Decoding Ecopreneurial Behavior: How Motivations Drive Eco-Efficiency in Indian Startups

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Abstract. This study leverages the Theory of Planned Behaviour to investigate the link between entrepreneurial behaviour focused on ecological sustainability, the motivations driving this behaviour, and overall eco-efficiency. Utilizing partial least squares structural equation modeling (PLS-SEM) to test hypotheses and bootstrapping for mediating analysis, the research explores the interplay between motivations for ecopreneurship, ecopreneurial actions, and their impact on eco-efficiency. Analyzing data from 280 startups, the findings reveal a positive correlation between ecopreneurial motivations and actions, as well as between ecopreneurial actions and eco-efficiency. The research underscores the mediating role of ecopreneurial behaviour in connecting motivations and eco-efficiency, offering a robust, pro-environmental framework beneficial for both academics and emerging entrepreneurs, emphasizing the dual achievement of economic and environmental goals through eco-efficiency.

Keywords: Eco-preneurship, Eco-efficiency, Theory of Planned Behaviour, Motivations, Startup Ecosystem, Structural Equation Modeling, Environmental Sustainability, Indian Startups, Entrepreneurial Behavior.

1 Introduction

Environmental pollution and ecological deterioration have negatively impacted human health, economic growth, and quality of life. The industrial sector, along with other sources of pollution, plays a significant role in causing these harmful effects. Although, business activities also have the potential to play a key role in solving these environmental problems. Environment entrepreneurship or green entreprenuership or ecopreneurship provides new prospects for the 'nimble first movers' who identify environmental issues and exploit such prospects for offering solutions (Schaper, 2002). Moreover, among various approaches to environmental management, ecopreneurship stands out as an innovative business initiative focused on offering environmentally friendly products and services. According to Schaltegger (2002, p. 48), 'Ecopreneurship is thus distinguished from other forms of corporate environmental development by the company's vivid commitment to environmental progress and its strong

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desire for business growth.' Researchers have identified relationship between various ecopreneurial motivations and ecopreneurial behaviour (Ekins, 2010; Gomez-Haro et. al, 2015). Bossle, Barcellos, and Vieira (2016) analysed internal and external factors that influence the adoption of eco-innovation, an important eco-behaviour construct. Eco-innovation or environmental innovation helps in development of product and services that enhance environmental performance by adopting sustainable technology and practices. The internal factors like 'environmental capability, environmental managerial concern and human resources' and external factors as 'regulatory and normative pressures, cooperation and government support' have a positive influence on adoption of eco-innovation. Studies like Kuo and Chen (2016) conform linkages between institutional pressures, eco-innovation and competitive advantages. The results revealed that eco-innovation practices have a significant positive impact on the firms' environmental performance, in turn leading to competitive advantage and increase in green reputation. Unfortunately, there is little evidence that highlights how eco- behaviour constructs influence eco-efficiency of an organisation. In order to fill this gap, present study attempts to find how eco-efficiency of an organisation is affected by eco-behaviour constructs and ecopreneurial motivations.

Thus, the study examined the influence of motivations on eco-behaviour based on theory of planned behaviour (Ajzen, 1991). The theory postulates that human behaviour is governed by one's attitude and behavioural motivations. This theory helps in understanding that the perceived intentions and motivations of StartUps to predict certain kind of ecopreneurial behaviour. This ecopreneurial behaviour is responsible for pioneering initiatives that are committed to supply eco-friendly products and services. This paper provides empirical evidence that can help organisations determine their ideal pro-environmental strategies to address existing environmental issues through their business initiatives and activities.

The findings serve as valuable references for managers and academics, enabling them to recognize the advantages of adopting eco-friendly behaviors to enhance eco-efficiency. Greater eco-efficiency indicates a firm's heightened effectiveness in conducting economic activities while considering the sustainable use of ecosystem resources.

The article begins by reviewing the conceptual evolution of ecopreneurship and subsequently presents research insights into the motivations behind becoming an ecopreneur. Furthermore, it highlights the influence of ecopreneurial behavior on an organization's eco-efficiency. In conclusion, the study connects the empirical outcomes to both theoretical frameworks and practical managerial implications.

2 Conceptual Evolution and Hypothesis Development

2.1 Ecoprenuership and Ecopreneurs

'Ecopreneurs are defined as those entrepreneurs who get in eco-friendly markets not only to make profits but also having strong, underlying green values' (Kirkwood & Walton, 2010, p. 205) and a concern for the environment (Gwyer, 1998). This definition also leads to the understanding that 'entrepreneurs who establish new businesses based on the principle of sustainability are known as ecopreneurs' (Kirkwood & Walton, 2010, p. 205). Ecopreneurship is a new and emerging concept which has been derived from an assimilation of elements from the two disciplines—entrepreneurship and sustainability— in order to do business in a more

environmentally friendly way. ‘The intersection of the fields of environmental sustainability and of entrepreneurship defines ecopreneurship’ (Kainrath, 2009, p. 15). It emerged in the early 1990s, and since then has attracted scholars’ attention time and again (Santini, 2017). Reasonably so, it is becoming more and more widespread as a new market-based approach to identify opportunities for improving environmental quality and capitalizing upon those for increased profits (Gwyer, 1998).

In a broader perspective, it will be appropriate to state that ecopreneurship is a subset of social entrepreneurship. While social entrepreneurs invest resources, develop and implement solutions to social, cultural and environmental issues, ecopreneurs essentially depict a strong desire and commitment to ‘environmental progress along with business growth’ (Schaltegger, 2002, p. 48) and deliver green products or services by starting non-profit businesses with deeply instilled ‘green values’ (Kirkwood and Walton, 2010, p.215).

Ecopreneurship is usually confused with Corporate Social Responsibility. Activities like promoting concern for the environment, environmental education and waste management—and in some cases, adoption of eco-efficiency—are helpful to understand corporate social responsibility. Corporate social responsibility seems to be an expensive affair and, thus, is mainly practised by larger entities. The Indian system makes it mandatory by laws rather than a voluntary initiative. Thus distinguishes corporate social responsibility from ecopreneurship.

Ecopreneurship is a way of doing responsible business with an underlying concern for the environment and for achieving economic growth. It can also be described as the environmental responsibility of entrepreneurs to mitigate environmental losses and innovate business solutions for the same (Thierry, 2002).

Schaper (2002) emphasized the need for greater focus on the role of entrepreneurs in driving the transition of the economy and business practices toward a sustainable economic model. He underscored the significance of eco-entrepreneurship in fostering innovative and adaptive business strategies. Eco-entrepreneurship, often referred to as ecopreneurship, presents opportunities for agile "first movers" who recognize and capitalize on these emerging possibilities. Moreover, among the various approaches to environmental management, ecopreneurship is particularly characterized by the creation of pioneering businesses that offer environmentally sustainable products and services. According to Schaltegger (2002, p. 48), ‘Ecopreneurship is thus distinguished from other forms of corporate environmental development by the company’s vivid commitment to environmental progress and its strong desire for business growth.’

An empirical study was conducted by Wagner (2009) indicated that the adoption of environment management systems can help to be an ecopreneur and that small- and medium-sized enterprises are less likely to be ecopreneurs. This likeliness could be because of less compliance and legal setups for small firms that does not motivate them to turn ecoprene urs. The compliance motivation necessitates the startup to adopt pro-environmental economic activities. Undoubtedly, ecopreneurship is an important solution to many social and environmental problems when rightly promoted in entrepreneurship learning and eco-behaviour development (McEwen, 2013). Innovative ecopreneurs create sustainable business solutions. Developing an ecopreneurial attitude by conveying ecopreneurial knowledge and improving ecopreneurial skills for promoting such innovative ecopreneurs could serve as a ‘remedy’ to many social and environmental problems (Toth and Imreh, 2014).

Although, stringent environmental legislation encourages large firms to take up environmental activities, but the same is not the case with small firms. SMEs are found ignorant towards environmental legislation and thus firms receiving financial support from government bodies tend to be more involved in environmental practices (Hoogendoorn, Guerra, and van der Zwan, 2015).

There is a notable scarcity of research within the field of ecopreneurship; however, this area is gradually attracting increased scholarly attention and is emerging as a promising domain of study (Santini, 2017). One potential explanation for this limited body of research may be the challenges associated with clearly defining the boundaries of ecopreneurship. To advance this field significantly, it is crucial to conduct both quantitative and qualitative research, including empirical studies and case studies, based on existing models, while also developing new business models centered around environmental technologies. Dimensions and more general empirical cases would be helpful to take forward much more defined theoretical boundaries of ecopreneurship (Santini, 2017; Abdelkafi & Hansen, 2018). Universities seem to stand at the forefront of an entrepreneurial culture and mindset among students and lecturers (E. Zaidan, 2024).

Generally, ecopreneurship is basically entrepreneurial activity that re-proposes the required elements of conventional entrepreneurship with particular attention to social and environmental innovation for sustainability. It pays most attention toward developing skills in that field (Alwakid et al., 2021; Dhahri et al., 2021; Gupta & Dharwal, 2022). It resonates well with sustainable development because it goes beyond monetary gains, instead of a monetary gain, it seeks other targets that are not monetary but address needs within the physical environments and within societies (Soomro et al., 2020; Bawakyillenuo & Agbelie, 2021). Entrepreneurial traits typically involve self-confidence, risk aversion, strategic planning, and persistence. Sustainable entrepreneurship traits comprise empathy, moral responsibility, and issues concerning the environment (Hockerts, 2017; Kaida & Kaida, 2019; Prado et al., 2022). Under such circumstances, it can be said that ecopreneurs are brilliant developers, who can develop brilliant solutions with innovation and critical thinking in order to mitigate the problems of nature (Bawakyillenuo & Agbelie, 2021). This, on the other hand, shifts the focus towards the fact that, to a large extent, they are intrinsically motivated for actualizing their ideas. This calls for further research since the general sentiment remains that entrepreneurship has been hailed as playing a pivotal role in job creation and national development (Audretsch et al., 2023), with sustainable entrepreneurial practices being essential pathways to the attainment of sustainable development goals.

One of the biggest challenges in ecopreneurship, according to Rodriguez-Garcia, Guijarro-Garcia, and Carrilero-Castillo (2019) is that there is usually an inadequate flow of information and business models and the products created turn out to be invisible. This can be solved by establishing communication between the ecopreneurs, consumers, and producers to establish sustainable long-term solutions. Such manager-ecopreneur partnerships may end up being one of the most important factors in making people more aware, enlightening them, and changing their actions as a consumer in those countries that have lately focused on sustainability and ecopreneurship (Kardos, Gabor, and Cristache, 2019).

2.2 What motivates ecopreneurs?

The motivational factors that have led to an increase in the number of ecopreneurs in business today include not only regulatory demands (compliance-based), the achievement of eco-efficiency (market-based) and the increasing environmental concerns of consumers (value based) (Post et al., 1994), but also the personal environmental values of entrepreneurs (intrinsic motivation) (Gomez-Haro et al., 2015). Thus, the four major motivators for shifting towards ecopreneurship as identified by the researchers are compliance-based motivation, market-based motivation, value-based motivation and intrinsic motivation.

Compliance-based motivations drive environmentally friendly behaviours through laws such as India's Air Act (1981) and National Green Tribunal Act (2010), China's Law on Promoting Clean Production (2002), and the USA's Ocean Dumping Act. Regulations banning plastics and court decisions against hazardous industries near human habitation also play a role.

Market-driven incentives push competition, and environmental friendliness becomes a unique selling proposition best said through the Rio Summit's ISO 14000 standards as well as how companies such as Tide and Toyota use green marketing. Consumer demand and personal values for eco-friendly products further push organizations toward environmentalism and thereby enhance customer-related performance and promote sustainability.

Post et al. (1994) contributed sufficiently to the establishment of a base of knowledge for understanding the motivations behind ecopreneurship. After reviewing thousands of pages of literature pre-1994, they identified three types of environmentalism, all of which are characterized by different legal, market and ethical constituents. The first type is "compliance-based environmentalism," which forms a vast number of statutes, administrative regulations, and court rulings, which clearly gives a public policy message pointing out the concern of society toward environmental issues. The second variant is market-concessionary environmentalism, based on incentives in the market to promote ecologically sound behavior. It promotes redesigning processes of manufacture to reduce toxicities, lower costs, improve quality, and increase efficiency toward better outcomes for the environment. The sense of promoting eco-efficiency also attracted attention as a potential cost-effective source of increased productivity, encapsulated in the new concept of Total Quality Environmental Management, or TQEM. The third type, value-driven environmentalism, speaks to the degree to which consumers are growingly willing to go about their environmental principles and assume the expenses (pp. 64–65).

In this regard, communities are no longer willing to accept extreme environmental degradation as the cost of economic opportunity; instead, they demand an integrated approach under which employment and environmental protection are achieved together. This perspective, then, is anchored on the integration of economic activity with environmental protection as an attempt to reap benefits for both present and future-a concept that has been spread through the lens of the sustainable development framework (Post et al., 1994, p. 66).

Ecological entrepreneurs operate in the context of society, and penetration into such a context determines their values and habits. Through the sociological analysis carried by Kirkwood and Walton (2010), it is essential to ask questions that touch on background or history of the decider, personal environmental beliefs, influence of family, and many more factors determining their motivation towards ecopreneurship. Arend (2014) argued on the knowledge that concerns the

motivations in SMEs, and actual and long-term motivation impacts the introduction of green practices especially with the SME's long-term relationship with the community and environment.

2.3 Ecopreneurial Behaviour

Ecopreneurial behavior refers to the environmental sensitivities of entrepreneurs through their market offers. There are three core concepts defining it: eco-innovation, eco-commitment, and eco-opportunity. Eco-innovation is related to new ideas, behaviors, products, and processes that help reduce negative environmental impacts (Rennings, 2000). Eco-commitment represents personal commitment to ecology; it impacts strategy and policy in a way not to harm the environment (Schaltegger, 2002). Finally, eco-opportunity refers to opportunities established in inefficient markets as mitigating the risk of negative degradation (Dean & McMullen, 2007). The above components together highlight the fact that entrepreneurs could deliberately steer ventures towards directions that environmentally become sustainable.

2.4 Eco-efficiency: Desirable Outcome of Ecopreneurial Behaviour

Eco- efficiency is the value of economic values in terms of environmental impact, combining both economic and environmental performance (Fan et al., 2017). This is a tool for analytical sustainability analysis that tracks the efficiency with which economic activity uses the ecosystem resources and services with a minimum impact on the environment. Eco-efficiency entails the production and delivery of competitive-priced goods and services within the limits that meet human needs, improve the quality of life, and reduce resource intensity and environmental impact along the entire life cycle, in harmony with Earth's carrying capacity (Hyde et al., 2007).

UNESCAP, 2009: Eco-efficiency indicators are regarded as critical to measure green growth towards enhancing ecological efficiency in the development planning of countries in Asia-Pacific. EEIs measure how economically active and resource-using activities correspond with associated environmental impacts.

Gomez-Navarro, Fernandez-Vine, and Capuz-rizo (2010) explored eco-efficiency in Venezuelan SMEs, revealing that while they understood environmental regulations, they struggled to recognize external drivers like customer demand for green products. Common practices included recycling and reuse, but other tools like EMS, renewable energy, or green marketing were underutilized. The study suggested that green associations and media could influence SMEs by highlighting their environmental impacts.

Charmondusit, Phatarachaisakul, and Prasertpong (2014) developed eco-efficiency indicators covering economic (net sales, gross margin), environmental (material, energy, water consumption, waste disposal), and social aspects (accident frequency, local employment, CSR). They recommended adopting eco-efficiency as industrial policy, combined with cooperative learning, for strategic industry development.

Despeisse et al. (2016) provided an eco-efficiency toolkit for factories, emphasizing resource utilization to deliver economic and social value while reducing environmental impact. Fan et al. (2017) supported eco-industrial development in Chinese commercial parks, using data envelopment analysis to assess sustainability in resource, economic, and environmental terms.

2.5 Studies on Motivators Leading to Ecopreneurial Behaviour

Eco-innovation has led to the establishment of substantial eco-industries, but it is largely because of environmental policies and not because of any personal environmental consideration. Ekins (2010, p. 267) stated that 'Public policies would need to become much more stringent if eco-innovation is to drive an adequately far-reaching technological transition to resolve pressing environmental challenges'.

Leitner, Wehrmeyer, and France (2010) anticipated that technological innovation would have a solution for many environmental problems. Strict regulations and environmental obligations do not fulfil long-term environmental goals; rather, they lead to the application of expensive and inefficient technologies which do not mitigate environmental issues. Leitner et al. (2010) also concluded, with the help of the existing literature, that the impact of regulations only depends on the design of the governing instrument and the context in which they are applied, so it becomes crucial to have a structured system for the application of these regulations.

A study by Klewitz, Zeyen, and Hansen (2012) focused on introducing the concept of sustainable development within German SMEs by implementing eco-innovations across various organizations. Their research identified key drivers of eco-innovation, including "profit and sales margin; reputation and brand image; attractiveness for employees; risk management; as well as cost and cost reduction" (p. 452).

Study indicates that small and medium-sized enterprises (SMEs) driven by authentic motivations and equipped with appropriate capabilities are more inclined to successfully implement ecological initiatives (Arend, 2014). Furthermore, individuals who possess strong environmental values tend to exhibit an increased desire to engage in proactive measures that reduce the environmental footprint of their organization, as well as to adopt precautionary strategies when the environmental consequences of specific actions remain uncertain (Marcus et al., 2015, p. 464). The decision-making processes of entrepreneurs shaped by various factors, including the individuals they reside with, such as family members (i.e., their immediate community); their educational background (both experiential and formal); their belief systems, including religious convictions; and the local cultural norms they embrace (Gunawan Arien et al., 2021).

The values of self-enhancement, conservation, and self-transcendence have driven entrepreneurs to engage in ecopreneurship practices. Other than that, the existence of various identities also affects the reasons why such ecopreneurs (Gunawan et al., 2021). Ecopreneurship and green technology significantly contribute to the negative emissions of greenhouse gases in the long run, which indicates their massive contribution to environmental sustainability (Chen, Y. et al., 2024). These were the "green identity" people concerned with indulging in self-enhancement, based on the fact that they can express their self-identity directly, rather than from "ecological concerns or moral imperatives." This "green identity" was interested in having a favorable self-image and reputation among those concerned with environmentally friendly practices wherein the actual aims of such eco-friendliness, such as the protection of the environment, are lost to such endeavor (De Pelsmacker et al., 2016). Wagner and Llerena (2011) have done exploratory interviews within the framework of nine in-depth case studies, with three firms in each of the chemicals (all firms of medium size), electronics (all large-sized firms), and

automotive industries (one small firm and two large firms). The firms belong to the United States, France, and Germany. The analysis highlighted that regulatory frameworks often act as facilitators for the broader adoption of eco-innovation. Additionally, the study underscored the significant role of regulation in various aspects of eco-innovation—such as being a direct catalyst, promoting diffusion, and fostering cooperation. The authors suggested that future research could benefit from exploring corporate strategies employed in this context, including foresight techniques, road mapping, and scenario planning.

Based on above review, following hypothesis was proposed in this study;

H1: There is a positive and direct relationship between motivations and eco-efficiency.

H2: There is positive and direct relationship between motivations and ecopreneurial behaviour

2.6 Relationship between ecopreneurial behaviour constructs and eco-efficiency and its Indicators

Economic performance and environment performance, both as indicators, help in quantifying the eco-efficiency of organizations.

Brasil, Abreu, Filho, and Leocadio (2016) conducted an investigation based on resource-based theory and concluded that process and product innovations both have a significant impact on the business performance of an organization. The researchers also recommended adoption of eco-innovative management designs to develop eco-efficient products and encourage sustainable consumption.

In addition to this, Kuo and Chen (2016) conducted a study in regions of Taiwan and China to conform linkages between institutional pressures, eco-innovation and competitive advantages. The results revealed that environmental innovation or eco-innovation practices have a significant positive impact on the firms' environmental performance, in turn leading to competitive advantage and increase in green reputation.

Based on above review, following hypothesis was proposed in this study;

H3: There is a positive relationship between ecopreneurial behaviour and eco-efficiency.

H4: Eco-Behaviour mediates the relationship between motivations and eco-efficiency.

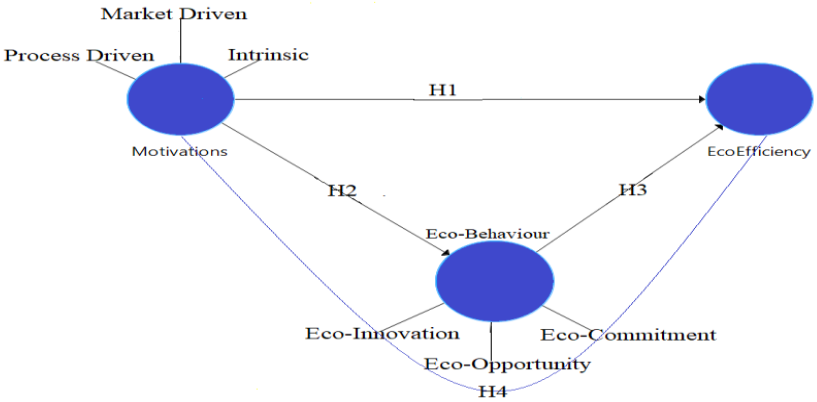


Fig.1. Conceptual Framework

3 Research Methods

In this study, a quantitative research approach was employed, utilizing an online survey conducted with a structured questionnaire as the primary research instrument. The proposed research framework is illustrated in Figure 1.

3.1 Sample and Data Collection

The sampling frame consisted of StartUp owners registered under the StartUp India program. These registered startups benefit from tax incentives, streamlined compliance procedures through an easy online system, fast-tracked Intellectual Property Rights, among other advantages (StartUpIndia, 2020). Additionally, startups face fewer regulatory constraints and are significant contributors to environmental degradation (Wagner, 2009; McEwen, 2013). Therefore, it is crucial to conduct a study aimed at identifying the pro-environmental motivations and behaviors that may influence the eco-efficiency of these StartUps.

The Department for Promotion of Industry and Internal Trade (DPIIT), under the Ministry of Commerce and Industry, Government of India, released the updated 2020 sampling list for registered startups. DPIIT, formerly known as DIPP, is tasked with formulating and executing policies aimed at promoting and developing the industrial sector, in alignment with national priorities and socio-economic goals. Additionally, DPIIT is responsible for coordinating the implementation of the Startup India initiative in collaboration with other government departments. Launched in January 2016, the Startup India initiative has seen significant progress since its inception.

The responses were collected using emails. The questionnaire was emailed to 500 StartUps and responses were obtained from 280 StartUps with a response rate of 58%, which was adequate (Nulty, 2008). The data was collected from March 2020 to June 2020. The sample size was verified using G* Power software 3.1 (Faul et. al, 2009). This software was the most appropriate choice because we had no literature to estimate adequate sample size. To reduce the possibility of common method bias, as the responses were collected from a single category of respondents, Harman's one factor test was used. The results of un-rotated analysis were within the threshold limit of 50% (Podsakoff et al., 2003).

3.2 Measures

a) Ecopreneurial Intentions

The measurement of motivations was conducted through a factor analysis process, resulting in a three-factor scale. Several researchers have contributed to the identification of motives for environmental engagement (Kirkwood and Walton, 2010; Best and Thapa, 2013; Huang et al., 2014; Mittal and Sangwan, 2014; Nhemachena and Murimbika, 2018), and their qualitative studies have been instrumental in defining the conceptual dimensions of ecopreneurship (Schaltegger, 2002; Kainrath, 2009; Gomez-Haro et al., 2015; Santini, 2017). These contributions informed the development of the scale used to measure the motivations of StartUps. The three motivational factors identified are: process- and compliance-based motivation, termed "process-driven," value-driven motivation, and intrinsic motivation.

Eco-Behaviour

The measure of eco-behaviour draws on theory of ecopreneurship given by Kainrath (2002) and Jansson et al. (2017) modified according to Indian situation and research theme, which evaluates

a) Eco-innovation was defined as the innovativeness in finding ways to "increase recycling, economize on resource use and minimize waste" during complete product lifecycle.

b) Eco-opportunity was defined as business opportunities that emerge out of environment failure and the customer is ready to pay for cost effective solutions made available in the market to eradicate that failure.

c) Eco-commitment was defined as personal commitment to the environment that influences an individual's business strategies and policies for achieving sustainability and refraining organization from taking actions that harm environment.

b) Eco-Efficiency

In this study, eco efficiency was calculated as a ratio of economic performance and environment performance. Thus, ratio was measured using indicators given by Charmonduist et al. (2014) developed for manufacturing sector in China and thus adapted to suit Indian context. The indicators considered for the study were; 1) Economic Indicators: Gross sales and Gross Margin (in rupees) and 2) Environment Indicators: material consumption (in Tons), energy consumption (megawatts), water consumption (in cubic meters) and waste disposal (in Tons).

The study employed IBM SPSS Statistics (version 25) to conduct descriptive statistical analysis on the preliminary data. Additionally, Partial Least Squares Structural Equation Modeling (PLS-SEM) was performed using SmartPLS (version 3.3.2) (Ringle et al., 2015) to test the proposed

hypotheses. The selection of PLS-SEM was guided by the sample size and the exploratory nature of the research, as recommended by Hair et al. (2017). A sample of 280 respondents met the minimum sample size requirement in accordance with Roscoe's rule of thumb. The analysis followed a two-step approach: first, the reliability of the constructs was assessed through composite reliability and Cronbach's alpha coefficients, and the validity was examined through convergent and discriminant validity. Second, the model testing was conducted. Mediating effects were analyzed using bootstrapping with 280 observations per subsample, 5,000 subsamples, and no sign changes, to obtain the direct and indirect path coefficients.

4 Results

4.1 Demographic information of respondents

This study considered StartUps with majority of them run by males (n=280, 85.72%). This is due to existing gender gap in entrepreneurship, innovation and patenting prevalent in India and will take years to reach parity (Chatterjee and Ramu, 2018). Majority of the respondents were from manufacturing and innovation sector. The respondents were at least graduates and had prior guidance of the business from either their family members, peers or friends. Interestingly majority of the respondents even had prior training and certification in the kind of the business they were running. This also highlights the readiness of young entrepreneurs and development of their abilities to engage in entrepreneurial activity (Olugbola, 2017). The characteristics of respondents are mentioned in Table 1.

Table 1. Demographic information of the respondents

Variables	Categories and Distribution	
Gender	Male: 85.72%	Female: 14.28%
Education	Graduate & Equivalent: 83.93%	Master Degree: 16.07%
Industrial Sector	Agro-Based: 19.28%	Manufacturing: 30.72%
	Service: 22.14%	Technology/Innovation: 27.86%
Any prior Training/ Certification	Yes: 36.79%	No: 63.21%
Any prior guidance from friends/family	Yes: 70.10%	No: 29.90%

4.2 Measurement Model

Before evaluating the measurement model presented in Figure 2, the reliability of the individual constructs—such as convergent and discriminant validity—was assessed, as shown in Table 2. Cronbach's alpha coefficients were used to measure internal consistency reliability, while composite reliability was employed to evaluate the adequacy of the measurement model. The factor loadings exceeded the acceptable threshold of 0.4 (Hinkin et al., 1997; Costello & Osborne, 2005; Osborne et al., 2008), rendering them both statistically significant and acceptable.

Table 2. Constructs and factor loadings

Construct	Item	Factor Loading	p-value
Motivations			
Process Driven	M1	0.628	**
	M3	0.609	**
	M6	0.631	**
	M8	0.739	**
	M11	0.461	**
	M12	0.686	**
	M13	0.665	**
	M19	0.699	**
Market Driven	M2	0.535	**
	M4	0.505	**
	M5	0.669	**
	M7	0.624	**
	M9	0.712	**
	M14	0.587	**
	M16	0.617	**
	M20	0.528	**
Intrinsic	M10	0.705	**
	M15	0.564	**
	M17	0.796	**
	M18	0.597	**
Eco-Behaviour			
Eco-Innovation	EI1	0.771	**
	EI2	0.744	**
	EI3	0.742	**
	EI4	0.792	**
	EI5	0.700	**
	EI6	0.580	**
	EI7	0.751	**
	EI8	0.817	**
Eco-Opportunity	EO1	0.615	**
	EO2	0.769	**
	EO3	0.621	**
	EO4	0.802	**
	EO5	0.530	**
	EO6	0.734	**
	EO7	0.795	**
	EO8	0.847	**
Eco-Commitment	EC1	0.811	**
	EC2	0.785	**
	EC3	0.812	**
	EC4	0.717	**
	EC5	0.796	**
	EC6	0.714	**
	EC7	0.765	
	EC8	0.585	

Note: **denotes statistically significant (p>0.05)

Cronbach's alpha coefficients, all above 0.7 (Nunnally & Bernstein, 1994), indicated a satisfactory level of reliability. Similarly, composite reliability values for both constructs were greater than 0.7, confirming high reliability (Fornell & Larcker, 1981). Convergent validity was evaluated based on the average variance extracted (AVE), with values surpassing the threshold of 0.5 (Fornell & Larcker, 1981), thereby confirming convergent validity, in Table 3.

Table 3. Results of reliability and convergent validity

	Cronbach's Alpha	**Composite Reliability**	**AVE**
Motivations	0.894	0.934	0.825
EcoBehaviour	0.863	0.916	0.784

Discriminant validity was tested using the Fornell-Larcker criterion, where the square roots of the AVEs for all constructs exceeded their correlations with other constructs, as shown in Table 4. This result affirmed the discriminant validity of the model, with the square roots of AVEs presented on the diagonal and the correlations located in the lower triangle. Thus, the measurement model was deemed reliable and valid.

Table 4. Results of Discriminant Validity

	EcoBehaviour	**EcoEfficiency**	**Motivations**
EcoBehaviour	0.908*		
EcoEfficiency	0.233	1.000*	
Motivations	0.502	0.023	0.885*

For the structural model, the hypotheses were tested using PLS-SEM analysis via Smart-PLS (version 3.3.2). The PLS estimation results (direct effects) are depicted in Figure 2, displaying path coefficients, R-squared values, and statistical significance. Additionally, the bootstrapping method was applied to assess the significance of the paths. The R-squared values indicated the predictive power of the proposed model. For instance, the R^2 value of 0.252 for eco-behavior suggests that motivation accounts for approximately 25% of the variance in eco-behavior.

T**able 5.** Regression weights of the research model

	Estimate	**p-Value**	**Result**
Motivations-> EcoBehaviour	0.502*	0.012	Support
EcoBehaviour->EcoEfficiency	0.296*	0.000	Support
Motivations-> EcoEfficiency	0.126	0.250	Not Support

Note: *p<0.05

Table 6. Bootstrapping analysis results for indirect effect

	Estimate	**p-Value**	**Result**
M-> EB->EE	0.149*	0.021	Support

Note: M stands for Motivations, EB for Eco-Behavior, and EE for Eco-Efficiency
*p<0.05

4.3 Structural Model

The PLS-SEM analysis using Smart-PLS (version 3.3.2) was used to test the hypothesis. The results PLS estimation (direct effects) are shown in figure 2, that indicates path coefficients, R square values and statistical significance. In addition, this study applied bootstrapping method and determined significance of these paths. R square values highlighted in the construct also predicts the power of proposed model. For instance, R^2 value of eco-behaviour 0.252 indicates that motivation accounts for approximately 25% of total variance in eco-behaviour.

4.4 Results of direct effect and mediating effect

It was ascertained that motivations has strong relationship with eco-behaviour. In addition, eco-behaviour has positive relationship with eco-efficiency accepting hypothesis H2 and H3. While there was no direct relationship between motivations and eco-efficiency, thus withdrawing support from H1.

Subsequently this study also examined the mediating effect of eco-behaviour by conducting bootstrapping procedure (i.e. 280 responses per subsample, 5000 subsamples and no sign change). The bootstrapping results also indicated indirect effect via mediator. In other words, eco-behaviour mediated the link between motivations and eco-efficiency. The indirect effect of motivations on eco-efficiency through eco-behaviour is significant supporting H4.

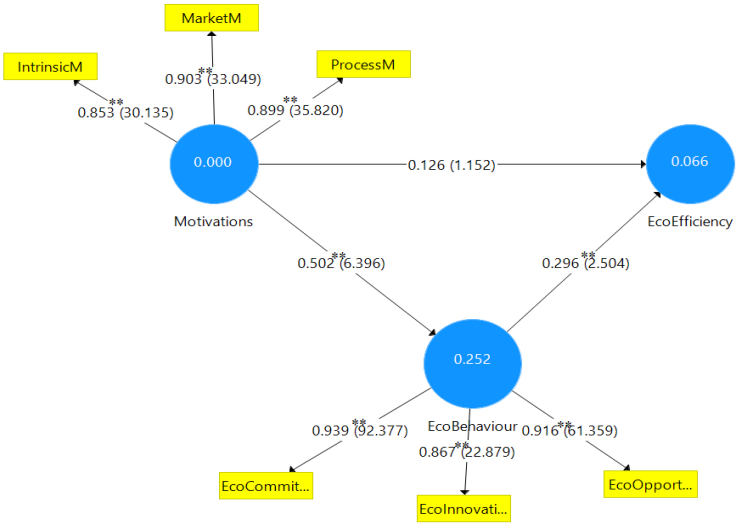


Fig.2. PLS results for direct effect

Note: ** indicates p<0.05, t- value in the parenthesis

5 Discussion

The study examined the effect of motivations and eco-behaviour on the eco-efficiency of the StartUps. This study was specifically aimed to determine the relationship between motivations, eco-behaviour and eco-efficiency. Moreover the proposed model for the research was validated. Specifically the outcomes of this study suggested that: 1) the adoption of motivations guide ecopreneurial behaviour 2) the adoption of ecoprenuerial behaviour leads to high eco-efficiency, and 3) StartUps are compelled to adopt ecoprenuerial behaviour to achieve high eco-efficiency.

The study revealed a strong relationship between eco-behaviour and eco-efficency reaffirming studies and corresponding themes (Brasil et al., 2016; Kuo & Chen, 2016). The positive relationship between motivations and behavioural constructs extends the theory of planned behaviour of entrepreneurship (Ajzen, 1991) in ecoprenuership and confirm existing studies (Wagner & Llerena, 2011; Gomex-Haro et al., 2015; Bossle et al., 2016). This study also revealed intermediate effect of eco-behaviour on motivation and eco-efficiency that is a novel finding in its own.

The growing environmental challenges are driving organizations to enhance their pro-environmental behavior. This study offers both theoretical and managerial contributions. Firstly, it proposes a business model for ecopreneurship aimed at optimizing environmental processes, addressing the gaps and limitations identified in prior research (Santini, 2017; Abdelkafi & Hansen, 2018). The findings are anticipated to provide valuable insights for startups and

aspiring entrepreneurs, demonstrating that pro-environmental practices lead to both economic and environmental benefits, referred to as eco-efficiency.

Secondly, this article expands the existing body of knowledge, particularly within the Indian context, similar to other developing nations that have increasingly embraced the concept of sustainability. It underscores the importance of adopting the dynamic principles of ecopreneurship. Previous studies have primarily focused on eco-behavior in relation to products, processes, and models. This study seeks to bridge that gap by incorporating additional eco-behavior constructs, such as opportunity and commitment, beyond just innovation.

The third significant contribution of this research is the development of a reliable and valid model, which can serve as a foundation for academicians to replicate the study in different contexts. This would facilitate the examination of how specific motivational factors influence ecopreneurial behavior and eco-efficiency. Eco-efficiency is critical in reducing the environmental impact of industries, promoting their strategic growth, and minimizing their ecological footprint.

6 Theoretical and Practical Contribution

This study contributes novel perspectives to established theories by showing how various motivations—such as a commitment to environmental stewardship or personal fulfillment—encourage entrepreneurs to implement sustainable practices. It enhances our comprehension of how factors beyond mere profit generation can foster more environmentally responsible business behaviors. By setting up a direct link between these motivations and eco-efficient practices, the research sets into perspective some innovative theoretical frames for grasping the way startups realize eco-efficiency. Based on this research, startup founders can receive practical advice on how to utilize their sustainability motivations when implementing proper eco-friendly practices. In this way, entrepreneurs can recognize that personal aspirations and commercial goals in running the business can indeed become aligned with environmental stewardship. These findings are strategies in which policymakers would formulate support programs and incentives that would appeal to the conscious environmentally friendly entrepreneur. The initiatives may lead to the development of better policies that foster a culture of adoption in new firms towards green practices. The paper will help investors in making decisions that best suit their needs by gaining insights into how entrepreneurs' motivations influence their commitment towards sustainability, hence ease the process of choosing the most appropriate eco-friendly start-ups for investment. Additionally, the study's findings can inform the creation of educational resources and training initiatives aimed at equipping future entrepreneurs with the knowledge to integrate their motivations with sustainable business practices. By highlighting successful eco-friendly startups, the research educates consumers about the advantages of supporting green businesses, potentially encouraging them to make more sustainable purchasing decisions.

7 Limitations

There were few limitations of this study. First, a small sample size may not reflect generalised findings due to its exploratory nature. The respondents were the owners of StartUps and thus recommended for future studies to engage two or more managerial staff to reduce bias and more StartUps to increase response rate.

Second, the social indicators and value of eco-efficiency considered for further studies. In India, corporate social responsibility is not legislatively enforceable to the StartUps. While, environmental laws and labour laws are self-certified by the StartUps for initial five years, creating biasness when responding to social indicators. Thus, we restricted the quantitative responses in the form of economic and environmental responses available in the form of secondary data. We recommend exploring social dimension of eco-efficiency.

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