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SPECIAL FOCUS PAPER

Sustainable Futures: Exploring the Power of Mobile Technologies in Eco-Friendly Product Promotion

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ABSTRACT

Mobile technologies have expressively altered the way eco-friendly products are promoted, offering a dynamic and engaging platform for both businesses and consumers. These technologies propose green businesses and artisans with innovative ways to showcase environmentally aware products, such as organic food, sustainable fashion, and biodegradable goods, to a global audience that highlights sustainability. Through mobile apps, e-commerce platforms, and social media, organisations can involve directly with consumers, bypassing the traditional intermediaries, reducing costs, and fostering deeper connections. The structures, such as real-time product updates, communicating storytelling, user-generated content, and influencer partnerships, enhance consumer trust and build brand awareness. Moreover, the integration of mobile data analytics and personalised notifications allows businesses to effectively target niche markets, ensuring that eco-friendly goods reach the true consumers. On behalf of small-scale producers and Indigenous artisans, mobile technologies link the gap between rural craftsmanship and the demand in urban areas, opening doors to global markets. Though, challenges like digital literacy, infrastructure limitations, and increasing market competition must be addressed to ensure inclusive and equitable access for all stakeholders. This paper explores the transformative influence of interactive mobile technologies in promoting sustainable products, empowering green entrepreneurs, and advancing the global shift towards responsible consumption and eco-friendly lifestyles.

KEYWORDS

mobile technologies, eco-friendly products, social media, niche markets

1 INTRODUCTION

In recent years, growing environmental awareness and the increasing demand for sustainable lifestyles have encouraged businesses and consumers to shift toward eco-friendly products. The worldwide emphasis on sustainable development and responsible consumption has given rise to green entrepreneurship and ethical

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consumerism, where products that are organic, biodegradable, and resource-efficient are preferred. However, one of the determined challenges faced by small-scale producers, especially in Indigenous communities, has been market access and visibility. The emergence of mobile technologies has significantly transformed this landscape by enabling direct engagement between producers and consumers, minimising intermediaries, and promoting inclusivity.

Mobile technologies, including smartphones, mobile applications, e-commerce platforms, and social media, have become vital tools in modern commerce. These technologies have redefined the approach businesses act together with their target audience by offering cost-effective, scalable, and interactive promotional strategies [1]. For eco-friendly products, which often influenced by storytelling, trust-building, and niche market targeting, mobile platforms deliver an ideal environment. Features like real-time product updates, personalised notifications, user-generated content, and influencer partnerships have been acknowledged to enhance brand credibility and increase consumer engagement [2]. The platforms such as WhatsApp Business, Instagram Shops, and dedicated green marketplaces like EcoCart and EarthHero authorise businesses to associate with environmentally conscious consumers in real-time.

Furthermore, mobile analytics facilitate green entrepreneurs to harness consumer insights, permitting them to tailor their offerings and marketing styles. The authors argued [3] that personalisation determined by mobile data fosters customer loyalty and improves purchase intent, especially among ethically motivated consumers. For rural artisans and micro-entrepreneurs, mobile technologies aid as a bridge between localised production and global markets. They democratise digital commerce by proposing tools for inventory management, digital payments, and storytelling, thus enabling even those with limited resources to participate in the green economy [4].

2 MATERIALS AND METHODS

This study adopts a quantitative research design, supported by the Partial Least Squares Structural Equation Modelling (PLS-SEM) approach, to study how mobile technologies are used by micro-level green entrepreneurs in resource-constrained settings to promote eco-friendly products. The study is based on a cross-sectional survey design, collecting data at a single point in time from selected eco-entrepreneurs.

To achieve the objective, a structural model is designed by using PLS-SEM. The hypothesised model includes the following constructs:

Independent Variables (Exogenous Constructs):

- Use of Mobile Technology
- Support and Willingness
- Content, Promotion, and Strategy
- Challenges

Dependent Variable (Endogenous Construct):

- Impact on Business

Each construct is treated as reflective, with multiple indicators measured using a 7-point Likert scale. The model hypothesises direct paths from each independent

variable to the dependent variable. Purposive sampling is employed to identify relevant participants who actively use mobile platforms for business promotion. The data has been collected from 380 respondents to ensure robust results. The study focuses on different parts of Odisha, including Bhubaneswar, Cuttack, Puri and other nearby districts. A structured questionnaire was developed and administered using both online (Google Forms) and offline (paper-based) methods. This methodology provides a solid foundation for analysing the role of mobile technologies in green entrepreneurship and understanding the barriers these micro-entrepreneurs face in resource-constrained settings.

Research Objectives

1. To examine how micro-level green entrepreneurs' resource-constrained settings utilise mobile technologies to promote eco-friendly products.
2. To recommend actionable strategies and practical interventions that improve the effective use of mobile technologies by micro-level green entrepreneurs in resource-constrained settings.

3 LITERATURE REVIEW

Mobile technologies have been recognised as transformative tools in digital marketing, transforming how businesses interact with consumers. The previous studies highlight that mobile platforms, mostly smartphones and mobile applications, have enabled a two-way communication channel between businesses and customers, basically reshaping marketing strategies [1]. Complementing this, the authors [2] discuss that mobile and social media marketing offer a high degree of agility and personalisation. Features such as push notifications, real-time updates, and geo-targeting permit businesses to offer timely and relevant messages, making mobile marketing especially advantageous for small and green enterprises seeking direct engagement with niche consumer segments.

The authors also stated that real green product marketing hinges on these skills, which digital platforms can strongly advertise through multimedia and storytelling [5]. The study also [3] further deliberates the influential power of online buyer reviews and social proof in increasing trust and influencing purchasing decisions, especially for environmentally conscious buyers. The study [6] assert that social media influencers play an essential role in promoting justifiable lifestyles, mainly among younger demographics, thus underscoring the growing synergy between mobile platforms and eco-conscious consumerism.

Mobile technologies are also demonstrating vital for green entrepreneurship, particularly among small-scale producers and artisans. The mobile phones help bridge the rural-urban divide, enabling micro-entrepreneurs in remote areas to access broader markets and digital tools [4]. The author demonstrates how platforms like WhatsApp Business and Instagram Shops provide cost-effective solutions for showcasing products, engaging customers, and managing transactions features crucial for low-resource enterprises trying to build a digital presence.

In spite of these assistances, significant challenges persist in implementing mobile marketing strategies among rural and low-resource eco-entrepreneurs. The authors [7] argued that the enduring digital divide in emerging regions indicating to issues such as poor internet connectivity, absence of access to digital devices, and low levels of digital literacy. In addition, previous studies [8] also discuss how the oversaturation of digital marketplaces makes it hard for small green businesses to gain visibility,

often leaving them overshadowed by larger, better-resourced competitors. These experiments underscore the need for targeted support, infrastructure development, and comprehensive digital policies to enable wider adoption of mobile technologies in green marketing.

4 ANALYSIS AND INTERPRETATION

Before analysing structural relationships, reliability, validity, and model fit were assessed. The results are presented in the following sections, beginning with measurement model evaluation and concluding with the structural model results.

Table 1. Construct reliability and validity

	Cronbach's Alpha	Composite Reliability (ρ_a)	Composite Reliability(ρ_c)	Average Variance Extracted (AVE)
C	0.837	0.843	0.885	0.609
CPS	0.932	0.936	0.946	0.745
IOB	0.806	0.845	0.862	0.522
SW	0.780	0.746	0.710	0.584
UMT	0.725	0.798	0.801	0.683

Source: Smart PLS Output.

The construct reliability and validity analysis indicates that all five constructs in the model meet the acceptable thresholds for internal consistency and convergent validity. The Cronbach's alpha values for all constructs are above the minimum threshold of 0.70, indicating satisfactory internal consistency. Among them, Content, Promotion, and Strategy (CPS) exhibits the highest reliability, with a Cronbach's alpha of 0.932 and composite reliability (ρ_a = 0.936, ρ_c = 0.946), suggesting excellent internal consistency and measurement quality. Similarly, Challenges (C) and Impact on Business (IOB) also demonstrate strong reliability, with composite reliability scores above 0.85 and AVE values of 0.609 and 0.522, respectively, confirming good convergent validity. Support and Willingness (SW) and Use of Mobile Technology (UMT) have slightly lower Cronbach's alpha values (0.780 and 0.725, respectively), but their composite reliability and AVE values remain within acceptable limits.

Particularly, UMT shows a strong AVE of 0.683, indicating that a substantial portion of variance in the indicators is explained by the construct. Overall, all constructs demonstrate adequate reliability and validity, with CPS and C emerging as the most psychometrically robust constructs in the model.

Table 2. Discriminant validity – heterotrait – monotrait ratio (HTMT) – matrix

	C	CPS	IOB	SW	UMT
C					
CPS	0.815				
IOB	0.846	0.856			
SW	0.802	0.825	0.843		
UMT	0.826	0.716	0.844	0.844	

Source: Smart PLS Output.

The assessment of discriminant validity using the Heterotrait-Monotrait (HTMT) ratio of correlations confirms that all constructs in the model are distinct from each other. According to the widely accepted thresholds of 0.90 (for conceptually different constructs) and 0.85 (for more conservative analysis), the HTMT values in this study are within acceptable limits. The highest HTMT value observed is 0.856 between Content, Promotion and Strategy (CPS) and IOB, which is marginally above the conservative threshold of 0.85 but still below the more lenient 0.90 cut-off, suggesting acceptable discriminant validity. Other construct pairings such as C and UMT (HTMT = 0.826), SW and UMT (HTMT = 0.844), and IOB and SW (HTMT = 0.843) also remain below the 0.90 threshold, indicating that the constructs do not overlap significantly in measurement. Overall, the results of the HTMT analysis confirm that the constructs used in the study are empirically distinct and exhibit adequate discriminant validity.

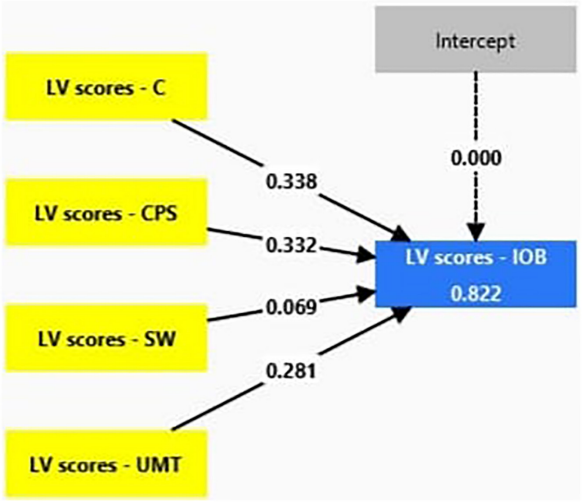

Fig. 1. Regression analysis results

Source: Smart PLS Output.

The regression model diagram (see Figure 1) visually represents the impact of four latent variables—C, Content and Promotion Strategies (CPS), SW, and UMT—on the IOB among micro-level green entrepreneurs. This model explains how key drivers affect business performance outcomes for rural and resource-constrained entrepreneurs using mobile technology. The R^2 value of 0.822 displayed within the endogenous construct (IOB) signifies that the model explains 82.2% of the variance in business impact, demonstrating strong explanatory power.

Table 3. Summary coefficients

	Unstandardised Coefficients	Standardised Coefficients	SE	T-Value	P-Value	2.5%	97.5%
LV Scores – C	–0.338	–0.338	0.038	8.986	0.000	0.264	0.412
LV Scores – CPS	0.332	0.332	0.038	8.666	0.000	0.257	0.407
LV Scores – SW	0.069	0.069	0.040	1.724	0.086	–0.010	0.149
LV Scores – UMT	0.281	0.281	0.034	8.208	0.000	0.214	0.349
Intercept	–0.000	0.000	0.022	0.000	1.000	–0.044	0.044

Source: Smart PLS Output.

The regression coefficient summary table provides insights into how four exogenous latent variables—C, CPS, SW, and UMT—influence the endogenous construct, IOB. Among these, C has a standardised coefficient of –0.338 with a T-value of 8.986 and a p-value of 0.000, indicating a statistically highly significant relationship, though the label suggests it should be negative; it may need to be corrected if that's the case. CPS also shows a strong positive and significant influence with a coefficient of 0.332, a T-value of 8.666, and a p-value of 0.000, highlighting the effectiveness of digital content and promotional strategies in enhancing business outcomes. UMT follows closely with a coefficient of 0.281 and a highly significant p-value, underscoring the positive role of mobile technology in supporting green entrepreneurship. In contrast, SW has a smaller coefficient of 0.069, a T-value of 1.724, and a p-value of 0.086, indicating that its influence on business impact is not statistically significant at the 0.05 level. These findings suggest that while strategic use of technology and content play key roles in driving business outcomes, emotional or motivational support alone may not be sufficient unless accompanied by actionable interventions.

Table 4. Interpretation of each construct

Code	Meaning	Coefficients	Interpretation
C	Challenges	**–0.338**	Highly significant and negative relationship. Highlights that overcoming these challenges is critical for improving business performance.
CPS	Content and Promotion Strategies	**0.332**	Strong positive effect; good content/ promotion strategies significantly improve business impact.
UMT	Use of Mobile T	**0.281**	Moderate positive effect; regular and strategic mobile use enhances business outcomes.
SW	Support and Willingness	**0.069**	Very low positive effect; although support and willingness matter, they have less direct impact on business success compared to other variables.

Source: Interpreted from Smart PLS Output.

Table 5. ANOVA summary

	Sum Square	df	Mean Square	F	P-Value
Total	357.000	356	0.000	0.000	0.000
Error	63.392	352	0.180	0.000	0.000
Regression	293.608	4	73.402	407.586	0.000

Source: Smart PLS Output.

The ANOVA summary table provides an overall assessment of the significance of the regression model predicting IOB. The regression sum of squares (293.608), relative to the total sum of squares (357.000), indicates that a large proportion of the variability in business impact is explained by the model. The error sum of squares (63.392) reflects the unexplained variation. The resulting F-statistic is 407.586 with a corresponding p-value of 0.000, which is highly significant. This confirms that the model, which includes the predictors C, CPS, SW, and UMT, significantly improves the prediction of business impact compared to a model with no predictors. The low mean square error (0.180) further suggests that the residuals are small, indicating a

good fit. In essence, the ANOVA results validate the overall strength and reliability of the regression model used to analyse how mobile-driven strategies influence the performance of micro-level green entrepreneurs.

Table 6. R-Square

	LV Scores – IOB
R-squared	0.822
R-square adjusted	0.820
Durbin-Watson test	1.753

Source: Smart PLS Output.

The R-squared summary table provides key insights into the model's explanatory power and the independence of residuals for the dependent variable, IOB. The R-squared value of 0.822 indicates that approximately 82.2% of the variance in business impact is explained by the predictor variables—C, CPS, SW, and UMT. This high R-squared value demonstrates that the model has strong explanatory power. The adjusted R-squared value of 0.820, which accounts for the number of predictors in the model, is only slightly lower, confirming that the model is not over fitted and remains robust. Additionally, the Durbin-Watson test statistic of 1.753 falls within the acceptable range (between 1.5 and 2.5), indicating that there is no significant autocorrelation among the residuals. Overall, these results validate that the regression model is both statistically sound and reliable in explaining how mobile-based strategies influence the performance of micro-level green entrepreneurs.

5 PRACTICAL RECOMMENDATIONS AND STRATEGIC IMPLICATIONS

The outcomes of this study underscore the transformative perspective of mobile technologies in enhancing the visibility, outreach, and business impact of micro-level green entrepreneurs, particularly in resource-constrained environments. Based on the data analysis and interpretation, the following tortious strategies and interventions are proposed to help such entrepreneurs better influence mobile platforms for sustainable growth, A substantial challenge in adopting mobile technology among micro-entrepreneurs is their limited digital literacy. Several people in this sector lack understanding of enlightened mobile applications, online marketplaces, and digital financial tools, making it hard to harness the full potential of mobile platforms. To report this gap, there is a determined need to enhance digital literacy and mobile skills through directed training curriculums and accessible educational resources. In addition, micro-entrepreneurs often face financial limitations, which calls for the progress of affordable and user-friendly mobile marketing solutions. These toolkits should be proposed to aid entrepreneurs in promoting their products effectively without incurring high costs.

Even though mobile technology offers the skill of direct-to-consumer access by eliminating intermediaries, many micro-entrepreneurs still depend on physical middlemen due to trust issues and restricted digital infrastructure. Hence, efforts must be made to develop direct mobile access while building confidence in digital transactions. Establishing local peer support networks can also play a vigorous role in this change. By development societies of peers and mentors, micro-entrepreneurs can share experiences, inspire technology adoption, and solve problems collaboratively.

Besides, creating partnerships with telecom operators and technology companies is vital to progress connectivity and reduce costs in underserved regions. These associations can help bridge infrastructure gaps and confirm broader accessibility. Increasing these efforts, governments and development organizations should implement supportive policies and institutional frameworks that inspire the adoption of mobile solutions among micro-entrepreneurs. Lastly, incorporating continuous feedback and assessment systems will be key to sustaining progress. Regular monitoring and user input will agree stakeholders to adapt strategies, address challenges, and ensure that mobile technologies continue to meet the evolving needs of micro-entrepreneurs.

6 RESEARCH GAPS

While scholars touch upon mobile accessibility for small-scale entrepreneurs, there is scarce in-depth analysis of how micro-level green entrepreneurs use mobile tools in developing regions or low-resource environments. Most existing studies generalise digital marketing success without fully addressing the exclusive constraints and opportunities in green entrepreneurship.

7 CONCLUSION

To sustain and measure the impact of mobile technologies on eco-friendly micro enterprises, an intermingling of capacity building, accessible technology, financial incentives, and policy alliances is essential. These justifications not only bridge the current digital divide but also confirm that micro-entrepreneurs in resource-constrained environments can actively participate in the green economy through empowered, mobile-driven marketing ecosystems.

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