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The sustainability scale-up framework: A tool to design scale-up strategies for sustainable businesses

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A B S T R A C T

Sustainable Business Model (SBM) is a strategic approach that integrates sustainability into the core operations and values of organisations. However, scaling SBMs remains a significant challenge due to resource constraints, operational inefficiencies, and stakeholder complexities, emphasising the need for structured frameworks to facilitate this process. This paper introduces the Sustainability Scale-Up Framework (SSF), a comprehensive tool explicitly developed through a design approach to help businesses scale their operations while maintaining alignment with environmental, social, and economic sustainability principles. The SSF was developed iteratively through an extensive literature review, and semi-structured interviews with experts and practitioners of sustainable startups. The SSF's layered structure systematically addresses value creation, operational scalability, stakeholder engagement, and strategic alignment, uniquely integrating value tensions across economic, social, and environmental dimensions to guide the scaling of SBMs. The SSF was validated through a business case workshop where its practical utility based on parameters like usability, flexibility, coherence, and applicability were examined. This paper contributes to SBM, scalability, and strategic design literature by offering insights through a vision-driven framework, providing a novel methodological approach to integrate strategic design principles into scaling processes, and delivering practical tools for businesses, and policymakers to foster sustainable growth for achieving transformative impact.

1. Introduction

Sustainability has grown in urgency due to increasing environmental crises, resource scarcity, and socio-economic inequalities. Moreover, growing public awareness and regulatory pressures have shifted embedding sustainability from an optional choice to an essential element for long-term survival and competitive relevance (Ivory and MacKay, 2020). Businesses implement sustainable practices in various ways, ranging from incremental environmental initiatives to systemic transformation (Boons et al., 2013; Boons and Lüdeke-Freund, 2013). One of the ways in which sustainability can be deeply integrated within an organisation is through the adoption of a Sustainable Business Model (SBM). SBMs integrate economic, environmental and social sustainability objectives into the architecture through which a business creates, captures, and delivers value (Bocken et al., 2014; Lüdeke-Freund et al., 2018) When organisations are able to combine their business model with strong commitment to environmental and social objectives, they are uniquely positioned to both drive systemic change (Bocken et al.,

2014) and maintain competitive advantage in sustainability-focused markets (Bradley et al., 2020).

While increasing attention is going into the dynamic process of designing a SBM or reconfiguring a business model (BM) into a sustainable one (Bocken et al., 2014; Lüdeke-Freund and Dembek, 2017), i. e. the research on sustainable business model innovation (Geissdoerfer et al., 2020), structured frameworks that guide the scaling of SBMs, balancing environmental, social, and economic goals, remain scarce. Many organisations struggle with scaling SBMs, often due to limited resources, operational inefficiencies, and complex stakeholder dynamics (Evans et al., 2017; Massa et al., 2017; Schaltegger et al., 2016a, 2016b). Here, scaling refers to expanding the impacts and reach of SBMs without proportional increases in resources, costs, or complexity (Bocken et al., 2016; Eisenmann, 2006) or compromising their sustainability integrity (Bocken et al., 2019).

Given the complexity of scaling SBMs, strategic design offers promising methodologies to address these multifaceted challenges (Calabretta et al., 2016). Strategic design integrates a creative problem-

solving approach of design thinking with the goal-oriented business strategy, enabling organisations to develop innovative and adaptable solutions (Amano et al., 2019; Calabretta et al., 2025). However, despite its potential, the application of strategic design specifically to support the scalable growth of SBMs has not been thoroughly explored in the literature. Thus, our research question aims at investigating *how organisations, through strategic design, can tackle the operational and strategic challenges in scaling their* SBM.

Employing a qualitative methodology, including semi-structured interviews with experts in sustainability, BM, and strategic design, this research identifies operational enablers, challenges, and strategies unique to scaling SBMs.

We combine these outcomes into the **Sustainability Scale-Up Framework (SSF)**, a novel and comprehensive tool developed in this research that leverages strategic design principles (Calabretta et al., 2016), and by integrating knowledge and practices from the BM (Bouwman et al., 2019) and the sustainability (Bączyk et al., 2024; Pollard et al., 2023; Velenturf and Purnell, 2021) to guide businesses in scaling their SBMs without compromising their sustainability objectives. The SSF contributes theoretically by offering a new lens to understand scalable SBMs and practically by providing actionable tools for entrepreneurs, policymakers, and scholars. More specifically, the SSFs' scaling strategies address environmental, social, and economic impacts throughout the product or service lifecycles, aligning with sustainability principles, preventing unintended trade-offs, and fostering systemic change (Christopher et al., 2024; Lüdeke-Freund et al., 2018; Santa-Maria et al., 2021). Practically, the SSF provides stakeholders with novel insights and tools necessary to innovate and scale BMs that effectively meet the intertwined sustainability and scalability challenges.

The remainder of the paper is organised as follows: Section 2 reviews literature on SBMs, scalability, and strategic design to develop the initial SSF iteration. Section 3 outlines the research methodology. Section 4 presents empirical findings, defines SSF key elements, and results of the validation workshop. Section 5 summarises how the SSF addresses scaling challenges and operationalises complexity. Section 6 discusses theoretical and practical implications, concludes, and proposes future research directions.

2. Literature review

2.1. Sustainable business models and innovation

The concept of Sustainable Business Models (SBMs) has evolved significantly over the past two decades, emerging as a response to growing demand for businesses to integrate environmental and social sustainability alongside economic objectives (Bradley et al., 2020; Karlsson, 2019). SBMs aim to balance the triple bottom line by creating value that supports business performance as well as environmental protection and social wellbeing (Bocken et al., 2014; Lüdeke-Freund et al., 2018). Early contributions, such as Hart and Milstein's (2003) framework, emphasised creating competitive advantage by addressing global social and environmental challenges through dimensions like pollution prevention, clean technology, and base-of-the-pyramid innovations. Lüdeke-Freund (2010) further refined SBMs as frameworks generating positive net effects on natural and social capital while maintaining economic viability. This integrated perspective connects sustainability with the triple-bottom-line framework, emphasising economic, environmental, and social dimensions. Literature also shows SBMs as dynamic and context-dependent, moving beyond rigid models toward adaptability and systemic integration (Lüdeke-Freund et al., 2019).

Moreover, several notable frameworks have advanced our current understanding of SBM. For example, Bocken et al. (2014) introduced SBM Archetypes that provide replicable patterns for value creation through strategies such as material efficiency, circularity, and sufficiency. The Triple-Layered Business Model Canvas (TLBMC) (Joyce and

Paquin, 2016) expands traditional models by incorporating environmental and social layers, offering a more holistic view of value creation. Similarly, the Flourishing Business Canvas (Upward and Jones, 2016) further highlights stakeholder wellbeing, and ecological and societal considerations embedded in business logic. These approaches converge on the principle that collaborative value creation and stakeholder engagement are critical to address sustainability challenges (Stubbs and Cocklin, 2008).

While these frameworks have significantly advanced the field, they provide limited integration across economic, environmental, and social layers in operational practice. Moreover, many frameworks focus on conceptual design rather than delivering implementable strategies for operationalising sustainability (Joyce and Paquin, 2016; Upward and Jones, 2016). Importantly, few address the challenges of scaling SBMs (Bocken and Geradts, 2020) while preserving their sustainability principles. In this context, managing value tensions (van Bommel, 2018), namely the inherent trade-offs and conflicts between economic, environmental, and social objectives, is critical in SBM design and implementation (Schaltegger et al., 2016a, 2016b; Lüdeke-Freund et al., 2018). Stakeholder dynamics introduce additional complexity that must also be addressed to make a SBM scalable (Matos and Silvestre, 2013; Rathobei et al., 2024).

2.2. Scaling sustainable business models

Scalability is a critical determinant of the success of SBMs. It enables organisations to extend their environmental, social and economic impact beyond local or small-scale operations, while maintaining efficiency, profitability, and alignment with sustainability principles (Nosratabadi et al., 2019). Despite its importance, SBM scalability remains understudied in the literature, with limited research addressing the practical and theoretical challenges businesses face when attempting to scale sustainable innovations effectively (Geissdoerfer et al., 2018). Early work by Eisenmann (2006) examined scalability primarily from a technical and economic perspective, focusing on cost structures and operational efficiencies. Building on this, existing literature has mainly focused on identifying key challenges to scaling SBMs, which are then translated to corresponding opportunities identified in this paper to build the foundation of the proposed framework's "SSF" elements (see Table 1).

Literature expands on the concept of scalability beyond economic

Table 1

Challenges and opportunities for scaling sustainable business models.

Challenges	Opportunities (Defined in this paper)
The lack of a clear and consistent definition and measurement of SBMs and scalability limits comparability and generalisability, and cumulative knowledge development (Geissdoerfer et al., 2018; Osmanovic et al., 2024).	Development of comprehensive frameworks, indicators, and metrics that capture the complexity and diversity of SBMs and scalability, facilitating clearer communication of impacts.
Tension between innovation and standardisation influences scalability and the balance of economic, environmental, and social value (Massa et al., 2017).	Leveraging the complementarity between innovation and standardisation can enhance scalability and value alignment.
Incumbent or dominant BM resistance creates lock-ins, hindering SBM adoption across markets and sectors (Evans et al., 2017).	Emergent or alternative BMs create niche opportunities fostering SBMs diffusion.
External environmental volatility poses risks to SBMs scalability (Evans et al., 2017).	Organisation adoptability and resilience enhance scalability by improving SBM robustness.
Maintaining a balance between economic, environmental and social objectives poses a significant barrier to preserving sustainability at scale (Schaltegger et al., 2016a, 2016b).	Collaboration across organisational boundaries involving partners, suppliers, customers, and even competitors is a critical enabler for scaling SBMs, facilitating knowledge exchange and co-innovation.

growth to incorporate social and environmental dimensions. Frameworks such as the SCALERS: (Staffing, Communicating, Alliance-Building, Lobbying, Earnings-Generation, Replicating, Stimulating Market Forces) (Bloom and Chatterji, 2009) highlights the organisational capabilities crucial for scaling social impact. Similarly, the Greiner Growth Model (Greiner, 1989) and the Startup Genome Project (Marmer et al., 2011) provide insights into the phases of organisational evolution during growth, highlighting the challenges and transitions businesses face as they scale.

Despite these advances, how to scale SBMs in practice remains insufficiently explored. Critical challenges include balancing trade-offs between growth and sustainability, aligning diverse stakeholder interests, balancing the value tension between economic, environmental and social objectives, and integrating scalability strategies with sustainable innovations. These issues emphasise the need to focus on these key aspects within SBM scalability and demand a holistic approach incorporating stakeholder alignment, dynamic capabilities (Teece, 2010), and iterative scalability processes tailored for sustainability-focused organisations.

2.3. Strategic design

Strategic design offers a promising avenue for addressing the challenges of scaling SBMs. Strategic design leverages design principles and practices like creativity, stakeholder collaboration, and systems thinking to address complex organisational challenges and foster innovation (Calabretta and Gemser, 2017). With an emphasis on creating multi-dimensional value (Sangiorgi, 2010) and iterative prototyping and stakeholder co-creation (Baldassarre et al., 2017), strategic design presents a viable and vision-driven approach to address interactions between economic, environmental, and social objectives.

In the context of SBM research, it provides structured methodologies that support iterative development, prototyping, and active stakeholder engagement (Bocken et al., 2014; Lüdeke-Freund et al., 2018). These elements are essential for developing adaptable SBMs capable of addressing evolving market demands and sustainability challenges. By embedding sustainability considerations into every phase of BM design, strategic design enables businesses to refine their value propositions and optimise value creation mechanisms (Calabretta et al., 2016).

As noted earlier, despite the increasing application of strategic design in sustainability and innovation, its specific role in supporting the scaling phase of SBMs remains underexplored (Calabretta et al., 2016; Sangiorgi, 2010). Existing research largely focuses on initial BMI, or product and service design, or a framework addressing how strategic design can guide the tension between the complexities of growth while preserving sustainability principles could contribute to advancing the field in this direction. The key gaps in existing frameworks based on this holistic review, subsequent design goals, and elements of the initial version of the framework are shown in Table 2.

This paper focuses on developing a vision-driven framework aiming at integrating strategic design's systemic, participatory, and iterative capabilities with SBM scaling challenges. By leveraging these tools, the framework supports businesses in scaling SBMs while maintaining their sustainability integrity, aiming at broader and deeper environmental, social, and economic impact. With this perspective and based on key insights from academic literature and design goals, which form the backbone, the first iteration of a vision-driven framework, labelled as Sustainability Scale-Up Framework (SSF), is proposed (see Fig. 1).

The value capture, creation, and delivery of the Business Model Canvas (Osterwalder and Pigneur, 2010) is retained to ensure the integration of a logical value chain in the framework. Still, the structure is modified to ensure the integration of the triple bottom line perspective, i.e. the integration of social and environmental values along with the economic one (Joyce and Paquin, 2016). To integrate a sense of directionality, the framework is picturised as a set of three concentric hexagons, each representing a segment of the value chain, i.e. value

Table 2
Key gaps in the literature and corresponding design goals and framework elements.

Key gaps in existing frameworks	Design goals	Framework elements
Limited integration across layers	To ensure well-defined relationships both within and across the layers	The pre-framework needs directionality, and the relationships between the layers need to be well-defined
Lack of operational guidance	To integrate operational elements that focus on the implementation of conceptual values	Operational aspects of a business, like production, supply chain and governance, must be integrated into the pre-framework
Scalability challenges	To ensure the generation of tangible strategies from the framework.	Actionable strategies related to branding, funding, and the circular economy should be integrated into the framework
Value tensions	To resolve the tensions between the social, environmental and economic value propositions of the business	The framework must follow a vision-driven approach, where the values are derived from a unified vision
Lack of metrics	To ensure that the necessary metrics are identified and integrated into the business model	The corresponding environmental, social and economic impact must be integrated into the framework
Stakeholder complexity	To help businesses identify the necessary stakeholders and stakeholder relationships	Essential partnerships, customers, and their relationship with the business must be incorporated into the framework

Note: these gaps have identified through the existing frameworks of e.g. Bloom and Chatterji, 2009; Joyce and Paquin, 2016; Upward and Jones, 2016.

proposition, value creation mechanism, and value delivery and capture mechanism.

The framework is centred around a unified vision, which lies in the innermost triangle and from which the value propositions are derived. Various operational and strategic mechanisms connect these value chains together based on a comprehensive review of the literature and BMI frameworks, like the SBM Archetypes (Bocken et al., 2014), the importance of internal governance to scale sustainable businesses (Evans et al., 2017; Massa et al., 2017), the SCALERS framework (Bloom and Chatterji, 2009) and consideration of other essential scale-up frameworks developed by e.g. Marmer et al. (2011) and Maurya (2016). In the next phase, the proposed framework (iteration 1) is refined and developed further through qualitative interviews with experts from businesses that are either preparing for or currently undergoing the scale-up phase.

3. Methods

This paper adopts a Design Science Research (DSR) Methodology (Peffers et al., 2007). This method has its foundations in the field of Information Systems and has also been applied in management studies (Van Aken and Romme, 2009) and SBM research (Baldassarre et al., 2020). DSR helps in generating scientific knowledge and tangible solutions to theoretical issues through the development and evaluation of an artefact (Peffers et al., 2007). In this paper, the artefact is the SSF, whose first version is developed based on a literature review of relevant fields. The first version is then iterated and validated through qualitative interviews and a business case workshop. This process is visualised in Fig. 2 and further discussed below.

3.1. Qualitative interviews

To refine the first version of the framework (Fig. 1) and its vision-driven approach to SBM scaling, semi-structured interviews were
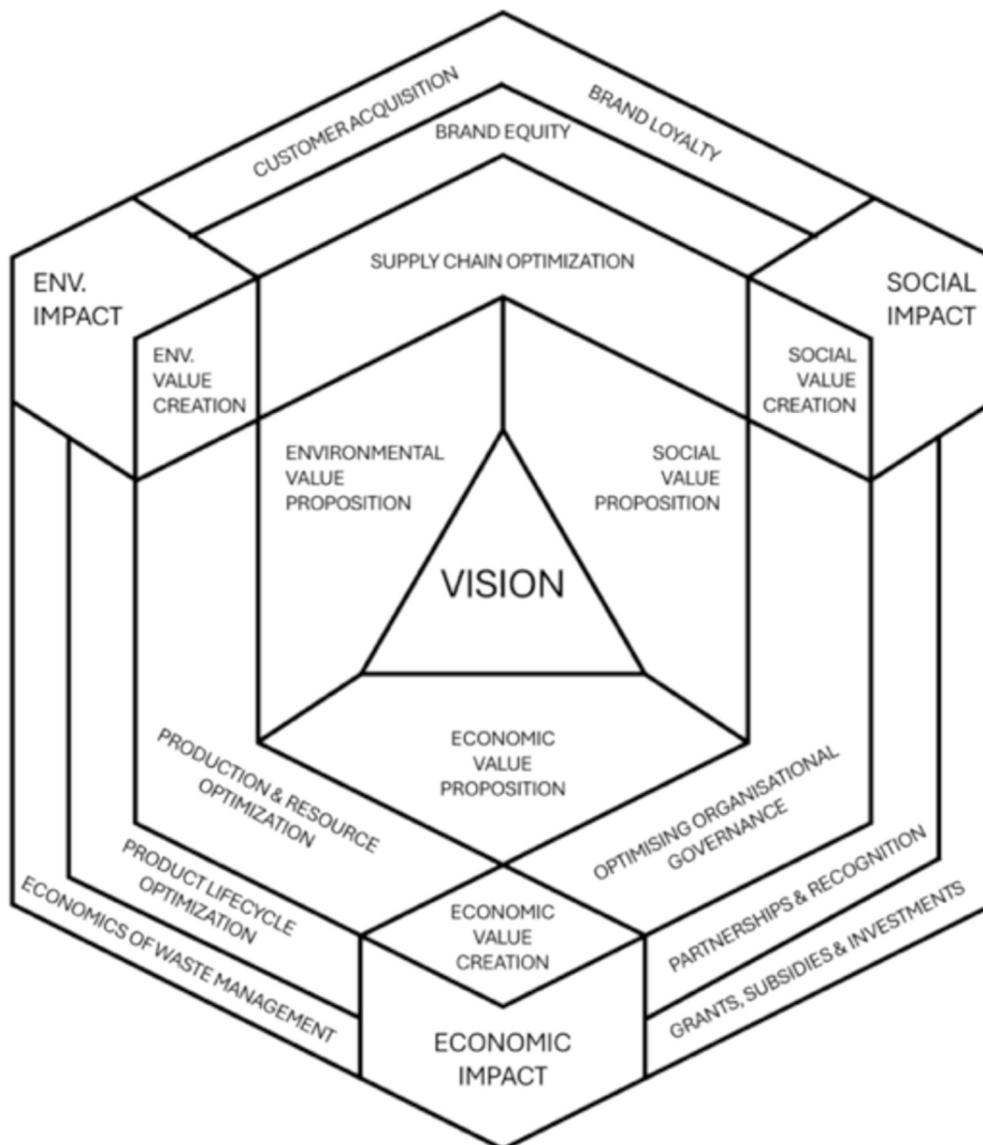
Fig. 1. The sustainability scale-up framework – iteration 1.
Note: ENV IMPACT = Environmental Impact, ENV. Value Creation = Environmental Value Creation.

conducted (see Supplementary information, Section S1). This approach was chosen due to its suitability for achieving the exploratory objectives of the research (Jain, 2021). To capture the perspectives and experiences of sustainable businesses, in-depth interviews were performed based on an interview guide developed following Kallio et al.'s (2016) guidelines and using the initial SSF as a probe (Patton, 2002).

Participants were carefully selected through purposeful sampling (Suri, 2011) to ensure the quality and relevance of collected data and insights. Companies were chosen from various stages of the business lifecycle: introduction, growth and maturity, and different geographical regions and industries, allowing for a holistic exploration of the subject, minimising domain or regional bias. This approach was designed to maximise participation and gather a diverse range of insights. In total, 10 interviews were conducted in a hybrid format in May 2024, encompassing both online and offline sessions, each lasting approximately one hour, and were recorded, see profiles of the participants in Table 3.

The interviews were transcribed and analysed using Deductive Thematic Analysis (Braun and Clarke, 2012). The transcripts were first analysed holistically to get an overall understanding of the domain and coded based on the elements of the SSF using Atlas.ti. The deductive

nature of the analysis resulted in a focused exploration of predefined themes based on the SSF and further discussed in the next section.

3.2. Business case workshop

In next phase, the business case workshop was conducted to provide a practical, real-world context for testing the usability, relevance, and effectiveness of the SSF, enabling iterative refinement based on participant feedback. The workshop used a simulated business scenario to engage participants in applying the framework, thereby generating relevant insights into its practicality and adaptability in addressing scaling challenges. While not a formal case study as defined by Yin (2003) or Eisenhardt (1989), the use of this business case aligns with its emphasis on iterative and experiential approaches to framework development. Additionally, Siggelkow (2007) highlights the utility of such interactive method in uncovering causal mechanisms and practical considerations often missed in purely theoretical analyses.

The business case workshop was developed around a fictional innovative, packaging-free online supermarket based in the Netherlands. This company promotes sustainability by delivering groceries in reusable glass jars. Customers pay a refundable deposit for the
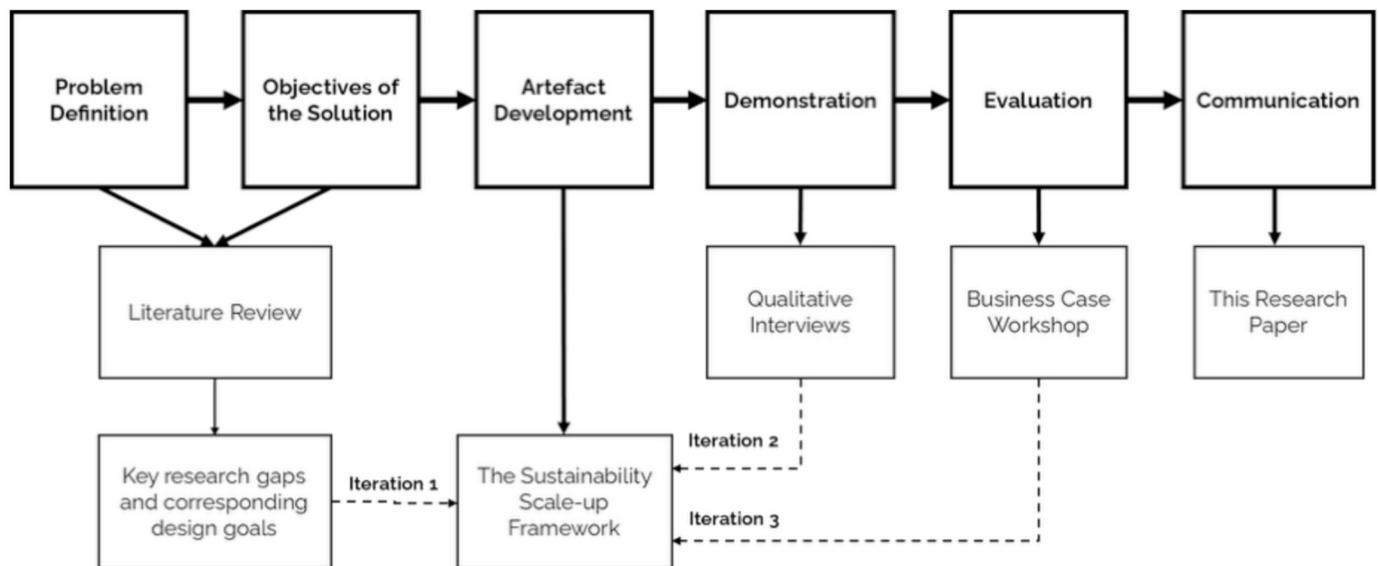
Fig. 2. Overview of the DSR research.
(Based on Baldassarre et al., 2020; Peffers et al., 2007).

Table 3
Participant profiles.

Interviewee number	Company description	Country	Role	Experience
Participant 1	Sustainable Design Consultancy	Netherlands	Co-Founder	1 Year
Participant 2	Sustainable Design Consultancy	India	Co-Founder	5 Years
Participant 3	Sustainable Fashion Business	Netherlands	Co-Founder	2 Years
Participant 4	Sustainable Apparel Business	India	Founder	8 Years
Participant 5	Design Consultancy	India and Netherlands	Co-Founder and CEO	6 Years
Participant 6	Sustainable Bicycle Bell Startup	Estonia	Co-Founder	4 Years
Participant 7	Sustainable Cup Cleaning Solutions Business	Netherlands	Co-Founder	2 Years
Participant 8	Sustainable Water Consultancy	India	CEO	6 Years
Participant 9	Sustainable Concrete Business	United Kingdom	Co-Founder and CTO	3 Years
Participant 10	Sustainable Menstrual Hygiene Business	India	Managing Director	7 Years

Note: CEO = Chief Executive Office; CTO = Chief Technology Office.

Table 4
Challenges to scale-up.

Challenge	Description
Operational weaknesses	Reliance on a single supplier exposes the business to supply chain risks, while inadequate infrastructure limits its ability to meet growing demand
Cost barriers	High production and transport costs for reusable jars strain financial resources, reducing competitiveness
Competitive pressure	Larger grocery competitors benefit from economies of scale and broader product ranges, intensifying the competitive landscape
Financial mismanagement	A narrow focus on sustainability has led to value misalignment, overspending, and poor cash flow management. The difficulty in securing additional funding compounds these issues
Employee retention	Limited growth affects job security
Investors value alignment	Financial losses reduced trust and diminished confidence in the business
Customer retention	The potential failure of case company could remove a valued sustainable shopping option, undermining customer loyalty
Industry challenges	The case underscores the broader challenges of implementing sustainable business models in the grocery delivery sector, particularly around cost and logistics

Table 5
Workshop participant profiles.

Participant	Expertise	Specialisation	Team
Participant 1	Business	Technology, Policy and Management (2nd year)	Team 1
Participant 2	Technology	Integrated Product Design (2nd year)	Team 1
Participant 3	Design	Strategic Product Design (1st year)	Team 1
Participant 4	Business and Design	Integrated Product Design and Strategic Product Design (3rd year)	Team 2
Participant 5	Technology	Environmental Engineering (2nd year)	Team 2
Participant 6	Business	Strategic Product Design (2nd year)	Team 3
Participant 7	Technology	Environmental Engineering (2nd year)	Team 3
Participant 8	Design	Integrated Product Design (2nd year)	Team 3

jars, reducing packaging waste and CO_2 emissions. The business also sources products locally, fostering community empowerment while advancing its mission to minimise plastic waste and support a circular economy. Despite its sustainable vision and initial success, the business faces several challenges in scaling its operations. An overview of the challenges is presented in Table 4.

Eight participants were recruited for the workshop to form three teams composed of postgraduate students pursuing master's degrees in diverse fields within the business, technology, and design to understand whether and how the SSF could improve the ability of generating scaling strategies in a multi-disciplinary team. Such diversity fosters innovative thinking and creative problem-solving that advocate for the integration

of varied perspectives during strategy formulation (Calabretta and Gemser, 2017). See Table 5 for the team profiles.

Participants in the workshop assumed the role of consultancy teams tasked with transforming the case company into a scalable and financially sustainable business. Guided by the SSF, participants were expected to devise strategies to resolve immediate challenges, position the company for long-term growth, and providing necessary recommendations.

Two types of data (qualitative and quantitative) were collected from the workshop. Qualitative data were derived from the team presentations and informal discussions after the presentations. Additionally, workshop participants were asked to evaluate seven parameters (Chatty et al., 2022), selected to assess both the SSF's user-friendliness (with parameters such as Understandability, Usability, Creativity and Structural Consistency) and its effectiveness (with parameters such as Flexibility, Coherence and Applicability) (see Table 6).

4. Results

Following the research design outlined in the previous section, we first present the results of the qualitative analysis of the interview data, elaborating on the four key themes (Framework Layout and General Perceptions, Core Values, Internal capabilities for Scaling, and Impacts and Strategies) and 13 sub-themes that have been emerged based on the SSF elements. See Fig. 3, for a graphical representation of the thematic tree (based on the initial framework). Subsequently, we provide the findings from the business case workshop, highlighting participant feedback and insights used to refine the SSF.

4.1. Theme 1: framework layout and general perceptions

The first theme includes the general perceptions and application of the framework and is further broken down into three sub-themes (Framework Use Cases, Features and Layout).

4.1.1. Framework use cases

The SSF was perceived as a valuable tool for scaling SBMs. It facilitates critical discussions with a structured approach to help businesses address key operational and strategic steps systematically. Participants also identified the SSF as a communication tool, emphasising that it could effectively convey a SBM to diverse stakeholders, including investors and partners. Participant 1 mentioned that the framework could raise fundamental questions related to scalability, such as resource optimisation and team building: "*We want to scale up? (but) how do we find those people?... And (at) this time, optimisation is pretty impor*tant". "*So yes, there are already 3 questions you can ask, which are quite paramount to*

Table 6
Parameters and their definitions.

Parameters	Definition
Understandability	Refers to the ease with which the participants could comprehend the structure, elements and relationships outlined within the framework.
Usability	Involves insights about the user-friendliness and intuitiveness of the SSF. It encompasses the framework's design and layout, ensuring that it is accessible, easy to navigate, and practical for the business case.
Flexibility	Refers to how easily the participants were able to adapt the framework to the business case.
Creativity	Encapsulates SSF's capability to help participants generate innovative and novel scale-up strategies.
Coherence	Signifies the logical consistency and alignment of its various elements.
Applicability	Refers to the relevance and suitability of the framework for the business case within the real-world context.
Structural Consistency	Evaluates the systematic arrangement and interconnectedness to support the SBMI process.

the future of your business. I think that is actually good" (Participant 1).

4.1.2. Framework features

Several participants highlighted the SSF vision-driven approach as an innovative approach. They appreciated how the centralisation of a unified vision provided a foundational anchor for scaling strategies, aligning the economic, social, and environmental objectives. Furthermore, the framework's directional nature, which allowed participants to work through its elements systematically, was considered a significant advantage. The approach to bridge distinct dimensions of sustainability such as linking social, economic, and environmental factors was appreciated for its clarity and relevance: "*It is sort of like a top-down versus down-up approach where it is like from proposition to large or larger, and it is cool how you are linking like social-economic, social-environments or environments-economic*" (Participant 4).

4.1.3. Framework layout

Participants found the layered structure quite intuitive, facilitating their understanding of the framework's directionality and purpose. The emphasis on social, economic, and environmental values, with the vision positioned as the central theme, was widely recognised as a strong conceptual foundation: "*Yeah. It may not be clear at the beginning how these exactly overlap, but you explain it here, so all that makes sense*" (Participant 5).

4.2. Theme 2: core values

The second theme encapsulates the foundational elements of the framework, i.e. the vision and value propositions and is further broken down into 2 sub-themes (Vision and Value Proposition).

4.2.1. Vision

Although participants emphasised the importance of a core vision for decision-making and long-term strategic alignment, they highlighted the challenge of balancing sustainability and economic priorities within their vision. Overemphasis on either aspect was seen as a potential pitfall, resulting in neglect of essential components required for holistic scaling. Participants often derived their vision from personal values and experiences, integrating these with sustainability goals. This alignment between personal and organisational values was identified as a critical factor in maintaining coherence and resilience during scaling. An interesting insight was the need to make visions more tangible. While visions often guided founding teams during the initial stages, they were less intuitively used later during the scaling processes. "*So, if there could be ways in your framework where this vision can be made tangible, through visualisation or through storytelling through drafting like a hypothetical speculative detail of the future, that might make it easier to define your value propositions as well*" (Participant 9).

4.2.2. Value propositions

Value propositions were identified as the mechanisms through which companies operationalise their vision. These were categorised into environmental, social, and economic propositions, each reflecting a distinct aspect of scaling. Environmental value proposition mainly focussed on themes like minimising waste, promoting reuse, and conserving resources, while the social value proposition included sustaining rural communities, creating livelihoods, and supporting beneficiaries. The economic value proposition addressed the need for value for money, affordability and financial sustainability.

4.3. Theme 3: internal capabilities for scale-up

This theme covers the elements in the second layer of the SSF, which include the value creation mechanisms and operational capabilities to support these mechanisms. This theme is further divided into four sub-themes (Value Creation, Production and Supply Chain, Target
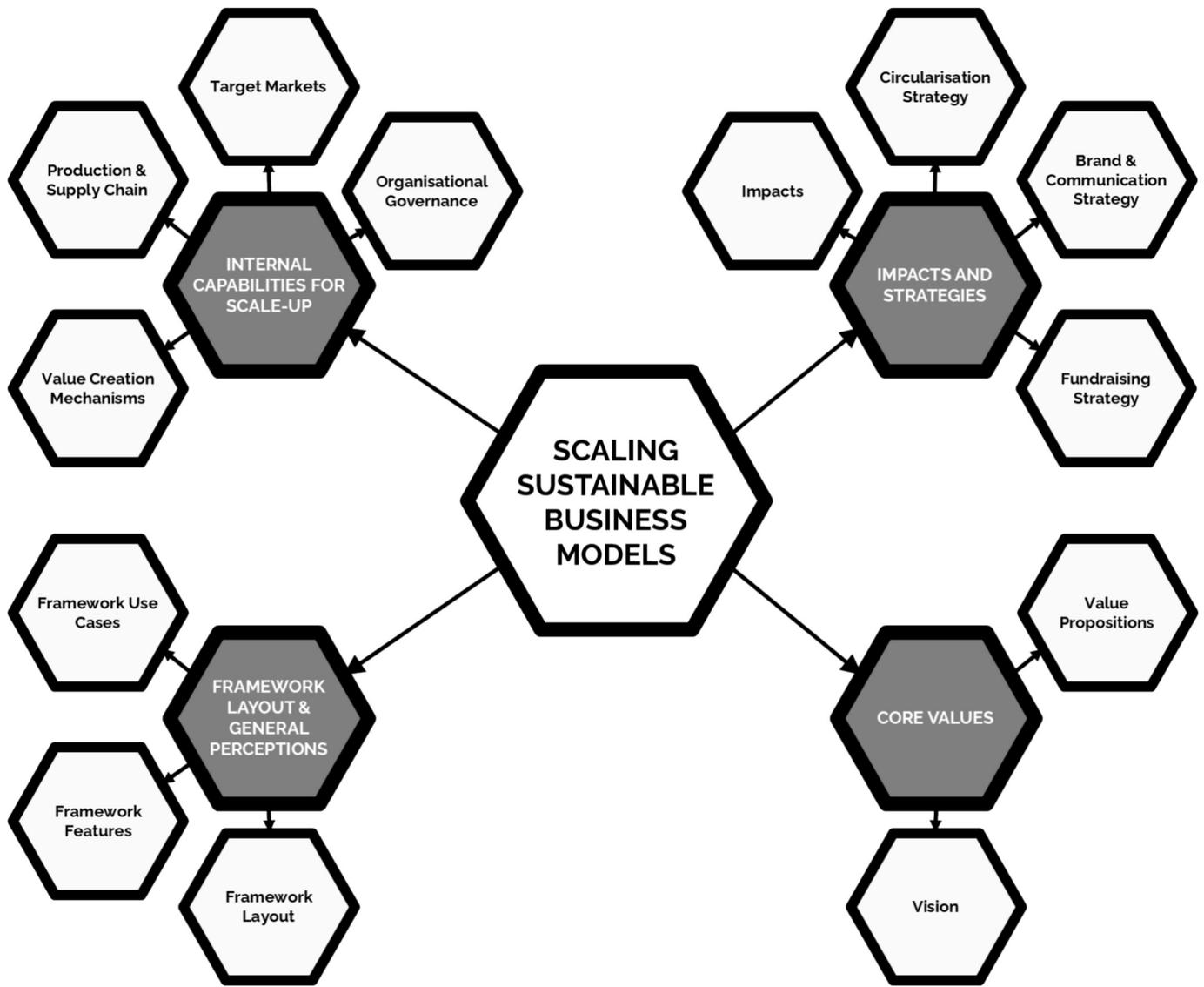
Fig. 3. Thematic tree.

Markets, Organisational Governance).

4.3.1. Value creation

Value creation mechanisms were explored across three dimensions: environmental, social, and economic, each representing essential mechanisms for fulfilling corresponding value propositions. Environmental value creation emphasised the importance of product attributes that align with environmental sustainability goals, like using mono-material designs or reducing plastic in packaging, which enhance the environmental appeal of their offerings. Social value creation involved mechanisms such as investing in Corporate Social Responsibility (CSR) initiatives, offering educational workshops, and improving accessibility for beneficiaries to foster positive engagements and social impact. Economic value creation focused on pricing strategies to ensure financial sustainability while scaling (Baldassarre et al., 2020). Participants noted that balancing affordability with profitability was crucial for maintaining business viability during growth phase.

4.3.2. Production and supply chain

Participants highlighted the need to evaluate and implement efficient manufacturing methods and explore robust supply chains to scale their operations. These efforts ensure that businesses can meet increased demand sustainably while maintaining reliability in sourcing materials. One participant mentioned that "*A lot of the work that we have been doing is focusing on how to scale up the production and start thinking about the manufacturing aspects as well, and how you to scale up even further*" (Participant 8).

4.3.3. Target markets

The identification and exploration of target markets emerged as a vital aspect of scaling. Participants mentioned the need to identify gaps in existing markets and expand it into new ones. They also emphasised the importance of achieving a strong "Product-Problem Fit" when entering new markets, ensuring their solutions effectively address identified needs. One of the participants mentioned that: "*OK, so what we do is we, first of all, make them understand the problem we are solving and try to get evidence that that problem really exists in the marketplace or wherever they are*" (Participant 7).

4.3.4. Organisational governance

Participants emphasised the importance of clear governance structures to support scaling. This included creating distinct departments and teams with well-defined responsibilities that were aligned with the business's values. Training programmes and structured guidelines were

highlighted as essential for fostering efficiency and enabling sustainable growth. Additionally, businesses often decentralised operational complexities while scaling up, allowing core teams to focus on strategic tasks.

4.4. Theme 4: impacts and strategies

The fourth theme addresses the components of the final layer of the SSF, focusing on the impacts and the strategies required to achieve them. In this layer, the value delivery and capture mechanisms were integrated into a unified "strategy" element to simplify the framework, a decision informed by insights gained from the interviews. This theme is divided into four sub-themes (Impacts, Circularisation Strategy, Fundraising Strategy, Branding & Communication Strategy).

4.4.1. Impacts

Participants highlighted the diversity of metrics applicable to SBMs, such as Life Cycle Assessments (LCA), Carbon Footprint, and Customer Satisfaction, stressing the importance of developing their own tailored metrics to guide scaling. While economic impacts, such as cash flow and valuation, were considered easier to measure, environmental and social impacts often required innovative approaches. They also noted the potential of aligning with the United Nations (UN) Sustainable Development Goals (SDGs) to standardise and communicate impact metrics. Despite some scepticism due to the non-measurable nature of SDGs, they were acknowledged for their recognition and utility in categorising impacts.

4.4.2. Circularisation strategy

Circular economy strategies, which refers to strategic approaches aimed at embedding circular economy principles within BMs to drive sustainability improvements (Brenner and Drdla, 2023) were considered essential for scaling, focusing on minimising waste and maximising resource utility. Participants emphasised the importance of optimising product life cycles, including repair, reuse, and recycling principles (Suárez-Eiroa et al., 2019). Enhancing product quality during upcycling processes and extending the end-of-life utility of products were also recurring themes. Additionally, identifying relevant partners and analysing competitor relationships were critical to implementing circularisation strategies effectively (Kirchherr et al., 2017).

4.4.3. Fundraising strategy

Unlike traditional businesses, sustainable businesses rely heavily on government subsidies and grants. Exploring these funding avenues required aligning with Environmental, Social, and Governance (ESG) standards and understanding investor values for funding, while aiming at SBMs (Kluza et al., 2021). While governmental grants are valuable, their competitive nature necessitated perseverance. One of the participants mentioned that "*We were really lucky that we got two grants... We applied for 200 grants, and we just got two grants*" (Participant 8).

4.4.4. Branding and communication strategy

Effective branding and communication were essential for spreading awareness about sustainability efforts, encouraging customer acceptance, and driving acquisition. Participants emphasised the importance of creating a coherent design and communication language to maintain brand consistency, especially when expanding into new markets or diversifying product portfolios. Awareness-building campaigns were seen as critical, especially in educating customers about concepts like upcycling, which are not widely understood. Participants also noted that communicating higher environmental and social impacts could reduce customer acquisition costs and strengthen brand loyalty, aligning customer values with the company mission. Recognising the role of consumer behaviour in sustainable production and consumption, the SSF incorporates strategies for consumer engagement and awareness through branding and communication strategies that align consumer values with sustainability goals, promoting behavioural change toward responsible consumption.

4.5. Framework development: Iteration 2

The interview results informed several conceptual and visual improvements to the SSF. Consequently, some elements of the SSF were merged, and new elements emerged, which resulted in the development of the second iteration of the SSF (see Fig. 4). The refined framework represents a more user-friendly and conceptually robust tool for scaling SBMs, integrating insights from academic literature review, experts' interviews, and subsequent analysis.

In particular, modifications were made based on the participant's key insights to enhance usability and clarity while maintaining effectiveness. The refinements include:

- **Conceptual Refinements:** Several structural changes were made to the core elements of the framework to reflect the interconnected nature of certain components. The "supply chain optimisation" and "production and resource optimisation" were combined into a single unit due to their strong interdependence, as identified during analysis. Additionally, a new element, "target markets", was introduced to the second layer of the framework, which reflects the importance of market exploration and expansion strategies.
- **Simplification vs Effectiveness:** To further streamline the framework, the final layer, previously comprising separate delivery and capture mechanisms, was restructured into different strategies, as can be seen in Fig. 4. This ensures that the proposed framework remained accessible while retaining its strategic utility.
- **Visual Enhancements:** Participants frequently noted that the framework's complexity could be reduced with visual enhancements to improve intuitiveness. To address this, the updated framework employs colour shades and line widths to create a visual hierarchy between layers. Regarding accessibility and inclusivity, a greyscale design was adopted, based on Rigden's (1999) research on colour-blind-friendly design.

4.6. Analysis of the business case

Overall, the SSF received positive feedback, participants highlighting its systematic approach, user-friendliness, and ability to foster structured, coherent scale-up strategies for businesses. During the workshop, the SSF enabled participants to develop strategies addressing operational weaknesses, financial challenges, and consumer engagement.

Moreover, this practical application demonstrated the SSF's utility in addressing real-world sustainability challenges. Moreover, the workshop participants' evaluations of the seven parameters introduced in the method section are presented below.

- **Understandability:** Participants found the framework comprehensible, with its elements and relationships clearly outlined. Its intuitive design allowed participants to focus on the business case without seeking clarification, demonstrating that the framework was comprehensive for its intended audience.
- **Usability:** The framework was practical and user-friendly, acting as an anchor to focus discussions: "*Very good anchor points to brainstorm. It helps in articulating thoughts and ideas. Also effective in aligning business needs with design requirements*" (Anonymous Survey). Teams developed coherent strategies by first addressing familiar elements (vision and value propositions) and later filling gaps iteratively. This approach suggests the framework's potential for enhanced flexibility in future iterations.
- **Flexibility:** Participants successfully adapted the framework to the different scale-up challenges. Its structure did not constrain the solution space, affirming its versatility in addressing the complexities of SBMs.
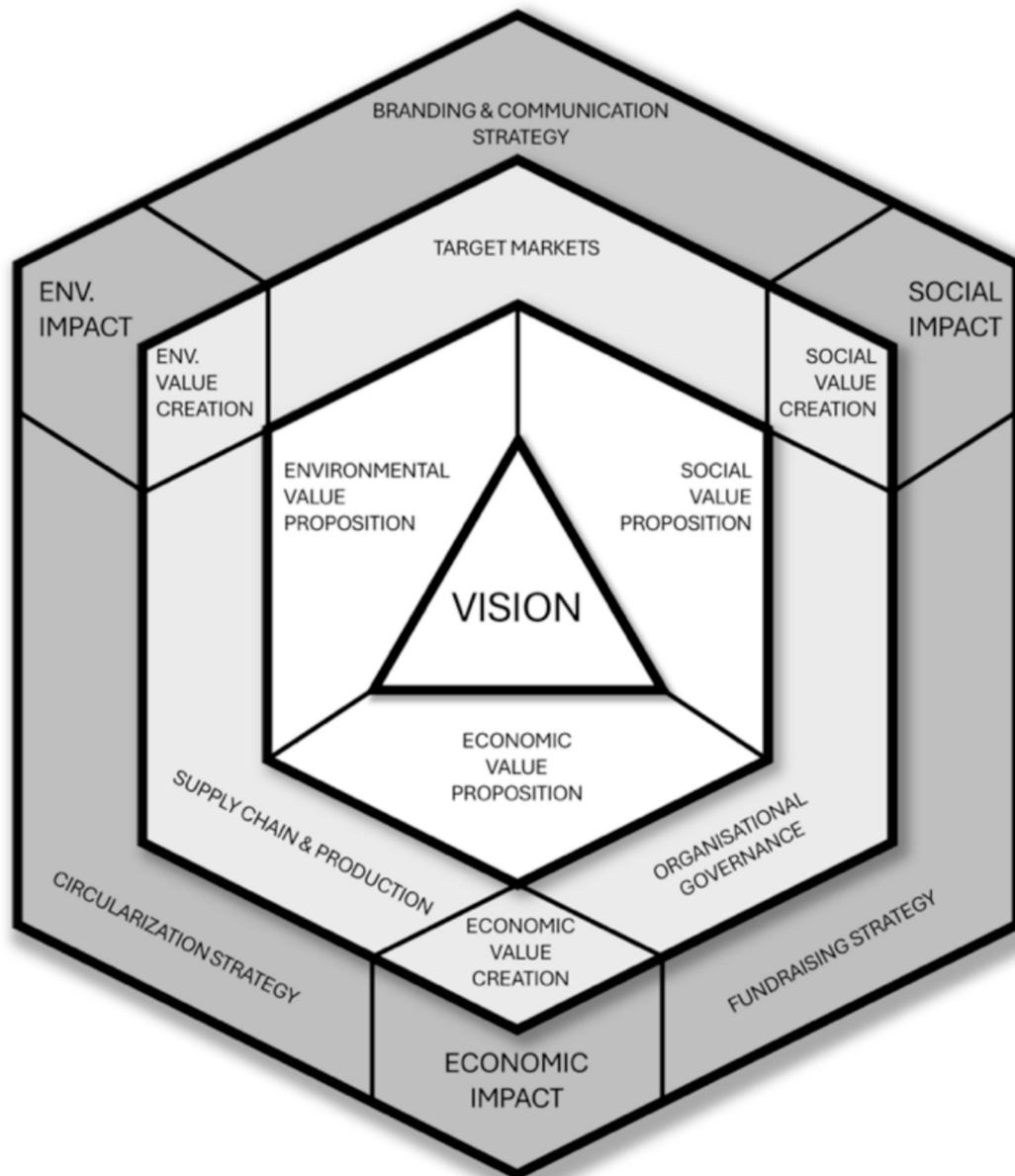
Fig. 4. The sustainability scale-up framework – iteration 2.
Note: ENV IMPACT = Environmental Impact, ENV. Value Creation = Environmental Value Creation.

- **Creativity:** While the framework encouraged grounded, real-world solutions, participants noted its limited ability to promote highly innovative or unconventional ideas. However, it could effectively be validated and integrate "*Wild*" *ideas into practical strategies, balancing creativity with feasibility: "…the framework helps as an anchor. It arranges your thoughts and keeps you tethered to the question at hand*" (Anonymous Survey).
- **Coherence:** Based on the results of the presentations, it was observed that SSF's structure facilitated the generation of consistent and actionable strategies. Participants appreciated its ability to align various elements cohesively, ensuring their solutions were implementable and well-integrated.
- **Applicability:** This was judged based on the final team presentations, and SSF's relevance was confirmed as it effectively addressed all key challenges in the case company. Its layered structure accommodated diverse aspects of scaling up, demonstrating its practical utility in real-world contexts.

- **Structural Consistency:** The layered approach, SSF's layered design and the directionality from vision to impact were well-received: "*Comprehensive and challenging business case, the framework looks very generalisable and relevant for early-stage sustainable startups*" (Anonymous Survey). However, participants treated elements within layers independently, rather than leveraging the interconnections between them, such as linking market targeting with social and environmental value creation.

In addition to this qualitative data, quantitative data was also collected through a short anonymous survey, where participants rated the framework based on the seven parameters on 5-point Likert scale. The result of the survey is presented as a Likert chart (Fig. 5), showing that most participants rated the framework as "Good" and "Very Good" across majority of the parameters.

To improve the framework's usability and accessibility, subtle visual modifications were implemented, and "Directions for Use" was developed based on the observations and feedback from the workshop. A
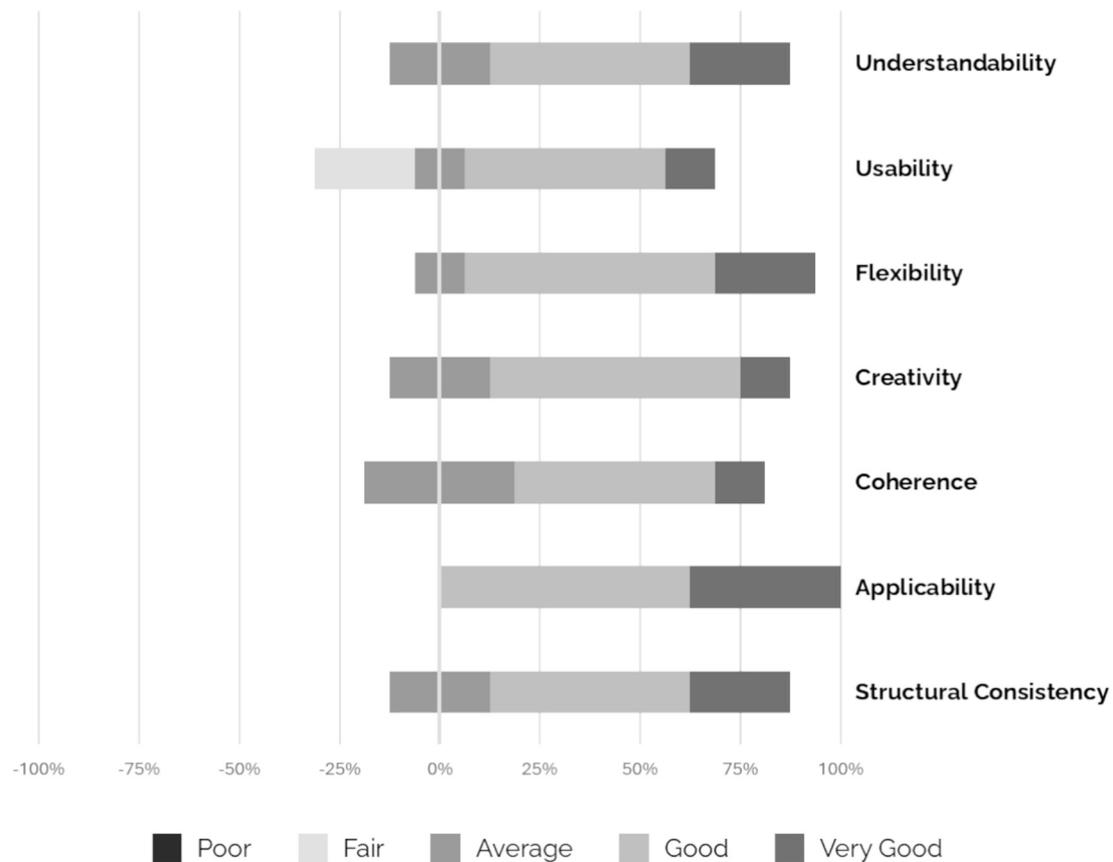
Fig. 5. Likert chart of business case workshop survey data.

detailed description of these improvements is discussed in the next section, which presents the final iteration of the SSF and its directions of use.

4.7. Final framework and its directions of use

The business case workshop validated the elemental alignment, structure and vision-driven approach of the SSF. The participants followed a layered approach while developing strategies with the SSF, pointing out that the lines between the layers informed a stronger hierarchy than the ones dividing the elements in the same layer. To promote this layered approach, minor visual modifications were made to the framework to stimulate users to focus more on the interconnectedness of the elements in each layer and take a directional approach while using the SSF. The result in the final iteration of the SSF is shown in Fig. 6. Along with the final framework, the need for "directions for use" was identified for guiding its users to navigate the framework's complexity.

In the next sections, we elaborate the final elements and layers of the SSF, diving deeper into their definitions and context of use, along with a detailed guideline of how the SSF can be used in practice. This guideline describes the process of scaling a SBM as an iterative one, in line with the strategic design principles from the work of Calabretta et al. (2016). The direction of use is illustrated in Fig. 7 and explained step-by-step in the following sub-sections.

4.7.1. Envisioning the scale-up

The first step focuses on creating or revisiting the business's vision to ensure it is both tangible and scalable. The vision element represents the desired state the SBM wants to achieve. It integrates the SBM's sustainability goals with its strategic worldview, aligning internal and external stakeholders toward a shared purpose. Apart from integrating

the social, environmental and economic stakeholder values (Massa et al., 2017; Velter et al., 2022) in this vision, it is also important to make it tangible.

4.7.2. Evaluating the existing model

The second step, users populate the SSF with details of their existing SBM, moving through its layers from the value propositions to the impacts layer. Enlisting and bringing together these elements can help them identify gaps, inefficiencies, and bottlenecks for scaling up, giving them a holistic view of their SBM. Based on expert insight from the interviews, a one-page explainer of the framework was created, an overview of which is discussed below.

In this step, the **value propositions** articulate the unique value the products or services of the SBM provide to its customers, beneficiaries and the environment. For SBMs, value propositions are crucial as they not only assist in attracting and retaining customers by clearly highlighting the distinct benefits offered but also effectively convey the sustainable values they provide to their stakeholders (social value propositions) and the environment (Patala et al., 2016). As the SBMs scale, the complexity of their sustainable solutions can increase, making it harder to communicate a clear and concise value proposition. The three value proposition elements in this layer are essential to create structure and clarity, and a holistic balance of these three is crucial for a successful scale-up strategy. The value tensions that arise due to the conflict between these values is a major theme discussed in the literature (Glinik et al., 2024) and in the qualitative interviews performed during this research.

Moreover, **value creation mechanisms** are the fundamental processes and activities through which SBMs can generate their value propositions. These mechanisms involve the development of unique products or services, enhancement of customer experiences, using environmental materials and innovation in financial and BMs. This layer
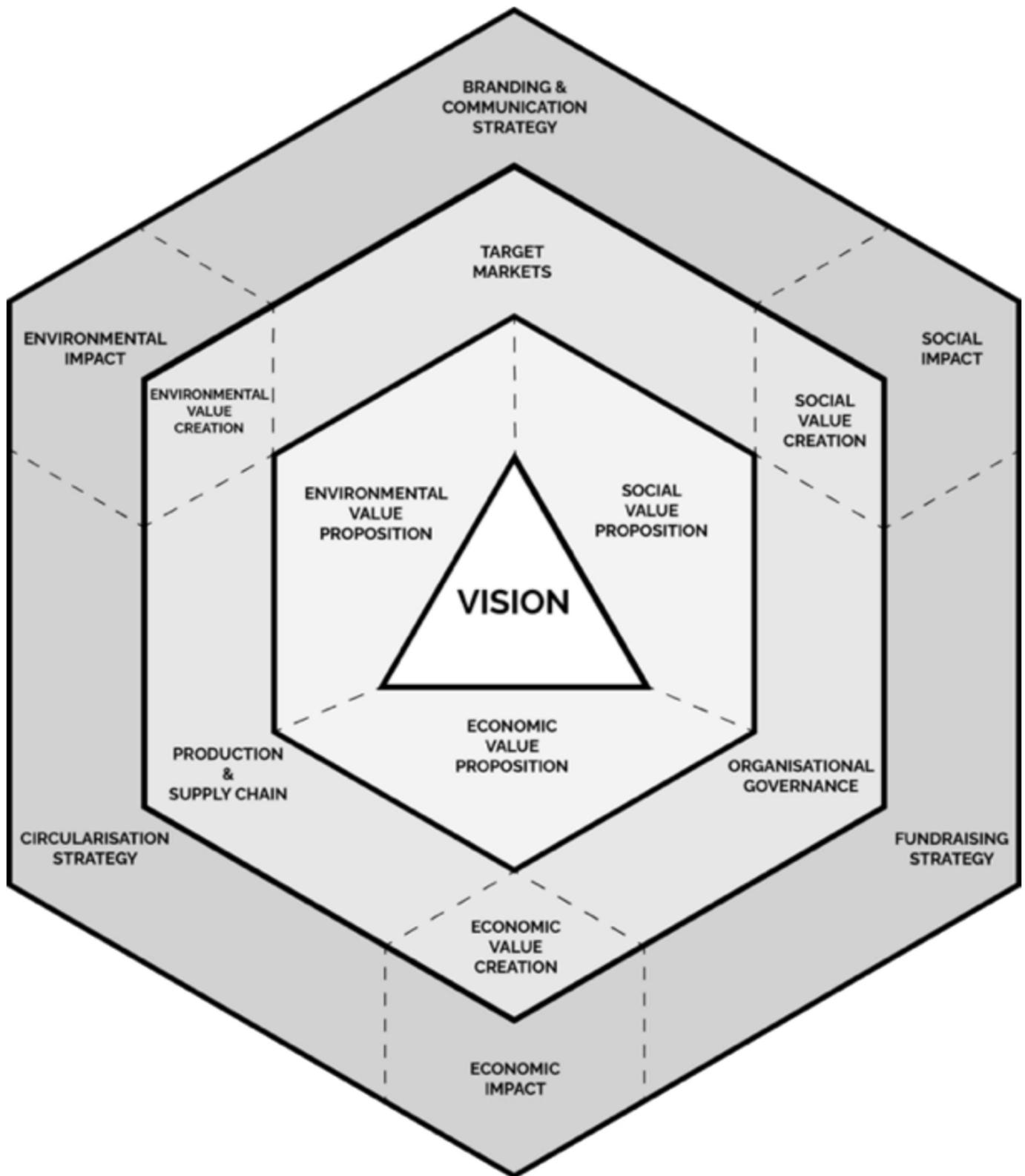
Fig. 6. The sustainability scale-up framework – final iteration.
Note: ENV IMPACT = Environmental Impact, ENV. Value Creation = Environmental Value Creation.

of the framework incorporates the internal infrastructure and helps to create coherency in the scale-up strategies.

This layer has two essential parts. The first part is about the environmental, social and economic value creation, which essentially describes the product or service features, policies and revenue model required to create the values promised in the value propositions (Lüdeke-Freund et al., 2020). The second part of this layer deals with the infrastructure of the SBMs that helps them complement the value-creation mechanisms and find gaps in their infrastructure through the three sub-elements:
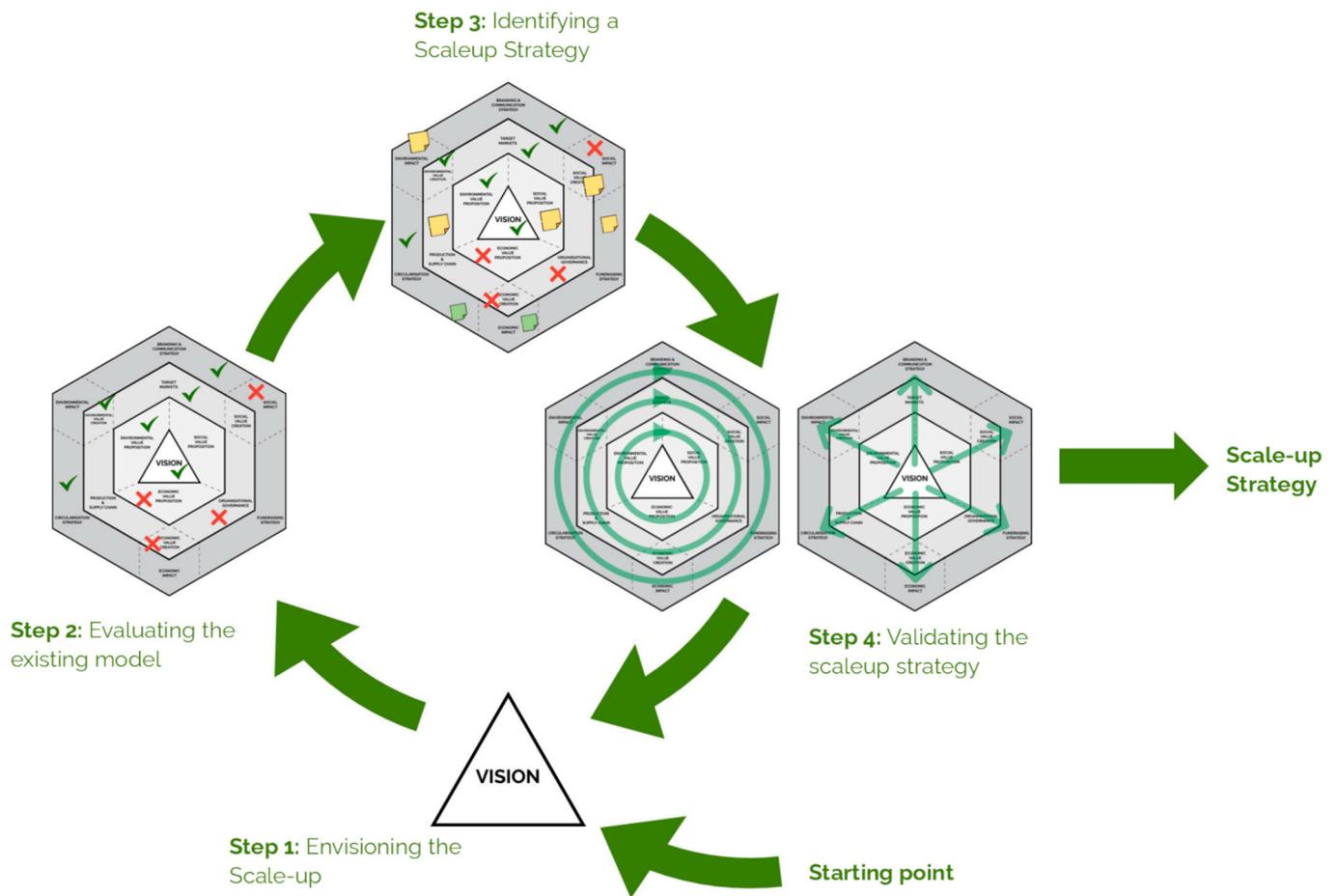
Fig. 7. Directions of use of SSF.

4.7.2.1. Target markets. Target markets refer to the specific group of consumers or organisations the business aims to reach by scaling up. This element is crucial if the business plans to create or increase demand for its offerings by expanding its current market or entering new ones.

4.7.2.2. Supply chain and production. This element involves the systems and processes that enable the SBM to produce and deliver its offerings to its markets. This element is crucial if the business already has a substantial demand for its offerings and faces a bottleneck on the supply side.

4.7.2.3. Organisational governance. This refers to the structures, processes, and culture that determine how an organisation is directed, administered, and controlled. It is crucial for SBMs to form resilient organisational structures while scaling to ensure that all their functions run as intended. Good governance ensures that the business's activities align with its values and vision and that resources are managed responsibly for the benefit of all stakeholders (Zurkinden, 2022).

The final layer of the SSF also consists of **impacts** and **strategies**. This layer focuses on what effect the business has on the external stakeholders and context. The first part consists of impacts which link the SBM's core vision and the scale up strategy. Impacts refer to the measurable outcomes that SBMs aim to achieve through scaling up. These evolve from the three pillars of the value creation layer, categorised as environmental, economic, and social impacts. These impacts are quantitative metrics, just as carbon footprint (environmental impact), number of beneficiaries helped (social impact) and valuation (economic impact), which act as essential targets guiding the scale-up strategies.

The strategy elements form the other part of this layer, which focuses on the comprehensive and actionable plans designed for the SBM to scale up. These strategies help SBMs reach more customers, create partnerships and find potential investors to scale up. These consist of three elements: circularisation strategy, branding and communication strategy and fundraising strategy.

- **Circularisation Strategy:** This element refers to the design and implementation of strategies that minimise waste and maximise the reuse and recycling of resources throughout the product life cycle (Geissdoerfer et al., 2017; Kirchherr et al., 2017). For SBMs, investing in a robust circularisation strategy is important while scaling up as it helps them manage their increasing waste and costs through strategic partnerships and collaborations (Santa-Maria et al., 2021).
- **Branding and Communication Strategy:** This element encompasses the development of a strong brand identity and the effective communication of that identity to the market. For SBMs, investing in an effective Brand and Communication Strategy is not just about creating a logo or a tagline; it is about creating awareness about their business and narratives that inspire engagement, loyalty, and growth.
- **Fundraising Strategy:** This element involves strategies that would help a business secure the financial resources it needs to scale up. It includes identifying potential sources of funding, such as grants, loans, equity, crowdfunding, or donations, and developing a compelling pitch that showcases the value propositions and impacts of the SBM. A fundraising strategy is important for the scale-up process because it enables businesses to overcome the financial

barriers and risks that often hinder the adoption and expansion of circular business models (Aranda-Usón et al., 2019). A good strategy also helps build trust and credibility with stakeholders such as customers, investors, partners, and regulators, who are essential for the success and sustainability of the business.

4.7.3. Identifying a scale-up strategy

The third step entails ideation sessions to address the gaps and bottlenecks from the previous step by involving multidisciplinary stakeholders and departments. The framework fosters the visualisation of values and value tensions, generating insights and actionable scaleup strategies. Based on the holistic analysis of the literature, qualitative interviews and the business case workshop, a non-exhaustive set of questions is created to probe the stakeholders to identify untapped opportunities to scale their SBM based on their vision, see Table 7.

4.7.4. Validating the scale-up strategy

The final step involves validating the SBM and scaleup strategies by assessing their coherence across two dimensions (shown in Figs. 8a & 8b):

- **Radial Coherence:** To ensure alignment and consistency within the elements of each layer of the SSF, addressing value tensions within the layers (Fig. 8a).
- **Axial Coherence:** To examine the integration of social, environmental, and economic value chains across the SSF's layers to identify and resolve gaps (Fig. 8b).

The iterative nature of the SSF aligns with the strategic design principles suggested by Calabretta and Gemser (2017), enabling continuous refinement of the SBM. By incorporating feedback and iterating through the steps, businesses can develop strategies that are

Table 7
Probes for innovating scale-up strategies using the SSF.

Sustainability pillars	Value propositions	Value creation mechanisms	Impacts
Social	1. How does the "desired behaviour" improve community wellbeing? 2. Which customer and beneficiary needs does our 'desired state' satisfy?	1. How do we influence people to adopt the "desirable behaviour"? 2. What activities would help us to deliver our value propositions to our customers and beneficiaries?	1. How do our value-creation mechanisms affect society? 2. How can we track and measure the "desired experience"?
Environmental	1. How does the "desired behaviour" contribute to environmental conservation? 2. In what ways does the "desired experience" encourage eco-friendly habits?	1. What changes can we make to our product/service to make it more environmentally friendly? 2. How do we create the "desired experience" that encourages eco-friendly behaviour?	1. How does the "desired experience", "desired behaviour" affect the environment? 2. How can we benchmark the environmental footprint of our "desired state" with the existing state of the world?
Economic	1. How does the "desired behaviour" drive economic growth or stability? 2. What economic challenges are we solving through the "desired experience"?	1. How do we earn money from our sustainable initiatives? 2. How can our business model sustain long-term profitability and growth	1. What is our valuation goal? 2. How much revenue can our business model generate?

adaptable to dynamic market conditions and their sustainability challenges.

The SSF and its "***directions of use***" were further validated with two participants from the initial qualitative interview (Participant 1 and Participant 3) to check its validity in real-world applications (see Supplementary information, Section S2). The participants appreciated SSF's ability to bridge vision and strategy, offering a comprehensive and layered structure that aligns sustainability objectives with operational and strategic elements. The framework's vision-driven approach was considered a new perspective to look at SBM scaling, which was a level deeper than the traditional value driven models.

Participant 1 also emphasised the need to update the vision over time, which is a vital part of the iterating nature of SSF's application: "*I think that having a vision is, yeah, it is paramount to start. But I also think that a vision should change with time... And if we want to make an impact, then we probably have to change and evolve. For the next challenge, I think that visions are just very important as starting points to give you a goal, to give you a start to say, but you should also be considerate of the outside world and think if your vision still fits*".

Participants also found the multi-dimensional aspect of environmental, social, and economic value chains particularly valuable, as it directs businesses to address sustainability principles holistically. While the framework was deemed actionable and clear, participants also identified certain areas of improvement, like using guides and workshops to improve its accessibility for stakeholders with limited knowledge of SBMs. Additionally, integrating the personal values of internal stakeholders emerged as a critical aspect of scaling SBMs, as participants 3 reflected: "*So it is not only expectations from how the companies going to but also expectations from each other. Like how is working together going to continue? How does everyone see working with the startup? … So, it is also expectations from each other…. What if someone wants to sell their assets and leave?*". Although these personal values of internal stakeholders and founding teams of a scaling business are interesting aspects, they were not integrated into the SSF to maintain a balance between the utility and complexity of the framework.

5. Discussion

The development and iterative refinement of the **SSF** demonstrate its potential as a transformative tool to address the multifaceted challenges inherent in scaling SBMs. Drawing on insights from expert interviews, business case workshops, and validation exercises, this research provides a robust integration of theoretical advances and practical requirements, positioning the SSF as both conceptually and operationally useful. Central to the SSF's strength is its ability to bridge theoretical advancements in SBM with actionable guidance for practitioners. By aligning a unified vision approach with the operational and strategic elements, the SSF supports businesses in addressing the complex trade-offs among economic, environmental, and social objectives during scaling. Its vision-driven perspective fosters a coherent integration of sustainability principles throughout the scale-up process, a feature that participants identified as a key innovation enhancing strategic alignment across diverse stakeholders.

The SSF's layered architecture, including value propositions, value creation mechanisms, and impact strategies, offers a comprehensive and adoptable pathway for scaling SBMs. The findings highlight SSF's effectiveness in addressing critical operational challenges such as production scalability and supply chain optimisation while maintaining sustainability alignment. The inclusion of elements such as targets markets and the consolidation of interdependent components reflects the framework's flexibility to accommodate different business contexts. Beyond serving as a strategic planning tool, the SSF also functions as an effective communication tool, facilitating stakeholder engagement such as investors, partners, and internal teams.

While the SSF was acknowledged for its clarity and usability, participants' feedback indicated opportunities for further refinement,
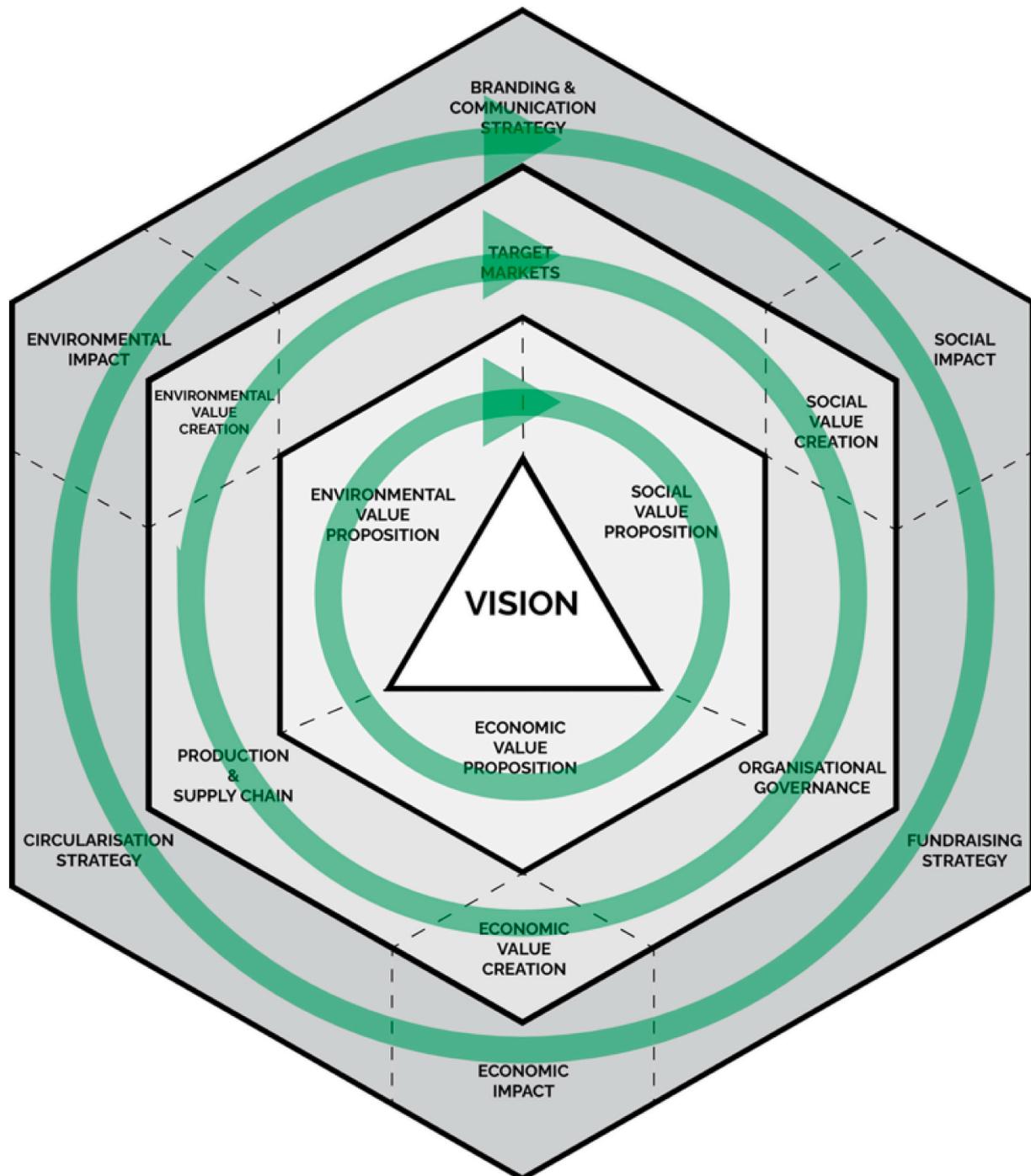
a

Fig. 8a. Validation of SSF: Radial coherence.

particularly in enhancing the visual hierarchy and adopting inclusive design principles. A notable challenge remains in encouraging users to perceive and leverage interconnections among elements within and across layers. Addressing this requires the development of improved user guidance and training materials to promote holistic engagement with the framework, thereby maximising its integrative potential.

Balancing value tensions across economic, environmental, and social dimensions remains one of the most significant challenges in scaling SBMs (Kwasi Sampene et al., 2023; van Bommel, 2018). Some other significant challenges for scaling SBMs include aligning diverse stakeholder values, adapting to uncertain and dynamic market conditions without compromising core principles, and securing partnerships that uphold sustainability objectives.

The SSF explicitly addresses this challenge by offering a structured approach to identify, understand, and resolve these tensions, ensuring that scaling strategies remain firmly aligned with the business's core sustainability vision. Additionally, the framework emphasises stakeholder engagement as a vital enabler of successful scaling. Our research indicates that incorporating personal values of internal stakeholders into the scaling process enhances organisational coherence, suggesting future opportunities for integrating participatory workshops and complementary tools within the SSF ecosystem.
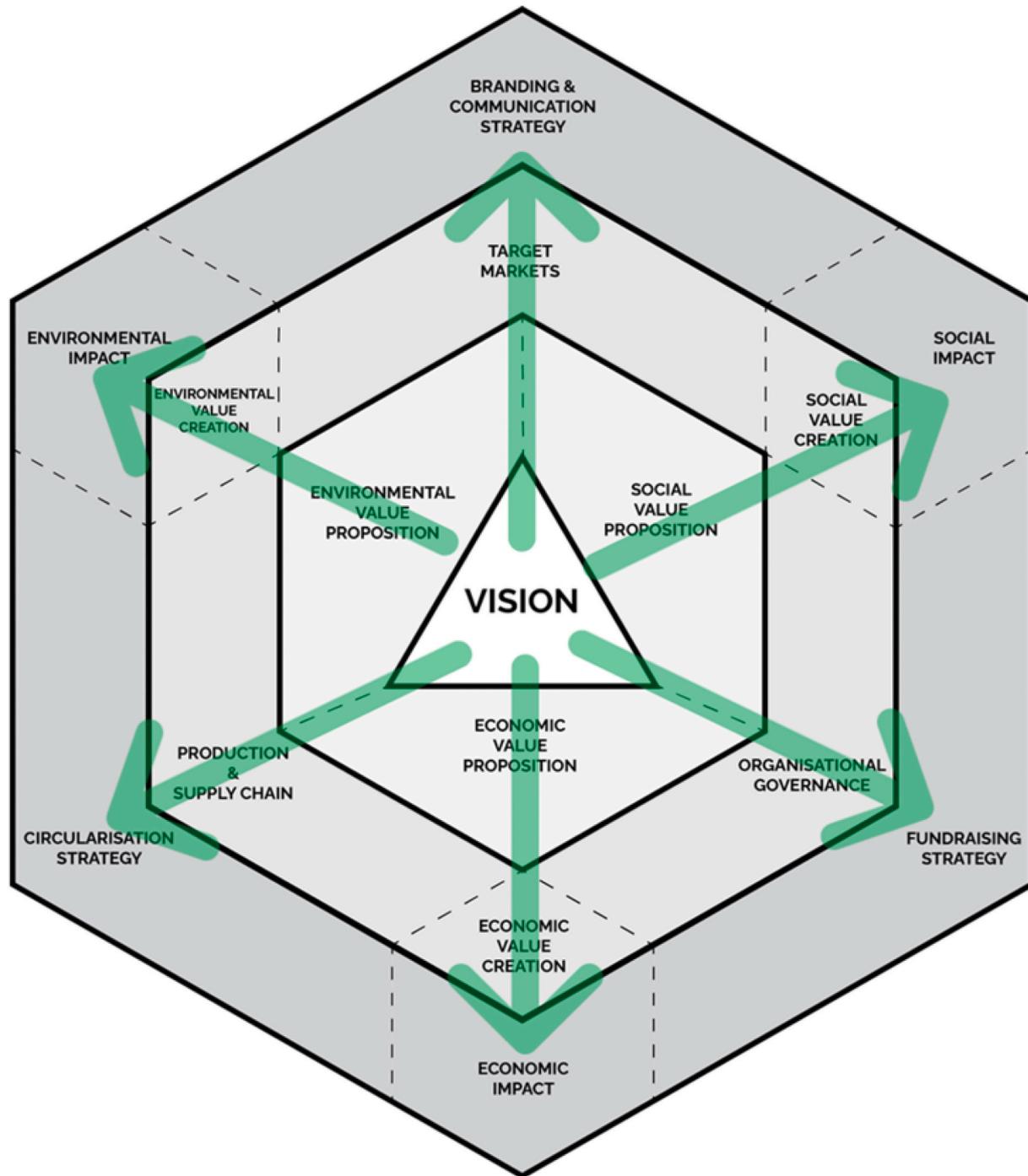
b

Fig. 8b. Validation of SSF: Axial coherence.

In summary, the SSF contributes a novel, vision-driven, and operationally grounded framework that can empower sustainable businesses to scale effectively while maintaining their environmental, social, and economic commitments.

5.1. Theoretical contributions

This research makes several important contributions to the academic fields of SBMs, scalability, and strategic design. For example, by explicitly integrating strategic design principles within the SBMs, the SSF extends existing BM frameworks (Bloom and Chatterji, 2009; Joyce and Paquin, 2016; Upward and Jones, 2016), beyond static conceptualisations to a dynamic, iterative, and vision-driven tool that supports operationalisation and scale-up processes. This bridges a critical gap between theory and practice, offering a comprehensive lens to understand how sustainable businesses can address the complex value tensions and stakeholder dynamics that limit scaling. Moreover, the SSF advances theoretical understanding of value tensions by positioning them not merely as challenges (van Bommel, 2018) but as integral drivers for strategic alignment and innovation within SBM scaling processes. By embedding a unified vision at the core of the framework, this research highlights the centrality of aligning economic, social, and

environmental goals in an interconnected and systemic manner, a perspective that enriches the sustainability transition literature.

The SSF also incorporates the desirability, feasibility, and viability dimensions, which are foundations of design thinking (Brown, 2008), in SBMs at their early development stage. This proactive approach is crucial for mitigating financial and operational bottlenecks when scaling sustainable businesses. As illustrated in Fig. 9, desirability is embedded within the target markets and branding and communication strategy, enabling businesses to identify customers whose needs align with their offerings and to develop effective strategies for reaching and engaging with these audiences. Viability is achieved through the fundraising strategy and organisational governance elements that form the financial and organisational backbone of the scale-up strategies, while the feasibility aspect is addressed by the production and supply chain and circularisation strategies, which integrate the capabilities, resources and partnerships to operationally execute the scale-up. It is worthwhile mentioning that the SSF directly supports SDG 12 (Responsible Consumption and Production) by enabling businesses to scale their sustainable practices while maintaining alignment with economic, environmental, and social objectives. Additionally, the framework contributes to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 13 (Climate Action) through its focus on innovation and environmental impact reduction.

5.2. Practical implications

The SSF offers practical insights for the businesses, investors, policymakers, and scholars, providing a structured approach and actionable framework to promote and support the scaling of SBMs. For businesses, we highlight the SSF's utility in strategic alignment and operational planning during scale-up. For investors, the framework offers a structured tool for assessing scalability potential and sustainability integration. Policymakers can leverage the SSF insights to design supportive regulatory frameworks that encourage sustainable scaling. Finally, for the academic community, the SSF provides a foundation for further theoretical development and empirical testing in the intersection of SBM literature and scalability. Overall, the SSF helps various stakeholders to design scale-up strategies for SBMs, in particular, the practical implications can be realised as:

- **An Assessment Tool:** Provides a comprehensive and systematic approach to evaluate businesses' scalability and sustainability
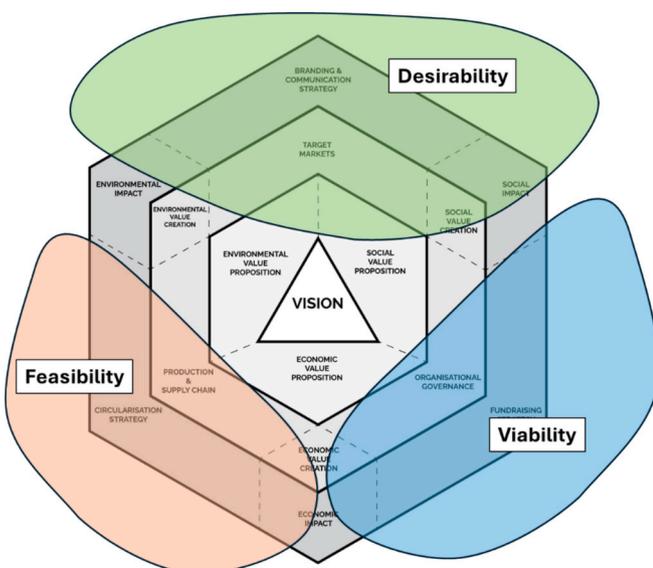
potential, identify gaps and challenges, map their current BM, and prioritise actions aligned with sustainability goals.

- **A Strategy Creation and Innovation Tool:** Offers guidelines to design and implement scalable SBMs through an iterative four-step approach that facilitates the co-creation of strategies considering social, environmental and economic values.

- **A Collaboration and Communication Tool:** Facilitates collaboration and communication among stakeholders such as managers, investors, customers, suppliers, partners, employees, regulators, and society, and helps businesses articulate their vision, values, social and environmental impact, competitive advantage, and financial viability. It facilitates the selection of partners, resources, and capabilities to sustain scale-up while enhancing sustainability performance.

- **A Research Tool:** Helps researchers and policymakers in understanding SBMs, designing appropriate policies and regulations, and supports investors and researchers in evaluating and comparing scalability and sustainability potential across businesses. These applications further strengthen the role of strategic designers to innovate scale-up strategies, facilitate collaborations, and contribute to the SBM scaling literature and policy development.

Moreover, by providing clarity through its layered architecture and directionality, SSF enables multidisciplinary teams, including entrepreneurs, managers, designers, and investors, to systematically align their efforts around a shared vision, mitigating conflicts and accelerating coherent scale-up. The findings of this research guide the design of supportive regulatory environments that foster sustainability and innovation in production and consumption systems.

5.3. Limitations

While the SSF demonstrates significant relevance and utility, several limitations were identified. Firstly, during the business case workshop, participants noted that the SSF's capacity to foster highly innovative or unconventional ideas was limited. Although the framework effectively grounds creative solutions within a practical structure, this suggests a potential trade-off between innovation and operational focus that warrants further exploration. Secondly, the exclusion of the personal values of stakeholders (an interesting direction identified in the qualitative interviews) represents an important area for future exploration. Qualitative interviews highlighted the critical influence of individual and cultural factors on scaling SBMs, and integrating this dimension could enhance the SSF's ability to address human and organisational dynamics more fully.

Thirdly, the relatively small sample size of the empirical participants limits the generalisability and validity of the findings. The results may not fully capture the diversity and complexity of the complete business ecosystem and the sustainability domain. Future research should incorporate larger, more diverse samples and employ mixed methods, such as surveys, longitudinal studies, and triangulation, to strengthen reliability and validity. Fourthly, the current research primarily draws from literature reviews, qualitative interviews, and a business case workshop focused on SBMs and scaling processes, rather than empirical evaluation of the long-term outcomes and performance of SBMs scaled using the SSF. Longitudinal studies assessing real-world implementation and impact are necessary to validate and refine the framework further.

Additionally, balancing framework comprehensiveness with usability remains a challenge. Ensuring that the SSF remains accessible and actionable without oversimplifying complex sustainability dynamics requires ongoing user-centred refinement. Finally, the rapidly evolving nature of sustainability challenges and BMs suggests that the SSF will require continuous updates to maintain its relevance. Furthermore, the

Fig. 9. The desirability, feasibility and viability perspective of SSF.

role of digitalisation and emerging technologies in scaling SBMs was not deeply explored in this study, representing a promising avenue for future research.

6. Conclusions

This research investigates the scalability of SBMs using strategic design principles and develops a comprehensive framework labelled as the ***Sustainability Scale-Up Framework***. The SSF attempts to resolve the value tension with a vision-driven approach, which adds a deeper layer to the traditional value-driven BM approach by aligning operational strategies with its long-term sustainability goals. The SSF provides a structured and iterative approach derived from strategic design principles. The directionality and inter-relationships between the elements and layers help the stakeholders understand and align their diverse values, whereas the iterative nature of the framework adds resilience to the SBM by integrating the changing external conditions with every step. In addition, the incorporation of desirability, feasibility, and viability dimensions early in the scaling processes, contributes novel insights into how sustainable businesses can proactively anticipate and manage operational and financial challenges. This proactive integration enhances theoretical models by emphasising scalability as a multi-dimensional construct involving market fit, operational capacity, and financial sustainability. This research contributes to the growing literature on strategic design as a significant enabler for sustainability transitions, demonstrating its value both in initial innovation stages and in critically guiding businesses through complex scale-up phases. By doing so, it opens new avenues for future research on iterative, participatory frameworks that balance systemic change with pragmatic business needs.

Future research could focus on conducting longitudinal studies and action research that track and measure the outcomes and impacts of SBMs applying the SSF over time. While the current literature mainly focuses on the conceptual design, archetypes and implementation of SBMs, this research opens new avenues for exploring the scalability of SBMs. Future research could build on this foundation by refining the SSF in close collaboration with practitioners and evaluating its usefulness and usability across diverse contexts and sectors. An interesting direction would be to develop and integrate tools aligned with each level and element of the framework, reinforcing their role in strategy formulation, especially for scaling SBMs. We also suggest exploring the integration of personal stakeholder values and cultural dimensions to better address human factors in scaling SBMs. Future research can also focus on further empirical validation across diverse sectors and the development of practical toolkits to support broader adoption and user engagement.

CRediT authorship contribution statement

Anshuman Panigrahi: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Conceptualization. **Shahrokh Nikou:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Conceptualization. **Giulia Calabretta:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization.

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Declaration of competing interest

The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.spc.2025.08.021.

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