxiang; Wei, Jing; Shi, Zhou	A comprehensive framework for assessing the impact of potential agricultural pollution on grain security and human health in economically developed areas	ENVIRONMENTAL POLLUTION	2020	Mixed-Methods	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Jiang, Yue; Lin, Wenpeng; Wu, Mingquan; Liu, Ke; Yu, Xumiao; Gao, Jun	Remote Sensing Monitoring of Ecological-Economic Impacts in the Belt and Road Initiatives Mining Project: A Case Study in Sino Iron and Taldybulak Levoberezhny	REMOTE SENSING	2022	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Jiang, Zhigang 1 jzg100@163.com; Zhang, Hua 1; Yan, Wei 1; Zhou, Min 1; Li, Gongfa 1	A method for evaluating environmental performance of machining systems.	International Journal of Computer Integrated Manufacturing	2012	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Jiang, Zhigang; Ding, Zhouyang; Zhang, Hua; Cai, Wei; Liu, Ying	Data-driven ecological performance evaluation for remanufacturing process	ENERGY CONVERSION AND MANAGEMENT	2019	Quantitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Jiang, Zhigang; Zhang, Hua; Yan, Wei; Zhou, Min; Li, Gongfa; Huang, Geng	Integrated Environmental Performance Assessment of Basic Oxygen Furnace Steelmaking	POLISH JOURNAL OF ENVIRONMENTAL STUDIES	2012	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Jinnan, Wang; Ying, Cao	Evaluation of the Social and Economic Impacts of Environmental Policy	PROCEEDINGS OF THE 2ND CHINA INTERNATIONAL FORUM ON ENVIRONMENTAL IMPACT ASSESSMENT-SEA IN CHINA	2007	Conceptual	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Joglekar, Saurabh N.; Darwai, Vivek; Mandavgane, Sachin A.; Kulkarni, Bhaskar D.	A methodology of evaluating sustainability index of a biomass processing enterprise: a case study of native cow dung-urine biorefinery	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2020	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Johnstone, Leanne 1 leanne.johnstone@oru.se	The means to substantive performance improvements – environmental management control systems in ISO 14001– certified SMEs.	Sustainability Accounting, Management & Policy Journal	2022	Qualitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Johnstone, Leanne 1 leanne.johnstone@oru.se	The construction of environmental performance in ISO 14001-certified SMEs.	Journal of Cleaner Production	2020	Qualitative	For-Profit	Neutral	Neutral	Neutral	Neutral	Not applicable	Neutral
Johnstone, Leanne; Hallberg, Peter	ISO 14001 adoption and environmental performance in small to medium sized enterprises	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2020	Qualitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Jones, F. Chris	Cumulative effects assessment: theoretical underpinnings and big problems	ENVIRONMENTAL REVIEWS	2016	Conceptual	Both	Not applicable	Supported	Neutral	Not applicable	Not applicable	Neutral

Jones, Meg	setting goals MEASURING ECONOMIC EMPOWERMENT.	International Trade Forum	2012	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Jovanovic, Milica; Dlacic, Jasmina; Okanovic, Milan	How does the digitalization impact society's sustainable development? Measures and implications	ECONOMICS OF DIGITAL TRANSFORMATION	2019	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Jung, Seok 1 js7707@mke.go.kr; Dodbiba, Gjergj 1; Chae, Song Hwa 2; Fujita, Toyohisa 1	A novel approach for evaluating the performance of eco-industrial park pilot projects	Journal of Cleaner Production	2013	Quantitative	For-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Not applicable
Jurgelane, Andra; Lanka, Svetlana	Social Impact Measurement: an Innovative Tool For Fostering the Positive Social Change Created by Social Enterprises	3RD INTERNATIONAL CONFERENCE ON LIFELONG LEARNING AND LEADERSHIP FOR ALL (ICLEL 2017)	2017	Qualitative	For-Profit	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Kafel, Tomasz; Ziebicki, Bernard	Multidimensional model for social enterprise performance measurement	IFKAD 2017: 12TH INTERNATIONAL FORUM ON KNOWLEDGE ASSET DYNAMICS: KNOWLEDGE MANAGEMENT IN THE 21ST CENTURY: RESILIENCE, CREATIVITY AND CO-CREATION	2017	Conceptual	For-Profit	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Kafel, Tomasz; Ziebicki, Bernard	MEASURING PERFORMANCE OF A SOCIAL ENTERPRISE: A THREE- DIMENSIONAL MODEL	BUSINESS AND NON-PROFIT ORGANIZATIONS FACING INCREASED COMPETITION AND GROWING CUSTOMERS' DEMANDS, VOL 17	2018	Conceptual	For-Profit	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Kaiser, FG; Wölfing, S; Fuhrer, U	Environmental attitude and ecological behaviour	JOURNAL OF ENVIRONMENTAL PSYCHOLOGY	1999	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Kaku, Pili Masoud 1,2 baha_masoud@yahoo.com; Zhu, Haochen 1,2,3; Fangninou, Fangnon Firmin 1,2	Evaluation of the EIA process in Zanzibar: the participation of stakeholders in public and private projects.	Environment, Development & Sustainability	2023	Mixed-Methods	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Kalandadze, Besik; Trapaidze, Vazha	QUANTITATIVE EVALUATION OF THE IMPACT OF OH HEAVI METALS ON SOIL PRODUCTIVITY ON THE EXAMPLE OF ORE-DRESSING AND PROCESSING PRODUCTION IN EAST GEORGIA	WATER RESOURCES, FOREST, MARINE AND OCEAN ECOSYSTEMS, SGEM 2015, VOL II	2015	Quantitative	Both	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Kamaruddin, Muhammad Iqmal Hisham; Auzair, Sofiah Md	Measuring 'Islamic accountability' in Islamic social enterprise (ISE)	INTERNATIONAL JOURNAL OF ISLAMIC AND MIDDLE EASTERN FINANCE AND MANAGEMENT	2020	Quantitative	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Kao, Fang-Chen; Huang, Shu-Chin; Lo, Huai-Wei	A Rough-Fermatean DEMATEL Approach for Sustainable Development Evaluation for the Manufacturing Industry	INTERNATIONAL JOURNAL OF FUZZY SYSTEMS	2022	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable

Kasem, Edward; Trenz, Oldrich; Hrebicek, Jiri	Statistical Method and Neural Network for Sustainability Evaluation	MATHEMATICAL METHODS IN ECONOMICS (MME 2014)	2014	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Kassem, Edward; Trenz, Oldrich	Automated Sustainability Assessment System for Small and Medium Enterprises Reporting	SUSTAINABILITY	2020	Mixed-Methods	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Kassem, Edward; Trenz, Oldrich; Hrebicek, Jiri; Faldik, Oldrich	Sustainability Assessment Using Sustainable Value Added	19TH INTERNATIONAL CONFERENCE ENTERPRISE AND COMPETITIVE ENVIRONMENT 2016	2016	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Katrijn, Bulckens; Hadiel, Holail Mohamed; Evelien, Neirynck; Tijs, Verbeke	The Mind-and Makerspace Impact evaluation of a university makerspace and the development of an impact measurement methodology	PROCEEDINGS OF 6TH FABLEARN EUROPE / MAKEED CONFERENCE 2022	2022	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Not applicable	Neutral
Kaulins, Janis; Ernsteins, Raimonds; Kudrenickis, Ivars	MONITORING AND REPORTING SYSTEM FOR MUNICIPAL SUSTAINABLE DEVELOPMENT GOVERNANCE IN LATVIA: SUSTAINABILITY OUTLOOK	ECONOMIC SCIENCE FOR RURAL DEVELOPMENT 2018	2018	Mixed-Methods	Both	Supported	Contradicted	Supported	Not applicable	Not applicable	Neutral
Kaymaz, Çağlar Kıvanç 1 ckkaymaz@atauni.edu .tr; Birinci, Salih 1; Kızılkan, Yusuf 1	Sustainable development goals assessment of Erzurum province with SWOT-AHP analysis.	Environment, Development & Sustainability	2022	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Kelly, Paul Richard 1,2 paulrichardkelly@g mail.com	An activity theory study of data, knowledge, and power in the design of an international development NGO impact evaluation.	Information Systems Journal	2018	Qualitative	Non-Profit	Neutral	Supported	Neutral	Not applicable	Neutral	Neutral
Kennedy, Pattye Weaver 1; Dreger, Ralph Mason 1	DEVELOPMENT OF CRITERION MEASURES OF OVERSEAS MISSIONARY PERFORMANCE.	Journal of Applied Psychology	1974	Quantitative	Non-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Keshavarz-Ghorabaee, Mehdi; Amiri, Maghsoud; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas; Antucheviciene, Jurgita	A Fuzzy Simultaneous Evaluation of Criteria and Alternatives (F-SECA) for Sustainable E-Waste Scenario Management	SUSTAINABILITY	2022	Conceptual	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Khan, Farman Ullah; Bugnar, Nicoleta; Zhang, Junrui; Badulescu, Alina; Khan, Muhammad Wasim Jan	Towards sustainable management: Exploring the role of internal monitoring in pollution prevention	PLOS ONE	2024	Quantitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Khan, Mehreen 1 mehreen.haider26@ gmail.com; Chaudhry, Muhammad Nawaz 2; Ahmad, Sajid Rashid 1; Saif, Samia 3	The role of and challenges facing non-governmental organizations in the environmental impact assessment process in Punjab, Pakistan.	Impact Assessment & Project Appraisal	2020	Qualitative	Non-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral

Khan, Missal; Majid, Abdul	Environmental strategic performance of SMEs in developing countries: perspectives of environmental strategic capabilities, environmental strategic assessment, and stakeholder engagement	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2023	Quantitative	For-Profit	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Neutral
Khare, Prajakta 1 prajakta@okayama-u.ac.jp; Joshi, Kanchan 2	Systems Approach to Map Determinants of a Social Enterprise's Impact: A Case from India.	Journal of Social Entrepreneurship	2018	Qualitative	For-Profit	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
Khrustalev, Boris; Smolich, Natalia; Malakhov, Alexey	Indicators of Estimation of Environmental Effectiveness Activities of the Enterprise	3RD WORLD MULTIDISCIPLINARY CIVIL ENGINEERING, ARCHITECTURE, URBAN PLANNING SYMPOSIUM (WMCAUS 2018)	2019	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Kianinejad, K.; Uhlmann, E.; Peukert, B.	Investigation into Energy Efficiency of Outdated Cutting Machine Tools and Identification of Improvement Potentials to Promote Sustainability	12TH GLOBAL CONFERENCE ON SUSTAINABLE MANUFACTURING - EMERGING POTENTIALS	2015	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Kinderyte, Loreta 1 oloretaloreta@yahoo.com; Ciegis, Remigijus 2 r.ciegis@evf.vdu.lt; Staniskis, Jurgis Kazimieras 1 justa@ktu.lt	ASSESSMENT OF ENTERPRISE PERFORMANCE FOR EFFICIENT SUSTAINABILITY MANAGEMENT.	Transformations in Business & Economics	2010	Mixed-Methods	For-Profit	Supported	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Klevas, Valentinas; Streimikiene, Dalia; Kleviene, Audrone	Sustainability assessment of the energy projects implementation in regional scale	RENEWABLE & SUSTAINABLE ENERGY REVIEWS	2009	Conceptual	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Kloviene, Lina; Speziale, Maria-Teresa	Is Performance Measurement System Going Towards Sustainability in SMEs?	20TH INTERNATIONAL SCIENTIFIC CONFERENCE - ECONOMICS AND MANAGEMENT 2015 (ICEM-2015)	2015	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Kluczek, Aldona	Quick Green Scan: A Methodology for Improving Green Performance in Terms of Manufacturing Processes	SUSTAINABILITY	2017	Conceptual	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Kluvánková, T; Spácilová, R	Valuing environment -: the instrument for democratic and efficient decision making at regional level	EKONOMICKY CASOPIS	1998	Mixed-Methods	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Kocmanova, Alena; Nemecek, Petr; Docekalova, Marie	ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) KEY PERFORMANCE INDICATORS FOR SUSTAINABLE REPORTING	7TH INTERNATIONAL SCIENTIFIC CONFERENCE BUSINESS AND MANAGEMENT 2012	2012	Mixed-Methods	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Kong, Lu; Li, Jihua	Environmental impact assessment and enlightenment of surface	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2021	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

	treatment production line during operation										
Korfmacher, Katrina Smith; Brody, Julia Green	Moving Forward with Reporting Back Individual Environmental Health Research Results	ENVIRONMENTAL HEALTH PERSPECTIVES	2023	Conceptual	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Köroğlu, Fatma 1 fkoroglu97@gmail.com; Yıldırım, Nihan 1	Social Impact & Project Performance Measurement Methods and Challenges in Practice: A Study on Women Empowerment NGOs.	Journal of Business & Economics Review (JBER)	2023	Qualitative	Non-Profit	Neutral	Supported	Supported	Neutral	Supported	Neutral
Koutsis, Kostas; Christofilogiannism, Panos; Markatos, Dimitris	Socially Sustainable MPAs and Marine Impact Trade	MEDCOAST 11, VOLS 1 AND 2	2011	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Kovalev, Nicole 1 kovalev@ile.tu-berlin.de; Koeppel, Johann 1 koeppel@ile.tu-berlin.de	Introduction to the Environmental Impact Assessment System and Public Participation in the Russian Federation.	Journal of Environmental Assessment Policy & Management	2003	Qualitative	Non-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Kralj, Davorin	The Role of Environmental Indicators in Environmental Management	RECENT ADVANCES IN CIRCUITS, SYSTEMS AND SIGNALS	2010	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
KRÁTKI, NOÉMI 1; SZABÓ, ROLAND Z. 2 zsoltroland.szabo@uni-corvinus.hu	Social Value Creation and Impact Measurement -- What Do They Mean Exactly?	Theory, Methodology, Practice	2018	Qualitative	Both	Neutral	Neutral	Not applicable	Not applicable	Neutral	Neutral
Krishna, Revathi Nuggehalli; Spencer, Caroline; Ronan, Kevin; Alisic, Eva	Child participation in disaster resilience education: potential impact on child mental well-being	DISASTER PREVENTION AND MANAGEMENT	2022	Qualitative	Non-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Kuo, Tsai Chi; Huang, Miao-Ling; Hsu, Chia Wei; Lin, Chiuhsiang Joe; Hsieh, Chih-Chun; Chu, Chih-Hsing	Application of Data Quality Indicator of Carbon Footprint and Water Footprint	INTERNATIONAL JOURNAL OF PRECISION ENGINEERING AND MANUFACTURING-GREEN TECHNOLOGY	2015	Quantitative	Both	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Kuo, Tsai Chi; Lee, Yile	Using Pareto Optimization to Support Supply Chain Network Design within Environmental Footprint Impact Assessment	SUSTAINABILITY	2019	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Lacchetti, Ines; Carere, Mario; Cristiano, Walter; Mancini, Laura	The role of ecotoxicology in the health impact assessment: an innovative ecosystem approach for the protection of human health in Italy	ANNALI DELL ISTITUTO SUPERIORE DI SANITA	2023	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

Lall, Saurabh	Measuring to Improve Versus Measuring to Prove: Understanding the Adoption of Social Performance Measurement Practices in Nascent Social Enterprises	VOLUNTAS	2017	Quantitative	Both	Supported	Neutral	Neutral	Not applicable	Neutral	Neutral
Lall, Saurabh A.	From Legitimacy to Learning: How Impact Measurement Perceptions and Practices Evolve in Social Enterprise-Social Finance Organization Relationships	VOLUNTAS	2019	Qualitative	Both	Supported	Neutral	Neutral	Not applicable	Not applicable	Supported
Lambert, D.; Schaible, G. D.; Johansson, R.; Vasavada, U.	The value of integrated CEAP-ARMS survey data in conservation program analysis	JOURNAL OF SOIL AND WATER CONSERVATION	2007	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Laner, David; Rechberger, Helmut	Quantitative evaluation of waste prevention on the level of small and medium sized enterprises (SMEs)	WASTE MANAGEMENT	2009	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Lapidus, Azariy; Dmitry, Topchiy	Formation of Methods for Assessing the Effectiveness of Industrial Areas' Renovation Projects	3RD WORLD MULTIDISCIPLINARY CIVIL ENGINEERING, ARCHITECTURE, URBAN PLANNING SYMPOSIUM (WMCAUS 2018)	2019	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Neutral	Not applicable	Neutral
Lask, Jan; Kam, Jason; Weik, Jan; Kiesel, Andreas; Wagner, Moritz; Lewandowski, Iris	A parsimonious model for calculating the greenhouse gas emissions of miscanthus cultivation using current commercial practice in the United Kingdom	GLOBAL CHANGE BIOLOGY BIOENERGY	2021	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Latifah, Sri Wahjuni 1,2; Soewarno, Noorlailie 1 noorlailie-s@feb.unair.ac.id	The environmental accounting strategy and waste management to achieve MSME's sustainability performance.	Cogent Business & Management	2023	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Lee, Christina; Papadopoulou, Panagiota; Asbjoernsson, Gauti; Hulthen, Erik; Evertsson, Magnus	Understanding Current Challenges in Evaluating Environmental Impacts for Aggregate Producers through a Case Study in Western Sweden	SUSTAINABILITY	2022	Mixed-Methods	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Lee, Ya-Ching 1 yaclee@cm.nsysu.edu.tw	Framing effects on sustainable behavior.	Sustainable Development	2024	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Lewis, Jenny M.	The politics and consequences of performance measurement	POLICY AND SOCIETY	2015	Conceptual	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Li, H. X.; Duan, G.; Bai, H.; Cang, D. Q.	Life cycle assessment of china's alumina manufacturing by Bayer process	ENERGY TECHNOLOGY 2011: CARBON DIOXIDE AND OTHER GREENHOUSE GAS REDUCTION METALLURGY AND WASTE HEAT RECOVERY	2011	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Li, Hongjuan 1 18684696883@163.com	Evaluation method for the impact of digital finance on the environmental performance of manufacturing industry.	International Journal of Computer Integrated Manufacturing	2024	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Li, Hui	Integrating eco-environment impact and eco-tourism using deep neural network algorithms in the GIoT environment	SOFT COMPUTING	2023	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Li, Jingjing 1,2 15201227202@163.com; Li, Yongjian 1,2,3 liyongjian@nankai.edu.cn; Fan, Chunxing 4 cfan@Tnstate.edu	A performance evaluation system for product eco-design in the fashion supply chain.	Journal of Cleaner Production	2024	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Neutral	Not applicable	Not applicable
LI, Jingjing; Luo, Xi; Yang, Na	DISCUSSION OVER CRITICAL FACTORS IN THE SUSTAINABLE DEVELOPMENT OF GYMNASIUMS	JOURNAL OF ENVIRONMENTAL PROTECTION AND ECOLOGY	2022	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Li, Jinhua; Zhang, Yun; Yu, Jinqiao; Shao, Shuai; Zhang, Shushen	A cleaner production evaluation indicator system available for Chinese fish processing industry	ADVANCES IN ENVIRONMENTAL TECHNOLOGIES, PTS 1-6	2013	Mixed-Methods	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Li, Jintao 1 lijt@mail.bnu.edu.cn; Jia, Linrui 1; Liu, Yansui 1,2 liuys@igsnrr.ac.cn; Yang, Yuanyuan 1,2; Jiang, Ning 1	Measuring model of rural transformation development path in Fuping County of Beijing-Tianjin-Hebei region.	Habitat International	2018	Quantitative	Both	Not applicable	Contradicted	Not applicable	Supported	Not applicable	Not applicable
Li, Lianhui; Mao, Chunlei; Sun, Hongxia; Yuan, Yiping; Lei, Bingbing	Digital Twin Driven Green Performance Evaluation Methodology of Intelligent Manufacturing: Hybrid Model Based on Fuzzy Rough-Sets AHP, Multistage Weight Synthesis, and PROMETHEE II	COMPLEXITY	2020	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Li, Ning; Guo, Yuhang; Wang, Liguan; Wang, Qizhou; Yan, Dairong; Zhao, Shugang; Lei, Tao	Evaluation and quantitative characterization for the ecological environment impact of open pit mining on vegetation destruction from landsat time series: A case study of Wulishan limestone mine	ECOLOGICAL INDICATORS	2024	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Li, Tingkun; Zhang, Yufen; Bi, Xiaohui; Wu, Jianhui; Chen, Mingyang; Luo, Bin; Feng, Yinchang	Comprehensive performance evaluation of coordinated development of industrial economy and its air pollution control	HELIYON	2023	Mixed-Methods	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable

Liang, Kaiming; Zhang, Yun; Li, Jinhua; Zhao, Chenchen	Carbon Footprint Analysis and Reductive Project Evaluation of Iron-making Enterprise Based on LCA	PROCEEDINGS OF THE 2015 INTERNATIONAL CONFERENCE ON EDUCATION, MANAGEMENT AND COMPUTING TECHNOLOGY	2015	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Liang, Tian 1; Wang, Shanshan 1 wangshanshan@zzu.edu.cn; Lu, Chunyang 1; Jiang, Nan 1; Long, Wenqi 1; Zhang, Min 1; Zhang, Ruiqin 1	Environmental impact evaluation of an iron and steel plant in China: Normalized data and direct/indirect contribution.	Journal of Cleaner Production	2020	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Liao, Chi-Horng	Evaluating the Social Marketing Success Criteria in Health Promotion: A F-DEMATEL Approach	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	2020	Quantitative	Non-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Liao, Yaqin; Yu, Guanghui; Liao, Yan; Jiang, Lei; Liu, Xianzhao	Environmental Conflict Risk Assessment Based on AHP-FCE: A Case of Jiuhua Waste Incineration Power Plant Project	SUSTAINABILITY	2018	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Liou, ML; Ku, NW; Yu, YH	Sustainable indicators for strategic environmental assessment in Taiwan	ECOSYSTEMS AND SUSTAINABLE DEVELOPMENT IV, VOLS 1 AND 2	2003	Mixed-Methods	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Liston-Heyes, Catherine 1 clistonh@uottawa.ca; Liu, Gordon 2	To measure or not to measure?An empirical investigation of social impact measurement in UK social enterprises.	Public Management Review	2021	Quantitative	Both	Neutral	Supported	Supported	Neutral	Neutral	Supported
Liu Hui-jun; Chen Chun-shuo; Liu Ling-jun	The Impact of Environmental Self-accountability on Green Consumption Behavior	INTERNATIONAL CONFERENCE ON ECONOMICS AND MANAGEMENT INNOVATIONS (ICEMI 2017), VOL 1, ISSUE 1	2017	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Liu Yongxiang; Zhang Kaokao	Study on the theories and application of enterprises environmental performance evaluation method	PROCEEDINGS OF THE 4TH INTERNATIONAL CONFERENCE ON INNOVATION & MANAGEMENT, VOLS I AND II	2007	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Liu, Bin; Lan, Ying	The assessment of suppliers under the environmental consideration	SIXTH WUHAN INTERNATIONAL CONFERENCE ON E-BUSINESS, VOLS 1-4: MANAGEMENT CHALLENGES IN A GLOBAL WORLD	2007	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Liu, Dongyue	Value evaluation system of ecological environment damage compensation caused by air pollution	ENVIRONMENTAL TECHNOLOGY & INNOVATION	2021	Quantitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Liu, Lirong; Wen, Xuejie; Ba, Jiajia; Wu, Shuxian	Comprehensive Evaluation of Environmental Performance Based on Offshore Oil Drilling	JOURNAL OF COASTAL RESEARCH	2020	Conceptual	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Liu, Quanlong 1 qll2016@cumt.edu.cn; Qiu, Zunxiang 1; Li, Ma 2; Shang, Jianping 1; Niu, Weichao 1	Evaluation and empirical research on green mine construction in coal industry based on the AHP-SPA model.	Resources Policy	2023	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Liu, Xu 1; Liu, Huatai 1 lht@xmu.edu.cn; Chen, Jichun 1; Liu, Tengwei 1; Deng, Zelin 1	Evaluating the sustainability of marine industrial parks based on the DPSIR framework.	Journal of Cleaner Production	2018	Quantitative	For-Profit	Not applicable	Contradicted	Neutral	Not applicable	Not applicable	Not applicable
Liu, YanMin	Research on civil engineering with ecological impact assessment of construction activities	ADVANCED RESEARCH ON CIVIL ENGINEERING, MATERIALS ENGINEERING AND APPLIED TECHNOLOGY	2014	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Liu, Yanxin; Li, Huajiao; An, Haizhong; Guan, Jianhe; Shi, Jianglan; Han, Xiaodan	Are the environmental impacts, resource flows and economic benefits proportional? Analysis of key global trade routes based on the steel life cycle	ECOLOGICAL INDICATORS	2021	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ljubisavljević, Snežana 1 ljubisavljevic@kg.ac.rs; Ljubisavljević, Luka lljubisavljevic510@gmail.com; Jovanović, Dejan 1 djovanovic@kg.ac.rs	ENVIRONMENTAL AUDIT FOR ENVIRONMENTAL IMPROVEMENT AND PROTECTION.	Economic Themes	2017	Conceptual	For-Profit	Supported	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Lo, Andrew W.; Zhang, Ruixun	Quantifying the Impact of Impact Investing	MANAGEMENT SCIENCE	2023	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
London, Ted; Esper, Heather	Assessing poverty-alleviation outcomes of an enterprise-led approach to sanitation	PATHS OF CONVERGENCE FOR AGRICULTURE, HEALTH, AND WEALTH	2014	Mixed-Methods	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Supported
Lu, Chengpeng; Ren, Wanxia; Jiang, Lu; Xue, Bing	Modelling impact of climate change and air pollution in cities	PROCEEDINGS OF THE INSTITUTION OF CIVIL ENGINEERS-ENGINEERING SUSTAINABILITY	2017	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Lu, Mengqiu; Cheng, Jianquan; Jin, Cheng	Assessment of Ecological Assets for Sustainable Regional Development: A Case Study of Deqing County, China	SUSTAINABILITY	2017	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
ŁUKASIŃSKI, Wiesław 1 wieslaw.lukasinski@uek.krakow.pl; LIS, Wiktor 2 wiktor.lis6633@gmail.com	TOOL FOR SELF-ASSESSMENT OF PRODUCTION-ORIENTED ORGANISATION'S ENVIRONMENTAL MATURITY.	Scientific Papers of Silesian University of Technology. Organization & Management / Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie	2023	Mixed-Methods	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Luo, Meng; Zhang, Shengwei; Huang, Lei; Liu, Zhiqiang; Yang, Lin; Li, Ruishen; Lin, Xi	Temporal and Spatial Changes of Ecological Environment Quality Based on RSEI: A Case Study in Ulan Mulun River Basin, China	SUSTAINABILITY	2022	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Ma, Hongqi 1; Zou, Jingxian 1,2 zou_jingxian@163.com	Impacts of official high-standard scenic spots on environment and growth — Evidence from China's 5A scenic spots at the city level.	Ecological Economics	2022	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Maas, Karen 1; Grieco, Cecilia 2 cecil.grieco@gmail.com	Distinguishing game changers from boastful charlatans: Which social enterprises measure their impact?	Journal of Social Entrepreneurship	2017	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Neutral	Supported
Magalhaes Costa, Ana Maria; da Silva, Katia; Clair Gomes, Saint, Jr.; Ines de Oliveira, Maria; de Mello, Rosane; de Carvalho, Marcia; Auxiliadora Gomes, Maria	Assessment of the impact of the NGO Refazer on medical care for children at social risk	REVISTA PANAMERICANA DE SALUD PUBLICA-PAN AMERICAN JOURNAL OF PUBLIC HEALTH	2011	Quantitative	Non-Profit	Neutral	Contradicted	Neutral	Supported	Supported	Supported
Mahajani, Anagha Anand; Prabhughate, Abhijit Shrinivas; Tiwari, Pearl; Sohoni, Shubhangi; Phatak, Ajay Gajanan; Morgaonkar, Vallaree Anant; Nimbalkar, Somashekhar Marutirao	Self-development matters - Perception of Sakhis (CHWs) assessing self-development outcomes of their participation in the HBNC Program	BMC WOMENS HEALTH	2018	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Malesios, Chrisovalantis 1 c.malesios@aston.ac.uk; Dey, Prasanta K. 1; Abdelaziz, Fuad Ben 2	Supply chain sustainability performance measurement of small and medium sized enterprises using structural equation modeling.	Annals of Operations Research	2020	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Malesios, Chrisovalantis 1,2 c.malesios@aston.ac.uk; De, Debashree 3 d.de@essex.ac.uk; Moursellas, Andreas 4 moursellas@env.aegean.gr; Dey, Prasanta Kumar 2 p.k.dey@aston.ac.uk; Evangelinos, Konstantinos 4 kevag@aegean.gr	Sustainability performance analysis of small and medium sized enterprises: Criteria, methods and framework.	Socio-Economic Planning Sciences	2021	Conceptual	For-Profit	Supported	Supported	Neutral	Not applicable	Not applicable	Neutral
Mamabolo, Anastacia 1 mamaboloa@gibs.co.za; Myres, Kerrin 1	Performance Measurement in Emerging Market Social Enterprises using a Balanced Scorecard.	Journal of Social Entrepreneurship	2020	Quantitative	For-Profit	Neutral	Contradicted	Supported	Not applicable	Neutral	Neutral
Manetti, Giacomo	The Role of Blended Value Accounting in the Evaluation of Socio-Economic Impact of Social Enterprises	VOLUNTAS	2014	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Neutral	Neutral
Mani-Peres, Caiua; Xavier, Luciana Y.; Santos, Claudia R.; Turra, Alexander	Stakeholders perceptions of local environmental changes as a tool for impact assessment in coastal zones	OCEAN & COASTAL MANAGEMENT	2016	Qualitative	Both	Neutral	Neutral	Supported	Neutral	Not applicable	Neutral

Mansfield, Theodore J.; Hertell, Ann M.	Institutionalizing Sustainability at the Level of State Departments of Transportation Quantitative Assessment of Transportation Sustainability Plan Quality	TRANSPORTATION RESEARCH RECORD	2012	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Maset-Llaudes, Amparo; Cahedo, David; Fuertes, Iluminada; Miguel Tirado, Jose	Social and Environmental Impacts Assessment in the Economy for the Common Good	VISION 2020: SUSTAINABLE ECONOMIC DEVELOPMENT, INNOVATION MANAGEMENT, AND GLOBAL GROWTH, VOLS I-IX, 2017	2017	Conceptual	Both	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Mason, Miriam; Galloway, David	Knowledge mobilisation in sub-Saharan Africa: an impact evaluation of CPDL in improving primary school children's performance	JOURNAL OF PROFESSIONAL CAPITAL AND COMMUNITY	2021	Quantitative	Non-Profit	Neutral	Contradicted	Not applicable	Not applicable	Supported	Neutral
Matuszak-Flejszman, Alina; Szyszka, Beata; Johannsdottir, Lara	Effectiveness of EMAS: A case study of Polish organisations registered under EMAS	ENVIRONMENTAL IMPACT ASSESSMENT REVIEW	2019	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Matza, Tomas	Global Ambitions: Evidence, Scale, and Child Well-being in El Salvador	MEDICAL ANTHROPOLOGY QUARTERLY	2019	Qualitative	Non-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Mazurkiewicz, Adam; Belina, Beata; Poteralska, Beata; Giesko, Tomasz; Karsznia, Wojciech	Universal Methodology for the Innovative Technologies Assessment	PROCEEDINGS OF THE 10TH EUROPEAN CONFERENCE ON INNOVATION AND ENTREPRENEURSHIP (ECIE 2015)	2015	Conceptual	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Mazzocchi, Mario; Ragona, Maddalena; Giorgi, Liana; Schiefer, Gerhard; Fritz, Melanie; Novelli, Emanuele; Krapp, Henrik; Spichtinger, Daniel; Poms, Roland	Assessing the socio-economic dimension of food quality and safety regulations: research challenges and recent advances	QUALITY ASSURANCE AND SAFETY OF CROPS & FOODS	2009	Mixed-Methods	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Meadows, Maureen 1 m.meadows@open.ac.uk; Pike, Matthew 2	Performance Management for Social Enterprises.	Systemic Practice & Action Research	2010	Qualitative	For-Profit	Neutral	Neutral	Neutral	Neutral	Not applicable	Neutral
Medvedev, Alexander N.; Medvedev, Maxim A.	AN ENVIRONMENTAL ASSESSMENT OF PLANS FOR ECONOMIC DEVELOPMENT OF KACHKANAR TITANIUM-MAGNETITE MINE IN RUSSIA	16TH INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEOCONFERENCE, SGEM 2016: SCIENCE AND TECHNOLOGIES IN GEOLOGY, EXPLORATION AND MINING, VOL II	2016	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Meena, M. S.; Singh, K. M.	Changing behaviour of self help group members: Pathway for sustainable rural livelihoods in Eastern India	INDIAN JOURNAL OF AGRICULTURAL SCIENCES	2013	Quantitative	Non-Profit	Not applicable	Not applicable	Not applicable	Supported	Not applicable	Neutral
Mengistu, Azemeraw Tadesse 1 azemerawtadesse.mengistu@phd.unipd.it; Panizzolo,	Tailoring sustainability indicators to small and medium enterprises for measuring industrial sustainability performance.	Measuring Business Excellence	2023	Quantitative	For-Profit	Neutral	Contradicted	Supported	Not applicable	Not applicable	Neutral

Roberto 1 roberto.panizzolo@unipd.it											
Mengistu, Azemeraw Tadesse; Panizzolo, Roberto	Indicators and Framework for Measuring Industrial Sustainability in Italian Footwear Small and Medium Enterprises	SUSTAINABILITY	2021	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Merino, Martín Hernani 1 mn.hernanim@up.edu.pe; Tarazona Vargas, Enver Gerald 2 enver.tarazona@pucp.pe; Pastorino, Antonieta Hamann 3 ahamann@esan.edu.pe; Mazzon, José Afonso 4 jamazzon@usp.br	VALIDATION OF SUSTAINABLE DEVELOPMENT PRACTICES SCALE USING THE BAYESIAN APPROACH TO ITEM RESPONSE THEORY.	Market / Trziste	2014	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Meyer, BC; Jacksche, J; Adrian, L	Indicators for landscape sustainability of farms	MULTIFUNCTIONAL LANDSCAPES, VOL III: CONTINUITY AND CHANGE	2003	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Michelini, RC; Razzoli, RP	Product-service for environmental safeguard: a metrics to sustainability	RESOURCES CONSERVATION AND RECYCLING	2004	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Mihaela, Nicoară 1 mihaela.nicoara@cantemircluj.ro	ENVIRONMENTAL MONITORING AND SUSTAINABLE DEVELOPMENT.	Annals of the University of Oradea, Economic Science Series	2013	Conceptual	Both	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Millar, Ross 1 r.millar@bham.ac.uk; Hall, Kelly 2	Social Return on Investment (SROI) and Performance Measurement.	Public Management Review	2013	Mixed-Methods	For-Profit	Neutral	Supported	Neutral	Neutral	Supported	Neutral
Misha, Farzana 1 fmisha@gmail.com; Shahed, Syeda Sitwat 2; Wagner, Natascha 3; Bedi, Arjun 4	Building resilience in the chars of Bangladesh: An impact assessment.	Journal of International Development	2022	Quantitative	Non-Profit	Neutral	Contradicted	Not applicable	Supported	Supported	Neutral
Mitchell, Ann; Maccio, Jimena	Using Multidimensional Poverty Measures in Impact Evaluation: Emergency Housing and the Declustering of Disadvantage	JOURNAL OF HUMAN DEVELOPMENT AND CAPABILITIES	2021	Quantitative	Non-Profit	Neutral	Contradicted	Neutral	Not applicable	Supported	Neutral
Molecke, Greg 1,2; Pinkse, Jonatan 3 jonatan.pinkse@manchester.ac.uk	Accountability for social impact: A bricolage perspective on impact measurement in social enterprises.	Journal of Business Venturing	2017	Conceptual	Both	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
Molecke, Greg; Pinkse, Jonatan	Justifying Social Impact as a Form of Impression Management: Legitimacy Judgements of Social Enterprises' Impact Accounts	BRITISH JOURNAL OF MANAGEMENT	2020	Qualitative	For-Profit	Neutral	Not applicable	Neutral	Not applicable	Neutral	Neutral

Molnár, Pavol; Dolinsky, Martin 1	Total Environmental Assessment Framework in an Organization.	Creative & Knowledge Society	2013	Conceptual	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Montano, Marcelo; Lima Ranieri, Victor Eduardo; Schalch, Valdir; Fontes, Aurelio Teodoro; Avezum Alves de Castro, Marcus Cesar; de Souza, Marcelo Pereira	Integrating technical, environmental and social criteria in landfill sitting studies	ENGENHARIA SANITARIA E AMBIENTAL	2012	Qualitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Moody, Michael 1; Littlepage, Laura 2; Paydar, Naveed 2	Measuring Social Return on Investment.	Nonprofit Management & Leadership	2015	Qualitative	Both	Supported	Supported	Supported	Not applicable	Neutral	Neutral
Moody, Michael; Littlepage, Laura; Paydar, Naveed	Measuring Social Return on Investment: Lessons from Organizational Implementation of SROI in the Netherlands and the United States	NONPROFIT MANAGEMENT & LEADERSHIP	2015	Qualitative	Both	Supported	Supported	Supported	Not applicable	Not applicable	Neutral
Mora, Miguel; Akinci, Burcu	Measuring the Social Impact of Innovation in the Fabrication and Delivery of Post-Disaster Temporary Housing-2017 Fire in Chile Case Study	CONSTRUCTION RESEARCH CONGRESS 2018: SAFETY AND DISASTER MANAGEMENT	2018	Mixed-Methods	Non-Profit	Neutral	Contradicted	Supported	Not applicable	Not applicable	Neutral
Moreira Neto, Ronan Fernandes; Paris, Luis Eduardo; Abrao Junior, Fued; Fernandes, Arthur Neiva	Environmental performance index for Brazilian public airports: The Infraero experience	ENVIRONMENTAL SCIENCE & POLICY	2020	Quantitative	For-Profit	Supported	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Morell, Jonathan A. 1,2 jamorell@jamorell.com	Systematic iteration between model and methodology: A proposed approach to evaluating unintended consequences.	Evaluation & Program Planning	2018	Conceptual	Both	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Morsicato, Helen G. 1; Diamond, Michael A. 2	An Approach to "Environmentalizing" Multinational Enterprise Performance Evaluation Systems.	International Journal of Accounting Education Research	1980	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Moses, Nicholas D.; MacCarty, Nordica A.	What makes a cookstove usable? Trials of a usability testing protocol in Uganda, Guatemala, and the United States	ENERGY RESEARCH & SOCIAL SCIENCE	2019	Mixed-Methods	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
MUÑOZ, PABLO 1 pablo.munoz-roman@durham.ac.uk; GAMBLE, EDWARD N. 2 edward.n.gamble@gmail.com; BEER, HALEY 3 Haley.Beer@wbs.ac.uk	IMPACT MEASUREMENT IN AN EMERGING SOCIAL SECTOR: FOUR NOVEL APPROACHES.	Academy of Management Discoveries	2022	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Not applicable	Supported

Murith, Christophe	Environmental monitoring: Why, where, what and how? - Illustration by the risk-related approach of radioactivity surveillance-in radiation protection	PROGRESS IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOL I	2007	Conceptual	Both	Supported	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Na, Jea Hoo; Choi, Youngok; Walters, Andrew; Lam, Busayawan; Green, Stephen	Creating a Tool for Measuring the Social Value of Design	DESIGN JOURNAL	2017	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Neutral	Neutral
Nantongo, Mary 1 mnantongo@mubs.ac.ug; Vatn, Arild 2 arild.vatn@nmbu.no; Soka, Geofrey 3 gsoka@sua.ac.tz; Molecke, Greg 1; Pinkse, Jonatan 2 jonatan.pinkse@manchester.ac.uk	REDD+: The perfect marriage between conservation and development? A comparative study of the impacts of REDD+ on livelihoods and deforestation in Tanzania.; Justifying Social Impact as a Form of Impression Management: Legitimacy Judgements of Social Enterprises' Impact Accounts.	World Development; British Journal of Management	2024	Mixed-Methods	Both	Neutral	Supported	Neutral	Neutral	Neutral	Neutral
Nemteanu, Sefora-Marcela; Dabija, Dan-Cristian; Gazzola, Patrizia; Vatamanescu, Elena-Madalina	Social Reporting Impact on Non-Profit Stakeholder Satisfaction and Trust during the COVID-19 Pandemic in an Emerging Market	SUSTAINABILITY	2022	Quantitative	Non-Profit	Neutral	Not applicable	Neutral	Not applicable	Neutral	Supported
Newcomer, Kathryn 1; Baradei, Laila El 2; Garcia, Sandra 3	EXPECTATIONS AND CAPACITY OF PERFORMANCE MEASUREMENT IN NGOs IN THE DEVELOPMENT CONTEXT.	Public Administration & Development	2013	Qualitative	Non-Profit	Supported	Neutral	Neutral	Not applicable	Supported	Neutral
Ngai, Phyllis Bo-yuen	Local Interpretation of the Global Discourse of Sustainability and Sustainable Development in Rural Cambodia	ENVIRONMENTAL COMMUNICATION-A JOURNAL OF NATURE AND CULTURE	2020	Qualitative	Non-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Nguyen, Linh 1; Szkudlarek, Betina 2; Seymour, Richard G. 2	Social impact measurement in social enterprises: An interdependence perspective.	Canadian Journal of Administrative Sciences (John Wiley & Sons, Inc.)	2015	Qualitative	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Nieder, Christina; Bosch, Johannes Florenz; Nockemann, Anna Panaiota; Kaertner, Joscha	Evaluation of RISE: A Sexual Violence Prevention Program for Female College Students in India	JOURNAL OF INTERPERSONAL VIOLENCE	2022	Quantitative	Non-Profit	Not applicable	Not applicable	Not applicable	Neutral	Not applicable	Neutral
NIEWIADOMSKI, Przemysław 1 p.niewiadomski@wez.uz.zgora.pl; STACHOWIAK, Agnieszka 2 agnieszka.stachowiak@put.poznan	A METHOD OF ASSESSMENT OF A SUSTAINABLE PRODUCT – THE CONCEPT AND ITS IMPLEMENTATION FOR PARTS AND SUBASSEMBLIES OF AGRICULTURAL TRANSPORT MEANS.	Scientific Papers of Silesian University of Technology. Organization & Management / Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie	2023	Mixed-Methods	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Niu Fangqu; Wang Fang; Chen Mingxing	Modelling urban spatial impacts of land-use/ transport policies	JOURNAL OF GEOGRAPHICAL SCIENCES	2019	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

Norris, Gregory A.; Burek, Jasmina; Moore, Elizabeth A.; Kirchain, Randolph E.; Gregory, Jeremy	Sustainability Health Initiative for NetPositive Enterprise handprint methodological framework	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT	2021	Conceptual	For-Profit	Not applicable	Supported	Neutral	Not applicable	Not applicable	Neutral
Noveiri, Monireh Jahani Sayyad; Kordrostami, Sohrab; Amirteimoori, Alireza	Sustainability Assessment and Most Productive Scale Size: a Stochastic DEA Approach with Dual Frontiers	ENVIRONMENTAL MODELING & ASSESSMENT	2021	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
O'Grady, Laura; Witteman, Holly; Bender, Jacqueline L.; Urowitz, Sara; Wiljer, David; Jadad, Alejandro R.	Measuring the Impact of a Moving Target: Towards a Dynamic Framework for Evaluating Collaborative Adaptive Interactive Technologies	JOURNAL OF MEDICAL INTERNET RESEARCH	2009	Conceptual	Both	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Oguzcan, Semih; Dvarioniene, Jolanta; Tugnoli, Alessandro; Kruopiene, Jolita	Environmental impact assessment model for substitution of hazardous substances by using life cycle approach	ENVIRONMENTAL POLLUTION	2019	Quantitative	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Oladinrin, Olugbenga Timo 1 o.oladinrin@wlv.ac.uk; Ojo, Lekan Damilola 2 ldojo2-c@my.cityu.edu.hk	Characterisation of the drivers of environmental management system implementation.	Engineering Construction & Architectural Management (09699988)	2022	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Ormiston, Jarrod 1 j.ormiston@maastrichtuniversity.nl	Blending practice worlds: Impact assessment as a transdisciplinary practice.	Business Ethics: A European Review	2019	Qualitative	Both	Supported	Supported	Neutral	Neutral	Neutral	Supported
Ormiston, Jarrod 1 jarrod.ormiston@sydney.edu.au; Seymour, Richard 1	Understanding Value Creation in Social Entrepreneurship: The Importance of Aligning Mission, Strategy and Impact Measurement.	Journal of Social Entrepreneurship	2011	Conceptual	Both	Neutral	Supported	Supported	Neutral	Neutral	Neutral
Ormiston, Jarrod 1 jarrod.ormiston@uts.edu.au	Why Social Enterprises Resist or Collectively Improve Impact Assessment: The Role of Prior Organizational Experience and "Impact Lock-In".	Business & Society	2023	Qualitative	For-Profit	Neutral	Neutral	Neutral	Neutral	Not applicable	Neutral
Pacheco-Blanco, Belgica; Collado-Ruiz, Daniel; Vinoles-Cebolla, Rosario	PERCEPTIONS OF A SME BUILDING SECTOR TOWARDS PROPOSALS FOR IMPROVEMENT BASED IN LIFE CYCLE ASSESSMENT	Dyna	2014	Qualitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Pan, Hengyu 1; Zhang, Xiaohong 1 zxh19701102@126.com; Wu, Jun 1; Zhang, Yanzong 2; Lin, Lili 3; Yang, Gang 4; Deng, Shihuai 4; Li, Li 3; Yu, Xiaoyu 1; Qi, Hui 1; Peng, Hong 1	Sustainability evaluation of a steel production system in China based on emergy.	Journal of Cleaner Production	2016	Quantitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable

Parent, Julie; Cucuzzella, Carmela; Reveret, Jean-Pierre	Impact assessment in SLCA: sorting the sLCIA methods according to their outcomes	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT	2010	Conceptual	Both	Neutral	Supported	Supported	Neutral	Not applicable	Neutral
Parker, Craig M. 1; Bellucci, Emilia 1; Torlina, Luba 2; Zutshi, Ambika 3; Fraunholz, Bardo 1	Towards a Method for Measuring the Quality of Environmental Improvement Communications on SME Websites.	Knowledge & Process Management	2014	Conceptual	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Parry, C. D. H.; Carney, T.; Williams, P. Petersen	Reducing substance use and risky sexual behaviour among drug users in Durban, South Africa: Assessing the impact of community-level risk-reduction interventions	SAHARA J-JOURNAL OF SOCIAL ASPECTS OF HIV-AIDS	2017	Quantitative	Non-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Pashaei Kamali, Farahnaz 1 farahnaz@kth.se; Meuwissen, Miranda P.M. 1; de Boer, Imke J.M. 2; van Middelaar, Corina E. 2; Moreira, Adonis 3; Oude Lansink, Alfons G.J.M. 1	Evaluation of the environmental, economic, and social performance of soybean farming systems in southern Brazil.	Journal of Cleaner Production	2017	Quantitative	For-Profit	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Patalas-Maliszewska, Justyna; Losyk, Hanna; Jasiulewicz-Kaczmarek, Malgorzata	A Sustainable Development Evaluation Card for a Manufacturing Company	IFAC PAPERSONLINE	2020	Qualitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Patsch, Kiki; King, Philip; Reineman, Dan R.; Jenkins, Sarah; Steele, Clare; Gaston, Emily; Anderson, Sean	Beach Sustainability Assessment: The Development and Utility of an Interdisciplinary Approach to Sandy Beach Monitoring	JOURNAL OF COASTAL RESEARCH	2021	Mixed-Methods	Both	Not applicable	Contradicted	Neutral	Not applicable	Not applicable	Not applicable
Pavia, Nadia; Floricic, Tamara; Cerovic, Marta	SUSTAINABLE SENSITIVITY OF TOURISTS AND SUSTAINABLE INITIATIVES IN TOURISM DESTINATION	3RD INTERNATIONAL SCIENTIFIC CONFERENCE TOSEE - TOURISM IN SOUTHERN AND EASTERN EUROPE 2015: SUSTAINABLE TOURISM, ECONOMIC DEVELOPMENT AND QUALITY OF LIFE	2015	Mixed-Methods	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Peigne, Sarah; Ben Rejeb, Helmi; Monnier, Elise; Zwolinski, Peggy	Navigating the Eco-Design Paradox: Criteria and Methods for Sustainable Eco-Innovation Assessment in Early Development Stages	SUSTAINABILITY	2024	Mixed-Methods	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Neutral
Peloia, Paulo R.; Milan, Marcos	PROPOSAL OF A PERFORMANCE MEASURING SYSTEM APPLIED TO AGRICULTURAL MECHANIZATION	ENGENHARIA AGRICOLA	2010	Mixed-Methods	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Peptan, Catalin; Holt, Alina Georgiana; Iana, Silviu Adrian; Sfintes, Costina; Iov, Claudia Anamaria; Marcau, Flavius Cristian	Considerations of the Impact of Seismic Strong Ground Motions in Northern Oltenia (Romania) on Some Indicators of Sustainable Development Characterization of	SUSTAINABILITY	2023	Quantitative	Both	Neutral	Not applicable	Not applicable	Neutral	Not applicable	Not applicable

	the Region from a Security Perspective										
Perrini, Francesco 1 francesco.perrini@unibocconi.it; Costanzo, Laura A. 2 Laura.Costanzo@soton.ac.u; Karatas-Ozkan, Mine 2 M.Karatas-Ozkan@soton.ac.uk	Measuring impact and creating change: a comparison of the main methods for social enterprises.	Corporate Governance: The International Journal of Effective Board Performance	2021	Conceptual	For-Profit	Neutral	Supported	Supported	Neutral	Neutral	Neutral
Perroni, Marcos G.; Gouvea da Costa, Sergio E.; de Lima, Edson Pinheiro; da Silva, Wesley Vieira; Tortato, Ubirata	Measuring energy performance: A process based approach	APPLIED ENERGY	2018	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Supported	Not applicable	Not applicable
Peruzzini, Margherita; Gregori, Fabio; Luzi, Andrea; Mengarelli, Marco; Germani, Michele	A social life cycle assessment methodology for smart manufacturing: The case of study of a kitchen sink	JOURNAL OF INDUSTRIAL INFORMATION INTEGRATION	2017	Mixed-Methods	For-Profit	Neutral	Supported	Supported	Not applicable	Not applicable	Neutral
Piot-Lepetit, Isabelle; Nzongang, Joseph	Business Analytics for Managing Performance of Microfinance Institutions: A Flexible Management of the Implementation Process	SUSTAINABILITY	2021	Conceptual	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Pires, S. P.; Senechal, O.; Loures, E. F. R.; Jimenez, J. F.	An approach to the prioritization of sustainable maintenance drivers in the TBL framework	IFAC PAPERSONLINE	2016	Quantitative	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Pittenger, Dominique M.	Evaluating Sustainability of Selected Airport Pavement Treatments with Life-Cycle Cost, Raw Material Consumption, and Greenroads Standards	TRANSPORTATION RESEARCH RECORD	2011	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Pohnan, Erica; Ompusunggu, Hotlin; Webb, Campbell	Does tree planting change minds? Assessing the use of community participation in reforestation to address illegal logging in West Kalimantan	TROPICAL CONSERVATION SCIENCE	2015	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Pokorny, B; Sabogal, C; Silva, JNM; Bernardo, P; Souza, J; Zweede, J	Compliance with reduced-impact harvesting guidelines by timber enterprises in terra firme forests of the Brazilican Amazon	INTERNATIONAL FORESTRY REVIEW	2005	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Polonsky, Michael Jay; Grau, Stacy Landreth; McDonald, Sharyn	Perspectives on social impact measurement and non-profit organisations	MARKETING INTELLIGENCE & PLANNING	2016	Qualitative	Non-Profit	Neutral	Supported	Supported	Neutral	Supported	Neutral

Price, MF; Kim, EG	Priorities for sustainable mountain development in Europe	INTERNATIONAL JOURNAL OF SUSTAINABLE DEVELOPMENT AND WORLD ECOLOGY	1999	Quantitative	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Pringle, Patrick; Conway, Declan	Voices from the frontline: the role of community-generated information in delivering climate adaptation and development objectives at project level	CLIMATE AND DEVELOPMENT	2012	Qualitative	Non-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Prokopiou, DG; Tselentis, BS	Environmental impacts of tourist development in Rhodes	SUSTAINABLE PLANNING AND DEVELOPMENT	2003	Mixed-Methods	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Pu, Xiao; Cheng, Hong Guang; Gong, Li; Hao, Fang Hua; Qi, Ye	Revision of three-stakeholder signaling game for environmental impact assessment in China	ENVIRONMENTAL IMPACT ASSESSMENT REVIEW	2011	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Pusnik, Matevz; Sucic, Boris; Al-Mansour, Fouad; Crema, Luigi; Cozzini, Marco; Mahbub, Shahriar; Holzner, Christoph; Kohlmaier, Johannes	Framework for Sustainability Assessment of Small and Medium-Sized Enterprises	SDEWES: THE 8TH CONFERENCE ON SUSTAINABLE DEVELOPMENT OF ENERGY, WATER AND ENVIRONMENT SYSTEMS	2014	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Quezada-Sanchez, Amado D.; Fuentes-Rivera, Evelyn; Garcia-Martinez, Angelica; Hernandez-Chavez, Maria del Carmen; Pineda-Antunez, Carlos; Martinez, Martin Romero; Garcia-Guerra, Armando; Garcia-Feregrino, Raquel; Madrigal-Ramirez, Abby; Santiago-Angelino, Tania; Olvera-Flores, Fabian; Schnaas, Lourdes; Perez-Escamilla, Rafael; Servan-Mori, Edson	Assessing the effect of an educational intervention on early childhood development among Mexican preschool children in the state of Oaxaca: a study protocol of a cluster randomized stepped-wedge trial	TRIALS	2022	Quantitative	Non-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Rahman, Khondokar M.; Melville, Lynsey; Edwards, David J.; Fulford, David; Thwala, Wellington Didibhuku	Determination of the Potential Impact of Domestic Anaerobic Digester Systems: A Community Based Research Initiative in Rural Bangladesh	PROCESSES	2019	Mixed-Methods	Both	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Neutral
Raine Isaksson; Rickard Garvare	Measuring sustainable development using process models.	Managerial Auditing Journal	2003	Conceptual	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Rajak, Sonu; Parthiban, P.; Dhanalakshmi, R.	Sustainable transportation systems performance evaluation using fuzzy logic	ECOLOGICAL INDICATORS	2016	Quantitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Rajaraman, Divya; Travasso, Sandra; Chatterjee, Achira; Bhat, Bhargav; Andrew, Gracy; Parab, Suraj; Patel, Vikram	The acceptability, feasibility and impact of a lay health counsellor delivered health promoting schools programme in India: a case study evaluation	BMC HEALTH SERVICES RESEARCH	2012	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Rakhmangulov, Aleksandr; Burmistrov, Konstantin; Osintsev, Nikita	Sustainable Open Pit Mining and Technical Systems: Concept, Principles, and Indicators	SUSTAINABILITY	2021	Conceptual	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Rakotomamonjy, S. N.; Jones, J. P. G.; Razafimanahaka, J. H.; Ramamonjisoa, B.; Williams, S. J.	The effects of environmental education on children's and parents' knowledge and attitudes towards lemurs in rural Madagascar	ANIMAL CONSERVATION	2015	Quantitative	Non-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Ramos, Saioa; Larrinaga, Lohitzune; Albinarrate, Unai; Jungbluth, Niels; Ingolfsdottir, Gyda Mjoll; Yngvadottir, Eva; Landquist, Birgit; Woodhouse, Anna; Olafsdottir, Gudrun; Esturo, Aintzane; Zufia, Jaime; Perez-Villareal, Begona	SENSE tool: easy-to-use web-based tool to calculate food product environmental impact	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT	2016	Mixed-Methods	For-Profit	Not applicable	Supported	Neutral	Neutral	Not applicable	Not applicable
Ran, Xianjin; Xiang, Yong; Wei, Yao	A NEW METHOD FOR MEASURING THE INFORMATION LEVEL OF ENVIRONMENTAL MONITORING OF CONSTRUCTION ENTERPRISES BASED ON MULTI-LEVEL GREY EVALUATION	FRESENIUS ENVIRONMENTAL BULLETIN	2022	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Rao, Purba H.	Measuring Environmental Performance across a Green Supply Chain: A Managerial Overview of Environmental Indicators.	Vikalpa: The Journal for Decision Makers	2014	Quantitative	For-Profit	Supported	Contradicted	Neutral	Neutral	Not applicable	Neutral
Raposo, Vera B.; Melo, Carlos S.; Silva, Luis; Ventura, Anunciacao; Camara, Rita; Pombo, Joana; Johnson, Markes E.; Avila, Sergio P.	Comparing Methods of Evaluation of Geosites: The Fossiliferous Outcrops of Santa Maria Island (Azores, NE Atlantic) as a Case Study for Sustainable Island Tourism	SUSTAINABILITY	2018	Quantitative	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Rasul, G; Thapa, GB	Sustainability of ecological and conventional agricultural systems in Bangladesh: an assessment based on environmental, economic and social perspectives	AGRICULTURAL SYSTEMS	2004	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Rawhouser, Hans 1 hans.rawhouser@unlv.edu; Cummings, Michael 2; Newbert, Scott L. 3	Social Impact Measurement: Current Approaches and Future Directions for Social Entrepreneurship Research.	Entrepreneurship: Theory & Practice	2019	Conceptual	Both	Neutral	Supported	Supported	Neutral	Neutral	Neutral
Recker, Malte; Michelfelder, Ingo	SUSTAINABLE ENTREPRENEURSHIP: HOW TO MEASURE FUTURE SUSTAINABILITY IMPACT FOR EARLY STAGE NEW VENTURES	PROCEEDINGS OF THE 5TH INTERNATIONAL CONFERENCE INNOVATION MANAGEMENT, ENTREPRENEURSHIP AND SUSTAINABILITY (IMES 2017)	2017	Conceptual	For-Profit	Supported	Supported	Supported	Neutral	Neutral	Neutral

Ribeiro, MD; de Carvalho, LN	The accounting information as a support to sustainable development	SUSTAINABLE CITY: URBAN REGENERATION AND SUSTAINABILITY	2000	Conceptual	For-Profit	Neutral	Not applicable	Neutral	Not applicable	Not applicable	Neutral
RIEZNYK, Oleksandra 1 rieznyko@gmail.com; TREUS, Alla 2; KOZMENKO, Serhiy 3	PRIORITIES OF IMPACT INVESTING IN ENVIRONMENTAL PROTECTION PROJECTS: THE CASE OF THE FUTURE POST-WAR RECONSTRUCTION OF UKRAINE.	Business: Theory & Practice	2023	Quantitative	Both	Not applicable	Neutral	Neutral	Not applicable	Neutral	Neutral
Rigotto, Raquel Maria	The inclusion of health in environmental impact studies: case report of a coal-fired power plant in Ceara State	CIENCIA & SAUDE COLETIVA	2009	Qualitative	Both	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Rivera Fernandez, German Marino; Alves de Brito, Ludmila Ladeira; Fonseca, Alberto	Does size matter? An evaluation of length and proportion of information in environmental impact statements	ENVIRONMENTAL IMPACT ASSESSMENT REVIEW	2018	Quantitative	Both	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Robinson, Benjamin L.; Clifford, Mike J.; Jewitt, Sarah	TIME to Change: Rethinking Humanitarian Energy Access	ENERGY RESEARCH & SOCIAL SCIENCE	2022	Conceptual	Both	Not applicable	Supported	Supported	Not applicable	Not applicable	Not applicable
Rodrigues, Margarida 1; Franco, Mário 1 mfranco@ubi.pt	Measuring the urban sustainable development in cities through a Composite Index: The case of Portugal.	Sustainable Development	2020	Quantitative	Both	Not applicable	Supported	Neutral	Not applicable	Not applicable	Neutral
Roomi, Muhammad Azam; Manuel Saiz-Alvarez, Jose; Coduras, Alicia	Measuring Sustainable Entrepreneurship and Eco-Innovation: A Methodological Proposal for the Global Entrepreneurship Monitor (GEM)	SUSTAINABILITY	2021	Conceptual	Both	Neutral	Supported	Neutral	Not applicable	Neutral	Neutral
Roshayani Arshad 1; Norliza Omar 2; Noorbijan Abu Bakar 2; Noraini Mohd Nasir 2	EXPLORING PERFORMANCE MEASUREMENT FROM THE PERSPECTIVE OF SOCIAL IMPACT.	Malaysian Accounting Review	2015	Mixed-Methods	Non-Profit	Supported	Supported	Supported	Neutral	Neutral	Supported
Rui-dong Chang 1 ruidong.chang@adelaide.edu.au; Jian Zuo 2 jian.zuo@adelaide.edu.au; Soebarto, Veronica 3 veronica.soebarto@adelaide.edu.au; Zhen-yu Zhao 4 zhaozhenyuxm@263.net; Zillante, George 5 george.zillante@adelaide.edu.au; Xiao-long Gan 6 songanxl@126.com	Discovering the Transition Pathways toward Sustainability for Construction Enterprises: Importance-Performance Analysis.	Journal of Construction Engineering & Management	2017	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

Ruzevicius, Juozas 1 juozas.ruzevicius@ef.vu.It	Environmental Management Systems and Tools Analysis.	Engineering Economics	2009	Conceptual	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Rybaczewska-Blazejowska, Magdalena	LIFE CYCLE ASSESSMENT - A TOOL FOR EVALUATING THE LEVEL OF TECHNOLOGICAL ECO-INNOVATION	PROCEEDINGS OF THE 5TH INTERNATIONAL CONFERENCE INNOVATION MANAGEMENT, ENTREPRENEURSHIP AND SUSTAINABILITY (IMES 2017)	2017	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
RYBACZEWSKA-BŁAŻEJOWSKA, Magdalena 1 m.blazejowska@tu.kielce.pl	ECO-INNOVATION MEASUREMENT OF ENTERPRISES - VALIDATION OF THE LCA-BASED APPROACH.	Scientific Papers of Silesian University of Technology. Organization & Management / Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie	2020	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Saad, Mohammed H.; Nazzal, Mohammad A.; Darras, Basil M.	A Comprehensive Rating Tool for Sustainability Assessment of Manufacturing Organizations: A Step Towards Sustainable Manufacturing	INTERNATIONAL JOURNAL OF PRECISION ENGINEERING AND MANUFACTURING-GREEN TECHNOLOGY	2023	Mixed-Methods	For-Profit	Not applicable	Supported	Neutral	Not applicable	Not applicable	Not applicable
Saleh Hasan, Saqr Ali 1 Saqrhasan81@gmail.com; Waghule, S. N. 2; Hasan, Murad Baqis 3	Linking environmental management accounting to environmental performance: the role of top management support and institutional pressures.	Cogent Business & Management	2024	Quantitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Sambo, Beatrice 1,2; Sano, Marcello 1; Sperotto, Anna 1,2,3; Zanetti, Marco 1,2; Torresan, Silvia 1,2; Lambert, James H. 4; Linkov, Igor 5,6; Critto, Andrea 1,2 andrea.critto@unive.it	Sensitivity analysis for a participatory approach to enhance the climate resilience of Venice, Italy.	Risk Analysis: An International Journal	2023	Mixed-Methods	Non-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
San Ong, Tze; Teh, Boon Heng; Lee, Ah Suat	Contingent Factors and Sustainable Performance Measurement (SPM) Practices of Malaysian Electronics and Electrical Companies	SUSTAINABILITY	2019	Quantitative	For-Profit	Supported	Neutral	Not applicable	Neutral	Not applicable	Neutral
Santamarta, Juan C.; Storch de Gracia, Ma Dolores; Carrascosa, Ma Angeles Huerta; Martinez-Nunez, Margarita; Garcia, Celia de las Heras; Cruz-Perez, Noelia	Characterisation of Impact Funds and Their Potential in the Context of the 2030 Agenda	SUSTAINABILITY	2021	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Santos, Barbara; Ferreira, Paula; Alves, Anabela	USING COST-BENEFIT ANALYSIS TO EVALUATE LEAN-GREEN PROPOSALS FOR A CONSTRUCTION NON-PROFIT ASSOCIATION	TECHNOLOGIES, MARKETS AND POLICIES: BRINGING TOGETHER ECONOMICS AND ENGINEERING	2022	Mixed-Methods	Non-Profit	Neutral	Neutral	Not applicable	Not applicable	Supported	Neutral

Sarkar, Prabir; Joung, Che Bong; Carrell, John; Feng, Shaw C.	SUSTAINABLE MANUFACTURING INDICATOR REPOSITORY	PROCEEDINGS OF THE ASME INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES AND COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE, 2011, VOL 2, PTS A AND B	2012	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Savall Morera, Teresa 1 teresa.savall@uv.es; Guzmán, Carmen 2; Santos, Francisco J. 2	Measuring the impact of sheltered workshops through the SROI: A case analysis in southern Spain.	Annals of Public & Cooperative Economics	2022	Quantitative	Both	Neutral	Contradicted	Neutral	Neutral	Not applicable	Supported
Schlattmann, Anna; Neuendorf, Felix; Burkhard, Kremena; Probst, Elisabeth; Pujades, Estanislao; Mauser, Wolfram; Attinger, Sabine; von Haaren, Christina	Ecological Sustainability Assessment of Water Distribution for the Maintenance of Ecosystems, their Services and Biodiversity	ENVIRONMENTAL MANAGEMENT	2022	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Sechrest, Lee; Figuerado, Aurelio Jose	Program evaluation.	Annual Review of Psychology	1993	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Seiffert, Mari Elizabete Bernardini 1 mari.seiffert@ibest.com.br	Environmental impact evaluation using a cooperative model for implementing EMS (ISO 14001) in small and medium-sized enterprises	Journal of Cleaner Production	2008	Qualitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Serzante, Milena; Khudozhnyk, Anastasiia	Reviewing Sustainability Measurement Methods for Enterprises	SUSTAINABILITY	2023	Conceptual	For-Profit	Not applicable	Supported	Neutral	Not applicable	Not applicable	Not applicable
Setiawan, Nashrullah; Salleh, Mohd Rizal; Ariff, Hambali A.; Rahman, Muhamad Arfauz A.; Mohamad, Effendi; Sulaiman, Mohd Amri; Zaini, Faizuddin Firdaus; Ito, Teruaki	A proposal of performance measurement and management model for 5S sustainability in manufacturing SMEs: A Review	JOURNAL OF ADVANCED MECHANICAL DESIGN SYSTEMS AND MANUFACTURING	2021	Conceptual	For-Profit	Neutral	Supported	Not applicable	Neutral	Not applicable	Neutral
Setty, R. Siddappa; Bawa, Kamal; Ticktin, Tamara; Gowda, C. Made	Evaluation of a Participatory Resource Monitoring System for Nontimber Forest Products: the Case of Amla (Phyllanthus spp.) Fruit Harvest by Soligas in South India	ECOLOGY AND SOCIETY	2008	Qualitative	Both	Neutral	Neutral	Supported	Supported	Not applicable	Not applicable
Shaw, Alan 1 alan.shaw@strategic-planet.com	Using the Social Return on Investment Framework to Evaluate Behavior Changes of Individuals Living With Learning Difficulties.	Social Marketing Quarterly	2018	Mixed-Methods	For-Profit	Supported	Contradicted	Supported	Not applicable	Not applicable	Neutral
Shaw, Kurt; da Silva, Rita de Cacia Oenning	Look Upstream: Measurement for Innovation on the Upper Rio Negro of the Amazon Basin	FRONTIERS IN PEDIATRICS	2021	Mixed-Methods	Non-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral

Shen, Qiong; Pan, Yuxi; Feng, Yanchao	The impacts of high-speed railway on environmental sustainability: quasi-experimental evidence from China	HUMANITIES & SOCIAL SCIENCES COMMUNICATIONS	2023	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Sheng, Kun; Li, Yun; Li, Jinming; Chen, Yidong; Zou, Jianting; Zhang, Yuanyuan; He, Yang	A Survey on Post-Evaluation Indicator System for Multi-Energy Infrastructure Investments	IEEE ACCESS	2020	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Shukla, Anuprita; Teedon, Paul; Cornish, Flora	Empty rituals? A qualitative study of users' experience of monitoring & evaluation systems in HIV interventions in western India	SOCIAL SCIENCE & MEDICINE	2016	Qualitative	Non-Profit	Supported	Supported	Neutral	Not applicable	Not applicable	Supported
Shut'ko, Larisa; Samorodova, Lyudmila; Ivanov, Anastas	Ecological Footprint and Decoupling in the Sustainable Development of a Region	VTH INTERNATIONAL INNOVATIVE MINING SYMPOSIUM	2020	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Sikula, M	The need of impact studies and co-ordinates to elaborate them	EKONOMICKY CASOPIS	2002	Conceptual	Both	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Simpson, Murray C.	An integrated approach to assess the impacts of tourism on community development and sustainable livelihoods	COMMUNITY DEVELOPMENT JOURNAL	2009	Mixed-Methods	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Singh, Gerald G.; Lerner, Jackie; Murray, Cathryn Clarke; Wong, Janson; Mach, Megan; Ranieri, Bernardo; St-Laurent, Guillaume Peterson; Guimaraes, Alice; Chan, Kai M. A.	Response to Critique of The Insignificance of Thresholds in Environmental Impact Assessment: An Illustrative Case Study in Canada	ENVIRONMENTAL MANAGEMENT	2019	Conceptual	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Singh, Mitrabinda 1 akan.raj.50@gmail.com; Brueckner, Martin 2 m.brueckner@murdoch.edu.au; Padhy, Prasanta Kumar 3 profpadhy@hotmail.com	Environmental management system ISO 14001: effective waste minimisation in small and medium enterprises in India.	Journal of Cleaner Production	2015	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Singh, Sujit 1 singhsujit@hotmail.com; Olugu, Ezutah Udoncy 1 olugu@um.edu.my; Musa, Siti Nurmaya 1; Mahat, Abu Bakar 1	Fuzzy-based sustainability evaluation method for manufacturing SMEs using balanced scorecard framework.	Journal of Intelligent Manufacturing	2018	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Singh, Sujit; Olugu, Ezutah Udoncy; Fallahpour, Alireza	Fuzzy-based sustainable manufacturing assessment model for SMEs	CLEAN TECHNOLOGIES AND ENVIRONMENTAL POLICY	2014	Quantitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable

Singh, Sujit; Olugu, Ezutah Udoncy; Musa, Siti Nurmaya	Development of sustainable manufacturing performance evaluation expert system for small and medium enterprises	13TH GLOBAL CONFERENCE ON SUSTAINABLE MANUFACTURING - DECOUPLING GROWTH FROM RESOURCE USE	2016	Conceptual	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Skorecova, Emilia; Lateckova, Anna	Monitoring costs of material flows - a new trend in environmental management and accounting	MANAGERIAL TRENDS IN THE DEVELOPMENT OF ENTERPRISES IN GLOBALIZATION ERA	2017	Conceptual	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Smith, Julie; Barling, David	Social impacts and life cycle assessment: proposals for methodological development for SMEs in the European food and drink sector	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT	2014	Mixed-Methods	For-Profit	Neutral	Supported	Supported	Not applicable	Neutral	Neutral
Solanki, Rahul; Darbari, Jyoti Dhingra; Agarwal, Vernika; Jha, P. C.	A Fuzzy Multi-criteria Decision Model for Analysis of Socio-ecological Performance Key Factors of Supply Chain	SOFT COMPUTING FOR PROBLEM SOLVING, SOCPROS 2018, VOL 1	2020	Quantitative	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Sommerville, Matthew; Milner-Gulland, E. J.; Rahajaharison, Michael; Jones, Julia P. G.	Impact of a Community-Based Payment for Environmental Services Intervention on Forest Use in Menabe, Madagascar	CONSERVATION BIOLOGY	2010	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Song, Qingbin; Wang, Zhishi; Li, Jinhui	Sustainability evaluation of e-waste treatment based on emergy analysis and the LCA method: A case study of a trial project in Macau	ECOLOGICAL INDICATORS	2013	Quantitative	For-Profit	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Song, Qingbin; Wang, Zhishi; Li, Jinhui; Zeng, Xianlai	Life cycle assessment of TV sets in China: A case study of the impacts of CRT monitors	WASTE MANAGEMENT	2012	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Sousa, Sérgio 1; Aspinwall, Elaine 2 E.Aspinwall@bham.ac .uk	Development of a performance measurement framework for SMEs.	Total Quality Management & Business Excellence	2010	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Neutral	Not applicable	Neutral
Souza, Erik Geraldo da Silva; Rebelato, Marcelo Girotto	Assessment of the environmental performance of sugarcane companies based on waste disposed of on the soil	JOURNAL OF ENVIRONMENTAL HEALTH SCIENCE AND ENGINEERING	2023	Quantitative	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Speiser, Bernhard; Stolze, Matthias; Oehen, Bernadette; Gessler, Cesare; Weibel, Franco P.; Bravin, Esther; Kilchenmann, Adeline; Widmer, Albert; Charles, Raffael; Lang, Andreas; Stamm, Christian; Triloff, Peter; Tamm, Lucius	Sustainability assessment of GM crops in a Swiss agricultural context	AGRONOMY FOR SUSTAINABLE DEVELOPMENT	2013	Mixed-Methods	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Spratt, Trevor; Swords, Lorraine; Vilda, Dovile	Outcomes for Families Referred to Family Centres: Using Validated Instruments to Chart Changes in Psychological Functioning, Relationships and Children's Coping Strategies over Time	BRITISH JOURNAL OF SOCIAL WORK	2021	Quantitative	Non-Profit	Supported	Contradicted	Neutral	Supported	Supported	Supported
Stanescu, Sorina Geanina; Cucui, Ion; Ionescu, Constantin Aurelian; Paschia, Liliana; Coman, Mihaela Denisa; Nicolau, Nicoleta Luminita Gudanescu; Uzlau, Marilena Carmen; Lixandru, Mihaela Leasa	Conceptual Model for Integrating Environmental Impact in Managerial Accounting Information Systems	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	2021	Mixed-Methods	For-Profit	Not applicable	Supported	Not applicable	Neutral	Not applicable	Neutral
Streimikiene, Dalia	Mitigation of energy impact on environment	Lithuanian Energy Institute 50	2006	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Striebing, Clemens; Schmidt, Evanthia Kalpazidou; Palmen, Rachel	Pragmatic ex-ante evaluation using an innovative conceptual framework: The case of a high-tech entrepreneurship program for women	EVALUATION AND PROGRAM PLANNING	2019	Conceptual	For-Profit	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Strong, Robert; Baker, Mitchell; Dooley, Kim; Ray, Nicole	The Often-Forgotten Innovation to Improve Sustainability: Assessing Food and Agricultural Sciences Curricula as Interventions in Uganda	SUSTAINABILITY	2023	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Su, Rongjun	Impact Evaluation on Air and Acoustic Environment of an Integrated Circuit Project	SUSTAINABLE CITIES DEVELOPMENT AND ENVIRONMENT, PTS 1-3	2012	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Sun, Zhonggen; Zhang, Furong; Wang, Yifei; Shao, Ziting	Literature review and analysis of the social impact of a just energy transition	FRONTIERS IN SUSTAINABLE FOOD SYSTEMS	2023	Conceptual	Both	Not applicable	Supported	Neutral	Not applicable	Not applicable	Not applicable
Susanty, A.; Puspitasari, N. B.; Purwaningsih, R.; Hazazi, H.	Prioritization an Indicator for Measuring Sustainable Performance in the Food Supply Chain: Case of Beef Supply Chain	2019 IEEE INTERNATIONAL CONFERENCE ON INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT (IEEM)	2019	Quantitative	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Svabova, Lucia 1 barbora.gabrikova@stud.uniza.sk; Gabrikova, Barbora 1	A Measure That Really Works? Impact Evaluation of the Contribution for Self-Employment as a Tool of Active Labour Market Policy in Slovakia.	Economies	2024	Quantitative	For-Profit	Neutral	Contradicted	Neutral	Not applicable	Not applicable	Supported
Svynchuk, A. A.	METHODICAL INSTRUMENTATION OF EVALUATION THE RESULTS OF SOCIAL ENTERPRISE ACTIVITY.	Scientific Bulletin of Polissia	2017	Conceptual	For-Profit	Neutral	Supported	Supported	Neutral	Neutral	Neutral

Tait, Meghan K.; Gaughen, Kapono Matthew; Tsang, Anita; Walton, Maya M.; Marcoux, Stacia D.; Kekoa, Luna; Kunz, Melissa; Vaughan, Mehana Blaich	Holomua Marine Initiative: community-generated socio-cultural principles and indicators for marine conservation and management in Hawai'i	ECOLOGY AND SOCIETY	2024	Qualitative	Non-Profit	Supported	Neutral	Supported	Not applicable	Not applicable	Neutral
Talbot, David 1 david.talbot@enap.ca; Raineri, Nicolas 2; Daou, Alain 3	Implementation of sustainability management tools: The contribution of awareness, external pressures, and stakeholder consultation.	Corporate Social Responsibility & Environmental Management	2021	Quantitative	For-Profit	Neutral	Neutral	Supported	Not applicable	Not applicable	Neutral
TAMURA, H; FUJITA, S; KOI, H	DECISION-ANALYSIS FOR ENVIRONMENTAL-IMPACT ASSESSMENT AND CONSENSUS FORMATION AMONG CONFLICTING MULTIPLE AGENTS - INCLUDING CASE-STUDIES FOR ROAD TRAFFIC	SCIENCE OF THE TOTAL ENVIRONMENT	1994	Conceptual	Both	Neutral	Supported	Not applicable	Not applicable	Not applicable	Neutral
Tamym, Lahcen; Benyoucef, Lyes; Moh, Ahmed Nait Sidi; El Ouadghiri, Moulay Driss	Big Data Analytics-based life cycle sustainability assessment for sustainable manufacturing enterprises evaluation	JOURNAL OF BIG DATA	2023	Mixed-Methods	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Tan, X. C.; Liu, F.; Liu, D. C.; Zheng, Li; Wang, H. Y.; Zhang, Y. H.	Research on the diagnosis and improvement method of a process route in an enterprise production process in terms of sustainable development III	INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY	2007	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Tasdemir, Cagatay 1 ctasdemi@purdue.edu; Gazo, Rado 1; Quesada, Henry J. 2	Sustainability benchmarking tool (SBT): theoretical and conceptual model proposition of a composite framework.	Environment, Development & Sustainability	2020	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Teodosiu, Carmen; Robu, Brindusa; Cojocariu, Claudia; Barjoveanu, George	Environmental impact and risk quantification based on selected water quality indicators	NATURAL HAZARDS	2015	Quantitative	Both	Supported	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Tetteh, Mershack Opoku; Chan, Albert P. C.; Darko, Amos; Ozorhon, Beliz; Adinyira, Emmanuel	Developing a multidimensional performance measurement framework for international construction joint ventures (ICJVs): the perspective of Ghana-hosted ICJVs' practitioners	ENGINEERING CONSTRUCTION AND ARCHITECTURAL MANAGEMENT	2023	Mixed-Methods	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Tewari, Seema 1; Singh, Harjit 1; Wadhwa, Shobhit 2; Tandon, Deepak 3	Scaling Impact Investment for Sustainable Development Goals: An Empirical Analysis.	Australasian Accounting Business & Finance Journal	2021	Mixed-Methods	Both	Supported	Supported	Supported	Neutral	Neutral	Neutral
Thi Tam Le; Thi Mai Anh Nguyen; Thi Thu Hien Phan	Environmental Management Accounting and Performance Efficiency in the Vietnamese Construction Material Industry-A	SUSTAINABILITY	2019	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral

	Managerial Implication for Sustainable Development										
Tikul, Nachawit	Assessing environmental impact of small and medium ceramic tile manufacturing enterprises in Thailand	JOURNAL OF MANUFACTURING SYSTEMS	2014	Qualitative	For-Profit	Neutral	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Titov, VK; Venkov, VA; Chernik, DA	Radiational impact of mining on the population at large	ATOMIC ENERGY	1998	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Tooranloo, Hossein Sayyadi 1; Karimi, Salim 1; Vaziri, Khatereh	Analysis of the Factors Affecting Sustainable Electronic Supply Chains in Healthcare Centers: An Interpretive-Structural Modeling Approach.	Information Resources Management Journal	2018	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Torresan, Fabio Enrique; Lorandi, Reinaldo	A methodological proposal for quantifying environmental compensation through the spatial analysis of vulnerability indicators	BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY	2008	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable
Trautwein, Constanze 1,2 trautwein@borderstep.de	Sustainability impact assessment of start-ups – Key insights on relevant assessment challenges and approaches based on an inclusive, systematic literature review.	Journal of Cleaner Production	2021	Conceptual	For-Profit	Neutral	Supported	Neutral	Neutral	Neutral	Neutral
Trevathan, Jarrod; Johnstone, Ron	Smart Environmental Monitoring and Assessment Technologies (SEMAT)-A New Paradigm for Low-Cost, Remote Aquatic Environmental Monitoring	SENSORS	2018	Conceptual	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Trianni, Andrea 1 andrea.trianni@uts.edu.au; Cagno, Enrico 2; Neri, Alessandra 2; Howard, Mickey 3	Measuring industrial sustainability performance: Empirical evidence from Italian and German manufacturing small and medium enterprises.	Journal of Cleaner Production	2019	Qualitative	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Troeger, Christopher 1; Pham, Thanh 2; Van Arsdale, Peter 3	Community-Level Perceptions and Outcomes of Water Source Development Projects in Timor-Leste: A Cross-Sectional Study.	Human Organization	2015	Qualitative	Non-Profit	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Neutral
Tseng, Ming-Lang; Lan, Lawrence W.; Wang, Ray; Chiu, Anthony; Cheng, Hui-Ping	Using hybrid method to evaluate the green performance in uncertainty	ENVIRONMENTAL MONITORING AND ASSESSMENT	2011	Mixed-Methods	For-Profit	Neutral	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Tsvakirai, Chiedza Zvirurami; Mosikari, Teboho Jeremiah	Investigating South Africa's Fresh Peach and Nectarine Value Proposition: Measuring Progress on	SUSTAINABILITY	2020	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable

	Achieving Sustainable Consumption in Exports										
Tu, Zhengge 1; Hu, Tianyang 1 louisehu1117@163.com; Shen, Renjun 1	Evaluating public participation impact on environmental protection and ecological efficiency in China: Evidence from PITI disclosure.	China Economic Review (1043951X)	2019	Quantitative	Both	Not applicable	Contradicted	Neutral	Not applicable	Not applicable	Neutral
Tucu, Alexandru; Purcarea, Anca-Alexandra; Crisan, George Catalin; Vasilica, Alexandru; Tucu, Dumitru	QUALITY EVALUATION OF OCCUPATIONAL HEALTH & SAFETY (OHS) RISK MANAGEMENT SYSTEMS FROM AGRICULTURE	ACTUAL TASKS ON AGRICULTURAL ENGINEERING (ATAE 2021)	2021	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Upham, P	A comparison of sustainability theory with UK and European airports policy and practice	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2001	Conceptual	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Urban, Boris 1 boris.urban@wits.ac.za	Evoaulution of social enterprise outcomes and self-efficacy.	International Journal of Social Economics	2015	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Neutral	Neutral
Valcarcel, M.; Lucena, R.	A quantitative model to assess Social Responsibility in Environmental Science and Technology	SCIENCE OF THE TOTAL ENVIRONMENT	2014	Quantitative	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Neutral
van Rijn, Michiel 1 a.m.vanrijn@tilburguniversity.edu; Raab, Jörg 2; Roosma, Femke 1; Achterberg, Peter 1	To Prove and Improve: An Empirical Study on Why Social Entrepreneurs Measure Their Social Impact.	Journal of Social Entrepreneurship	2021	Quantitative	For-Profit	Supported	Neutral	Neutral	Neutral	Neutral	Supported
VANCLAY, FRANK 1 Frank.Vanclay@utas.edu.au	THE TRIPLE BOTTOM LINE AND IMPACT ASSESSMENT:: HOW DO TBL, EIA, SIA, SEA AND EMS RELATE TO EACH OTHER?	Journal of Environmental Assessment Policy & Management	2004	Conceptual	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Neutral
Vashi, A. N.; Shah, N. C.	Impacts of a participatory approach to assess sustainable sewage treatment technologies for urban fringe of Surat city in India	WATER SCIENCE AND TECHNOLOGY	2008	Mixed-Methods	Both	Not applicable	Neutral	Supported	Not applicable	Not applicable	Not applicable
Vasilyev, A. V.	Environmental impact assessment of electromagnetic fields near to the specially protected natural areas on the example of Samara region of Russia	4TH CONFERENCE ON ACTUAL PROBLEMS OF SPECIALLY PROTECTED NATURAL AREAS	2020	Qualitative	Both	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable

Vaslyev, Andrey; Bukhonov, Vitaly; Vasilyev, Vladislav	APPROACHES TO ENVIRONMENTAL IMPACT ASSESSMENT OF PHYSICAL POLLUTIONS OF TERRITORIES DURING DESIGN AND CONSTRUCTION OF INDUSTRIAL OBJECTS AND ITS REALIZATION IN SAMARA REGION OF RUSSIA	HERITAGE, ARCHITECTURE, LANDESIGN: FOCUS ON CONSERVATION, REGENERATION, INNOVATION	2013	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Vasquez, Jenifer; Bruno, Giulia; Settineri, Luca; Aguirre, Santiago	Conceptual Framework for Evaluating the Environmental Awareness and Eco-efficiency of SMEs	6TH CIRP GLOBAL WEB CONFERENCE - ENVISAGING THE FUTURE MANUFACTURING, DESIGN, TECHNOLOGIES AND SYSTEMS IN INNOVATION ERA (CIRPE 2018)	2018	Conceptual	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Vavra, Jan; Bednarikova, Marie; Ehlova, Zuzana	ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS BY SOCIAL LCA METHOD ALONG THE WHOLE SUPPLY CHAIN	CLC 2013: CARPATHIAN LOGISTICS CONGRESS - CONGRESS PROCEEDINGS	2014	Conceptual	For-Profit	Not applicable	Supported	Supported	Not applicable	Not applicable	Neutral
Verdugo, Gustavo Barrera; Villarroel, Antonio Villarroel	Measuring the association between students' exposure to social media and their valuation of sustainability in entrepreneurship	HELIYON	2021	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Vergnoux, A.; Allari, E.; Sassi, M.; Thimonier, J.; Hammond, C.; Clouzot, L.	A multidisciplinary investigation of aquatic pollution and how to minimise it	JOURNAL OF BIOLOGICAL EDUCATION	2011	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Verkooijen, Kirsten Thecla; Super, Sabina; Mulderij, Lisanne Sofie; de Jager, Dico; Wagemakers, Annemarie	Using Realist Interviews to Improve Theory on the Mechanisms and Outcomes of Sport for Development Programmes	SOCIAL INCLUSION	2020	Qualitative	Both	Supported	Supported	Neutral	Not applicable	Not applicable	Neutral
Verschoor, Aart-Jan; Gandidzanwa, Colleta; Newby, Terence; Collett, Anneliza; Venter, Sonja	Proposing a farm assessment toolkit: evaluating a South African land reform case study	AGREKON	2023	Mixed-Methods	Both	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Villarroel Gonzalez, Carlos; Cabrales Gomez y Maria, Fernando; Ramirez Prado, Maria Angelica	IMPACT EVALUATION METHODOLOGY APPLIED TO CORFO'S REGIONAL ENTREPRENEURSHIP SUPPORT PROGRAM IN CHILE	INTERCIENCIA	2019	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Viviani, Jean-Laurent; Maurel, Carole	Performance of impact investing: A value creation approach	RESEARCH IN INTERNATIONAL BUSINESS AND FINANCE	2019	Conceptual	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Vo, Anne T.; Christie, Christina A.; Rohanna, Kristen	Understanding evaluation practice within the context of social investment	EVALUATION	2016	Mixed-Methods	Both	Neutral	Supported	Supported	Not applicable	Neutral	Neutral

Wade, Jay 1 jay@pieorg.org; Kallemeyn, Leanne 2 lkallemeyn@luc.edu	Evaluation capacity building (ECB) interventions and the development of sustainable evaluation practice: An exploratory study.	Evaluation & Program Planning	2020	Qualitative	Both	Neutral	Neutral	Neutral	Supported	Neutral	Neutral
Wagemans, Andrea; Witschge, Tamara; Harbers, Frank	Impact as driving force of journalistic and social change	JOURNALISM	2019	Qualitative	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Neutral
WALK, Marlene 1; GREENSPAN, Itay 2; CROSSLEY, Honey 3; HANDY, Femida 1	MIND THE GAP: EXPECTATIONS AND EXPERIENCES OF CLIENTS UTILIZING JOB-TRAINING SERVICES IN A SOCIAL ENTERPRISE.	Annals of Public & Cooperative Economics	2015	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Not applicable	Neutral
Wandersee, Sarah M.; An, Li; Lopez-Carr, David; Yang, Yeqin	Perception and decisions in modeling coupled human and natural systems: A case study from Fanjingshan National Nature Reserve, China	ECOLOGICAL MODELLING	2012	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Wang Chunmei; Sun Dezhi; Wang Zhen; Lin Zhaolan	The Analysis of Performance of Total Amount Reduction of Pollutants Emission Based on Logistic Regression Model	INTERNATIONAL CONFERENCE ON ECOLOGICAL INFORMATICS AND ECOSYSTEM CONSERVATION (ISEIS 2010)	2010	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Wang Ruyan; Ding Rijia; Zhang Mei; Lin Yulian	Environment Performance Audit Index System and Model for Beijing's Three Wastes	ITESS: 2008 PROCEEDINGS OF INFORMATION TECHNOLOGY AND ENVIRONMENTAL SYSTEM SCIENCES, PT 1	2008	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Wang, Haocheng; Wang, Lin; Jiang, Aihua; Wei, Baoli; Song, Chuan	Assessing impact of land use change on ecosystem service value in Dasi River Basin of China based on an improved evaluation model	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2023	Quantitative	Both	Not applicable	Supported	Not applicable	Supported	Not applicable	Not applicable
Wang, Huan; Jafar, Rana Muhammad Sohail; Fei, Bian	Research on an Evaluation Model of Social Impact Bonds to Reduce the Short-Term Achievements Tendency	2018 15TH INTERNATIONAL CONFERENCE ON SERVICE SYSTEMS AND SERVICE MANAGEMENT (ICSSSM)	2018	Conceptual	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Neutral
Wang, Qiu Lian; Li, Cong Bo	Environmental Performance Measurement for Green Manufacturing Program Based on BP Neural Network	ADVANCED MEASUREMENT AND TEST, PARTS 1 AND 2	2010	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Wang, Qiulian; Fei Liu; Li, Congbo; Cao, Huajun	Study on process-oriented environmental performance measurement system of green manufacturing	2008 PROCEEDINGS OF INFORMATION TECHNOLOGY AND ENVIRONMENTAL SYSTEM SCIENCES: ITESS 2008, VOL 2	2008	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Wang, Shanshan 1 wangshanshan@zzu.edu.cn; Lu, Chunyang 1; Gao,	Life cycle assessment of reduction of environmental impacts via industrial symbiosis in an energy-intensive industrial park in China.	Journal of Cleaner Production	2019	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral

Yu 1; Wang, Ke 1; Zhang, Ruiqin 1 rqzhang@zzu.edu.cn											
Wang, Shaowen	The positive effect of green agriculture development on environmental optimization: Measurement and impact mechanism	FRONTIERS IN ENVIRONMENTAL SCIENCE	2022	Quantitative	Both	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Wang, Shiyan; Li, Chengjiang; Zhang, Wei; Sui, Jingyu; Negnevitsky, Michael	Assessing the impact of prefabricated buildings on urban green total factor energy efficiency	ENERGY	2024	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Wang, Yu-Jie	Extending Quality Function Deployment and Analytic Hierarchy Process under Interval-Valued Fuzzy Environment for Evaluating Port Sustainability	SUSTAINABILITY	2023	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Wang, Zishu; Wang, Chunyan; Liu, Yi	Evaluation for the nexus of industrial water-energy-pollution: Performance indexes, scale effect, and policy implications	ENVIRONMENTAL SCIENCE & POLICY	2023	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Ward, Caroline; Stringer, Lindsay C.; Holmes, George	Protected area co-management and perceived livelihood impacts	JOURNAL OF ENVIRONMENTAL MANAGEMENT	2018	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Wasniewski, Piotr	Informal performance measurement in small enterprises	KNOWLEDGE-BASED AND INTELLIGENT INFORMATION & ENGINEERING SYSTEMS (KSE 2021)	2021	Quantitative	For-Profit	Neutral	Not applicable	Neutral	Neutral	Not applicable	Neutral
Weinhardt, Lance S.; Galvao, Loren W.; Mwenyekonde, Thokozani; Grande, Katarina M.; Stevens, Patricia; Yan, Alice F.; Mkandawire-Valhmu, Lucy; Masanjala, Winford; Kibicho, Jennifer; Ngui, Emmanuel; Emer, Lindsay; Watkins, Susan C.	Methods and protocol of a mixed method quasi-experiment to evaluate the effects of a structural economic and food security intervention on HIV vulnerability in rural Malawi: The SAGE4Health Study	SPRINGERPLUS	2014	Mixed-Methods	Non-Profit	Not applicable	Neutral	Not applicable	Supported	Not applicable	Not applicable
Weng, Lisheng; He, Bao-Jie; Liu, Lina; Li, Chenxi; Zhang, Xin	Sustainability Assessment of Cultural Heritage Tourism: Case Study of Pingyao Ancient City in China	SUSTAINABILITY	2019	Quantitative	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable
White, Michelle C.; Randall, Kirsten; Avara, Esther; Mullis, Jenny; Parker, Gary; Shrime, Mark G.	Clinical Outcome, Social Impact and Patient Expectation: a Purposive Sampling Pilot Evaluation of Patients in Benin Seven Years After Surgery	WORLD JOURNAL OF SURGERY	2018	Qualitative	Non-Profit	Not applicable	Not applicable	Not applicable	Supported	Not applicable	Neutral

White, Robin R.; Brady, Michael; Capper, Judith L.; Johnson, Kristen A.	Optimizing diet and pasture management to improve sustainability of U.S. beef production	AGRICULTURAL SYSTEMS	2014	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Wildmannova, Mirka	MEASURING SOCIAL IMPACTS IN A SELECTED SOCIAL ENTERPRISE	RELIK 2020: REPRODUCTION OF HUMAN CAPITAL - MUTUAL LINKS AND CONNECTIONS	2020	Quantitative	For-Profit	Neutral	Contradicted	Neutral	Not applicable	Neutral	Neutral
WillekeWetstein, C; Schmidt, A; Abresch, JP; Steinbach, J; Bauer, S	Methodological approach to evaluate the environmental impact of livestock production systems	LIVESTOCK FARMING SYSTEMS: RESEARCH, DEVELOPMENT SOCIO-ECONOMICS AND THE LAND MANAGER	1996	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Williams, Victoria; Flannery, Orla; Patel, Ajay	Eco-score labels on meat products: Consumer perceptions and attitudes towards sustainable choices	FOOD QUALITY AND PREFERENCE	2023	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Neutral
Winroth, Mats 1,2; Almström, Peter 1,2; Andersson, Carin 1,2	Sustainable production indicators at factory level.	Journal of Manufacturing Technology Management	2016	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Not applicable
Worku, Hailu 1 hailu.worku@eiabc.edu.et	Mainstreaming environmental impact assessment as a tool for environmental management in Ethiopia: Current challenges and directions for future improvements.	Environmental Quality Management	2017	Mixed-Methods	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Wu, Chia-Chin; Chang, Ni-Bin	Evaluation of environmentally benign production program in the textile-dyeing industry (I): an input-output analysis	CIVIL ENGINEERING AND ENVIRONMENTAL SYSTEMS	2007	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Wu, Kuo-Jui; Chen, Qing; Qi, Yun; Jiang, Xiaoyue; Gao, Shuo; Tseng, Ming-Lang	Sustainable Development Performance for Small and Medium Enterprises Using a Fuzzy Synthetic Method-DEMATEL	SUSTAINABILITY	2019	Quantitative	For-Profit	Not applicable	Supported	Neutral	Not applicable	Not applicable	Neutral
Wu, Xiangyang; Si, Yu; Mehmood, Usman	Analyzing the linkages of rural tourism, GDP, energy utilization, and environment: Exploring a sustainable path for China	HELIYON	2023	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Xavier, M. J. 1 xavier@mba.srmuniv.ac.in; Raja, J. 2 johnraja62@yahoo.com; S., Usha Nandhini 3 nandhini@nitt.edu	Impact Assessment of a Rural Women's Micro Entrepreneurship Project using Path Analysis Models.	IIMB Management Review (Indian Institute of Management Bangalore)	2008	Mixed-Methods	For-Profit	Not applicable	Contradicted	Neutral	Not applicable	Neutral	Supported
Xie, Fangting; Liu, Shaoquan; Zhang, Haiqin; Guo, Shili	Environmental Pollution and Its Influencing Factors in Mountainous and Hilly Rural Area of Sichuan Province in China	ADVANCES IN ENVIRONMENTAL SCIENCE AND ENGINEERING, PTS 1-6	2012	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Xie, Lifeng; Wu, Weicheng; Huang, Xiaolan; Ou, Penghui; Lin, Ziyu; Wang, Zhiling; Song, Yong; Lang, Tao; Huangfu, Wenchao; Zhang, Yang; Zhou, Xiaoting; Fu, Xiao; Li, Jie; Jiang, Jingheng; Zhang, Ming; Zhang, Zhenjiang; Qin, Yaozu; Peng, Shanling; Shao, Chongjian; Bai, Yonghui	Mining and Restoration Monitoring of Rare Earth Element (REE) Exploitation by New Remote Sensing Indicators in Southern Jiangxi, China	REMOTE SENSING	2020	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Supported	Not applicable	Not applicable
Xu Bingsheng; Lin Ling; Huang Jin	Research on evaluation of third-party governance operation services for environmental pollution	2017 3RD INTERNATIONAL CONFERENCE ON ENERGY, ENVIRONMENT AND MATERIALS SCIENCE (EEMS 2017)	2017	Quantitative	Both	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Xu, Ye; Wen, Shuang; Tao, Chang-Qi	Impact of environmental tax on pollution control: A sustainable development perspective	ECONOMIC ANALYSIS AND POLICY	2023	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Xuantong Wang 1 xuanwang@ttu.edu; Hopeward, James 2; Ilcheong Yi 3; McElroy, Mark W. 4; Sutton, Paul C. 5 paul.sutton@du.edu	Supporting the Sustainable Development Goals: A context sensitive indicator for sustainable use of water at the facility level.	Sustainable Development	2022	Conceptual	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Yang Yuxiang; Wu Dan	Research on environmental impact assessment of e-waste reverse logistics	PROCEEDINGS OF 2016 12TH INTERNATIONAL CONFERENCE ON COMPUTATIONAL INTELLIGENCE AND SECURITY (CIS)	2016	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Yang, Bo 1; Li, Shujuan 1; Binder, Chris 1	A research frontier in landscape architecture: landscape performance and assessment of social benefits.	Landscape Research	2016	Quantitative	Both	Neutral	Supported	Neutral	Not applicable	Not applicable	Neutral
Yang, Junyao; Guo, Liangliang	Dynamic Evaluation of Water Utilization Efficiency in Large Coal Mining Area Based on Life Cycle Sustainability Assessment Theory	GEOFLUIDS	2021	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Yang, Shan; Li, Ke; Wu, Shuliang; Xu, Zitong; Liu, Taoying	Quality Evaluation of Wasteless Mining in Dongguashan Based on Intuitionistic Fuzzy Set and VIKOR	APPLIED SCIENCES-BASEL	2022	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Yang, Yunjeong	Gaps in post-disaster community changes in building back better in Ayeyarwaddy, Myanmar	DISASTER PREVENTION AND MANAGEMENT	2020	Mixed-Methods	Non-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Yao Ligen; Feng Peipei	Research on the EVA Integrated Scorecard Performance Index of Measuring System	RESEARCH ON ORGANIZATIONAL INNOVATION - 2007 PROCEEDINGS OF INTERNATIONAL CONFERENCE ON ENTERPRISE ENGINEERING AND MANAGEMENT INNOVATION	2007	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Neutral

Yi, Wang	Evaluation of Steel Enterprises Environmental Performance	PROCEEDINGS OF THE 6TH INTERNATIONAL CONFERENCE ON INNOVATION AND MANAGEMENT, VOLS I AND II	2009	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Yıldırım, Nihan 1 yildirimni@itu.edu.tr; Köroğlu, Fatma 1	Revisiting the Impact Evaluation of Women's Empowerment: A MCDM-Based Evaluation Indicator Selection Framework Proposal.	Social Indicators Research	2024	Mixed-Methods	Non-Profit	Neutral	Supported	Supported	Neutral	Supported	Neutral
Yıldız, Taşkın Deniz 1 tdyildiz@atu.edu.tr	How can the effects of EIA procedures and legislation foreseen for the mining operation activities to mining change positively in Turkey?	Resources Policy	2021	Mixed-Methods	For-Profit	Neutral	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Yu, Tingting; Huo, Yunxiang	COMPREHENSIVE COMPARISON AND SENSITIVITY ANALYSIS OF ECONOMIC EFFECTS OF ENVIRONMENTAL ENTERPRISES FROM THE PERSPECTIVE OF SUSTAINABLE DEVELOPMENT	JOURNAL OF ENVIRONMENTAL PROTECTION AND ECOLOGY	2021	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Yu, Xi; Nongaillard, Antoine; Sekhari, Aicha; Bouras, Abdelaziz	An Environmental Burden Shifting Approach to Re-evaluate the Environmental Impacts of Products	PRODUCT LIFECYCLE MANAGEMENT IN THE ERA OF INTERNET OF THINGS, PLM 2015	2016	Mixed-Methods	For-Profit	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Neutral
Yu, Xi; Sekhari, Aicha; Nongaillard, Antoine; Bouras, Abdelaziz; Yu, Suiran; Yang, Qingyan	A LCIA Model Considering Pollution Transfer Phenomena	PRODUCT LIFECYCLE MANAGEMENT FOR SOCIETY (PLM 2013)	2013	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Yu, Zhichong; Tian, Xu; Gao, Yichun; Yuan, Xuehong; Xu, Zhenming; Zhang, Lingen	Monitoring the Resources and Environmental Impacts from the Precise Disassembly of E-Waste in China	ENVIRONMENTAL SCIENCE & TECHNOLOGY	2023	Mixed-Methods	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zain, Nor Syahirah; Hassan, Rusni	What Can Waqf Organisations Learn from Non-profit Organisations on Accountability? A Proposal for Social Impact Measurement	INNOVATION OF BUSINESSES, AND DIGITALIZATION DURING COVID-19 PANDEMIC, ICBT 2021	2023	Conceptual	Non-Profit	Supported	Supported	Supported	Not applicable	Not applicable	Neutral
Zanecchia, Armando L.	TOBACCO DEPENDENCY, SUSTAINABLE AGRICULTURE, AND REGIONAL FOOD SECURITY - A CASE STUDY IN MALAWI	INTED2014: 8TH INTERNATIONAL TECHNOLOGY, EDUCATION AND DEVELOPMENT CONFERENCE	2014	Qualitative	Both	Not applicable	Not applicable	Neutral	Not applicable	Not applicable	Not applicable
Zarte, Maximilian; Pechmann, Agnes; Nunes, Isabel L.	Sustainable Evaluation of Production Programs Using a Fuzzy Inference Model - A Concept	10TH CIRP CONFERENCE ON INDUSTRIAL PRODUCT-SERVICE SYSTEMS, IPS2 2018	2018	Conceptual	For-Profit	Neutral	Supported	Neutral	Not applicable	Not applicable	Not applicable

Zeng, Juying; Blanco-Gonzalez-Tejero, Cristina; Sendra, F. Javier	The spatial difference-in-difference measurement of policy effect of environmental protection interview on green innovation	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	2023	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Neutral
Zhang, Cai-Ping; Timothy, Randhir O.	Carbon Performance Evaluation Method from Resource Value Flow Analysis Perspective	INTERNATIONAL CONFERENCE ON ENERGY AND ENVIRONMENT ENGINEERING (ICEEE 2015)	2015	Conceptual	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Caiping 1; Yu, Ning 1; Yin, Xiangxiang 1; Randhir, Timothy O. 2	Environmental performance evaluation of enterprises using internal resource loss and external environmental damage costs.	Journal of Environmental Planning & Management	2021	Mixed-Methods	For-Profit	Neutral	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Caiping 1; Yue, Wenjie 1; Tan, Deming 1 1499686214@qq.com; Su, Zhenkun 1	Carbon performance evaluation system and practice analysis for the sustainable enterprises.	Sustainable Development	2023	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Jianqing; Wang, Song; Yang, Peilei; Fan, Fei; Wang, Xueli	Analysis of Scale Factors on China's Sustainable Development Efficiency Based on Three-Stage DEA and a Double Threshold Test	SUSTAINABILITY	2020	Quantitative	Both	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Jingshen 1,2; Zhou, Xinzhu 1,3; Bai, Rong 1,4; Dong, Haoyang 5; Tang, Tingting 6; Wang, Zeyu 1,7; Yang, Ya 8; Huang, Feng 1,9 feng@zafu.edu.cn	Impact of environmental supervision reform on green innovation in mineral enterprises.	Resources Policy	2024	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Jingxiao; Zhang, Zhiyue; Ballesteros-Perez, Pablo; Skitmore, Martin; Yang, Guoliang; Philbin, Simon P.; Lu, Qingchang	Factors influencing environmental performance: a bibliometric review and future research agenda	INTERNATIONAL JOURNAL OF URBAN SCIENCES	2023	Conceptual	Both	Neutral	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Kerong; Hou, Youxin; Jiang, Liangyu; Xu, Yasong; Liu, Wuyi	Performance evaluation of urban environmental governance in Anhui Province based on spatial and temporal differentiation analyses	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	2021	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Liming 1; Geng, Yong 2 ygeng@sjtu.edu.cn; Dong, Huijuan 1,3; Zhong, Yongguang 4; Fujita, Tsuyoshi 3; Xue, Bing 1; Park, Hung-suck 5	Emergy-based assessment on the brownfield redevelopment of one old industrial area: a case of Tiexi in China.	Journal of Cleaner Production	2016	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Supported	Not applicable	Not applicable
Zhang, Xiao Hong; Deng, ShiHuai; Jiang, WenJu; Zhang, YanZong; Peng, Hong; Li, Li; Yang, Gang; Li, YuanWei	Emergy evaluation of the sustainability of two industrial systems based on wastes exchanges	RESOURCES CONSERVATION AND RECYCLING	2010	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Zhang, Xugang 1,2 whkjdxzxg@wust.edu.cn; Ao, Xiuyi 1,2; Cai, Wei 3; Jiang, Zhigang 1,2; Zhang, Hua 1,2	A sustainability evaluation method integrating the energy, economic and environment in remanufacturing systems.	Journal of Cleaner Production	2019	Quantitative	For-Profit	Not applicable	Supported	Not applicable	Not applicable	Not applicable	Neutral
Zhang, Yalian	The Environment Performance Evaluation of the Enterprise Based on the Product Life Cycle (PLC)	NINTH WUHAN INTERNATIONAL CONFERENCE ON E-BUSINESS, VOLS I-III	2010	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Yan; Xin, Zihan; Gan, Guoya	Evaluating the Sustainable Development Performance of China's International Commercial Ports Based on Environmental, Social and Governance Elements	SUSTAINABILITY	2024	Quantitative	For-Profit	Neutral	Neutral	Neutral	Not applicable	Not applicable	Neutral
Zhang, Yi; Li, Feng; Peng, Najun; Peng, Lihong	Environmental impact assessment of air-permeable plastic runway production in China	SCIENCE OF THE TOTAL ENVIRONMENT	2020	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Yong 1,2; Zhao, Tingsheng 1; Zhang, Zhengzhu 3; Wan, Jun 4; Feng, Xiaonan 4; Liang, Xiangmin 5; Zhou, Aijiao 4	Modeling and dynamic assessment on sustainable development of drainage enterprise: Application of a coupled system dynamics-comprehensive assessment model.	Journal of Cleaner Production	2017	Quantitative	For-Profit	Neutral	Neutral	Not applicable	Supported	Not applicable	Not applicable
Zhang, Yu; Lu, Wen-xi; Guo, Jia-yuan; Zhao, Hai-qing; Yang, Qing-chun; Chen, Mo	Geo-environmental impact assessment and management information system for the mining area, Northeast China	ENVIRONMENTAL EARTH SCIENCES	2015	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zhang, Zhiqin; Zhang, Liangliang; Liu, Dong; Sun, Nan; Li, Mo; Faiz, Muhammad Abrar; Li, Tianxiao; Cui, Song; Khan, Muhammad Imran	Measurement and analysis of regional water-energy-food nexus resilience with an improved hybrid kernel extreme learning machine model based on a dung beetle optimization algorithm	AGRICULTURAL SYSTEMS	2024	Quantitative	For-Profit	Not applicable	Contradicted	Not applicable	Not applicable	Not applicable	Not applicable
Zhao, Lian-Rong; Chen, Wei	Establishment of Assessment Indicator System of Sustainable Development in Mining Industry and Evaluation of Pilot Project	PROCEEDINGS OF THE 2014 INTERNATIONAL CONFERENCE ON SOCIAL SCIENCE	2014	Quantitative	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zheng, Jun; Chen, Ankai; Zheng, Wang; Zhou, Xingjian; Bai, Bing; Wu, Jian; Ling, Wei; Ma, Hongping; Wang, Wei	Effectiveness analysis of resources consumption, environmental impact and production efficiency in traditional manufacturing using new technologies: Case from sand casting	ENERGY CONVERSION AND MANAGEMENT	2020	Quantitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zheng, Qiuqin; Chen, Qiuhua; Kong, Deyi	Performance evaluation of the development of eco-cultural tourism in Fujian Province based on the method of fuzzy comprehensive evaluation	FRONTIERS IN ENVIRONMENTAL SCIENCE	2022	Quantitative	Both	Not applicable	Neutral	Neutral	Not applicable	Not applicable	Not applicable

Zhou, Leilei; Mao, Rui; Li, Peng	Performance evaluation of environmental management for sustainable development of enterprises based on human resource management	INTERNATIONAL JOURNAL OF ENVIRONMENT AND POLLUTION	2020	Qualitative	For-Profit	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zhou, Saijun; Deng, Mingjun; Luo, Wenbing	Livestock-Product Nitrogen-Footprint: a Fresh Method to Assess the Sustainability of Livestock Breeding	PROCEEDINGS OF THE 2016 INTERNATIONAL CONFERENCE ON ENGINEERING AND TECHNOLOGY INNOVATIONS	2016	Conceptual	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zhu, Lisha; Chen, Lizhu; Wu, Xiongying; Ding, Xuemei	Developing a greenhouse gas management evaluation system for Chinese textile enterprises	ECOLOGICAL INDICATORS	2018	Mixed-Methods	For-Profit	Not applicable	Neutral	Not applicable	Not applicable	Not applicable	Not applicable
Zinovyeva, E. G.; Koptyakova, S., V	Integrated Assessment of Sanitary and Epidemiological Safety Management Efficiency of the Population in Industry - Based Cities in the Russian Federation	PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCE FAR EAST CON (ISCFEC 2018)	2018	Quantitative	Both	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Zulkefly, Nur Azreen; Abdul Ghani, Norjihan; Chin, Christie Pei-Yee; Hamid, Suraya; Abdullah, Nor Aniza	The future of social entrepreneurship: modelling and predicting social impact	INTERNET RESEARCH	2022	Quantitative	For-Profit	Neutral	Supported	Neutral	Neutral	Neutral	Neutral

Table 14: Representative Data, Essay II

Dimensions, themes and categories	Representative data
I. Positioning of impact in the value proposition	
1. Impact as marginal	
A. Impact as minimal part of the value proposition	A1. "Our value promise to you: Services from consultation to the remodeled bathroom" (SocialRenovation, online source). A2. "At that point, we were already deep into the topic of digitizing craft services and then discovered a bit more added value and social benefits with the idea of SocialRenovation" (SocialRenovation, co-founder & CEO, online source). A3. "It had to be a company that runs online, but also one that does something more meaningful than just e-commerce or, say, lifestyle products. At some point, when we tweaked the idea together in a 'funpreneur competition', my co-founder and I knew we just wanted to do something that solved practical problems" (SocialRenovation, co-founder & CEO, online source).
B. Impact as negligible for customers	B1. "The employees work quickly, very precisely, with high quality and without any reworking" (SocialRenovation, customer 1, online source). B2. "The planning showed that SocialRenovation works in a highly professional manner. The execution, especially the materials used and the performance of the team on site left us and the entire neighborhood speechless" (SocialRenovation, customer 2, online source). B3. "Quiet and clean work" (SocialRenovation, customer 3, online source).
2. Impact as relevant	
C. Impact as integral part of the value proposition	C1. "We want to digitize elderly care. We can show nursing homes or care facilities that they can save money in this way while also show that for the people in need of care we are improving the quality of sleep" (DigitalCare, CEO, interview). C2. "We have the product itself and we have the CO_2 reduction impact that we can advertise. This is why we believe we have the right to be seen as an impact company because we offer a massive alternative to something that causes 3-4 times as many emissions as our solution" (GreenMobility, CEO, interview). C3. "Packaging with Reason. […] With our solution, we are turning agricultural waste into a reasonable organic

	alternative to plastic packaging" (BioPackaging, internal document).
D. Impact as added value for customer	D1. “We are testing the product because we see the opportunity for an environmentally friendly alternative to conventional delivery vehicles" (GreenMobility, customer, online source). D2. "And they use raw materials that are available and can be used. That's why it's a more sustainable product per se than our alternatives" (BioPackaging, customer, interview). D3. “The [social] value proposition was also a driving force for us. But then you always have to look at whether the product also delivers what it promises" (DigitalCare, customer, interview).
3. Impact as core	
E. Impact as dominant part of the value proposition	E1. "Unique selling proposition: One-click impact" (PlasticCompensation, internal document). E2. "Credibility, transparency and impact, these are the core of our services” (PlasticCompensation, co-founder & CMO, interview). E3. "That the plastic waste is actually collected is the number one core value proposition" (WasteCollection, co-founder & CEO).
F. Impact as the service for customer	F1. “We found the WasteCollection concept of working together with existing local recycling companies and to collect the non-recyclable plastic and to sell it as a credit to have an impact very compelling” (Waste Collection, customer 1, interview). F2. “They have to collect the amount of plastic for us that we agreed upon. That is for us the most important thing” (Waste Collection, customer 1, interview). F3. “We are a customer of WasteCollection since 2021 in order to have an impact” (Waste Collection, customer 1, interview).
II. Reactive impact measuring pathway	
4. Neglecting impact monetization opportunities	
G. Being unaware of potential impact monetization opportunities	G1. "More and more companies today are aware of a societal or ecological challenge that they want to address actively because they want to do something with impact. Here it was different. […] They just started a company and I told them they were an impact company" (SocialRenovation, business angel, interview). G2. "It was [only later] that we learned that there are so called "impact start-ups" in general and there is even an impact

	investor scene" (SocialRenovation, co-founder & CEO, interview). G3. „There are not really impact investors in Germany" (SocialRenovation, co-founder & CEO, interview).
H. Prioritizing non-impact related monetization opportunities	H1. "I always have cash or customers or something like that on my plate when things get stressful" (SocialRenovation, co-founder & CEO, interview). H2. "Impact is kind of a cool topic, but in the daily business it falls behind" (SocialRenovation, co-founder & CEO, interview). H3. "For SocialRenovation, [Impact Investors] do not play a big role [...], but rather it goes into the direction whether SocialRenovation would be an interesting target for a traditional M&A project" (SocialRenovation, co-founder & CEO, interview).
5. Conforming to impact measurement demand	
I. Receiving explicit impact measurement requests from investors	I1. "What I requested is that they commit to at least one impact indicator" (SocialRenovation, business angel, interview). I2. "During the funding round I said: "Only those who count and measure can also manage and whether it's just a good business idea or whether it's really an impactful business idea that will keep me on board as an investor [depends on impact numbers]." And that was then the reason why they started working on it" (SocialRenovation, business angel, interview). I3. "Some institutional investors said: 'We will only invest if you can prove to us with a model how your impact journey will continue and report that exactly like you report the rest of the financial numbers in your business plan. So make a model and convince us that this model is valid'" (SocialRenovation, business angel, interview).
J. Working on impact measurement only after being triggered by investors	J1. "We were triggered by our mentor and shareholder, who was involved in the area of impact measurement. He triggered us to do this and always asked questions regarding impact" (SocialRenovation, co-founder & CEO, interview). J2. "I usually deal with IM only when it's really good for external reasons: e.g., there's a partnership right now and they want to see it that way" (SocialRenovation, co-founder & CEO, interview). J3. "The quantitative aspect usually comes from being asked by, among others, impact investors: "Yes, have you ever counted that?" So, the motivation, even if it would be kind of intrinsically there, it needs an external trigger" (SocialRenovation, business angel, interview).
6. Bricolaging ad-hoc impact measurement	

K. Using data at hand for impact measurement	K1. “The number of renovations that we have made, multiplied by 5 years, is our core impact indicator. Which brings us to the point that we say: we have already enabled more than 10,000 years of independent living at home, which for us already carries an enormous impact” (SocialRenovation, COO, interview). K2. "I have somehow only briefly thought about IM a few times now. I think this can certainly be put on a better footing: maybe there are several indicators, I only know the whole impact measurement world rather rudimentarily. I have little or no knowledge of it. That could certainly be improved" (SocialRenovation, co-founder & CEO, interview). K3. “The topic of impact measurement gets some attention sporadically every few quarters" (SocialRenovation, co-founder & CEO, interview).
L. Using qualitative data for impact measurement	L1. "Otherwise, these are more qualitative topics that the team and we pick up spontaneously from time to time, so that we realize ‘hey look, this is one of our user stories, he can now live at home longer’ or ‘this and this is his individual story and that was his problem and now it's solved’” (SocialRenovation, co-founder & CEO, interview). L2. "When Mrs. R. moved into her apartment in Berlin more than 30 years ago, she knew she had found her dream home. She has already spent many happy decades here. But at some point, the previously beneficial bath caused her difficulties. [...] Since Mrs. Rudeck has been able to shower again, she feels really comfortable in her own four walls" (SocialRenovation, online source). L3. "After SocialRenovations renovation, Mrs. Bergmann and her daughter are happy that daily personal hygiene can be carried out much more safely now" (SocialRenovation, online source).
III. Proactive impact measuring pathway	
7. Discovering impact monetization opportunities	
M. Discovering an opportunity to raise funding through impact	M1. “But the bank doesn’t give loans to start-ups. So, our approach was to talk to impact investors who say: ‘yes, we have a nice return on a certain risk profile, but we also support the countable impact of a company.’ […] And in this context, I was the one who said ‘If we approach impact investors, of course, what is your impact model?’” (GreenMobility, consultant, interview). M2. "But in any case, it's also very important to us to find impact investors that we don't have this conflict of objectives. E.g., someone is waving money around and wants to buy you. And here are your values that you once had [...]. Of course, you close a few doors, but we don't like going through them anyway." (BioPackaging, co-founder & CEO, interview).

	M3. "The impact measurement concept was created for and was part of the grant application" (DigitalCare, COO, interview).
N. Discovering an opportunity to increase sales through impact	N1. "We discovered that the sustainability managers are actually the customers, and not the normal procurement department" (GreenMobility, investor, interview). N2. "With customers [...] if you could somehow present them that we save CO_2 compared to the previous alternative, then they would also make a checkbox" (BioPackaging, co-founder & CEO, interview). N3. "It is extremely important for our solution to enable adequate impact measurement with corresponding endpoints in order to make it reimbursable, i.e., reimbursability by health insurers or long-term care insurers is absolutely fundamental for us, because in the end, of course, the best case scenario is that we digitize our customer and they pay nothing for it" (DigitalCare, CEO, interview).
8. Foreseeing impact measurement demand	
O. Not receiving impact measurement demand from investors and customers in the present	O1. "No one has ever asked me 'how much CO_2 do I save with your vehicle now?'" (GreenMobility, CEO, interview). O2. "We don't need a certificate that this is somehow particularly sustainable. [...] We don't make a big deal of assessing our sustainability ourselves, it doesn't play such a big role for us now. [...] We haven't asked for any impact data" (BioPackaging, customer, interview). O3. "No there are no external IM expectations, we honestly carried that rather proactively into the investor circle." (DigitalCare, COO, interview).
P. Expecting impact measurement demand from investors and customers in the future	P1. "For hardware, it is much more difficult to find the right investors. And the ones who are interested will say 'okay, I'm an impact investor, it's important to me because I see the impact and I'm also a bit excited about it, I want to give my money for it, so I also want to understand what do I get for it?'" (GreenMobility, CEO, interview). P2. "I think it's precisely those who know very little about [impact measurement] are the ones who will demand it first." (BioPackaging, co-founder & CEO, interview). P3. "My experience is that the importance [of impact measurement] is growing more and more. […] The impact data we are generating and the possibilities we now have to demonstrate this this sustainability effect will stimulate the imagination" (DigitalCare, COO, interview).
9. Leveraging advanced impact measurement	
Q. Advancing impact measurement through external parties	Q1. "But we also got input from an impact agency that helped us and gave us comparative values. So that we didn't do some kind of youth research like preschoolers, but we got pre-

	defined footprint assumptions, a footprint model and a target model from them" (GreenMobility, CEO, interview). Q2. "That's why we had various bachelor's and master's theses at the beginning to assess our impact. We also had some of the studies being challenged by institutes afterwards" (BioPackaging, co-founder & CEO, interview). Q3. "One can simply say with a clear conscience that we have surveyed people without DigitalCare telling us what we should survey. And that's how it was done with these questionnaires, that is all developed by us and they are also used and evaluated by us" (DigitalCare, external researcher, interview).
R. Integrating holistic and robust impact metrics	R1. "You just have to know exactly: How do I get a model in the first place? Where do I get the data? What does an average car consume? How much carbon does it cost to produce it? How long does such a vehicle drive? How many kilometers does it drive on average? What is the greenhouse gas footprint for you? We still have to include batteries and so on. So, we have built a relatively complex model together" (GreenMobility, consultant, interview). R2. "We have also been trying for a long time to assess this impact in terms of a life cycle assessment" (BioPackaging, co-founder & CEO, interview). R3. "We tried to define the metrics from different dimensions: [...] How does sleep quality change? Are there improvements over time? We have the number of falls as a metric. We also have a few other things that are patient-related, but a lot of it ultimately comes down to the nursing staff themselves" (DigitalCare, CEO, interview).
IV. Agentic impact measuring pathway	
10. Creating impact monetization opportunities	
S. Creating an opportunity to sell impact through compensation schemes	S1. "So the question of "how do we get money to where the waste is" is ultimately a key issue in dealing with the waste problem. And with that came the shift to this compensation scheme. The transfer of carbon credits to the plastics sector" (PlasticCompensation, co-founder & CEO, interview). S2. "PlasticCompensation offers plastic compensation for companies and consumers. For every kilogram of plastic that enters circulation, PlasticCompensation ensures that one kilogram of plastic waste is also collected and recycled in countries of the Global South" (PlasticCompensation, internal document). S3. "The idea was, you can actually apply the concept of carbon credits to waste and say: there are those who produce this waste and […] at least they'll pay for it so that it doesn't end up in the environment. And that's why we created the platform" (WasteCollection, co-founder & CEO, interview).

T. Creating an opportunity to raise funding through impact	T1. [Referring to the creation of their own crowdfunding campaign through which crowdfunders could buy impact through plastic credits:] “Plastic neutrality for three months [for 8€]: On average an individual in Germany generates 16.25 kg of plastic waste in a quarter. Recover and recycle an equivalent volume of plastic waste from the environment that would otherwise end up in our water bodies or in landfills" (PlasticCompensation, online source). T2. “Plastic has value! there are thousand different types of plastic with different compositions. It is obvious that the plastic with high value gets collected as there exists a monetary incentive and what's left behind in our waterbodies and landfills is the low value plastic waste. And it will remain in the environment for years to come if we don't do anything about it today. Recover and recycle 1000kg of plastic waste [for 440€] while supporting us in sophisticating our digital tools!” (PlasticCompensation, online source). T3. "The purpose of our crowdfunding is to recover and recycle 90-160 metric tons of low value plastic in India" (PlasticCompensation, online source).
11. Shaping impact measurement demand	
U. Exceeding impact measurement expectations from investors and customers	U1. “At the moment, the business angels have low expectations in terms of impact measurement. I would say that the co-founders are pretty much the only ones who are setting the guidelines at the moment” (PlasticCompensation, co-founder & CTO, interview). U2. "But that customers ask for more impact information only happens in 1 out of 100 customer meetings, but in 99 of the other meetings it is good if you can say that you have already done it anyway, because it simply builds trust" (WasteCollection, co-founder & CEO, interview). U3. "WasteCollection has whole suite of information material that they give you although the most important thing for us, of course, is just the amount of plastic" (WasteCollection, customer 1, interview).
V. Influencing impact measurement demand from investors and customers through radical transparency	V1. “We use technology to be as transparent as possible. And we want to provide and enable as much insight as possible into our processes and workflows” (PlasticCompensation, co-founder & CEO, interview). V2. “We want to use technology for transparency and to build trust […]. People don't trust that you will be using the money in the right way and I feel that this trust stops a lot of people from doing good. We want to change that. We want to make sure that people have that trust, because of the transparency through technology” (PlasticCompensation, co-founder & CMO, interview). V3. "Software we built from day 1 and this transparency theme in the collection was there from day 1" (WasteCollection, co-founder & CEO, interview).

12. Institutionalizing novel impact measurement	
W. Creating momentum for impact measurement by conducting novel impact verification	W1. “But for the impact measurement it was pretty clear from the beginning that we now want to use state-of-the-art technology. […] This data is also stored on a blockchain, i.e., it is somehow decentralized and can no longer be changed as soon as you scan it” (PlasticCompensation, co-founder & CTO, interview). W2. "This means that we have started to build track-and-trace software for the waste, with which you can clearly trace: Who did what where, when, and where did this waste go. Was everything done as it was described. Because the thing is, we're talking about millions of tons of waste, there's a whole lot of paperwork involved if you really want to keep track of it cleanly. And we have digitized and automated that process. Which also means that when a system like that scales, you have extremely high level of governance without having extremely high cost because that's done by software at the end of the day" (WasteCollection, co-founder & CEO, interview). W3. "Impact verification is actually the part where we invest the most. We also have a data scientist who puts every single data point in the chain […] and our algorithm checks whether all of our social and safety are applied" (WasteCollection, co-founder & CEO, interview).
X. Establishing impact measurement toward broader impact creation along the value chain	X1. “Be the brand that leaves a clean legacy instead of plastic waste behind!” (PlasticCompensation, internal document). X2. "One of our biggest local partners has now received funding from an impact fund because they were able to prove through our impact measurement technology that they create positive social impact and were able to build up trust with the investor through that" (WasteCollection, co-founder & CEO, interview). X3. "Another example from our partner company from Germany: They want to conduct plastic collections in Indonesia but they are not familiar with the situation here, we help them check the safety of the collection sites and operate legally" (WasteCollection, Head of Impact, interview).

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