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How Startups Gain a Market Edge Through Eco-Friendly Practices: Empirical Insights from Sustainable Startups through Data-Driven Analysis

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Abstract

In the dynamic landscape of the entrepreneurial ecosystem, where ventures are adopting sustainable business models, it becomes essential to analyze whether the adoption of sustainable business practices has a competitive advantage. This study investigates the complicated relationship between Sustainable Business Practices (SBP) and Competitive Advantage (CA) on a robust dataset of diverse startups and applies advanced regression analysis with a 10-fold cross- validation methodology. The results show a strong and positive association between SBP and CA. The results not only establish a statistical relation but also highlight the significant impact of sustainable practices on startup competitive advantage. This research contributes to both academic literature and management decision-making by giving detailed insights, as well as a strategic roadmap for entrepreneurs looking to exploit sustainability as a cornerstone of their competitive strategy.
Keywords—Competitive Advantage, Circular Economy, Startup, Regression, Sustainable Business Practices

1 Introduction

The world is transitioning towards achieving sustainability, where customers are making rational buying decisions forcing business houses to deliver sustainable products and services.[15] Sustainability, which includes environmental, social, and economic components, has progressed from a niche issue to a widespread necessity. Given its complex impact on local people, ecosystems, and cultural heritage, sustainable business practices play a vital role in enabling

sustainability[1]. Startups are well-positioned towards enabling sustainable practices due to their natural dynamism and potential for innovation. Their versatility enables them to adopt novel methodologies and apply sustainability notions in different ways when compared to conventional business standards. Thus, it becomes vital to investigate sustainable startups in the global landscape. Sustainable startups refer to those business ventures that draw their business activities on the line of sustainability [31], adopt environment-friendly policies, and deliver societal benefits while remaining economically viable in the long run.

Investigating the role of startups in embracing and implementing sustainability provides a more detailed picture of how these enterprises contribute to bigger societal and environmental goals[31]. In today's quickly changing world, startups are considered as the driving force of innovation and disruption. Startups are applying sustainable business techniques that focus on the three components of the triple bottom line: the environment, economy, and society [16]. It is crucial to analyze startup firm models that prioritize sustainability, as well as their long-term success or failure rate. It is vital to investigate whether implementing sustainable business practices gives startups a competitive advantage. In the context of this study, competitive advantage refers to the ability of startups in the entrepreneurial ecosystem to acquire a superior and sustainable market position by using sustainable business practices[21]. Green practices, such as the use of renewable energy sources, contribute to a more efficient supply chain and logistics, resulting in improved performance and effectiveness that can provide a competitive edge to firms [5]. Prioritizing sustainability and green practices helps firms improve their brand image, competitiveness, and market position. Pricing, quality, delivery, and flexibility have all been cited as competitive advantage features in the literature.[26].Several characteristics of competitive advantage have been identified in literature including pricing, quality, delivery, and flexibility[19][32]. The impact of strategic capabilities on these competitive advantage elements suggests that firms with strong strategic competencies, such as technical expertise, resource generation and ownership, and technology utilization, are more likely to achieve long-term competitive advantages in terms of cost, quality, delivery, and flexibility [11].

Companies can get a competitive edge by transforming to a more sustainable corporate environment, which helps them to boost transparency[29], create a good workplace[22], and attract more customers. By differentiating the organization, boosting brand image[3], and meeting customer wants, integrating sustainable practices, and exhibiting a commitment to social responsibility can contribute to attaining a competitive edge in the market.

This paper's subsequent sections are organized as follows: The second portion delves deeply into current literature on the junction of sustainable business practices and competitive advantage. Following the examination of the literature, the research methodology is explained, including the study design, data gathering methodologies, and statistical techniques used. The report then digs into the complexities of data analysis and interpretation, offering light on the empirical investigation of the relationship between sustainable business practices and competitive advantage in the context of Indian startups. The analysis's conclusions are reported in the next part, along with a full commentary that situates the findings with future scope of work.

2 Literature Review

Researchers have evaluated the impact of strategic capabilities on long-term competitive advantage, with a particular emphasis on technical knowledge, resource generation and ownership, and technology as strategic capability aspects[14]. Past studies[20],[23] have discovered a substantial association and influence between strategic competencies and long-term competitive advantage, implying that organisations that can create value and supply products and services

to customers can attain long-term competitive advantage. The creative use of resources in connection with customer needs can increase the value of products and services and contribute to economic growth.

A study[27] integrated simultaneous engineering and green target cost technologies in order to offer environmentally friendly goods that match consumer requirements in the shortest amount of time and at the lowest feasible cost. The study suggests that transitioning from sequential to simultaneous product development allows for faster response and adaptation to changing work circumstances. Using simultaneous engineering and green target cost methodologies in product development is a shortcut in the product design and development process adding to the competitive advantage. As the global interest in environmental issues and the paucity of natural resources,[33] the study proposes channeling current technologies towards servicing the environment. Past studies have highlighted businesses delayed adoption of sustainable products and the necessity to understand how to gain a competitive advantage through the use of sustainable products. The study[4] employs a grounded theory approach including interviews with important stakeholders such as entrepreneurs, investors, customers, and academic/non-governmental organisation representatives. Recent studies[8], [9] have shown that investors are skeptical of sustainable technologies, yet customers are open and eager to participate. In addition to the product, sustainable entrepreneurs should focus on establishing a good business case[2]. The primary challenge to the success of sustainable innovations is not cost but the tendency to postpone change until issues become urgent. Investing in sustainable inventions is more appealing in different areas with favorable environmental rules.

2.1 Sustainable business practices

Sustainable business practices are strategies and actions made by businesses to reduce their negative impact on the environment and society while increasing long -term economic viability[17]. According to literature, these techniques strive to address the demands of the current generation without compromising future generations' ability to meet their own needs[10]. According to[18], using eco-friendly manufacturing processes and renewable energy sources will reduce carbon emissions and resource utilization. Implementing trash reduction and recycling programs will reduce waste generation and promote the concepts of the circular economy[7]. Sustainable practices also helps to ensure the ethical and fair treatment of employees, suppliers, and stakeholders, such as fair wages, safe working conditions, and human rights respect[13] and also encourages to participate in corporate social responsibility activities such as assisting local communities and encouraging diversity and inclusion [25].

Companies must build sustainability in order to remain competitive in the global market, boost their reputation, and produce more money[24]. The use of alternative energy sources assists businesses in lowering operational costs, improving economic growth, and increasing supply chain productivity. Green practices, such as the use of renewable energy sources, enhance supply chain and logistics efficiency, reduce carbon emissions and waste creation[6]. Adopting cutting-edge technologies and prioritizing personnel training help to ensure the successful construction of long-term businesses[30]. To improve sustainability, the study emphasizes the need of using renewable energy sources and applying green practices within the company periphery[12]. Companies that embrace sustainable business practices can establish a positive reputation, attract environmentally conscious customers, and gain a competitive advantage in the market in long run.

2.2 Competitive advantage

Researchers have highlighted the significance of sustainability in strategic management as well as the variables that contribute to long-term competitive advantages[4]. It emphasizes the importance of both internal and external settings in establishing long-term competitive advantages. In literature, sustainable competitive advantages are not explicitly defined, but are understood as advantages that lead to an organization's ongoing growth. They cover a wide range of topics and can be constructed using long-term techniques.

Recent studies[28] emphasise the importance of businesses recognizing the variety of sustainability concerns and developing a consistent sustainability framework. It also discusses many stages of corporate sustainability, ranging from pre-corporate to comprehensive corporate sustainability.

According to [23] the two sustainability strategies are relevant conservative-efficiency, which focuses on coefficiency, and visionary-holistic, which focuses on internal company activities to obtain sustainability.

With research literature highlighting the need for sustainability incorporation in business models to gain competitive advantage, it becomes imperative to test that to what extent the inclusion of sustainability helps business ventures to gain competitive advantage. This study is an effort to test the relationship between the two variables and help firms to take strategic decisions.

3 Research Methodology

The proposed work adopts a robust mechanism for analysis . The data is collected from new ventures belonging to diverse industries through structured questionnaire. Total 498 responses were received out of which only 441 responses were completely filled and could be considered for further evaluation. The questionnaire is based on five-point Likert scale with sixteen variables of sustainable business practices and 12 variables of competitive advantage were examined among the business houses. Descriptive analysis, reliability analysis, correlation and regression analysis were performed using the statistical tool R.

3.1 Data Analysis and Interpretation

This section presents a comprehensive analysis of the dataset to explore the relationship between sustainable business practices and competitive advantage. To examine the in initial association between SBP and CA correlation analysis was employed. Equation 3.1 represents the regression equation indicating SBP has a coefficient of 0.8487. This means that a one-unit rise in SBP is connected with a 0.8487-unit increase in CA.

$$CA = 0.6083 + 0.8487SBP$$

The t-value of 36.14 provides an indication of the significance of a variable. It indicates that SBP and CA have a substantial connection at less than 0.05 significance level as depicted in Table 1. VIF indicates that there is no issue of multicollinearity between SBP and CA constant.

As depicted in Table 2, the model accounts for approximately 74.84% of the variation in CA. This suggests that SBP accounts for a significant percentage of the variation in Competitive advantage. At 74.78%, the adjusted R-squared takes into account the number of predictors in the model, providing a more trustworthy estimate of model fit. R-squared prediction (R-sq(pred)): The anticipated R-squared (74.56%) predicts the model's performance on new data, implying

Table 1: SBP COEFFICIENT VALUES

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	0.6083	0.0890	6.84	0.001	
SBP	0.8487	0.0235	36.14	0.001	1.00

Table 2: MODEL SUMMARY

S	R-sq	R-sq(adj)	R-sq(pred)	10-fold S	10-fold R-Sq
0.319239	74.84%	74.78%	74.56%	0.322398	74.22%

resilience in CA prediction based on SBP. Cross-validation results confirm the hypothesis with an R- squared of 74.22% and affirm the model's effectiveness and generalizability.

According to the ANOVA results in Table 3, the regression model is very significant (F-Va lue = 1305.79, p 0.001), emphasizing the significance of SBP in predicting CA.

The Durbin-Watson test is a statistical test used to detect the presence of autocorrelation in the residuals of regression analysis. The Durbin- Watson score is 2.05631(Table 4), indicating that the residuals have no substantial autocorrelation. This shows that the model adequately accounts for observations' time dependence. A solid and statistically significant positive link exists between SBP and CA according to the regression study. The model has a strong exp lanatory power, accounting for a significant fraction of the variability in CA.

The normal probability plot of residuals in figure 1. shows a relatively straight line, suggesting normal distribution of residuals. The Durbin-Watson statistic indicates no significant auto-correlation in the residual as depicted in normal probability plot.

The results of this study depicts that there is a strong positive association between the two variables. The ventures that adopt sustainable business practices in their respective business models tend to gain a strong competitive advantage over others.

4 Findings and Discussion

The findings align and extend the existing literature particularly in the context of startups. By evaluating the relationship between sustainability and competitive advantage, this study contributes empirical evidence to the ongoing academic discussion on the strategic consequences of sustainable company practices. This significant relationship illustrates the inter connectedness of these variables and demonstrates that when businesses adopt sustainable practices, their competitive advantage is likely to improve concurrently. These findings serve as a strategic road map for startups. Adopting sustainable practices can be positioned as more than just a corporate social responsibility endeavor, but also as a realistic strategy of gaining a competitive edge.

Table 3: ANALYSIS OF VARIANCE

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	1	133.077	133.077	1305.79	0.001

Table 4: ANALYSIS OF VARIANCE

Durbin-Watson Statistic	2.05631

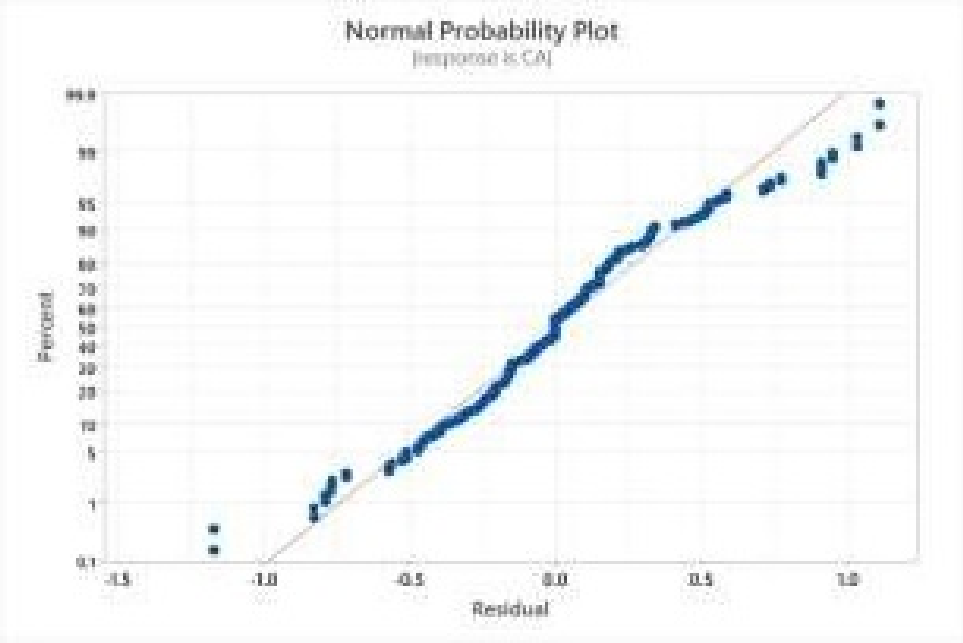

Figure 1: Normal Probability Plot: Competitive Advantage

5 Implications

This proposed work has both practical and managerial implications. Regression model suggest that startups that adopt sustainable practices have the potential to gain competitive advantage not only in terms of market positioning, but also in terms of long-term viability. Investors, entrepreneurs and other relevant stakeholders can use these findings to make educated resource allocation decisions, concentrating on areas of sustainability that provide strong competitive advantage. As the rate of failure among startups is very high the adoption was sustainable business practices will help them gain competitive advantage as a result it may help in reducing the rate of failure. Startups can focus on unique, industry-specific sustainable projects, gaining benefits in terms of cost efficiency, brand reputation, and income generation. The findings may also have implications for policy formulation at both regional and national level. The future policies can incorporate sustainability related incentives to foster the growth of sustainable entrepreneurial ecosystem. The work implies that a deliberate focus on sustainability can be a critical driver of startup success, influencing consumer perception, operational efficiency and business resilience

6 Conclusion

To conclude, the findings of this study underscore the significance of environmentally sustainable practices in conferring competitive advantage to businesses. The research reveals a direct correlation between such practices and organizational success in the market. To supplement the quantitative data, qualitative research methods, including in-depth interviews and case studies, can be employed to gain deeper insights into the mechanisms through which sustainable strategies translate into competitive advantage. Furthermore, longitudinal studies are warranted to test the dynamic nature of sustainable business practices across various industries and their long -term impact on market competitiveness. Such research efforts hold the potential for enhancing our understanding of the intricate relationship between sustainability initiatives and business performance, focusing on future strategic decisions and adopting a more sustainable economic landscape.

References

[1] Oihab Allal-Chérif, Juan Costa Climent, and Klaus Jurgen Ulrich Berenguer. Born to be sustainable: How to combine strategic disruption, open innovation, and process digitization to create a sustainable business. *Journal of Business Research*, 154:113379, 2023.

[2] Raymond J Andrews, Catherine Fazio, Jorge Guzman, Yupeng Liu, and Scott Stern. Reprint of "the startup cartography project: measuring and mapping entrepreneurial ecosystems". *Research Policy*, 51(9):104581, 2022.

[3] I Kahraman Arslan. The importance of creating customer loyalty in achieving sustainable competitive advantage. *Eurasian Journal of Business and Management*, 8(1):11–20, 2020.

[4] Brian Baldassarre, Giulia Calabretta, NMP Bocken, and Tomasz Jaskiewicz. Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design. *Journal of cleaner production*, 147:175–186, 2017.

[5] David Bendig, Lucas Kleine-Stegemann, Colin Schulz, and David Eckardt. The effect of green startup investments on incumbents' green innovation output. *Journal of Cleaner Production*, 376:134316, 2022.

[6] Gonçalo Cardeal, Bruna Ferreira, Paulo Peças, Marco Leite, and Inês Ribeiro. Designing sustainable business models to reduce spare part inventory. *Procedia CIRP*, 105:171–176, 2022.

[7] Songlei Chao, Chengfeng Huang, and Wenxuan Chen. The impact of air pollution on startups and structural transformation: Evidence from newly registered enterprises in china. *Journal of Cleaner Production*, 422:138537, 2023.

[8] Federica Ciccullo, Margherita Fabbri, Nizar Abdelkafi, and Margherita Pero. Exploring the potential of business models for sustainability and big data for food waste reduction. *Journal of Cleaner Production*, 340:130673, 2022.

[9] Sarishma Dangi, Riya Sharma, Ravi Tomar, and Ambica Prakash Mani. Blockchain-based framework for indian retail market in smes. In *Workshop on Mining Data for Financial Applications*, pages 287–296. Springer, 2022.

[10] Luciano Mathias Döll, Micaela Ines Castillo Ulloa, Alexandre Zammar, Guilherme Francisco do Prado, and Cassiano Moro Piekarski. Corporate venture capital and sustainability. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(3):132, 2022.

[11] Ashish Mohan Dubey, Geetika Goel, and GP Sahu. Effective implementation of competitive advantage and sustainable competitive advantage: a conceptual model. *International Journal of Business Innovation and Research*, 7(5):519–535, 2013.

[12] Dulce Gonçalves, Magnus Bergquist, Sverker Alänge, and Richard Bunk. How digital tools align with organizational agility and strengthen digital innovation in automotive startups. *Procedia*

Computer Science, 196:107–116, 2022.

[13] Mercedes Grijalvo and Carmen García-Wang. Sustainable business model for climate finance. key drivers for the commercial banking sector. *Journal of Business Research*, 155:113446, 2023.

[14] Muhammad Haseeb, Hafezali Iqbal Hussain, Sebastian Kot, Armenia Androniceanu, and Kittisak Jermsittiparsert. Role of social and technological challenges in achieving a sustainable competitive advantage and sustainable business performance. *Sustainability*, 11(14):3811, 2019.

[15] Jannic Horne and Klaus Fichter. Growing for sustainability: Enablers for the growth of impact startups–a conceptual framework, taxonomy, and systematic literature review. *Journal of Cleaner Production*, 349:131163, 2022.

[16] Kaltrina Kajtazi, Gadaf Rexhepi, Arshian Sharif, and Ilknur Ozturk. Business model innovation and its impact on corporate sustainability. *Journal of Business Research*, 166:114082, 2023.

[17] Deepak Kaushal, Sanjeev Kumar, Rahul Raj, and Abhishek Negi. Understanding the effect of entrepreneurial orientation, innovation capability and differentiation strategy on firm performance: a study on small and medium enterprises. *International Journal of Business and Globalisation*, 30(1):57–80, 2022.

[18] Nicole Cecchele Lago, Arthur Marcon, Jose Luis Duarte Ribeiro, Yasmin Olteanu, and Klaus Fichter. The role of cooperation and technological orientation on startups' innovativeness: An analysis based on the microfoundations of innovation. *Technological Forecasting and Social Change*, 192:122604, 2023.

[19] Elisa Medina, Federico Caniato, and Antonella Moretto. Framing sustainable supply chain finance: how can supply chain sustainability practices and supply chain finance solutions be integrated? *Journal of Purchasing and Supply Management*, 29(3):100837, 2023.

[20] Sandra Naomi Morioka, Ivan Bolis, Steve Evans, and Marly M Carvalho. Transforming sustainability challenges into competitive advantage: Multiple case studies kaleidoscope converging into sustainable business models. *Journal of cleaner production*, 167:723–738, 2017.

[21] Isabela Moroni, Amilton Arruda, and Kátia Araujo. The design and technological innovation: how to understand the growth of startups companies in competitive business environment. *Procedia Manufacturing*, 3:2199–2204, 2015.

[22] Devika Nadarajah and Sharifah Latifah Syed Abdul Kadir. A review of the importance of business process management in achieving sustainable competitive advantage. *The TQM journal*, 26(5):522–531, 2014.

[23] Mostafa Nejati, Amirul Shah Bin, Shahbudin, and Azlan Bin Amran. Sustainable development: a competitive advantage or a threat? *Business strategy series*, 11(2):84–89, 2010.

[24] Fábio Lotti Oliva, Pedro Marins Freire Teberga, Lucas Israel Oliveira Testi, Masaaki Kotabe, Manlio Del Giudice, Peter Kelle, and Miguel Pina Cunha. Risks and critical success factors in the internationalization of born global startups of industry 4.0: A social, environmental, economic, and institutional analysis. *Technological Forecasting and Social Change*, 175:121346, 2022.

[25] Maximilian Palmié, Jonas Boehm, Jonas Friedrich, Vinit Parida, Joakim Wincent, Jonas Kahlert, Oliver Gassmann, and David Sjödin. Startups versus incumbents in 'green'industry transformations: A comparative study of business model archetypes in the electrical power sector. *Industrial Marketing Management*, 96:35–49, 2021.

[26] Ayoob Sadeghiani, Sajjad Shokouhyar, and Sadra Ahmadi. How digital startups use competitive intelligence to pivot. *Digital Business*, 2(2):100034, 2022.

[27] Willem Schramade. Investing in the un sustainable development goals: opportunities for companies and investors. *Journal of Applied Corporate Finance*, 29(2):87–99, 2017.

[28] Vinothkumar Sivalingam, Haochen Liu, Baskaran Selvam, Guo Kai, Poongavanam Ganesh Kumar, Munish Kumar Gupta, Mehmet Erdi Korkmaz, and Jie Sun. Towards sustainability assessment, energy consumption, and carbon emissions in cryogenic drilling of alloy 20: a new approach towards sustainable future and challenges. *The International Journal of Advanced Manufacturing Technology*, pages 1–15, 2024.

[29] Mukesh Srivastava, Andy Franklin, and Louis Martinette. Building a sustainable competitive advantage. *Journal of technology management & innovation*, 8(2):47–60, 2013.

[30] Mehdi Tajpour, Elahe Hosseini, and Muhammad Mohiuddin. Effects of innovative climate, knowledge sharing, and communication on sustainability of digital start-ups: Does social media matter? *Journal of Open Innovation: Technology, Market, and Complexity*, 9(2):100053, 2023.

[31] Sarah Tiba, Frank J van Rijnsoever, and Marko P Hekkert. Sustainability startups and where to find them: Investigating the share of sustainability startups across entrepreneurial ecosystems and the causal drivers of differences. *Journal of Cleaner Production*, 306:127054, 2021.

[32] Till J Winkler, Pinar Ozturk, and Carol V Brown. Sustainability strategies for regional health information organization startups. *Health Policy and Technology*, 5(4):341–349, 2016.

[33] Huan Xiao and Dengke Yu. Achieving sustainable competitive advantage through intellectual capital and corporate character: the mediating role of innovation. *Problemy ekorozwoju*, 15(1), 2020.