Determinants of Sustainable Entrepreneurship in Palmyrah-Based Enterprises in Jaffna

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Abstracts - *In the competitive business era, moving towards sustainable entrepreneurship is a vital part. In that context, the present study aims to determine the drivers for sustainable entrepreneurship in Palmyrah-based enterprises in Jaffna. Especially in Jaffna, many entrepreneurship activities are based on the Palmyrah-based product, as Palmyrah is one of the iconic resources in Jaffna. In that context, in order to improve the business path, researchers collected data from 184 registered Palmyrah-based enterprises in Jaffna by issuing a Likert scale questionnaire. Green technology, products innovation, digital marketing, and digital financing were considered as the independent variables of the study, while sustainable business practices were considered as the dependent variable of the study. The researcher used SPSS to run statistical analysis and reliability tests, normality tests, correlation analysis, multiple regression analysis, and multicollinearity test. Based on the analysis, it is concluded that green technology, product innovation, digital financing, and digital marketing had a positive effect on business sustainability in Palmyrah-Based Enterprises in Jaffna.*

Keywords: Digital Marketing, Digital Financing, Innovation in products, Green. technology

I. INTRODUCTION

For many centuries in the northern province of Sri Lanka, palmyrah has been an integral part of the cultural, economic, and social aspects (Mahilrajan et al., 2025). In that context, the palmyrah offers a wide range of products such as jaggery, toddy, handicrafts, and value-added food items. This contribution is a vital part of the economic situation of Northern Province (Sayanhika & Selvakumar, 2024). In the present era of digital transformation and sustainability, this sector faces both challenges and opportunities (Danuharan, Kuruppu, & Sumithira, 2024). The main reason for the challenges is that it remains largely traditional, with limited integration of modern technology and sustainable practices. This barrier affects the innovativeness of the business, market expansion opportunities, and livelihoods.

In these sustainable entrepreneurship activities, green digital innovations play a vital role. It includes eco-friendly processing technologies, digital marketing platforms, innovative product development, and access to digital financial services. These innovative practices not only enhance efficiency and reduce negative environmental impacts. In addition to that, it helps to empower rural entrepreneurs to reach wider markets, strengthen competitiveness, and contribute to the local economy in a sustainable manner.

In developed nations, the transition to green technology is supported by their promotion of sustainable development. However, merging countries like Sri Lanka still struggle due to several reasons, such as a lack of awareness, limited technological infrastructure, financial constraints, and insufficient policy support. Especially in Jaffna, over the decades of conflict, many businesses collapsed. Due to the war situation, many palmyrah-based enterprises in Jaffna suffered from loss of infrastructure, displacement of skilled labour, and disruption of supply chains. This practice limited production and market access and causing a decline in traditional palm-based industries. As a result, post-

conflict recovery efforts have focused on rebuilding these enterprises while preserving their cultural and economic significance the post-conflict situation, many businesses improved their activities but failed to consider green technology due to barriers such as lack of awareness, limited technological infrastructure, financial constraints, and insufficient policy support. In that context, addressing these gaps facilitates transforming palmyrah-based enterprises into sustainable business models. Furthermore, that will help to preserve traditional heritage while embracing modern digital opportunities.

A. Research Problem

Considering the National Figures, 60% of Sri Lanka's 11 million palmyrah trees are not in use (Ceylon Today, 2023). Meanwhile, export revenue from palm-based products was reported as Rs. 78 million in 2023. This is evidence that a figure that reflects both growing international demand and the sector's underperformance compared to its potential. At the same time, it is evidenced that 53.6% internet penetration and 35.4% social media usage as of 2025 in Sri Lanka. It is an opportunity for small medium enterprises to expand through green technologies, e-commerce, and digital financial tools. Even though there are favorable situation palm-based businesses in Jaffna largely remain confined to traditional methods, struggling with outdated production techniques, limited market access, and low innovation adoption. This gap between the natural resource availability, rising digital infrastructure, and the actual performance of enterprises highlights a critical research problem as "What are the factors that influence the adoption of sustainable entrepreneurship in palmyrah-based businesses in Jaffna?"

In that context, the present study aims to provide insight into how green digital innovations can enhance sustainability and entrepreneurial growth in Palmyrah-based businesses in Jaffna. This particle sight will be useful for local entrepreneurs and policymakers. In addition to that, research highlights pathways for environmentally responsible and economically viable business practices. Also, it will provide academic insight regarding green innovation in the Sri Lankan context. The researchers organized the rest of the chapters into four sections such as literature, a description of the research methodology, presentation and analysis of findings, and a conclusion with recommendations for practice and future research.

B. Research Objective

To examine the determinants of factors influencing sustainable entrepreneurship in palmyrah-based businesses in Jaffna.

1) Specific Objectives

- To assess the impact of the adoption of green technologies on sustainable entrepreneurship.
- To determine the effect of digital marketing on sustainable entrepreneurship.
- To investigate the influence of innovation in product development on sustainable entrepreneurship.
- To examine the role of access to digital financial services in promoting sustainable entrepreneurship.

2) Research Question

To what extent do factors influence sustainable entrepreneurship in palmyrah-based businesses in Jaffna?

II. LITERATURE REVIEW

A. Theoretical Review

The present study is based on the Resource-Based View (RBV) Theory (Clulow, Gerstman, & Barry, 2003). This theory suggests that the competitive advantage of the firm depends on unique resources and capabilities that are valuable, rare, inimitable, and non-substitutable. Therefore, this theory offers a perspective for understanding how internal resources such as green technology, innovative product development, digital marketing skills, and access to digital financing contribute to enhancing business performance. These resources are essential for creating distinctive capabilities that enable enterprises to operate efficiently, respond to market demands, and minimise environmental impact. When connecting the resource-based view to sustainable entrepreneurship, effective utilisation of green technologies and innovation facilitates enhancing the production process. Similarly, digital marketing helps reach a wider audience, and digital financing helps strengthen the financial situation. In that context, the present theoretical framework highlights how palmyrah-based enterprises can transform traditional operations into competitive and environmentally responsible business activities, demonstrating that the strategic deployment of resources directly influences the adoption of sustainable business practices.

Similarly, Diffusion of Innovations (DOI) Theory explains how new ideas, technologies, or practices spread within a social system over time (Khan et al., 2022). This theory explains that relative advantages, compatibility with existing practices, complexity, trialability, and observability are the main key factors that determine the adoption of innovations. In that context, this theory suggests how entrepreneurs adopt innovations such as green technology, product innovation, digital marketing, and digital financing to enhance sustainable business practices. The perceived economic benefit and social network through which information is spread are the two things that influence the adoption of innovation. In that case, the present theory suggested explaining how the diffusion of these innovations can enable palmyrah-based enterprises to transform traditional operations into more efficient, competitive, and environmentally responsible business models. With the help of this theory, examining the determinants of innovation adoption provides a conceptual foundation for understanding the factors that facilitate or hinder sustainable business practices in palmyrah enterprises.

B. Empirical Review

Sustainable entrepreneurship has played a vital role in the present world. Sustainable entrepreneurship is the driver of economic growth while emphasizing environmental stewardship. According to Odeyemi et al. (2024), eco-friendly practices relating to circular economy, eco-innovation, and sustainable supply chain management enable entrepreneurs to reduce negative environmental impacts and enhance business profitability. The study proved that technological innovations, including renewable energy and data analytics, are key enablers for advancing sustainable entrepreneurship. However, market acceptance and regulatory constraints remain the major challenges.

At the same time, Starchenko et al. (2021) found that effective environmental management enhances the green brand of a company. This practice led to higher net profit and increased brand loyalty. Based on the finding, Researchers confirmed that in order to create a competitive advantage in the market, sustainable business practices are vital part.

The study conducted by Yasir et al. (2023) proved the role of environmental values in shaping sustainable entrepreneurial intentions. In addition to that, the authors indicated that attitudes toward sustainability and perceived behavioral control positively

influence entrepreneurial intentions. However, subjective norms are less significant in sustainable entrepreneurship. Also, they argued that prior entrepreneurial experience further strengthens the relationship between environmental values and the intention to launch sustainable ventures. Collectively, the study proved that integrating green practices, innovation, and environmental consciousness is crucial for fostering sustainable entrepreneurship.

The sustainable entrepreneurship drive from Digital technologies and e-commerce. According to Zrybnieva, Larina, and Semenda (2023), social media, content marketing, and influencer strategies were important tools that promoted sustainable entrepreneurship. The main reason highlighted by the study is that raising consumer awareness of green practices is key. In addition to that, the study proved that in developed nations, advanced technologies like AI and big data analytics further enhance marketing strategies. On the other hand, in developing nations, leverage e-commerce and localized marketing to connect with diverse customer groups.

According to Xie et al. (2022), digital infrastructure has opened new entrepreneurial opportunities for rural residents. The study indicated that by utilizing a neural network model, businesses identified factors influencing entrepreneurial intentions in rural e-commerce.

On the other hand, Yacob, Sulistiyo, Erida, and Siregar (2021) found that e-commerce significantly improves business sustainability. Also, a strong entrepreneurial orientation along with an E-commerce platform enhanced entrepreneurial sustainability. These findings suggest that digital platforms not only enhance firm performance but also contribute to long-term sustainability.

III. RESEARCH METHODOLOGY

A. Research Approach

The present study focused on quantitative research approaches to examine the determinants of factors influence of sustainable entrepreneurship in palmyrah-based businesses in Jaffna. The researcher collected the data by using 5-point Likert scale structured survey for the study. Based on literature evidence, the independent variables are adoption of green technologies, digital marketing, innovation in product development, and access to digital financial services, and the dependent variable of the study is sustainable entrepreneurship performance.

B. Research Design

The study employed a cross-sectional survey design to collect primary data at a single point in time. The design is used in order to assess the strength and significance of the relationships between independent and dependent variables. The study used structured questionnaires with a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) to measure respondents' perceptions and practices.

C. Population and Sample

The population of the study includes all registered palmyrah-based businesses in Jaffna that included small-scale producers, artisans, cooperatives, and medium enterprises involved in palmyrah-based product production and marketing. The study excluded unregistered craftsmen who were involved in the business.

In terms of sample size, using a 95% confidence level and 5% margin of error, the required sample is approximately 184 respondents. In that context, a sample of 184 respondents was collected, which is sufficient for regression analysis and correlational

studies for 4 independent variables according to the 5– 10 respondents per item rule. A convenience sampling method was utilized by the researchers based on the availability and willingness to participate in the study. However, there are some limitations associated with the convenience sampling method. First, selection bias occurs as participation is selected based on availability. These practices led to over-representing certain groups and under-representing others. Voluntary response and coverage biases may occur as only willingness and easy access participate, leaving out portions of the population. It limited the generalisability of the study and led to systematic differences between the sample and the target population.

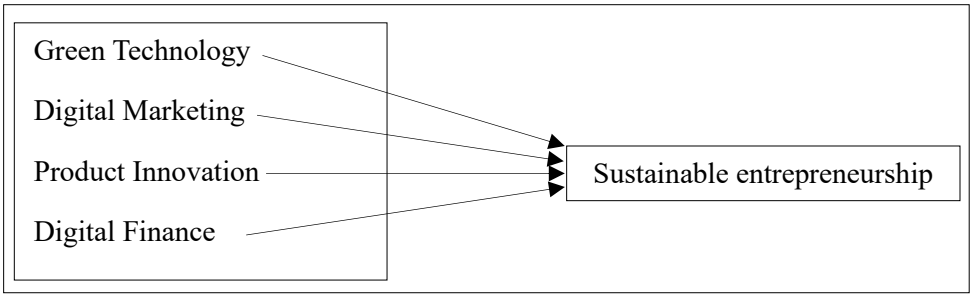
D. Data Analysis

Researchers utilized SPSS to run the data analysis. On that basis, descriptive analysis, reliability test, normality test, correlation analysis, multicollinearity test, and multiple regression were run by the researchers. Reliability analysis was run to ensure internal consistency of the scale. Correlation Analysis to determine the relationship between independent variables and sustainable entrepreneurship, and Multiple Regression Analysis to assess the influence of each independent variable on sustainable entrepreneurship and determine their relative contribution.

E. Operationalization

The Adoption of Green Technologies is measured through four items such as the use of eco-friendly production methods, the adoption of energy-efficient tools, the application of waste reduction practices, and the implementation of green innovations to improve sustainability (Schaltegger & Wagner, 2011). The second independent variable, Digital Marketing and E-Commerce Utilization was measured with four statements such as active use of digital platforms for promotion, online sales increasing the customer base, digital marketing enhancing competitiveness, and e-commerce improving profitability, measured on a 5-point Likert scale (Tiago & Veríssimo, 2014). Innovation in Product Development is the third independent variable that is measured through items such as introducing new palmyrah-based products, innovative product designs and packaging, creating value-added products that meet consumer needs, and using innovation to enhance competitiveness, also measured on a 5-point Likert scale (Cooper, 2019). Access to Digital Financial Services is captured with statements on the use of mobile banking and digital payments, reducing transaction costs, access to online financing supporting growth, and digital payments improving operational efficiency, using a 5-point Likert scale (Demirgüç-Kunt et al., 2018). Finally, the dependent variable, Sustainable Entrepreneurship, is operationalized through items evaluating long-term sustainability practices, balancing profitability with social and environmental responsibility, enhancement of sustainability through digital innovations, and achieving growth through green and digital innovations, all measured on a 5-point Likert scale (Cohen & Winn, 2007).

Figure 1. Conceptual framework



Source: Author's Illustration

F. Hypotheses

Based on the literature evidence, the researchers drive the hypotheses for the study as follows.

Table 1. Hypothesis

Hypothesis No.	Hypothesis
H_1	There is a significant positive relationship between the adoption of green technology and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.
H_2	There is a significant positive relationship between the adoption of digital marketing sustainable entrepreneurship in palmyrah-based businesses in Jaffna.
H_3	There is a significant positive relationship between innovation in product development and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.
H_4	There is a significant positive relationship between access to digital financial services and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.

Source: Authors' compilation

G. Ethical Consideration

In the aspect of ethical consideration, the researchers followed standard research ethics to ensure the integrity and credibility of the findings. The respondents of the study were informed about the purpose of the study, and they participated entirely voluntarily, and they could withdraw at any point in time. Along with the questionnaire, informed consent was obtained from all participants, and it assured that their data were solely used for academic purposes only. Also, throughout the research process, confidentiality and anonymity were strictly maintained by the researchers.

IV. RESULTS AND DISCUSSION

A. Reliability Test

Table 2. Reliability test

Variable	Cronbach's alpha value
Greentech	0.84
Digital Marketing	0.92
Innovation Product	0.82
Digital Finance	0.81
Sustainable Entrepreneurship	0.78

Source: Authors' compilation

As shown in Table 2, all constructs demonstrated acceptable to excellent internal consistency, as measured by Cronbach's alpha. Based on the constructions of green technology, innovative products, and Digital Finance showcased good reliability, while exhibiting excellent reliability digital marketing. Since all the values were above 0.7, the measurement scale used in the study can be internal consistency.

B. Normality Test

Table 3. Normality test

Variable	W Statistic	p-value
Greentech	0.880	> 0.05
Digital Marketing	0.888	> 0.05
Innovation Product	0.887	> 0.05
Digital Finance	0.886	> 0.05
Sustainable Entrepreneurship	0.890	> 0.05

Source: Authors' compilation

Table 4. Jarque-Bera (JB)

Test	Value	p-value
Jarque-Bera (JB)	2.569	0.277
Kurtosis	3.396	

Source: Authors' compilation

The above table 3 illustrates the Normality output. According to the table, the Null hypothesis of normality could not be rejected as all variables recorded p-values greater than 0.05. Therefore, it can be concluded that all the constructions met the assumption of Normality and are best fit for parametric statistical analyses. This ensures the strong explanatory power of the model. The p- value of Jarque Bera test is higher than 0.05 that (JB = 2.569, p = 0.277) proved that the data were normally distributed.

C. Correlation Analysis

Table 5. Correlation Analysis

Predictor	r (Correlation)	p-value
Greentech	0.797	< 0.001
Digital Marketing	0.742	< 0.001
Innovation Product	0.788	< 0.001
Digital Finance	0.770	< 0.001

Source: Authors' compilation

According to the above table 5, it shows that all independent variables were statistically positively associated with Sustainable Entrepreneurship. Green Technology has statistically strong positive correlation with sustainable business practice ($r = 0.797$, $p < 0.001$). Likewise, innovation in products, digital Marketing and digital finance also showcased a statistically positive relationship with sustainable business practice ($r = 0.788$, $p < 0.001$). Based on the p-values of all the variables, which were lower than 0.001, the relationships were statistically significant. Based on that, it can be concluded that the adoption of green technologies, the use of digital marketing, innovation in products, and digital finance practices all contribute positively to sustainable entrepreneurship.

D. Multiple Regression Analysis

Table 6. Model summary

Statistic	Value
R-squared (R^2)	0.727
Adjusted R-squared	0.721
F-statistic	119.3
Prob (F-statistic)	0.000
Durbin-Watson	2.095
No. of Observations	184

Source: Authors' compilation

Table 7. Multiple regression analysis

Predictor	Coefficient (β)	p-value
Constant	0.3420	0.013
Greentech	0.3064	0.000
Digital Marketing	0.1854	0.004
Innovation Product	0.2571	0.000
Digital Finance	0.1618	0.020

Source: Authors' compilation

The above Table 6 illustrates the model summary. Based on the results, the overall model was statistically significant ($F119.3$, $p < 0.001$). According to the R-Squared value 72% indicated that a unit change in the independent variable explained 72.7% of the variance

in Sustainable Entrepreneurship. The results of Durbin–Watson statistic of 2.095 indicated no issues with autocorrelation.

When considering the predictors, Green Technology had the statistically significant positive effect on Sustainable Entrepreneurship ($\beta = 0.306$, $p < 0.001$). Similarly, Innovation Product ($\beta = 0.257$, $p < 0.001$), Digital Marketing ($\beta = 0.185$, $p = 0.004$), and Digital Finance ($\beta = 0.162$, $p = 0.020$) had statistically positive effect on Sustainable Entrepreneurship. Based on the above results, Green Technology is the most influential factor in determining Sustainable Entrepreneurship. Finally, it can be concluded that Green Technology, Innovation Product, Digital Marketing, and Digital Finance had a statistically positive relationship with Sustainable Entrepreneurship.

E. Multicollinearity Test

Table 8. Multicollinearity test

Variable	VIF
Greentech	3.51
Digital Marketing	2.75
Innovation Product	3.46
Digital Finance	3.33

Source: Authors' compilation

As shown in Table 8 illustrates the output of the multicollinearity test. As the VIF value of all the independent variables is lower than 5, it is evident that there is no multicollinearity issue.

Table 7. Hypothesis status

Hypothesis No	Hypothesis	Status
H_1	There is a significant positive relationship between the adoption of green technology and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.	Accepted
H_2	There is a significant positive relationship between the adoption of digital marketing and e-commerce utilization and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.	Accepted
H_3	There is a significant positive relationship between innovation in product development and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.	Accepted
H_4	There is a significant positive relationship between access to digital financial services and sustainable entrepreneurship in palmyrah-based businesses in Jaffna.	Accepted

Source: Authors' compilation

V. CONCLUSION AND RECOMMENDATION

The Present study examined the impact of Green Technology, Digital Marketing, Innovation Product, and Digital Finance on Sustainable Entrepreneurship. Findings of the study indicated that all four predictors positively and significantly influenced Sustainable Entrepreneurship while Green Technology had the strongest effect on sustainable business practice.

Based on the findings, policymakers need to encourage entrepreneurs to adopt eco-friendly technologies and sustainable production methods. This practice will enable them to sustain themselves in the market for a long time. Similarly, if the business wants to compete in the market, it needs to pay more attention to product innovation. As technology has increased, promotions should take place via a digital platform. Then only they can target the audience regardless of geographical barriers. Also, prioritizing digital funding tools will be more advantageous for overall financial sustainability. In that context, initiating Workshops and training programs regarding green technologies, digital marketing, and financial management for sustainable business practices will be more advantageous.

VI. LIMITATIONS AND RECOMMENDATIONS

A. Limitation

The present study is based on the convenient sampling method. This method may reduce the generalisability of the finding. Also, the study only targeted 184 registered palmyrah-based entrepreneurs. It failed to consider the unregistered population. Also, it is focused on the Jaffna region only, which may affect the originality of the findings. The biased responses are another issue, as the study relied on self-reported data. In addition to that, only quantitative data was collected, which limited the deeper exploration of participant perspectives. The study only considers the selected independent variables based on the literature, excluding other possible influence factors.

B. Recommendations

In the future, it is suggested to use the probability sampling method to select the sample of the study, as it will enhance the representativeness and generalisability of findings. Also, expanding the research to include larger and more diverse samples across different regions would provide a broader understanding of sustainable entrepreneurship. Also, it is suggested to use both quantitative and qualitative approaches, as it will give deeper and more comprehensive insights into the factors influencing sustainability practices. The present study relies on cross-sectional analysis; therefore, it is suggested that longitudinal studies are also recommended to examine the long-term effects of green technology and digital innovations on entrepreneurial sustainability.

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