From Constraint to Capability: Sustainable Start-ups in Emerging Economies

Abstract

Sustainable start-ups play a crucial role in addressing environmental and social challenges, particularly in emerging economies characterized by institutional complexity. Drawing on Dynamic Capability Theory and Institutional Theory, this study examines how sustainable start-ups in India develop dynamic capabilities across the start-up and scaling-up stages of venture growth. Using a qualitative research design, data were collected through in-depth interviews with founders and senior decision-makers from ten sustainability-oriented ventures operating across diverse sectors. The data were analyzed using thematic analysis, enabling the identification of processes related to sensing, seizing, and transforming capabilities. The findings show that sensing capabilities emerge through close engagement with sustainability challenges embedded in local contexts, often supported by informal research and experimentation. Seizing capabilities involve mobilizing resources and legitimacy while responding to normative pressures and market expectations surrounding sustainable products. Transforming capabilities become critical as ventures scale, requiring technological adaptation, process formalization, and continuous navigation of regulatory constraints. Overall, the study demonstrates that dynamic capabilities in sustainable entrepreneurship are shaped by ongoing interactions with institutional environments rather than linear, purely market-driven processes. The findings contribute to a deeper understanding of capability development in sustainability-oriented ventures and offer insights for entrepreneurs and policymakers seeking to support sustainable innovation in emerging economies.

Introduction

Sustainable entrepreneurship has gained increasing scholarly and policy attention as a means of addressing environmental degradation and social challenges while fostering economic development (Dean & McMullen, 2007; Shepherd & Patzelt, 2011). In emerging economies such as India, sustainable start-ups are particularly significant given rapid industrialization, resource constraints, and persistent institutional challenges related to regulation, market development, and social norms. While prior research has examined why entrepreneurs engage in sustainability-oriented ventures, less is known about how such ventures develop the organizational capabilities needed to survive and scale within institutionally complex environments. This paper addresses this gap by examining how sustainable start-ups in India develop dynamic capabilities across different stages of venture growth.

Dynamic Capability Theory provides a useful framework for understanding how firms adapt to changing environments through processes of sensing opportunities, seizing them, and transforming organizational resources (Teece et al., 1997; Teece, 2007). Recent studies have extended this framework to sustainability-oriented firms, highlighting the role of dynamic capabilities in enabling long-term environmental and social value creation (Hart 1995; Knoppen & Knight, 2022). However, much of this literature is grounded in developed economy contexts and often treats institutional environments as relatively stable. In contrast, emerging economies are characterized by institutional voids, fragmented regulations, and evolving market norms, which shape entrepreneurial behavior in distinctive ways (Khanna & Palepu, 2010).

Institutional Theory further emphasizes that entrepreneurial action is embedded within formal regulatory systems, normative expectations, and shared cognitive beliefs (Scott, 2013). In the Indian context, sustainable entrepreneurs must navigate misaligned regulations, limited policy support for upcycled or innovative products, and widespread misconceptions regarding the cost and value of sustainability-oriented offerings. Prior research suggests that such institutional conditions influence opportunity recognition and resource mobilization (Mair & Marti, 2009), yet empirical work integrating institutional theory with dynamic capability processes in sustainable entrepreneurship remains limited.

This study responds to calls for more context-sensitive and process-oriented research on sustainability and entrepreneurship in emerging economies (Hoskisson et al., 2013).

To address these gaps, this study adopts a qualitative research design based on in-depth interviews with founders and senior decision-makers from ten sustainable start-ups operating across diverse sectors in India. Data were analyzed using thematic analysis, following a systematic coding process that identified patterns related to sensing, seizing, and transforming capabilities across the start-up and scaling-up stages (Braun & Clarke, 2006). Secondary data sources, including company documents and publicly available materials, were used to triangulate interview data and enhance analytical rigor (Yin, 2018).

The findings reveal that institutional conditions strongly shape dynamic capabilities in Indian sustainable start-ups. Sensing capabilities emerge through close engagement with environmental and social problems embedded in local contexts, often reinforced by informal research and experimentation. Seizing capabilities involve mobilizing resources and legitimacy while responding to normative pressures surrounding sustainable products and pricing. Transforming capabilities become critical as ventures scale, requiring technological adaptation, process formalization, and continuous navigation of regulatory constraints. Together, these findings demonstrate that dynamic capabilities in sustainable entrepreneurship evolve through ongoing interaction with institutional environments rather than through linear or purely market-driven processes.

By integrating Dynamic Capability Theory and Institutional Theory, this paper contributes to a deeper understanding of how sustainable start-ups in emerging economies build adaptive capabilities across venture stages. The study offers insights for scholars, entrepreneurs, and policymakers seeking to support sustainability-driven ventures in institutionally complex contexts.

Theoretical Framework

This study is grounded in an integrative theoretical framework that combines Dynamic Capability Theory and Institutional Theory to examine how sustainable start-ups develop adaptive capabilities across venture stages in an emerging economy context. Together, these perspectives enable a nuanced understanding of how firms respond to environmental and social challenges and adapt to institutional complexity, regulatory uncertainty, and evolving market norms.

Dynamic Capability Theory and Sustainable Entrepreneurship

Dynamic Capability Theory explains how firms achieve and sustain performance in rapidly changing environments through their ability to sense opportunities, seize them, and transform organizational resources (Teece et al., 1997; Teece, 2007). Unlike operational capabilities, which focus on efficiency in stable contexts, dynamic capabilities enable firms to reconfigure resources and routines in response to environmental change. This theory has become central to strategic management research, particularly in contexts characterized by uncertainty and innovation (Helfat et al., 2009).

Recent scholarship has extended the dynamic capability perspective to sustainability-oriented firms, arguing that such capabilities are essential for addressing environmental and social challenges while maintaining economic viability (Hart 1995). Studies on "born sustainable" firms suggest that sensing sustainability-driven opportunities, seizing them through innovative business models, and transforming organizational processes are critical for achieving what has been termed sustainability advantage (Knoppen & Knight, 2022). However, much of this literature has focused on firms operating in relatively stable institutional environments, leaving open questions about how dynamic capabilities develop under institutional fragmentation and constraint.

Moreover, while dynamic capabilities research acknowledges environmental turbulence, it often treats the institutional context as a background condition rather than a central explanatory factor (Teece, 2018). This limits the framework's explanatory power in emerging economies, where

regulatory systems, market institutions, and social norms are evolving and unevenly enforced. Addressing this limitation requires integrating insights from Institutional Theory.

Institutional Theory and Entrepreneurial Action

Institutional Theory emphasizes that organizational behavior is shaped by formal regulations, normative expectations, and shared cognitive beliefs (Scott, 2013). From this perspective, entrepreneurs do not operate in a vacuum; rather, their actions are embedded within institutional environments that both enable and constrain strategic choices. In emerging economies, institutional environments are often characterized by institutional voids, where formal market-supporting institutions are weak or absent (Khanna & Palepu, 2010).

Prior research shows that entrepreneurs operating in such contexts must navigate regulatory ambiguity, legitimacy challenges, and socially embedded expectations (Mair & Marti, 2009). For sustainability-oriented ventures, these challenges are particularly pronounced, as new products and business models frequently fall outside existing regulatory classifications and challenge established norms regarding pricing, quality, and value (Pacheco et al., 2010). Institutional theory thus provides a critical lens for understanding how sustainability-driven entrepreneurs respond to pressures for legitimacy while pursuing innovation.

However, institutional theory has traditionally focused on conformity and stability, offering limited insight into how firms actively adapt and reshape their practices over time (Greenwood et al., 2011). This creates an opportunity to link institutional constraints with firm-level adaptation mechanisms, which is where dynamic capability theory becomes particularly relevant.

Integrating Dynamic Capability and Institutional Perspectives

Integrating Dynamic Capability Theory with Institutional Theory allows for a more comprehensive understanding of sustainable entrepreneurship as a process of adaptation within institutional constraints. Dynamic capabilities explain how firms act and change, while institutional

theory explains why certain actions are enabled or constrained. Recent studies have called for such integrative approaches better to capture the complexity of entrepreneurship in emerging economies (Hoskisson et al., 2013).

In this integrated framework, sensing capabilities involve not only identifying market opportunities but also recognizing sustainability challenges arising from institutional failures, such as inadequate waste management or environmental regulation. Seizing capabilities encompass resource mobilization and strategic commitment while addressing normative pressures and legitimacy concerns associated with sustainable products. Transforming capabilities involve reconfiguring organizational processes and technologies to align with evolving regulatory and policy environments as ventures scale.

By focusing on sustainable start-ups in India, this study builds on and extends prior research by empirically examining how dynamic capabilities are shaped by institutional conditions across venture stages. In doing so, it contributes to ongoing theoretical debates on the contextual embeddedness of dynamic capabilities. It responds to calls for more empirically grounded research on sustainability and entrepreneurship in emerging economies.

Methodology

This study investigates the following research question: How do sustainable start-ups in India develop dynamic capabilities across the start-up and scaling-up stages within an institutionally complex environment? This question is theoretically relevant because, while Dynamic Capability Theory explains how firms adapt through sensing, seizing, and transforming processes (Teece, 2007), it remains underexplored how these processes unfold in sustainability-oriented ventures operating under fragmented and evolving institutional conditions typical of emerging economies. From a practical perspective, understanding these processes is critical for entrepreneurs and policymakers seeking to support sustainable innovation in contexts characterized by regulatory uncertainty, normative ambiguity, and resource constraints. Given the processual, contextual, and exploratory nature of the research question, a qualitative case study approach is particularly well suited to capturing how dynamic

capabilities are developed and enacted over time (Yin, 2018). We begin this section with an overview of the case study approach and then outline the specific methodological choices adopted in this research; a more detailed account of the full methodology is provided in the appendix.

Research Design and Framework

The study adopts a multiple case study design, which enables in-depth examination of complex organizational processes while allowing for analytical comparison across cases (Eisenhardt, 1989; Yin, 2018). This approach is appropriate for theory-building research where existing theoretical explanations are incomplete or insufficiently contextualized. The research is guided by an integrative framework combining Dynamic Capability Theory and Institutional Theory. Dynamic capabilities— conceptualized as sensing, seizing, and transforming—provide the core analytical lens for examining how start-ups adapt and evolve (Teece, 2007). Institutional Theory complements this perspective by emphasizing how regulatory, normative, and cognitive institutions shape entrepreneurial behavior and organizational action (Scott, 2013). Together, these theories enable a contextualized understanding of capability development in sustainability-oriented ventures operating in emerging economies.

Case Selection

Cases were selected using purposeful sampling to ensure relevance to the research question (Patton, 2015). The sample consists of ten sustainable start-ups operating in India across sectors such as waste management, sustainable materials, recycling, agri-based innovation, and eco-friendly consumer products. All selected firms were founded with an explicit environmental and/or social mission and had progressed beyond the ideation stage, allowing examination of both start-up and early scaling dynamics. India provides a theoretically significant setting due to its combination of pressing sustainability challenges, entrepreneurial activity, and institutional complexity, making it a suitable context for extending existing theory (Khanna & Palepu, 2010).

Data Collection

Primary data were collected through semi-structured interviews with founders and senior decision-makers who were directly involved in strategic decision-making and operational development. Semi-structured interviews are well suited for exploring processes and meanings while allowing flexibility to probe emergent themes (Kvale 2009). Interviews focused on venture origins, opportunity recognition, resource mobilization, responses to institutional pressures, scaling challenges, and adaptation over time. Each interview lasted between 60 and 90 minutes and was audio-recorded and transcribed verbatim.

To enhance the richness and credibility of the data, secondary sources were used for triangulation, including company websites, media articles, sustainability reports, policy documents, and publicly available records. Triangulation strengthens construct validity by corroborating interview insights with independent sources (Yin, 2018). The details of the Start-ups are given in Table 1.

Table 1: Details of the Start-ups

S.No.	Start-ups	Key Focus Area	Establish-ment year	Firm Revenue (in USD)	Location
1	A	Banana Crop Waste–Based Leather Alternatives	2023	11,851	Jaipur, Rajasthan
2	B	Upcycled Products from Scrap Tyres	2019	4,14,783	Kanpur, Uttar Pradesh
3	C	Environmentally Sustainable Products	2020	17,778	Bangalore, Karnataka
4	D	Waste-Derived Brick Manufacturing	2020	8,295	Udaipur, Rajasthan
5	E	Plastic Waste Processing and Recycling	2020	2,48,859	Pune, Maharashtra
6	F	Eco-Friendly and Sustainable Gifting Solutions	2018	1,77,778	Delhi
7	G	Reusable Menstrual Health Products	2021	2,33,209	Agra, Uttar Pradesh
8	H	Recycled Products from Dry Coconut Leaves	2018	31,483	Bangalore, Karnataka
9	I	Manufacturer of Recycled Plastic Products	2022	5,830	Lucknow, Uttar Pradesh
10	J	Bamboo-Based Home Décor Manufacturing	2022	58,823	Bhubaneswar, Odisha

Data Analysis

Data were analyzed using thematic analysis, following a systematic and iterative coding process (Braun & Clarke, 2006). The analysis began with open coding, where interview transcripts were examined line by line to identify actions, practices, and experiences related to sustainability and growth. These first-order codes remained close to participants' language and reflected empirical observations.

In the second stage, axial coding was used to cluster related codes into broader themes corresponding to sensing, seizing, and transforming capabilities (Strauss & Corbin, 1998). Institutional influences—such as regulatory constraints, market norms, and social expectations—were simultaneously coded to capture how institutional conditions shaped capability development. In the final stage, patterns were compared across cases to identify commonalities and differences between start-up and scaling-up stages.

Several measures were employed to ensure the rigor and trustworthiness of the study. Data triangulation across multiple sources enhanced validity, while maintaining a detailed audit trail of coding decisions ensured transparency and reliability (Lincoln 1985). Regular peer debriefing and iterative comparison with existing literature helped refine interpretations and reduce researcher bias. These procedures strengthen confidence in the robustness of the findings and their theoretical relevance.

Overall, the qualitative multiple case study approach adopted in this research is well suited to addressing the research question. It enables a process-oriented and context-sensitive examination of how dynamic capabilities evolve within sustainability-oriented start-ups operating under institutional complexity. By combining dynamic capability and institutional perspectives, the methodology allows for a nuanced understanding of both firm-level adaptation and the broader environmental conditions shaping entrepreneurial action.

Findings

This section presents the empirical findings derived from a thematic analysis of interviews with founders and senior decision-makers from ten sustainable start-ups operating in India. Guided by Dynamic Capability Theory and Institutional Theory, the findings are organized around the three core dynamic capability processes—sensing, seizing, and transforming—and illustrate how these capabilities unfold across the start-up and scaling-up stages within an institutionally complex environment.

Sensing Capabilities: Recognizing Sustainability-Oriented Opportunities

The findings reveal that sensing capabilities among Indian sustainable start-ups are closely linked to entrepreneurs' direct encounters with environmental and social challenges embedded in their institutional contexts. Founders frequently described emotionally salient experiences that heightened their awareness of sustainability problems and enabled them to recognize entrepreneurial opportunities. For instance, one entrepreneur recounted witnessing the treatment of animal hides, stating,

> *"I saw… animal hide, skin of truck… and the cow is, you know, standing there and smelling that raw hide and some tears in her eyes"*. This experience motivated the exploration of agricultural waste as an alternative raw material for leather production.

Similarly, other founders connected opportunity recognition to long-standing exposure to environmental degradation. One entrepreneur reflected,

> *"I really enjoy sitting around these lakes… and the underground water is getting reduced"*, which prompted the search for construction solutions using waste materials. In another case, health-related challenges within the family served as a trigger for opportunity identification, with a founder explaining, *"My wife faced UTI problem… during the menstrual time and we've gone through lots of solutions."* These experiences sensitized entrepreneurs to unmet needs that existing market and institutional arrangements failed to address.

Beyond personal experiences, sensing capabilities were reinforced through informal research, experimentation, and early prototyping. Entrepreneurs actively searched for viable solutions within the constraints of existing institutional systems, as illustrated by statements such as,

> *"We did some research online. Is there any solution of plastic waste?"* and *"We have a prototype… then we find out some prototype samples. We make some trials."* These activities enabled founders to connect perceived sustainability problems with feasible business opportunities, even in the absence of formal market data.

Seizing Capabilities: Mobilizing Resources and Responding to Market and Normative Pressures

Once opportunities were identified, entrepreneurs engaged in seizing activities aimed at mobilizing resources, accessing markets, and building legitimacy. A recurring theme across cases was the challenge posed by normative assumptions surrounding sustainable and recycled products. Several founders highlighted consumer skepticism regarding pricing, with one stating,

> *"Everybody sees that you are making a product out of waste, why is it expensive? There's a real myth that recycled products are cheaper."* This perception created constraints on pricing strategies and required entrepreneurs to actively educate customers and justify value propositions.

Entrepreneurs responded to these pressures by experimenting with different market entry strategies and leveraging early customer feedback as validation. One founder described how online platforms facilitated legitimacy-building, noting,

> *"We uploaded our products on Amazon. We got good feedback, good reviews. People started buying good high-ticket items."* Others adopted segmented approaches, as reflected in the statement, *"We have a dual approach. Some products are for the mass market, others for premium clients."* These strategies enabled ventures to balance sustainability goals with revenue generation.

Seizing capabilities were also shaped by engagement with local communities and informal institutional actors. Many entrepreneurs emphasized sourcing materials and labor through socially embedded networks. One founder explained,

> *"We are generating extra income opportunity to our local farmers,"* while another noted, *"People started knowing in the local market that this company takes tyres not to burn but to make furniture."* Such interactions not only facilitated access to resources but also enhanced social acceptance of the ventures' activities.

Transforming Capabilities: Scaling, Technological Adaptation, and Regulatory Navigation

As ventures progressed beyond initial market entry, transforming capabilities became increasingly salient. Entrepreneurs described efforts to formalize processes, invest in technological development, and adapt organizational structures to support scaling. Technological innovation played a central role in this transformation, with founders highlighting the need for specialized knowledge and experimentation. One entrepreneur stated,

> *"Each polymer needs to be treated differently to create anything meaningful out of,"* while another emphasized innovation outcomes, noting, *"We have already filed the patent… and within 4 to 5 months will get it."*

Transforming capabilities were also shaped by interactions with regulatory institutions. Entrepreneurs frequently encountered misalignments between existing policies and the nature of sustainable or upcycled products. One founder highlighted challenges with public procurement systems, stating,

> *"That portal does not have upcycled products as a listing… we've been trying for more than a year."* Others described the difficulty of navigating administrative requirements without prior business experience, as reflected in the statement, *"Being engineers, we had to learn business, finance, and registrations from scratch."*

Despite these challenges, entrepreneurs adapted by engaging with incubation centers, leveraging government initiatives related to waste sourcing, and adjusting growth strategies. For example, one founder noted,

> *"With the help of government initiatives, we are able to source abundance of plastic waste."* These adaptive responses illustrate how transforming capabilities involved continuous alignment with evolving regulatory and institutional conditions rather than one-time structural change.

Overall, the findings show that sustainable start-ups in India develop dynamic capabilities through continuous interaction with their institutional environments. Sensing capabilities emerge from close engagement with environmental and social problems, often grounded in lived experiences and informal experimentation. Seizing capabilities involve mobilizing resources and legitimacy while responding to market expectations and normative pressures surrounding sustainability. Transforming capabilities reflect ongoing efforts to scale operations, adopt new technologies, and navigate regulatory complexity. Together, these findings demonstrate how dynamic capabilities in sustainable entrepreneurship evolve across venture stages within institutionally constrained and resource-limited contexts.

Discussion

This study set out to examine how sustainable start-ups in India develop dynamic capabilities across the start-up and scaling-up stages within a complex institutional environment. By integrating Dynamic Capability Theory (Teece, 2007) with Institutional Theory (Scott, 2014), the findings offer several principles and generalizations that advance understanding of sustainable entrepreneurship in emerging economies.

Principles and Generalizations from the Findings

First, the findings suggest that dynamic capabilities in sustainable start-ups are deeply contextual and institutionally embedded. Sensing capabilities do not emerge solely from formal market

analysis but are shaped by entrepreneurs' close engagement with environmental and social problems that are inadequately addressed by existing institutions. This aligns with and extends prior work suggesting that opportunity recognition in sustainability-oriented ventures is closely linked to institutional gaps and failures (Dean & McMullen, 2007; Mair & Marti, 2009).

Second, the results demonstrate that seizing capabilities are inseparable from legitimacy-building processes in the Indian context. Entrepreneurs must actively respond to normative beliefs—such as the assumption that recycled products should be inexpensive—while mobilizing resources and accessing markets. This supports institutional theory's emphasis on normative and cognitive pressures (Scott, 2014) and complements recent dynamic capability research highlighting the role of external stakeholders in shaping strategic action (Teece, 2018).

Third, the findings indicate that transforming capabilities are strongly constrained and shaped by regulatory institutions, rather than unfolding linearly as ventures grow. Scaling requires not only internal restructuring and technological upgrading but also continuous adaptation to misaligned or underdeveloped regulatory frameworks, such as procurement systems and certification regimes. This reinforces the view that in emerging economies, firm-level capabilities and institutional environments co-evolve (Khanna & Palepu, 2010).

Taken together, these findings suggest a general pattern in which dynamic capabilities in sustainable start-ups evolve through ongoing interaction with institutional constraints, rather than through autonomous strategic choice alone. This challenges implicit assumptions in parts of the dynamic capability literature that capabilities primarily respond to market dynamism, by highlighting the central role of institutional complexity in shaping capability development.

Exceptions, Problems, and Limitations

Despite these insights, the study has several limitations. First, the findings are based on a qualitative sample of 10 sustainable start-ups in India, limiting the generalizability of the results beyond

similar emerging-economy contexts. While the depth of qualitative data enables rich process insights, future research could test these patterns using larger samples or mixed-method approaches.

Second, the study relies primarily on self-reported interview data, which may be subject to recall bias or social desirability bias. Although triangulation with secondary sources was used to mitigate this issue, observational or longitudinal data could further strengthen causal inferences regarding capability development over time.

Third, the focus on successful or surviving ventures may underrepresent failed or stalled start-ups, potentially overlooking how the absence or breakdown of dynamic capabilities affects sustainability outcomes. Examining unsuccessful cases would offer valuable counterfactual insights.

Theoretical Implications

Theoretically, this study contributes to the dynamic capability literature by demonstrating that capability development in sustainable entrepreneurship is institutionally contingent and stage-dependent. While prior research has emphasized sensing, seizing, and transforming as firm-internal processes (Teece, 2007), the findings show that these processes are continuously shaped by regulatory, normative, and cognitive institutions in emerging economies.

In addition, by empirically grounding dynamic capabilities within the Indian sustainability context, the study responds to calls for more context-sensitive applications of strategy theories beyond developed economies (Hoskisson et al., 2013). The integration of Institutional Theory highlights how dynamic capabilities operate not only as mechanisms of competitive adaptation but also as responses to institutional misalignment and uncertainty.

Practical Implications

For practitioners, the findings underscore the importance of actively engaging with institutional environments rather than treating them as exogenous constraints. Sustainable entrepreneurs should

anticipate legitimacy challenges, invest in stakeholder education, and design flexible business models that can adapt to regulatory uncertainty.

Policymakers and ecosystem actors can draw on these insights to better support sustainable start-ups. Improving regulatory alignment—such as updating procurement platforms to include upcycled products—and strengthening incubation and advisory support can significantly enhance ventures' transforming capabilities. Facilitating market access and awareness can also reduce normative barriers faced by sustainable products.

Conclusion

This study examined how sustainable start-ups in India develop dynamic capabilities across different stages of venture growth within an institutionally complex environment. The findings show that sensing capabilities emerge from close engagement with sustainability challenges and institutional gaps, seizing capabilities involve mobilizing resources and legitimacy under normative pressures, and transforming capabilities require continuous adaptation to regulatory constraints during scale-up.

Based on these conclusions, several recommendations emerge. For researchers, future studies should adopt longitudinal designs to track the evolution of dynamic capabilities over time and explore comparative analyses across different emerging economies. For practitioners, building early awareness of institutional constraints and proactively engaging with policymakers and stakeholders can enhance long-term adaptability. For policymakers, creating supportive regulatory frameworks and reducing misalignments in sustainability-related markets can strengthen the impact and scalability of sustainable entrepreneurship.

Overall, the study reinforces the importance of viewing dynamic capabilities in sustainable entrepreneurship not as static organizational attributes, but as contextually embedded processes shaped by ongoing interaction with institutional environments.

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Appendix A

Research Design and Data Sources

Overview of Research Design

This study adopted a qualitative, multiple-case research design to examine how sustainable start-ups in India develop dynamic capabilities across the start-up and scaling-up stages within institutionally complex environments. Consistent with established guidance on qualitative case study and process research, the design emphasizes theoretical sampling, contextual sensitivity, and systematic within- and cross-case comparison (Eisenhardt, 1989). The approach is particularly appropriate for exploring capability development processes that are embedded in regulatory, normative, and market institutions and that unfold over time.

Table A1 summarizes the key elements of the research design, following conventions commonly used in management and strategy research appendices.

Table A1

Overview of Research Design

Element	Description
Research purpose	To examine how sustainable start-ups in India develop sensing, seizing, and transforming capabilities across venture stages under institutional constraints
Research design	Qualitative, multiple-case study of 10 sustainable start-ups in India with comparative within-case and cross-case analysis

Time frame	Fieldwork conducted between 2024 and 2025; retrospective reconstruction of venture development from founding to current stage
Units of analysis	Venture-level and founder-level processes related to opportunity recognition, resource mobilization, scaling, and institutional interaction
Theoretical lenses	Dynamic Capability Theory and Institutional Theory
Data sources	Semi-structured interviews, follow-up conversations, company websites, reports, media coverage, policy documents, and archival materials

A1. Case Selection and Research Context

India provides a theoretically relevant context for studying sustainable entrepreneurship, given the coexistence of pressing environmental challenges, growing entrepreneurial activity, and fragmented institutional arrangements. Sustainable start-ups in India operate amid regulatory ambiguity, uneven enforcement, evolving market norms, and widespread misconceptions surrounding sustainable and recycled products. These conditions make India a suitable setting for examining how institutional environments shape dynamic capabilities.

Cases were selected using purposive sampling to ensure theoretical relevance and variation (Patton, 2015). The final sample comprises 10 sustainable start-ups operating across sectors such as waste recycling, sustainable materials, eco-friendly consumer products, agri-based innovation, and circular economy solutions. Case selection followed three criteria:

(1) an explicit environmental and/or social sustainability mission;

(2) active market operations beyond the ideation stage; and

(3) evidence of engagement with regulatory, market, or community institutions.

To capture regional diversity, ventures were drawn from North, South, East, and West India. All firms were anonymized and assigned alphabetical identifiers (Company A–J) to ensure confidentiality.

A2. Interview Sampling and Data Collection

Primary data collection centered on semi-structured interviews with founders and senior team members directly involved in strategic decision-making, operations, or scaling activities. Semi-structured interviews are well suited to capturing processual insights while allowing respondents to reflect on experiences across venture stages (Kvale 2009).

For each venture, one to two in-depth interviews were conducted, resulting in a total of interviews conducted between 2024 and 2025. Interviews lasted between 45 and 90 minutes and were conducted either in person or online, depending on logistical considerations. Participants were recruited through sustainability networks, incubators, and referrals, combining purposive and snowball sampling techniques.

The interview guide was structured around four core domains:

1. Venture origins and opportunity recognition

   – Founders' motivations and sustainability concerns

   – Early identification of environmental or social problems

2. Sensing activities

   – Information sources, experimentation, and early trials

   – Responses to institutional gaps or failures

3. Seizing activities

   – Resource mobilization, partnerships, and market entry strategies

   – Responses to normative and market pressures

4. Transforming activities

    – Scaling decisions, technological adaptation, and process formalization

    – Engagement with regulatory systems and policy constraints

All interviews were audio-recorded with informed consent and transcribed verbatim. Where appropriate, transcripts or summaries were shared with participants to clarify factual matters.

Secondary data were collected to triangulate interview insights, including company websites, product descriptions, media articles, policy documents, and publicly available reports. These materials were systematically archived and linked to corresponding cases.

A3. Data Analysis Procedures

A3.1 Coding and Thematic Structuring

Data analysis followed a thematic, theory-informed approach, combining Braun and Clarke's (2006) procedures with the inductive rigor. Interview transcripts and documentary data were imported into qualitative analysis software and coded iteratively.

First-order coding involved line-by-line coding to identify concrete actions, decisions, and experiences related to sustainability and venture development (e.g., "trial-based product testing," "educating customers on recycled pricing," "navigating regulatory ambiguity"). Codes were kept close to informant language to preserve empirical meaning.

Second-order coding clustered related first-order codes into broader themes aligned with sensing, seizing, and transforming capabilities, while also capturing institutional influences such as regulatory barriers, normative expectations, and market structures.

Aggregate dimensions were then developed to reflect higher-level patterns across cases and venture stages, enabling comparison between start-up and scaling-up phases.

Throughout the analysis, the research team moved iteratively between data, emerging themes, and theory to refine interpretations and ensure analytical rigor.

A3.2 Cross-Case Analysis

To enhance robustness, cross-case pattern matching was employed. Cases were compared along key dimensions, including:

- Dominant sustainability challenge addressed

- Venture stage (start-up vs. scaling-up)

- Primary institutional pressures (regulatory, normative, market-based)

- Emphasis on sensing, seizing, or transforming activities

Matrices were used to identify recurring patterns and variations across cases, enabling analytical generalization rather than statistical inference.

A4. Reliability, Validity, and Limitations

A4.1 Ensuring Research Quality

Several strategies were employed to enhance rigor and trustworthiness:

- Construct validity: Triangulation across interviews and secondary sources strengthened confidence in empirical interpretations.

- Internal validity: Temporal sequencing of venture activities enabled process-oriented explanations of capability development.

- External validity: Sectoral and regional variation enhanced analytical generalization to similar emerging economy contexts.

- Reliability: A case study protocol guided data collection and documentation. A subset of transcripts was independently coded by multiple researchers, with discrepancies discussed to reach interpretive alignment.

A4.2 Limitations

The study focuses on a limited number of sustainable start-ups within a single national context, which constrains generalizability. Retrospective accounts may be subject to recall bias, although triangulation with archival materials helped mitigate this risk. In addition, ventures that failed or exited early are underrepresented, potentially limiting insights into capability breakdowns. These limitations point to opportunities for future longitudinal and comparative research.