1-2023

Sustainability impact assessment of new ventures: An emerging field of research

Klaus FICHTER
Carl von Ossietzky Universitat Oldenburg

Florian LUDEKE-FREUND
ESCP Business School

Stefan SCHALTEGGER
Leuphana University

Simon J.D. SCHILLEBEECKX
Singapore Management University, simon@smu.edu.sg

Journal of Cleaner Production 384 (2023) 135452

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Sustainability impact assessment of new ventures: An emerging field of research

Klaus Fichter [a,b,*], Florian Lüdeke-Freund [c], Stefan Schaltegger [d], Simon J.D. Schillebeeckx [e]

[a] Carl von Ossietzky University of Oldenburg, Department of Business Administration, Economics and Law, Innovation Management and Sustainability, Ammerländer Heerstraße 114-118, 26111, Oldenburg, Germany
[b] Borderstep Institute for Innovation and Sustainability, Clayallee 323, 14169, Berlin, Germany
[c] ESCP Business School Berlin, European Sustainability Department, Chair for Corporate Sustainability, Heubnerweg 8-10, 14059, Berlin, Germany
[d] Centre for Sustainability Management (CSM), Leuphana University, Universitätsallee 1, 21335, Lüneburg, Germany
[e] Lee Kong Chian School of Business, Singapore Management University, 50 Stamford Road, 178899, Singapore

ARTICLE INFO

Keywords:
Sustainability
Impact assessment
Entrepreneurship
Venture
Start-up
Business model
Framework
System levels

ABSTRACT

Entrepreneurs and start-ups are key actors in implementing environmental innovation and accelerating sustainability transitions. Thus, analyzing as well as predicting the impact of entrepreneurial ventures is central to management and entrepreneurship research. The sustainability performance, value and impact of incumbent firms and their products and services has been a key topic in business-related sustainability research for many years. However, assessing the sustainability effects of new ventures such as start-ups is a neglected area in the research literature. This article therefore provides an overview, including key definitions, a new conceptual framework, and notions that can help guide and inspire a future research agenda. In this way, it also serves as an introductory article for the Journal of Cleaner Production's special issue 'Assessing and forecasting the sustainability impact of new ventures: Theories, methods, and empirical evidence'.

1. Introduction

Sustainability impact is a core topic in the area of cleaner production and sustainable entrepreneurship research, the latter being a relatively new, yet rapidly developing stream of entrepreneurship research (Binder and Belz, 2015; Johnson and Schaltegger, 2020; Muñoz and Cohen, 2018). Entrepreneurs and start-ups are seen as key actors in terms of implementing environmental innovation and accelerating sustainability transitions and thus have the potential to create significant sustainability effects (Lüdeke-Freund, 2020; Schaltegger and Wagner, 2011). Therefore, according to Davidsson (2015), analyzing the impact of entrepreneurial ventures is central to management and entrepreneurship research. In light of this claim, researchers are challenged to examine "how, by whom, and *with what effects* opportunities to create future goods and services are discovered, evaluated, and exploited" (Shane and Venkataraman, 2000: 241, *italics added*). For entrepreneurship to foster sustainable development, it is essential to understand the nature and scale of the effects created by sustainability-minded entrepreneurial young ventures (Horne and Fichter, 2022). The sustainability impact, both for profit-oriented or non-profit organizations, can be understood as the effects of entrepreneurial activity on key sustainability challenges such as those defined by the United Nations Sustainable Development Goals (UN SDGs) or the planetary boundaries (United Nations, 2015; Rockstrom et al., 2009), which can eventually lead to economic, social and ecological value preservation and creation for stakeholders (Freudenreich et al., 2020; Dijkstra-Silva et al., 2022).

While the sustainability effects of incumbent firms and their products and services has been a key topic in business-related sustainability research for many years (Omri, 2018; Schaltegger et al., 2017), much less attention has been devoted to the sustainability effects of new ventures, thus creating a salient knowledge gap in the research literature. In the following, "new ventures" refer to founding teams, start-ups and young companies that are usually less than 10 years old. A key question to consider here is, for example, whether the sustainability contributions of established corporations and new ventures are or even should be similar? Empirical findings suggest that incumbents typically improve the environmental efficiency of their processes and products to become more sustainable, while young sustainability-oriented ventures often focus on introducing radically new sustainable products and services to the market (Fichter and Clausen, 2013, p. 275). This raises the

* Corresponding author.
E-mail address: klaus.fichter@uol.de (K. Fichter).

https://doi.org/10.1016/j.jclepro.2022.135452

Available online 1 December 2022

question as to how these different strategies and their interplay contribute to sustainability transition pathways.

The goal of this article and the special issue 'Assessing and forecasting the sustainability impact of new ventures: Theories, methods, and empirical evidence' is to help fill the research gap in sustainability management and entrepreneurship research. Our aim is to create a better understanding of how past, present, and potential future sustainability impact of new ventures can be properly explained and assessed. This contribution builds on the Theory of Change (e.g. Wagner et al., 2021) and a multi-level perspective on new ventures and corporate sustainability (e.g. Starik et al., 2016). We propose a new conceptual framework and discuss the contributions to this special issue in light of how they address different elements of our framework. The article then offers suggestions for future research. In this way, this conribution also serves as an introduction to the special issue.

This article is structured as follows. We start by discussing why sustainability impact assessment is likely to differ between large established companies and new ventures, which is becoming apparent in relation to some emerging themes (Section 2). Yet, the current literature seems to underestimate some of the complexity of new venture impact assessment and forecasting, which led us to propose a new framework for investigating sustainability impact assessment across multiple levels, anchored in a dynamic, non-linear Theory of Change perspective (Section 3). Building upon the articles in this special issue of the Journal of Cleaner Production, this framework presents three important units of analysis (new ventures, stakeholder interaction, and business models), three thematic areas that deal with (i) processes, methods, and tools supporting sustainability impact assessment, (ii) system levels and contexts of sustainability impact assessment, and (iii) resources for new venture activity and the assessment and forecasting of their sustainability effects. Section 4 then concludes this overview by presenting possible avenues for future research along with a brief conclusion.

2. Sustainability impact assessment and forecasting for incumbents and new ventures

2.1. Sustainability effects of companies' activities

The term 'sustainability impact' is widely used, but often defined differently (e.g., Maas and Liket, 2011; Souza et al., 2015). We base our understanding of the term 'impact' on the Theory of Change (Funnell and Rogers, 2011; McLaughlin and Jordan, 1999) and its Input-Output-Outcome-Impact (IOOI) concept (Kurz and Kubek, 2016). This follows the idea of logic models (descriptions of cause-effect relations and how changes are triggered by certain activities or interventions) and a multicausal understanding of impact (Fichter et al., 2021, p. 25 ff.). Building upon this, impact is understood as system-level change (Bagnoli and Megali, 2011), that addresses meso-level (e.g., industry standards) and macro-level phenomena (e.g., climate change) beyond organizational boundaries (Johnson and Schaltegger, 2020; Schaltegger et al., 2022a) and beyond value creation for (single) stakeholders (Dembek et al., 2022). 'System' refers to more complex aspects of the natural environment (e.g., natural habitats), parts of society (e.g., social groups) or the economy (e.g., markets), and to their interplay and the joint systems they create (e.g., industrial systems of production and consumption). Change, on the level of systems, unfolds in the medium or long-term (Bagnoli and Megali, 2011). Hence, in its positive version, 'sustainability impact' refers to longer-term changes in social, technical, or natural systems that bring us closer to sustainable development (Dembek et al., 2022; Dijkstra-Silva et al., 2022; Schaltegger et al., 2022b).

The literature furthermore distinguishes between the scale of sustainability effects, including global, longer-term sustainability impacts on the one hand and rather local, short-term effects on the other hand. Further key distinctions are made between outputs (countable results such as sustainable products), outcomes (qualitative improvements for stakeholders), and impact (medium- to long-term system-level effects and changes) (Fichter et al., 2021), which cover the scope of effects that emerge from organizational activities (Dembek et al., 2022).

Assessments often tend to focus on outputs (e.g., products or number of social projects) and outcomes (e.g., the value created for stakeholders by sustainable products) (cf. Bagnoli and Megali, 2011; Dembek et al., 2022; Dembek and York, 2019; Wagner et al., 2021) as they can be linked rather directly to corporate and entrepreneurship activities and are often easy to measure quantitatively. Output and outcome, however, are precedents to impacts, the final, inherent goals that characterize what sustainable development is actually intended to achieve. Impacts are furthermore specific ends rather than general effects. Within a broad interpretation of sustainability, impacts include both the reduction of negative externalities (e.g., carbon emission reduction, i.e. the footprinting paradigm), as well as the creation of positive externalities (e.g., carbon sequestration through nature-based solutions, i.e. the handprinting paradigm) (Schillebeeckx and Merrill, 2022; Dijkstra-Silva et al., 2022). To make the distinctions clear, we therefore propose to either use these more nuanced terms (outputs, outcomes, impact), or to simply refer to 'sustainability effects' if we refer to sustainability-related effects in general without distinguishing the scope, scale, and temporality of the effects of sustainability-oriented corporate and entrepreneurial activities. Fig. 1 below summarizes some key terms that are typically used (and often confused) when referring to the sustainability effects of companies.

Sustainability effects are also created at different levels (Johnson and Schaltegger, 2020): the micro-level of organizations, the meso-level of business models, value chains, and networks, as well as the macro-level of society and the natural environment (e.g., with regard to meeting the UN SDGs and planetary boundaries) (Starik et al., 2016; Schaltegger et al., 2018). These distinctions make clear that sustainability impact assessment goes beyond simply measuring business performance or assessing outputs and outcomes (Schaltegger et al., 2022a). Sustainability impact assessment includes the medium- and long-term transformative changes of the natural environment, society, and markets. It considers, as Patzelt and Shepherd (2011: 141) write, the "important role of entrepreneurs in developing non-economic gains to society" and the crucial role of entrepreneurs as catalysts for larger-scale socio-economic structural transformations aiming to increase sustainability (Aargaard et al., 2021; Parrish, 2010; Volkmann et al., 2019).

2.2. Sustainability effects of incumbent firms vs. new ventures

The sustainability effects of incumbent firms and their products and services have been a key topic in business-related sustainability research for many years, in fields ranging from social and sustainability accounting and reporting to entrepreneurship research (Omri, 2018; Schaltegger et al., 2017). However, the assessment of sustainability impacts of new ventures and start-ups, for example by means of life cycle assessment or social impact analysis, has remained a rather neglected area of research (Ramani et al., 2017). This is surprising, given that a vast body of literature either assumes or emphasizes that start-ups are essential change agents for radical innovations (Schneider and Veugelers, 2010) and key players in introducing radical environmental product and service innovations (Fichter and Clausen, 2016). Hockerts and Wüstenhagen (2010) suggest that sustainable 'Davids' (start-ups and niche actors) play a key role in new markets and early growth phases of market development, while 'Greening Goliaths' (established, larger-sized companies) take on a more important role in the growth and maturity phases of industries and markets. The sustainable entrepreneurship literature has also addressed the interplay of pioneers and incumbents in co-evolutionary interactions (Schaltegger et al., 2016) and as learning processes (Hübel et al., 2022). The question how these different contributions to sustainable development could or should be assessed, however, has not been investigated as much.

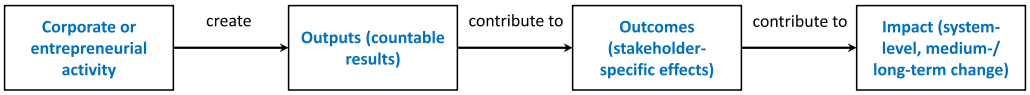

Fig. 1. Key terms denoting companies' sustainability effects: output, outcome, and impact (based on Fichter et al., 2021; McLaughlin and Jordan, 1999; and Dembek et al., 2022).

2.3. Requirements for assessing sustainability impacts of new ventures

With regard to their business characteristics, new ventures differ considerably from incumbents. For example, continually evolving business models, typical in ventures, lead to a lack of historical data that can be used to carry out sustainability impact assessments (Trautwein, 2021). Therefore, the assessment of sustainability impacts in the start-up or early growth phase is much more a question of predictive, modelling-based, *ex ante* evaluation (forecasting) than of retrospective, experience-based, *ex post* evaluation like for established companies (Clarke-Sather et al., 2011; Hörisch et al., 2015). In early venturing phases, it seems more fruitful to assess the prospective and not only the current sustainability impacts of new ventures due to the different characteristics of these young companies, which create idiosyncratic challenges when trying to assess their impact (Trautwein et al., 2018, p. 281), including the following:

- *Informal and fast-moving working and management structures* (Picken, 2017)*:* This leads to the challenge of ensuring continuity and replicability in the assessment. For instance, the types of data used for any kind of assessment are more likely to shift over time as management and monitoring structures are developed. As a consequence, the timeliness of monitoring and data is crucial in creating good quality information.
- *Resource restrictions* (Lepoutre and Heene, 2006; Skala, 2019): Even if new ventures would like to assess impacts themselves or support external assessments, they are often unable to do so due to a lack of resources. Similar problems persist in larger organizations. The Boston Consulting Group, for instance, suggested that the error rate in companies' emissions measurements can range from 30% to 40% (BCG, 2021).
- *Volatility in business models and value chains* (Clarke-Sather et al., 2011; Picken, 2017): Sustainability assessment has to deal with uncertainties and unforeseeable changes in business models and value chains (Ries, 2011). Similarly, mergers, acquisitions, alliances, etc. can lead to fast changes in the structure and size of a business (Hübel et al., 2022). This implies that the assessment targets set by new ventures and the goals themselves are likely to be much more fluid, making intertemporal comparisons difficult.
- *New to the market* (Skala, 2019) and *early phase* of assessment: This leads to the challenge of measuring sustainability impact without historical performance data (Judl et al., 2015), and is related to the observation that many entrepreneurs, managers and organizations have only recently started dealing with the issue of sustainability impact assessment. Alternatively to collecting data themselves, new ventures may adopt data from third parties that are only minimally relevant or potentially incorrect, which risks creating disillusionment. An example here could be car manufacturers trying to achieve Volkswagen's proclaimed carbon efficient combustion engines, only to find out years later that Volkswagen was cheating.
- *Lack of specific knowledge* (Lepoutre and Heene, 2006): New ventures that want to conduct impact assessments need simple and easy to use assessment approaches to avoid overwhelming their otherwise specialized and busy venture teams (Hansen and Schaltegger, 2016; Shields and Shelleman, 2017).

These challenges have important implications in terms of explaining and assessing the sustainability impacts of new ventures. A conceptual framework for this purpose therefore needs to 1) consider the reality that new ventures' assessments need to focus more on potential rather than actual sustainability effects, 2) recognize the inherently fluid nature of young venture business models and be flexible enough to remain useful as these models evolve, 3) be open to the dynamic processes that are particularly salient for new ventures, and 4) acknowledge that sustainability effects take place on multiple levels and across multiple layers of context, and that young ventures cannot optimize for all of these at once. The following main requirements can be derived from these considerations:

First, *capturing the sustainability impacts of new ventures requires a future-oriented assessment that focuses on potentials, not actuals*. The assessment of sustainability impacts in the start-up or early growth phase needs to be more based on predictive, modelling-based, *ex ante* evaluation (forecasting) instead of a retrospective, experience-based, *ex post* evaluation, as is the case for established companies (Clarke-Sather et al., 2011; Hörisch et al., 2015). In early venturing phases, it seems more fruitful to assess the prospective and not only the current sustainability effects of new ventures (Trautwein et al., 2018). This shift is important as it increases the likelihood that the focus is more on opportunities that contribute to ecological and social value creation and eventually positive sustainability impacts on the macro-level instead of just 'any kind' of entrepreneurial opportunity (Coffay et al., 2022; Strömmer and Ormiston, 2022).

Second, *new ventures' impact should be driven by their business models and their evolution, not the constitution and scale these ventures have at present.* New ventures' products, services, value chains, and company structures are still being developed and changed in the first years of their entrepreneurial lifecycle. Therefore, an impact assessment cannot use 'the company' as the usual unit of analysis (Lüdeke-Freund et al., 2017, 2021). Instead of focusing on the legal unit of a company and its established structures and market offers, impact assessments for young ventures need to focus on the business model and its evolution over time. This implies a paradigm shift in corporate sustainability assessment from company assessment (legal corporate units) and supply chains (area of influence) to business model assessment (e.g., Alonso-Martinez et al., 2021; Lüdeke-Freund et al., 2017, 2021; Rauter et al., 2019). With this, the construct of the business model, including the various shapes it can take (Lüdeke-Freund et al., 2018, 2022) and the (potential) impacts it enables, becomes the focal unit of analysis (Bhatnagar et al., 2022; Laukkanen and Tura, 2022).

Third*, new ventures create impact in a highly dynamic world in which markets and industries are being shaped and reshaped with increasingly porous boundaries.* Many markets today are already subject to strong dynamics of change . In the case of innovative young companies in particular, their market entry often triggers considerable competitive dynamics and, in some cases, creates new market segments or changes established markets. The market dynamics triggered by young innovative companies are therefore often considerable and usually exhibit high volatility, which must be acknowledged when assessing impacts on customers, the competitive environment, as well as social and environmental impacts (Coffay et al., 2022; Fischer-Kreer and Brettel, 2022). Carrying out impact assessments in young companies therefore requires a dynamic process perspective that considers market dynamics, stakeholder interactions, and the continuous entrepreneurial adaptation to the framework conditions (effectuation) (Bhatnagar et al., 2022; Laukkanen and Tura, 2022).

Fourth, *narrow definitions of sustainability effects that only focus on*

either outputs, outcomes, or impacts undervalue the need to evaluate new ventures' potential across multiple contextual and structural levels. Previous studies of the causal mechanisms and effects of entrepreneurial activity show that sustainability effects can occur not only at the level of the individual company (micro-level) but also on a meso- and macro-level (Johnson and Schaltegger, 2020). This means that an impact assessment has to consider potential effects on external stakeholders such as customers and investors (Bendig et al., 2022; Laukkanen and Tura, 2022; Woehler and Haase, 2022), and furthermore on higher systemic levels such as ecological systems, regions, society, and markets. A multi-level view is therefore necessary to analyze and evaluate effect chains (Schaltegger et al., 2022a). New ventures' limited resources require collaboration with actors in the entrepreneurial support system, such as incubators, accelerators, and investors (Karahan et al., 2022; Woehler and Haase, 2022). Understanding and explaining the interaction in entrepreneurial ecosystems and its effects requires a multi-level view on sustainability impacts (cf. Starik et al., 2016). This allows for considering and understanding the role of different context variables that influence the sustainability effects of young ventures (Horne and Fichter, 2022).

2.4. Emerging themes in assessing the sustainability impact of new ventures

Various key themes related to the assessment of new ventures' sustainability impacts can be identified. In the following, we differentiate between three thematic areas that emerged from the co-authors discussions about the existing literature and imbuing it with the findings and insights from the articles in this special issue (Table 1).

The first thematic area is clustered around relevant *system levels, contexts, and stakeholder interaction* that must be taken into consideration when assessing and forecasting the sustainability impact of new ventures. Research in this first cluster explicitly distinguishes between micro-, meso-, and macro-level phenomena such as business model development and evolution, stakeholder interaction, or national-level impacts of sustainable entrepreneurship.

The second area revolves around the *processes, methods, and tools* supporting *sustainability impact assessment and forecasting*. Assessment challenges include how ventures can evaluate and appraise the inherent dynamics and temporality of sustainability effects and how to design processes, methods, and tools that offer entrepreneurs practically meaningful support.

Finally, one area investigates important resources for sustainability-oriented ventures , such as venture capital and intellectual property, and how these resources influence the sustainability effects of new ventures. This third thematic area thus centers on the *resources, activities, and effects of new ventures* in terms of inputs, outputs, outcomes, and impact. Key challenges include how these resources eventually contribute to new ventures' sustainability impacts on different system levels. This topic is also of key importance to impact investors (e.g., Hockerts et al., 2022). While this cluster is related to the two preceding themes, its focus is explicitly on resources and sustainability effects of new ventures' activities.

3. A conceptual framework for investigating sustainability impacts of new ventures

In the following section, we develop a conceptual framework for studying the sustainability impacts of new ventures. It serves three purposes: first, to provide relevant theories and perspectives that help describe and explain the sustainability impacts ; second to help position findings and insights from ongoing research within the larger research landscape; and third, to identify research gaps and develop a future research agenda.

Table 1
Overview of articles in the JCLP Special Issue "Assessing and forecasting the sustainability impact of new ventures".

Authors	Title	Research method	Main contribution relates to:		
			System levels, contexts, stakeholder interaction	Processes, methods, and tools	Resources, activities, and effects
Neumann (2022)	Impact of green entrepreneurship on sustainable development: An ex-post econometric assessment	Empirical, quantitative study	X		X
Karahan et al. (2022)	Gearing-up for purpose: The relationship between entrepreneurs' usage of incubation support services and sustainable impacts	Empirical, quantitative study	X		X
Bendig et al. (2022)	The effect of green startup investments on incumbents' green innovation output	Empirical, quantitative study	X		X
Woehler and Haase (2022)	Exploring investment decision-making between traditional venture capital investors and sustainable startups	Empirical, mixed method qualitative and quantitative study	X		
Laukkanen and Tura (2022)	Sustainable value propositions and customer perceived value: Clothing library case	Empirical, qualitative study	X		(X)
di Vaio, Hassan, Chhabra, Arrigo and Palladino (2022)	Sustainable entrepreneurship impact and entrepreneurial venture life cycle: A systematic literature review	Systematic literature review	X		
Bhatnagar et al. (2022)	Design principles for sustainability assessments in the business model innovation process	Systematic literature review		X	
Coffay et al. (2022)	Effectuated sustainability: Responsible Innovation Labs for impact forecasting and assessment	Conceptual		X	
Strömmer and Ormiston (2022)	Forward-looking impact assessment – An interdisciplinary systematic review and research agenda	Systematic literature review		X	
Fischer-Kreer and Brettel (2022)	Accentuate the positive? Sustainable entrepreneurs' framing of positive and negative impacts	Empirical, qualitative study			X
Hirschmann and Block (2022)	Trademarks and how they relate to the sustainability and economic outcomes of social startups	Empirical, quantitative study			X
Vimalnath et al. (2022)	Intellectual property strategies for green innovations - An analysis of European Inventor Awards	Empirical, qualitative study			X

Table 2
Key contributions and insights from the articles in the JCLP special issue "Assessing and Forecasting the Sustainability Impacts of New Ventures".

Article	Contribution to assessing or forecasting the sustainability impact of new ventures	Implications for future research	Framework positioning
Neumann (2022)	This paper contributes to the recent stream of econometric entrepreneurship research by introducing the environmental orientation of new ventures as a key factor for sustainable development. It empirically assesses whether relationships exist between national shares of green entrepreneurial activity (GEA) and economic, social, and environmental development. The results confirm that higher shares of GEA are positively related to economic and social development but not to national GHG emissions. The latter finding is counterintuitive. The paper provides possible rationales for this.	The environmental impact of green entrepreneurship might only come into effect years later. Temporality must be considered. The impacts are also influenced by the support quality of the entrepreneurial ecosystems. Macro-level effects and their temporality need to be considered.	Context, system levels and long-term impact
Karahan et al. (2022)	Business incubators (BI) are increasingly expected to nurture sustainability-driven start-ups and contribute to the economy's sustainable transformation. However, how BIs contribute to sustainable development is uncertain, leaving sustainability-driven business incubation (SBI) haphazard and strategically ill-informed. The study finds support for a correlation between entrepreneurs' usage of various BI support services and their self-proclaimed contributions to the UN Sustainable Development Goals (SDGs).	Support actors, such as business incubators, play a key role in the sustainability impact of young ventures through various influencing and imprinting mechanisms. This could prove to be an underexplored variable in the sustainability impact of young ventures that "graduate" from different incubators or accelerators.	Contexts, stakeholder interaction
Bendig et al. (2022)	Incumbents possess the resources to exploit green innovations and establish them on the market, while start-ups typically explore the underlying technology in the first place. The study finds empirical support that corporate venture capital investments in green start-ups are associated with a higher number of green patent applications filed by the parent firm, thus allowing researchers and practitioners to better assess start-ups' sustainability impact across firm boundaries. The contribution of this study is to enrich our understanding of the distinct roles of incumbents and start-ups and their joint interplay in the green transformation of markets.	The interplay and cooperation with incumbents need to be considered when investigating and explaining the sustainability impacts of young ventures. Finances should be considered as an important resource (input) of entrepreneurial activity.	Activities, resources (financial input), stakeholder interaction
Woehler and Haase (2022)	Venture capital is an important funding source for sustainable entrepreneurship and, thus, drives sustainable development. The study investigates venture capital investment decisions without a dedicated green focus on sustainable start-ups. Traditional VCs do not integrate sustainability issues into their decision justification, but they do argue emotionally when writing about potential sustainable business investments. The stronger emotional connection to sustainability might also be influenced by emotional contagion arising from entrepreneurs' business plans.	Theories of emotion in business decision-making Sustainability seems to involve a higher level of emotionality than traditional economic issues. Describing and explaining sustainability impact assessment should take the emotionality of involved actors into consideration.	Business model evolution and performance, stakeholder interaction with resource providers
Laukkanen and Tura (2022)	It is not self-evident that companies' sustainable value propositions are perceived by customers as such. Identifying overlaps and gaps between these intentions and perceptions requires a stakeholder-specific understanding and analysis of value creation. This in turn makes assessing the (mis-)match between intended and perceived sustainable value propositions possible in terms of sustainable business models. Managing both intentions and perceptions is recommended to better assess and manage the sustainability effects of companies.	The unfolding of intended sustainability effects depends on how these are perceived and eventually accepted or rejected by customers. In the evolution of business models, sustainability intentions and perceptions should be assessed and managed together.	Business model evolution, stakeholder interaction (with customers), value creation, effects are considered from customer perspective.
di Vaio, Hassan, Chhabra, Arrigo and Palladino (2022)	This study shows that sustainable entrepreneurs achieve success when they align stakeholders' (internal and external) thinking. The studies analyzed in the article, which build on recent efforts to connect social movement research and institutional theory, show how the rise and spread of sustainability product-service systems, such as green information systems, are the result of multiple interactions, both conflictual and collaborative, within a larger system of activists, corporate managers, and various stakeholders.	Aligning stakeholders' thinking and venture teams' thinking is relevant for generating sustainability effects Actor interaction plays a crucial role in the evolution of sustainable business models and in generating positive impacts on larger product-service-systems.	Stakeholder interaction, value creation
Bhatnagar et al. (2022)	To help companies transition towards sustainability, it has become necessary to assess the sustainability effects of their business models . Most companies face multiple challenges when developing better business	The future sustainability effects of companies depend on how their business models are developed. Design principles for process-integrated sustainability impact assessment should be	Processes, methods, and tools, business model evolution and level

(*continued on next page*)

Table 2 (*continued*)

Article	Contribution to assessing or forecasting the sustainability impact of new ventures	Implications for future research	Framework positioning
	models. Many of these challenges can be solved by assessing the likely sustainability effects of future business models. The paper analyzes several assessment frameworks and tools for business model development and syntheses the findings into a set of design principles for assessing the sustainability of business models. The proposed design principles can serve as guidelines to help companies integrate sustainability assessment into their business model development processes.	considered in business model development and evolution.	
Coffay et al. (2022)	While it is tempting to think of forecasting in terms of predicting outcomes, such an interpretation assumes a causal logic, failing to acknowledge the effectuation processes involved in new ventures. The paper presents the Responsible Innovation Lab (RIL) as a conceptual synthesis of responsible research and innovation (RRI), living labs and effectuation theory as well as two tools (the Responsible Innovation Tool and Responsible Impact Tool). These help guide multi-stakeholder sustainability-focused innovation activities in an RIL as well as facilitate the development of context-specific methodologies for forecasting and assessing sustainability impacts.	Effectuation theory and assessment tools Impact assessment must consider effectuation theory and effectuation processes, particularly in start-up evolution. Impact forecasting and assessment can be achieved in line with effectuation processes, e.g. in a Responsible Innovation Lab (RIL).	Process dynamics, assessment tools for new sustainable ventures, stakeholder context
Strömmer and Ormiston (2022)	While many practitioners now pay greater attention to their future impact, most impact assessment research still focuses on the retrospective measurement of impact. This study presents an integrated theoretical framework to show the relationships between various antecedents, methods, and organizational and societal effects of forward-looking impact assessment. The authors provide an overview of how the current literature comprehends forward-looking approaches and create insights into how a more holistic view of temporality in impact assessment can be developed.	The available methods and tools do not take temporality sufficiently into consideration, which is critical particularly for forward-looking approaches. Sustainability impact assessment is a process covering antecedents (e.g. motivation), assessment methods, and effects on organizations and society.	Processes, methods, and tools, temporality is crucial and supports the iterative and cyclical interpretation of the Theory of Change.
Fischer-Kreer and Brettel (2022)	The study shows how sustainable entrepreneurs apply a variety of techniques to downplay their ventures' negative sustainability impacts. The empirically grounded model illustrates entrepreneurs' bias for highlighting the salience of their positive sustainability impacts while downplaying or ignoring their negative sustainability impacts, resulting in a strong positivity bias.	Impact assessment needs to critically reflect a possible positivity tendency amongst entrepreneurs and other involved actors. It requires objective, evidence-based facts and figures.	Entrepreneurs of new ventures, stakeholder interaction, effects
Hirschmann and Block (2022)	Prior research shows that trademarks positively relate to start-ups' growth and survival. The study aims to fill a research gap by investigating how early trademarking relates to the sustainability and economic outcomes of social start-ups. It demonstrates that trademarks and their diverse characteristics significantly relate to economic outcomes in the form of jobs created by social start-ups. While previous studies identify how trademarks serve as an indicator for innovation or internationalization, this study provides initial evidence on how trademarks and trademark-based indicators predict sustainability outcomes and how to identify particularly impactful social start-ups.	Trademarks and intellectual property rights (IPR) can serve as a predictor of economic and sustainability outcomes. Trademarks and IPR should be considered as important resources (inputs) of entrepreneurial activity.	Activities, performance and value created by new ventures
Vimalnath et al. (2022)	The analysis shows that unlike established firms, who adopt closed intellectual property (IP) models predominantly throughout the innovation process phases, new ventures and universities adopt closed IP models in research and development phases to protect inventions and later share the IP with others via licensing (exclusive or non-exclusive) to accelerate commercialization and diffusion for broader sustainability effects. The findings point towards a need for managerial and IP policy-level discussions on moving beyond incentivizing innovations through exclusivity towards facilitating strategic IP sharing and collaborative approaches to IP for sustainability.	IP models and strategies influence the sustainability effects of young ventures. Facilitating strategic IP sharing and collaborative approaches to IP appear to be important options in accelerating the commercialization and diffusion of green innovations. IP should be considered an important resource (input) of entrepreneurial activity.	Resources, activities and sustainability effects of new ventures

We introduce the framework in five steps. Section 3.1 introduces the theoretical assumptions and perspectives for the framework. This is followed by a description of the central units of analysis (Section 3.2). The next three sections then address the three key themes for assessing the sustainability impacts of new ventures. Section 3.3 explains why context matters and a differentiation of levels is needed. The importance of a dynamic process perspective, including suitable methods and tools for assessing and forecasting sustainability effects, is introduced in Section 3.4. The relevance of resources, activities, and effects is described in Section 3.5. Finally, we provide an overview of the key contributions and insights from the articles in the special issue and show where they are anchored within the framework (Table 2).

3.1. Theory of Change, multi-level view, and framework

To structure and systemize the potential effects originating from a new venture and its business model, we apply the Theory of Change, a common reference point in sustainable entrepreneurship research and practice (Wagner et al., 2021). The Theory of Change allows for a broad understanding of logically interconnected causes and effects, combining inputs, activities, outputs, outcomes, and impacts (McLaughlin and Jordan, 1999). As discussed in Section 2.1, it is important to distinguish between different types of sustainability effects to make logical connections between the activities of new ventures and the outputs, outcomes, and impacts they create and the system levels on which these will most likely occur (cf. Dembek et al., 2022).

Usually, the Theory of Change is applied using a linear understanding of how effects emerge. We favor a rather non-linear reasoning and suggest that the steps in the evolution of a sustainability effect must be conceptualized in a dynamic and iterative perspective. This includes feedback loops between both the different levels and types of sustainability effects (Schaltegger et al., 2022b). This points to rather iterative and cyclical instead of purely linear relationships between the sequential steps discussed in the Theory of Change – as indicated in the center of Fig. 1. This explicitly includes phenomena of effectuation (Sarasvathy, 2001) and relates to situations wherein formulating courses of action based on one's predictions about the future becomes fundamentally difficult, if not impossible altogether. According to Grégoire and Cherchem (2020: 622, italics added), "This is the case of situations qualified as radically uncertain, that is, situations wherein the consequences of one's actions and the conditions and/or factors of success are *ex ante* unknowable.". Effectuation is thus particularly relevant for entrepreneurial efforts to introduce innovative products, services, and other ways of doing business in the economy (McMullen and Dimov, 2013).

Beyond recognizing that the effects of presumed-to-be causal chains and mechanisms often unfold in a non-linear, iterative, and cyclical manner, our framework adds a multi-level view on sustainability effects, indicated by the system levels and contexts dimension in Fig. 2. Not only do some of the articles in the special issue suggest that such a multi-level view is required, but also earlier and more recent work on the relationships between micro-, meso-, and macro-level aspects of business and sustainability show that a multi-level view helps in bringing more clarity to the embeddedness and contexts of business activities (e.g., Aargaard et al., 2021; Starik et al., 2016; Stubbs and Cocklin, 2008). Therefore, the framework (see Fig. 2 below) explicitly considers such a multi-level view in its vertical dimension with regard to both the sustainability embeddedness and impact of the entrepreneurial venture (Johnson and Schaltegger, 2020) as well as the measurement of sustainability embeddedness and impact (Schaltegger et al., 2022a).

We propose the interplay of a Theory of Change-inspired cascade of sustainability effects (iterating between activities, performance, value, and impact) and the multi-level view (from venture to business model, stakeholders, and macro-context) as a new theoretical contribution. Despite the increase in conceptual complexity, our framework provides more clarity in terms of structuring and systemizing the sustainability effects of new ventures and hence provides guidance for the development of processes, methods, and tools for assessing and forecasting these effects.

3.2. New ventures, stakeholder interaction, and business model evolution as key units of analysis

Based on the insights generated in Section 2 and on the findings of the articles in the special issue (Table 2), the conceptual framework (Fig. 2) puts the following key units of analysis in the center:

First, new ventures are key actors in the emergence of impacts. The environmental orientation and sustainability intentions of entrepreneurs can play a key role in the assessment of sustainability impacts (Neumann, 2022). This is also true for the way sustainable entrepreneurs perceive and frame the sustainability impacts of their businesses (Fischer-Kreer and Brettel, 2022). The findings in Woehler and Haase (2022) underline the importance of emotions in the way start-ups describe their business models, and that investors argue more emotionally when writing about potential sustainable business investments. Therefore, actors and their intentions, framing, emotions, and effectuation strategies must be core elements in a conceptual framework for investigating the potential sustainability impacts of young ventures. This aspect is mainly considered at the venture level of the framework in Fig. 2 which directly relates to the activities of ventures, the resources available to them, and the business models they set up. These, in turn, have an influence on their output and performance.

Second, business model design and business model evolution are key levers of future sustainability impacts. Bhatnagar et al. (2022) underline the relevance of business model design and related design principles in helping new ventures integrate sustainability assessment into business model innovation processes. While it is tempting to think of forecasting of sustainability effects in terms of 'predicting outcomes and impacts', such an interpretation assumes a causal logic, failing to acknowledge the effectuation processes involved in young ventures. Based on this observation, Coffay et al. (2022) underline that impact assessment must consider effectuation theory and effectuation processes, which is especially relevant in business model evolution. They stress that impact forecasting and assessment can be achieved in line with effectuation processes via different tools that support the evolution of business models. Nevertheless, the development of business models is not a pure adaptation process between the original value proposition of new ventures and the reality of market and customer demand, but often is and needs to be guided by a normative perspective and an entrepreneurial mission to develop a business case for sustainability (e.g. Breuer et al., 2018; Lüdeke-Freund, 2020; Schaltegger et al., 2019). Thus, business model evolution and transformation need to be considered in a conceptual framework for investigating the sustainability impacts of new ventures. Business model development, which includes aspects such as business model innovation (Bhatnagar et al., 2022) and value proposition design (Laukkanen and Tura, 2022), is mainly considered at the business model level of the framework in Fig. 2. However, as argued above, a static and linear-predictive perspective on the business models and sustainability effects of new ventures would be misleading. Hence, the interplay between ventures, their founders and supporters, as well as other stakeholders must be considered (di Vaio et al., 2022; Fischer-Kreer and Brettel, 2022), along with considering to what extent ventures' activities have an influence on performance and value creation for stakeholders.

Third, sustainability impacts emerge via interactions with stakeholders. The papers from the special issue also make clear that the potential sustainability effects of new ventures are heavily influenced by various stakeholders and actors within the entrepreneurial support system, such as (corporate) investors (Bendig et al., 2022), business incubators (Karahan et al., 2022), innovation labs (Coffay et al., 2022), and venture capital providers (Woehler and Haase, 2022). The same is true for the interaction between different actors along an effect chain,

for example between start-ups and investors (Woehler and Haase, 2022), business incubators and founding teams (Karahan et al., 2022), start-ups and customers (Laukkanen and Tura, 2022), corporate investors and start-ups (Bendig et al., 2022), or between young ventures and stakeholders in general (di Vaio et al., 2022). The relevance of stakeholder interaction for generating, predicting, monitoring, or assessing sustainable value creation and sustainability impacts underscores the importance of the stakeholder concept, which we incorporate into the conceptual framework with a dedicated layer in our multi-level view. In addition, our Theory of Change interpretation makes explicit that while value creation and perception is mainly an issue at the stakeholder level, it is also related to the performance of a venture's business model as well as potential system-level impacts (Dembek et al., 2022). Here, we also build on the notion of value creation with and for stakeholders proposed by Freudenreich et al. (2020), which offers a more nuanced perspective on the relationships between focal actors, such as new ventures, and their various stakeholders.

3.3. System levels and contexts of sustainability impact assessment and forecasting

The relevance of a multi-level view for describing and explaining the sustainability impact of new ventures was described in Section 3.1. Such a view requires taking the interplay between different levels and differentiation of the contexts or entrepreneurial ecosystems in which young companies operate and interact into consideration (Volkmann et al., 2019).

Several articles in the special issue point to the need to consider different system levels and contexts in sustainability impact assessment and forecasting (Schaltegger et al., 2022a). We identify these as the micro-level of single ventures and their business models, the meso-level of their stakeholder networks, and the macro-level of society, economy, and policy making (Johnson and Schaltegger, 2020). While distinguishing these levels seems reasonable and necessary to identify different types of sustainability effects, the inherent challenges and even trade-offs of comprehensive impact assessment and forecasting become obvious. While in some contexts it is required to consider, for example, the interests and emotions of investors and other supporters (Woehler and Haase, 2022), it is no less important to consider the higher-level implications of certain investment and business model design decisions (Neumann, 2022). Comprehensive impact assessments and forecasts would require assessing the effects on different levels in an integrated manner, while always keeping an eye on the stakeholder environment (Bendig et al., 2022; Di Vaio et al., 2022). In this regard, Bendig et al. (2022) focus on a specific cooperation context and highlight the financial contributions of incumbents in green innovation. The role of venture capital (VC) providers and the role of emotionality in the interplay with sustainable start-ups has been identified as a further important element (Woehler and Haase, 2022).

The assumption that micro-level sustainable entrepreneurship contributes effectively to solving macro-level sustainability problems has been investigated empirically by Neumann (2022). While common profit-oriented entrepreneurs drive economic growth, entrepreneurs with a strong environmental orientation (Schaltegger, 2002) are able to specifically address environmental market failures (Cohen and Winn, 2007; Dean and McMullen, 2007) and stimulate social and environmental development. Different types of entrepreneurship, such as innovation-, opportunity-, and growth-oriented entrepreneurship, do furthermore create different sustainability effects (Neumann, 2022). While the overall picture seems clear in terms of past developments, the question remains what exactly governments and sustainable entrepreneurs need to keep in mind to create positive sustainability impacts on the macro-level and how impact assessment and forecasting can support this.

With regard to policy requirements, Karahan et al. (2022), study the role of business incubators as support systems with an influence on new ventures' sustainability impacts. They show that support actors, such as business incubators, can play a key role in the sustainability impact of new ventures through various influencing and imprinting mechanisms. They can provide a specific support context which promotes the sustainability effects of young ventures.

3.4. Processes, methods, and tools supporting sustainability impact assessment and forecasting

Processual approaches play an important role in sustainability impact assessment, both with regard to time as well as with regard to the stepwise organization of the assessment. Time is without doubt a key element in sustainable development, but it is surprisingly often neglected.

A systematic review of various types of sustainability assessment approaches (Strömmer and Ormiston, 2022) confirms that temporality is typically ignored in specific methods such as scenario analyses, algorithmic models, and environmental modelling. This also holds for the

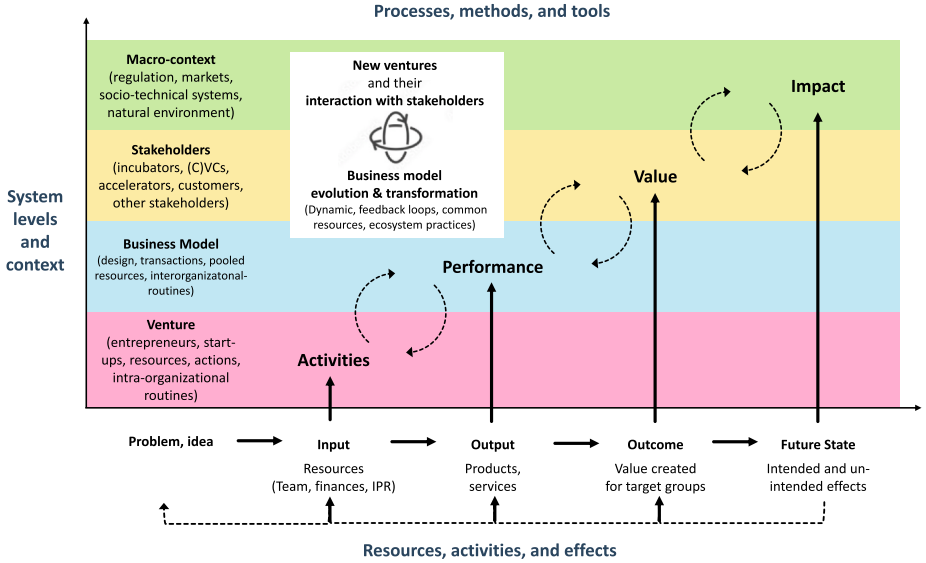

Fig. 2. A conceptual framework for investigating sustainability impacts of new ventures.

antecedents of assessments (e.g., organizational goals and stakeholder pressure) and the effects on organizations and society (e.g., decision-making and knowledge sharing). Given the early stage of organizational development that characterizes new ventures, temporality and forecasting methods and tools play an important role for influencing future sustainability impacts. Determining which type of forecasting and assessment processes, methods, and tools are appropriate is essential because the investigation of sustainability effects of young ventures needs to be future-oriented and an ex ante assessment of potentials. Strömmer and Ormiston (2022) show that, so far, most impact assessment approaches are focused on retrospective measurement of impact. Given the lack of forward-looking impact assessment processes, methods, and tools, they develop a more holistic view and underline the key role of temporality in modelling and assessing sustainability impacts. The authors therefore propose a process model that explicitly considers temporality in impact assessment to better deal with the actual and future sustainability effects of companies. This is in line with an effectuation-based perspective on impact assessment as we suggest above, and it is also supported by the works of Bhatnagar et al. (2022) and Laukkanen and Tura (2022) who are explicit about the need for more process-oriented and adaptive approaches to developing businesses and assessing their sustainability effects. In addition, Coffay et al. (2022) introduce two tools that can facilitate the development of context-specific methodologies for forecasting and assessing sustainability impacts. Dynamism and temporality are indicated as overarching principles underlying their framework.

The important role of sustainability impact assessments as an element of business model development processes is emphasized by Bhatnagar et al. (2022), who find that process-guiding sustainability assessments can positively contribute to the future sustainability impacts of companies. Using the CAMO logic, which considers the context (C), actions (A), mechanisms (M), and outcomes (O) of a design task, the authors derive design principles to help develop and apply process-integrated assessments – including principles such as co-creation, contextual awareness, and taking a systemic perspective.

The core notion of sustainability impact assessment and forecasting has, however, also been challenged from an effectuation perspective (Coffay et al., 2022). For many new ventures, the nature of sustainable business model development as it unfolds in its idiosyncratic contexts is such that forecasting, in terms of predicting outcomes or impacts, may be problematic because it could slow or even halt the natural tendency of new ventures to pivot based on new insights. Thus, in the context of new ventures, effectuation theory may provide a useful lens to conceptualize sustainability effects. Coffay et al. (2022) leverage the concepts of Responsible Research and Innovation within the context of a Responsible Innovation Lab and introduce Responsible Innovation and Responsible Impact Tools to guide multi-stakeholder sustainability-focused entrepreneurial activities.

3.5. Resources, activities, and effects of new ventures

In an entrepreneurship context, the 'impact cycle' (Fichter et al., 2021) – indicated at the bottom horizontal dimension of the framework in Fig. 2 – starts either with a perceived (sustainability) problem, such as climate change, or with an innovative idea about how to offer a (partial) solution to that challenge. A potential sustainability impact, i.e., a desired system-level change, begins with entrepreneurial activities, which require resources such as a founding team, funding (Bendig et al., 2022), or trademarks and intellectual property (Hirschmann and Block, 2022; Vimalnath et al., 2022). These serve as inputs for the development of innovative products or services, which can then be classified as outputs of the entrepreneurial activity.

Products and services are typically the vehicle to deliver value to customers and other stakeholders and are hence central indicators of a new venture's performance. In the linear causal logic of the Theory of Change, the effects for customers and other stakeholders are typically called outcomes (Dembek et al., 2022). While products and services are typically countable outputs (e.g., the quantity of sustainably produced textiles), the outcomes for stakeholders, and hence the value created for them, depend on their perception and how well the products and services meet their needs (e.g., whether the textiles are needed and useful). Because there is no guarantee that outputs automatically translate into valuable outcomes, it is important to align new ventures with their stakeholder networks (di Vaio et al., 2022; Fischer-Kreer and Brettel, 2022), provide sustainability-oriented guidance during venture formation and business model development (Bhatnagar, 2022), and make sure that there is no intention-perception-gap in its value proposition (Laukkanen and Tura, 2022).

In the broad Theory of Change community of researchers and practitioners, the term impact is defined differently. As stated in Section 2.1, by "impact" we mean system-level changes, that is, "the broader changes that occur within the market, society and natural environment as a result of the outcomes" (Fichter et al., 2021, p. 14). Impact tends to be located on the macro-level of a multi-level system (as studied by Neumann, 2022). This includes effects on public policies, market structures and institutions, socio-technical systems such as energy or mobility systems, as well as effects on the natural environment (e.g., the climate system and natural eco-systems on land or below water). A better understanding of new ventures' resources and activities, how they inform and affect business model design and evolution, how they create the various types of sustainability effects, how these effects are monitored and measured (if at all), and how such measurements provide feedback that in turn allow the venture to adapt its resources, activities, and business model is of utmost importance.

4. Conclusion and areas for future research

While the last decade has produced a vast body of research literature on sustainable entrepreneurship and corporate sustainability assessment and measurement, the assessment and forecasting of sustainability impacts of new ventures has remained a gap. Based on a synthesis of the existing literature, this article has therefore developed a framework that helps situate findings and insights from ongoing research and guide future research. The contributions in this special issue furthermore propose analyses and approaches that are structured with this framework and that offer a range of conclusions for management, politics, and future research.

4.1. Effectuated value creation and capture, and evolving stakeholder perceptions

How companies create and capture private value while also supporting the creation of societal value is a topic of much scholarly debate (George and Schillebeeckx, 2021; Porter and Kramer, 2011). Priem (2007) and colleagues opened this debate by clarifying that companies can obtain some form of competitive advantage not because they possess unique resources, but because customers perceive a specific value. Schmidt and Keil (2013) theoretically developed this notion and differentiated between *ex ante* and *ex post* resource value, suggesting that firms make decisions about expected *ex ante* value of a resource, but their performance depends on *ex post* resource value which in part is attributed by external stakeholders' evolving perceptions and unpredictable events. In this special issue, Laukkanen and Tura (2022) highlight that for sustainability-oriented new ventures a similar process may be at play, where the sustainability value or impact they seek to create may not be aligned with customers' and other stakeholders' perceptions of the resulting outcomes. This underlines the challenges associated with forecasting sustainability effects. Furthermore, Coffay et al. (2022) remind us that an overly causal approach to predicting outcomes may hamstring new ventures in their ability to create sustainability effects over time. They cite Sarasvathy's (2001: 245) explanation of effectual processes as those that "take a set of means as given and focus on

selecting between possible effects that can be created with that set of means" in opposition to causal processes which take a specific effect as given and focus on selecting the means to create that effect. Within the context of subjective or pluralistic public value creation driven by diverse stakeholder perceptions, this raises important questions. For example, how new ventures can be informed and influenced by their external stakeholders about diverging perceptions of value while these ventures are in the midst of effectual processes or bricolage (Baker and Nelson, 2005). Another question is whether such feedback leads to changes in the internal resource constellation and ability to create pluralistic public value. In-depth case studies and ethnographic research will be needed to disentangle these value creation and capture processes.

4.2. Born global digital ventures and their impact

While successful new ventures often followed an Uppsala-model-like international expansion strategy, nowadays, digital young ventures are often 'default global', tackling multiple markets at once while also being decentralized in terms of human and other resources. This creates important implications for how to assess their sustainability impacts. Because digital sustainable ventures can scale very rapidly and have significant effects on the natural world (George et al., 2021), they often lack the capacity to properly manage the unintended or unanticipated outcomes of their rapid ascension. This is particularly evident in the areas of artificial intelligence (AI) and blockchain. As AI evolves faster and faster, there are genuine concerns about the potential for AI to overtake human intelligence and become an arbiter of human activity, rather than a tool to improve lives. While AI can play a crucial role in advancing sustainability (Merrill, Schillebeeckx, Blakstad, 2019; Nishant et al., 2020), there are many open questions pertaining to, for instance, racial bias in AI (Kostick-Quenet et al., 2022) and the ethics of AI more generally (Russell et al., 2015). Given the potential transformative effects of AI, new ventures building business models based on this technology must think deeply about the potential sustainability effects and the unintended consequences of their business models. Blockchain business models are another example here because their growth often relies on significant energy consumption. While this reality largely depends on the consensus mechanism used by the specific blockchain technology, the fact that these business models often involve significant decentralization and unclear governance structures makes it very hard for them to change, as is evident in the many years it took Ethereum to transform its Proof-of-Work consensus mechanism into Proof-of-Stake (Schillebeeckx and Schletz, 2022). Though blockchain technology is a type of software, updating the blockchain is much more complex than other software and even more complex than hardware, because it is impossible to do a "recall" (Antonopoulos, 2017).

4.3. Need for research in the evaluation and assessment of sustainable business models

The characteristics of new ventures (see Section 2.3) require a different focus on and methodology of sustainability assessment. New ventures' impact will be driven by their business models and their evolution, not the constitution and scale these ventures have in the present. This requires a shift from the conventional focus of the company as an organizational or legal unit to the business model as the central unit of analysis (Lüdeke-Freund et al., 2017, 2021). As shown in this paper, business model design and business model evolution are key levers of future sustainability impacts. Three observations can be made based on the literature on assessment of sustainable business models. First, existing assessment approaches do not apply a multi-level view, as we propose with our conceptual framework, and work with rather fuzzy conceptualizations of sustainability effects. Thus, an elaborated concept of system-level effects is missing. Second, while most approaches consider environmental impacts, other system-level impacts such as market changes or wider social impacts beyond single stakeholders of focal organizations are not systematically considered. Third, most existing assessment approaches focus on methodologies that help to evaluate environmental impacts (mostly LCA approaches), but do not provide a holistic multi-level assessment methodology. Thus, while sustainable business model research has emphasized the importance of considering sustainability impacts, no elaborated conceptualization of system level impacts has yet been provided, nor have there been any empirical investigations into the system level effects of business models beyond environmental impact assessments. Thus, there is a clear gap in sustainable business model research with regard to the conceptualization of system level impacts and related empirical evidence (Lüdeke-Freund et al., 2021). Beyond the business model concept, the work of Norris et al. (2021) on handprints is a step in this direction.

4.4. Research into the formative and constraining influences of sustainability impact assessment

As we have elaborated in this article, temporality and future orientation must be taken into consideration when assessing sustainability impacts, but future-oriented impact assessment might hamper pivoting and thus venture development, whereas it can at the same time be a valuable motivation and guide during venture development. Therefore, we call for more research into the formative and constraining influences of sustainability impact assessment. The exact moment in time at which assessment becomes a driver of both venture development and positive sustainability effects may be contingent upon various factors that require closer investigation.

4.5. Need for longitudinal studies to investigate cause-effect chains and system-level effects

The temporality in sustainability impact assessment also leads to another research demand: In this article, we concluded that capturing the sustainability impacts of new ventures requires future-oriented assessment that focuses on potentials, not actuals, while recognizing that new ventures' business models are likely to be in flux during formative stages. Given the fact that hardly any empirical data exists on the system-level potential effects of new ventures, there is a need to expand the research in two ways: First, there is a need for accompanying research into the development of new ventures and their business models over a longer period of time. Longitudinal studies would help to understand how the interaction between the venture and its stakeholders and institutional contexts leads to different effects over time (Schaltegger et al., 2022b). Usually, the Theory of Change is applied using a rather linear understanding of how effects emerge. We propose a non-linear reasoning in investigating cause-effect chains and suggest that the steps in the evolution of a sustainability effect must be conceptualized in a dynamic and iterative perspective. This includes feedback loops between both the different levels and types of sustainability effects. Second, there is a clear need to expand the investigation of correlations between micro-level venturing and business model activities and the long-term system-level effects. This includes identifying and selecting appropriate indicators and developing consistent sets of metrics for multiple levels.

Acknowledgements

In April 2021, we conducted a workshop to identify promising papers. The research interaction that was initiated with this workshop started a research stream on sustainability assessment and forecasting of sustainable ventures that has culminated in this special issue and that has inspired further researchers to continue exploring new approaches in this emerging field of research. Our thank-you goes to all workshop presenters and discussants.

Klaus Fichter would like to express his sincere thanks to the Department of Business Administration, Economics and Law at Carl von

Ossietzky University Oldenburg for their support, which made it possible to publish this paper as an Open Access article.

Simon JD Schillebeeckx gratefully acknowledges the support of the Lee Kong Chian Fellowship from Singapore Management University for the article.

We are grateful for the support we received as guest editors of the Special Issue 'Assessing and forecasting the sustainability impacts of new ventures: Theories, methods and empirical evidence' of the Journal of Cleaner Production. We are very thankful for the great support we received from Cecilia M. V. B. Almeida, Co-Editor-in-Chief of the Journal of Cleaner Production, and the over 30 experts who served as reviewers.

References

Aagaard, A., Lüdeke-Freund, F., Wells, P., 2021. Introduction to business models for sustainability transitions. In: Aagaard, A., Lüdeke-Freund, F., Wells, P. (Eds.), Business Models for Sustainability Transitions: How Organisations Contribute to Societal Transformation. Springer International, Palgrave Macmillan, Cham, pp. 1–25. https://doi.org/10.1007/978-3-030-77580-3_1.

Alonso-Martinez, D., De Marchi, V., Di Maria, E., 2021. The sustainability performances of sustainable business models. J. Clean. Prod. 323, 129145 https://doi.org/10.1016/j.jclepro.2021.129145.

Bagnoli, L., Megali, C., 2011. Measuring performance in social enterprises. Nonprofit Voluntary Sect. Q. 40, 149–165. https://doi.org/10.1177/0899764009351111.

Baker, T., Nelson, R.E., 2005. Creating something from nothing: resource construction through entrepreneurial bricolage. Adm. Sci. Q. 50, 329–366.

BCG, 2021. New BCG GAMMA Survey Reveals that Only 9% of Organizations Are Able to Measure Their Total Greenhouse Gas Emissions Comprehensively. Oct 13, 2021. Boston Consulting Group. https://www.bcg.com/press/13october2021-only-nine-percent-of-organizations-measure-emissions-comprehensively. (Accessed 1 October 2022).

Bendig, D., Kleine-Stegemann, L., Schulz, C., Eckardt, D., 2022. The effect of green startup investments on incumbents' green innovation output. J. Clean. Prod. 134316 https://doi.org/10.1016/j.jclepro.2022.134316.

Bhatnagar, R., Keskin, D., Kirkels, A., Romme, A.G.L., Huijben, J.C.C.M., 2022. Design principles for sustainability assessments in the business model innovation process. J. Clean. Prod. 377, 134313 https://doi.org/10.1016/j.jclepro.2022.134313.

Binder, J.K., Belz, F.M., 2015. Sustainable entrepreneurship: what it is. In: Kyrö, P. (Ed.), Handbook of Entrepreneurship and Sustainable Development Research. Edward Elgar Publishing, Cheltenham, pp. 30–75.

Breuer, H., Fichter, K., Lüdeke-Freund, F., Tiemann, I., 2018. Sustainability-oriented business model development: principles, criteria, and tools. Int. J. Entrepreneurial Ventur. 10, 256–286.

Clarke-Sather, A.R., Hutchins, M.J., Zhang, Q., Gershenson, J.K., Sutherland, J.W., 2011. Development of social, environmental, and economic indicators for a small/medium enterprise. Int. J. Account. Inf. Manag. 19, 247–266. https://doi.org/10.1108/18347641111169250.

Coffay, M., Coenen, L., Tveterås, R., 2022. Effectuated sustainability: Responsible Innovation Labs for impact forecasting and assessment. J. Clean. Prod. 376, 134324 https://doi.org/10.1016/j.jclepro.2022.134324.

Cohen, B., Winn, M., 2007. Market imperfections, opportunity and sustainable entrepreneur-ship. J. Bus. Ventur. 22, 29–49.

Davidsson, P., 2015. Entrepreneurial opportunities and the entrepreneurship nexus: a re-conceptualization. J. Bus. Ventur. 30, 674–695. https://doi.org/10.1016/j.jbusvent.2015.01.002.

Dean, T.J., McMullen, J.S., 2007. Toward a theory of sustainable entrepreneurship: reducing environmental degradation through entrepreneurial action. J. Bus. Ventur. 22, 50–76. https://doi.org/10.1016/j.jbusvent.2005.09.003.

Dembek, K., York, J., 2019. Sustainable business models: rethinking value and impact. In: Wunder, T. (Ed.), Rethinking Strategic Management: Sustainable Strategizing for Positive Impact, CSR, Sustainability, Ethics & Governance. Springer International, Cham, pp. 131–148. https://doi.org/10.1007/978-3-030-06014-5_7.

Dembek, K., Lüdeke-Freund, F., Rosati, F., Froese, T., 2022. Untangling business model outcomes, impacts and value. Bus. Strat. Environ. https://doi.org/10.1002/bse.3249.

Di Vaio, A., Hassan, R., Chhabra, M., Arrigo, E., Palladino, R., 2022. Sustainable entrepreneurship impact and entrepreneurial venture life cycle: a systematic literature review. J. Clean. Prod., 134469 https://doi.org/10.1016/j.jclepro.2022.134469.

Dijkstra-Silva, S., Schaltegger, S., Beske-Janssen, P., 2022. Understanding positive contributions to sustainability. A systematic review. J. Environ. Manag. 320, 115802 https://doi.org/10.1016/j.jenvman.2022.115802.

Fichter, K., Clausen, J., 2013. Erfolg und Scheitern "grüner" Innovationen. Metropolis, Marburg.

Fichter, K., Clausen, J., 2016. Diffusion dynamics of sustainable innovation - insights on diffusion patterns based on the analysis of 100 sustainable product and service innovations. J. Innovat. Manag. 4, 30–67.

Fichter, K., Olteanu, Y., Widrat, A., 2021. IMPACT Guide: from Evaluation to Impact Management of Start-Up Support Programs. Borderstep Institute for Innovation and Sustainability, Berlin.

Fischer-Kreer, D., Brettel, M., 2022. Accentuate the positive? Sustainable entrepreneurs' framing of positive and negative impacts. J. Clean. Prod. 376, 134319 https://doi.org/10.1016/j.jclepro.2022.134319.

Freudenreich, B., Lüdeke-Freund, F., Schaltegger, S., 2020. A stakeholder theory perspective on business models: value creation for sustainability. J. Bus. Ethics 166, 3–18. https://doi.org/10.1007/s10551-019-04112-z.

Funnell, S.C., Rogers, P.J., 2011. Purposeful Program Theory: Effective Use of Theories of Change and Logic Models, first ed. Jossey-Bass, San Francisco, CA.

George, G., Schillebeeckx, S.J.D., 2021. Digital sustainability and its implications for finance and climate change. MAS Macroecon. Rev. 103–109.

George, G., Merrill, R.K., Schillebeeckx, S.J.D., 2021. Digital sustainability and entrepreneurship: how digital innovations are helping tackle climate change and sustainable development. Enterpren. Theor. Pract. 45, 999–1027. https://doi.org/10.1177/1042258719899425.

Grégoire, D.A., Cherchem, N., 2020. A structured literature review and suggestions for future effectuation research. Small Bus. Econ. 54, 621–639. https://doi.org/10.1007/s11187-019-00158-5.

Hansen, E.G., Schaltegger, S., 2016. The sustainability balanced scorecard: a systematic review of architectures. J. Bus. Ethics 133, 193–221. https://doi.org/10.1007/s10551-014-2340-3.

Hirschmann, M., Block, J.H., 2022. Trademarks and how they relate to the sustainability and economic outcomes of social startups. J. Clean. Prod. 376, 134320 https://doi.org/10.1016/j.jclepro.2022.134320.

Hockerts, K., Wüstenhagen, R., 2010. Greening Goliaths versus emerging Davids — theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. J. Bus. Ventur. 25, 481–492. https://doi.org/10.1016/j.jbusvent.2009.07.005.

Hockerts, K., Hehenberger, L., Schaltegger, S., Farber, V., 2022. Defining and conceptualizing impact investing: attractive nuisance or catalyst? J. Bus. Ethics 179 (4), 937–950.

Hörisch, J., Johnson, M.P., Schaltegger, S., 2015. Implementation of sustainability management and company size: a knowledge-based view: implementation of sustainability management and company size. Bus. Strat. Environ. 24, 765–779. https://doi.org/10.1002/bse.1844.

Horne, J., Fichter, K., 2022. Growing for sustainability: enablers for the growth of impact startups – a conceptual framework, taxonomy, and systematic literature review. J. Clean. Prod. 349 https://doi.org/10.1016/j.jclepro.2022.131163.

Hübel, C., Weissbrod, I., Schaltegger, S., 2022. Strategic alliances for corporate sustainability innovation: the 'how' and 'when' of learning processes. Long. Range Plan., 102200 https://doi.org/10.1016/j.lrp.2022.102200.

Johnson, M.P., Schaltegger, S., 2020. Entrepreneurship for sustainable development: a review and multilevel causal mechanism framework. Enterpren. Theor. Pract., 104225871988536 https://doi.org/10.1177/1042258719885368.

Judl, J., Mattila, T., Manninen, K., Antikainen, R., 2015. Life cycle assessment and ecodesign in a day-Lessons learned from a series of LCA clinics for start-ups and small and medium enterprises (SMEs). Rep. Finn. Environ. Inst. 18.

Karahan, M., Rashid, L., Kratzer, J., 2022. Gearing-up for purpose: the relationship between entrepreneurs' usage of incubation support services and sustainable impacts. J. Clean. Prod. 377, 134315 https://doi.org/10.1016/j.jclepro.2022.134315.

Kostick-Quenet, K.M., Cohen, I.G., Gerke, S., Lo, B., Antaki, J., Movahedi, F., Njah, H., Schoen, L., Estep, J.E., Blumenthal-Barby, J.S., 2022. Mitigating racial bias in machine learning. J. Law Med. Ethics 50, 92–100. https://doi.org/10.1017/jme.2022.13.

Kurz, B., Kubek, D., 2016. Social Impact Navigator – the Practical Guide for Organizations Targeting Better Results.

Laukkanen, M., Tura, N., 2022. Sustainable value propositions and customer perceived value: clothing library case. J. Clean. Prod., 134321 https://doi.org/10.1016/j.jclepro.2022.134321.

Lepoutre, J., Heene, A., 2006. Investigating the impact of firm size on small business social responsibility: a critical review. J. Bus. Ethics 67, 257–273. https://doi.org/10.1007/s10551-006-9183-5.

Lüdeke-Freund, F., Freudenreich, B., Schaltegger, S., Saviuc, I., Stock, M., 2017. Sustainability-oriented business model assessment—a conceptual foundation. In: Carayannis, E.G., Sindakis, S. (Eds.), Analytics, Innovation, and Excellence-Driven Enterprise Sustainability, Palgrave Studies in Democracy, Innovation, and Entrepreneurship for Growth. Palgrave Macmillan US, New York, pp. 169–206. https://doi.org/10.1057/978-1-137-37879-8_7.

Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., Breuer, H., 2018. The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation. Sustain. Prod. Consum. 15, 145–162. https://doi.org/10.1016/j.spc.2018.06.004.

Lüdeke-Freund, F., Dembek, K., Rosati, F., Rauter, R., Schaltegger, S., Fichter, K., 2021. Assessing and Managing Sustainable Business Models - A Status Update. Presented at the 6th International Conference on New Business Models, 9-11 June 2021, Halmstad, Sweden (virtual).

Lüdeke-Freund, F., Breuer, H., Massa, L., 2022. Sustainable Business Model Design - 45 Patterns, first ed. (Berlin).

Lüdeke-Freund, F., 2020. Sustainable entrepreneurship, innovation, and business models: integrative framework and propositions for future research. Bus. Strat. Environ. 29, 665–681. https://doi.org/10.1002/bse.2396.

Maas, K., Liket, K., 2011. Social impact measurement: classification of methods. In: Burritt, R., Schaltegger, S., Bennett, M., Pohjola, T., Csutora, M. (Eds.), Environmental Management Accounting and Supply Chain Management, Eco-Efficiency in Industry and Science. Springer Netherlands, Dordrecht, pp. 171–202. https://doi.org/10.1007/978-94-007-1390-1_8.

McLaughlin, J.A., Jordan, G.B., 1999. Logic models: a tool for telling your programs performance story. Eval. Progr. Plann. 22, 65–72. https://doi.org/10.1016/S0149-7189(98)00042-1.
McMullen, J.S., Dimov, D., 2013. Time and the entrepreneurial journey: the problems and promise of studying entrepreneurship as a process: time and the entrepreneurial journey. J. Manag. Stud. 50, 1481–1512. https://doi.org/10.1111/joms.12049.
Merrill, R., Schillebeeckx, S.J.D., 2019. Sustainable Digital Finance in Asia: Creating Environmental Impact through Bank Transformation. Sustain. Digit. Finance Allliance. https://www.dbs.com/iwovesources/images/sustainability/reports/Sustainable%20Digital%20Finance%20in%20Asia_FINAL_22.pdf.
Muñoz, P., Cohen, B., 2018. Sustainable entrepreneurship research: taking stock and looking ahead: sustainable entrepreneurship research. Bus. Strat. Environ. 27, 300–322. https://doi.org/10.1002/bse.2000.
Neumann, T., 2022. Impact of green entrepreneurship on sustainable development: an ex-post empirical analysis. J. Clean. Prod. 377, 134317 https://doi.org/10.1016/j.jclepro.2022.134317.
Nishant, R., Kennedy, M., Corbett, J., 2020. Artificial intelligence for sustainability: challenges, opportunities, and a research agenda. Int. J. Inf. Manag. 53, 102104 https://doi.org/10.1016/j.ijinfomgt.2020.102104.
Norris, G.A., Burek, J., Moore, E.A., Kirchain, R.E., Gregory, J., 2021. Sustainability health initiative for NetPositive enterprise handprint methodological framework. Int. J. Life Cycle Assess. 26, 528–542. https://doi.org/10.1007/s11367-021-01874-5.
Omri, A., 2018. Entrepreneurship, sectoral outputs and environmental improvement: international evidence. Technol. Forecast. Soc. Change 128, 46–55. https://doi.org/10.1016/j.techfore.2017.10.016.
Parrish, B.D., 2010. Sustainability-driven entrepreneurship: principles of organization design. J. Bus. Ventur. 25, 510–523. https://doi.org/10.1016/j.jbusvent.2009.05.005.
Patzelt, H., Shepherd, D.A., 2011. Recognizing opportunities for sustainable development. Enterpren. Theor. Pract. 35, 631–652. https://doi.org/10.1111/j.1540-6520.2010.00386.x.
Picken, J.C., 2017. From startup to scalable enterprise: laying the foundation. Bus. Horiz. 60, 587–595. https://doi.org/10.1016/j.bushor.2017.05.002.
Porter, M.E., Kramer, R.M., 2011. Creating Shared Value: how to reinvent capitalism - and unleash a wave of innovation and growth. Harv. Bus. Rev. 89, 1–17.
Priem, R.L., 2007. A consumer perspective on value creation. Acad. Manag. Rev. 32, 219–235. https://doi.org/10.5465/amr.2007.23464055.
Ramani, S.V., SadreGhazi, S., Gupta, S., 2017. Catalysing innovation for social impact: the role of social enterprises in the Indian sanitation sector. Technol. Forecast. Soc. Change 121, 216–227. https://doi.org/10.1016/j.techfore.2016.10.015.
Rauter, R., Zimek, M., Baumgartner, R.J., Schöggl, J.-P., 2019. Assessing the impact of sustainable business models: challenges, key issues and future research opportunities. In: Bocken, N., Ritala, P., Albareda, L., Verburg, R. (Eds.), Innovation for Sustainability, Palgrave Studies in Sustainable Business in Association with Future Earth. Springer International, Palgrave Macmillan, Cham, pp. 253–269. https://doi.org/10.1007/978-3-319-97385-2_14.
Ries, E., 2011. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, first ed. Crown Business, New York.
Rockström, J., Steffen, W., Noone, K., Falkenmark, M., Karlberg, L., Persson, Å., Chapin, F.S.I., Lambin, E., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Sve-din, U., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J., 2009. Planetary boundaries: exploring the safe operating space for humanity. Ecol. Soc. 14, 1–36.
Russell, S., Hauert, S., Altman, R., Veloso, M., 2015. Robotics: ethics of artificial intelligence. Nature 521, 415–418. https://doi.org/10.1038/521415a.
Sarasvathy, S.D., 2001. Causation and effectuation. Toward a theoretical shift from economic inevitability to entrepreneurial contingency. Acad. Manag. Rev. 26, 243–263. https://doi.org/10.5465/AMR.2001.4378020.
Schaltegger, S., 2002. A framework for ecopreneurship: leading bioneers and environmental managers to ecopreneurship. Greener Manag. Int. 38, 45–58.
Schaltegger, S., Wagner, M., 2011. Sustainable entrepreneurship and sustainability innovation: categories and interactions. Bus. Strat. Environ. 20, 222–237. https://doi.org/10.1002/bse.682.
Schaltegger, S., Lüdeke-Freund, F., Hansen, E.G., 2016. Business models for sustainability: a Co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. Organ. Environ. 29, 264–289. https://doi.org/10.1177/1086026616633272.
Schaltegger, S., Christ, K.L., Wenzig, J., Burritt, R.L., 2022a. Corporate sustainability management accounting and multi-level links for sustainability – a systematic review. Int. J. Manag. Rev. 24, 480–500. https://doi.org/10.1111/ijmr.12288.
Schaltegger, S., Etxeberria, I.Á., Ortas, E., 2017. Innovating corporate accounting and reporting for sustainability - attributes and challenges: innovating accounting and reporting for sustainability. Sustain. Dev. 25, 113–122. https://doi.org/10.1002/sd.1666.
Schaltegger, S., Beckmann, M., Hockerts, K., 2018. Sustainable entrepreneurship: creating environmental solutions in light of planetary boundaries. Int. J. Entrepreneurial Ventur. 10 (1), 1–16.
Schaltegger, S., Hörisch, J., Freeman, R.E., 2019. Business cases for sustainability: a stakeholder theory perspective. Organ. Environ. 32, 191–212. https://doi.org/10.1177/1086026617722882.
Schaltegger, S., Loorbach, D., Hörisch, J., 2022b. Managing entrepreneurial and corporate contributions to sustainability transitions. Bus. Strat. Environ. 29, 1617–1618. https://doi.org/10.1002/bse.3080.
Schillebeeckx, S.J.D., Merrill, R.K., 2022. Conflicting institutional logics as a safe space for collaboration: action research in a reforestation NGO. In: Handbook on the Business of Sustainability. Edward Elgar Publishing, pp. 344–360.
Schillebeeckx, S.J.D., Schletz, M., 2022. The Governance of Blockchain(s) Revisited (submitted for publication).
Schmidt, J., Keil, T., 2013. What makes a resource valuable? Identifying the drivers of firm-idiosyncratic resource value. Acad. Manag. Rev. 38 (2), 206–228. https://doi.org/10.5465/amr.2010.0404.
Schneider, C., Veugelers, R., 2010. On young highly innovative companies: why they matter and how (not) to policy support them. Ind. Corp. Change 19, 969–1007. https://doi.org/10.1093/icc/dtp052.
Shane, S., Venkataraman, S., 2000. The promise of entrepreneurship as a field of research. Acad. Manag. Rev. 25, 217–226. https://doi.org/10.5465/amr.2000.2791611.
Shields, J.F., Shelleman, J.M., 2017. A method to launch sustainability reporting in SMEs: the B corp impact assessment framework. J. Strateg. Innov. Sustain. 12 https://doi.org/10.33423/jsis.v12i2.798.
Skala, A., 2019. Digital Startups in Transition Economies: Challenges for Management, Entrepreneurship and Education. Springer International Publishing, Cham. https://doi.org/10.1007/978-3-030-01500-8.
Souza, R.G., Rosenhead, J., Salhofer, S.P., Valle, R.A.B., Lins, M.P.E., 2015. Definition of sustainability impact categories based on stakeholder perspectives. J. Clean. Prod. 105, 41–51. https://doi.org/10.1016/j.jclepro.2014.09.051. Decision-support models and tools for helping to make real progress to more sustainable societies.
Starik, M., Stubbs, W., Benn, S., 2016. Synthesising environmental and socio-economic sustainability models: a multi-level approach for advancing integrated sustainability research and practice. Australas. J. Environ. Manag. 23, 402–425. https://doi.org/10.1080/14486563.2016.1188425.
Strömmer, K., Ormiston, J., 2022. Forward-looking impact assessment – an interdisciplinary systematic review and research agenda. J. Clean. Prod. 377, 134322 https://doi.org/10.1016/j.jclepro.2022.134322.
Stubbs, W., Cocklin, C., 2008. Conceptualizing a "sustainability business model". Organ. Environ. 21, 103–127. https://doi.org/10.1177/1086026608318042.
Trautwein, C., 2021. Sustainability impact assessment of start-ups – key insights on relevant assessment challenges and approaches based on an inclusive, systematic literature review. J. Clean. Prod. 281, 125330 https://doi.org/10.1016/j.jclepro.2020.125330.
Trautwein, C., Fichter, K., Masri, R., Tober, C., 2018. Manual for the Sustainability Assessment of Start-Ups: A Practical Tool for Start-Up Teams, Investors and Funding Organizations. Borderstep, Berlin.
United Nations General Assembly, 2015. In: Transforming Our World: the 2030 Agenda for Sus-Tainable Development. Resolution Adopted by the General Assembly on 25 September 2015. United Nations, New York.
Vimalnath, P., Tietze, F., Jain, A., Gurtoo, A., Eppinger, E., Elsen, M., 2022. Intellectual property strategies for green innovations - an analysis of the European Inventor Awards. J. Clean. Prod. 377, 134325 https://doi.org/10.1016/j.jclepro.2022.134325.
Volkmann, C., Fichter, K., Klofsten, M., Audretsch, D.B., 2019. Sustainable entrepreneurial ecosystems: an emerging field of research. Small Bus. Econ. https://doi.org/10.1007/s11187-019-00253-7.
Wagner, M., Schaltegger, S., Hansen, E.G., Fichter, K., 2021. University-linked programmes for sustainable entrepreneurship and regional development: how and with what impact? Small Bus. Econ. 56, 1141–1158. https://doi.org/10.1007/s11187-019-00280-4.
Wöhler, J., Haase, E., 2022. Exploring investment processes between traditional venture capital investors and sustainable start-ups. J. Clean. Prod. 134318 https://doi.org/10.1016/j.jclepro.2022.134318.