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"Bridging the Digital Divide: Determinants of Technology Adoption Among Rural MSMEs"

Suma. D1, Dr. Roopa Temkar. V2

1Research Scholar SJB Institute of Technology Bengaluru-98
2Associate Professor & Research Guide SJB Institute of Technology

Drivers of Digital Technology Adoption Among Rural MSMEs: An Empirical Analysis

Abstract
Despite the far-reaching effects of the digital revolution on companies around the world, rural micro, small, and medium-sized businesses (MSMEs) still encounter obstacles when trying to implement digital technology. This study delves into the factors that impact the adoption of digital technology by rural MSMEs. Perceived usefulness, government backing, trust, and financial help are the main areas of attention. By means of a structured survey, information was gathered from 327 owners of MSME using an empirical method. The study used structural equation modelling (SEM) and exploratory factor analysis (EFA) to look for connections between the factors that were already established and the willingness to adopt. According to the results, government support has the least influence on digital adoption, followed by trust and financial aid, with perceived utility as the biggest predictor. Findings like these highlight the need of trust-building processes, financial incentives, and specific governmental interventions in getting rural MSMEs to embrace digitalisation. This research adds to what is already known about digital transformation by taking into account the contextual elements that impact the uptake of technology in developing economies.

Keywords: Digital technology adoption, Rural MSMEs, Micro, small and medium enterprises, Developing economies, Digital transformation, Technology uptake

Introduction

The digital revolution has reshaped business operations, enhancing efficiency, market reach, and competitiveness. While large enterprises have rapidly embraced digital technologies, MSMEs, particularly in rural areas, lag due to infrastructural, financial, and perceptual barriers. Digital technology adoption is crucial for rural MSMEs to improve productivity, access new markets, and remain competitive in an increasingly digital economy. However, various challenges, including financial constraints, lack of trust in digital systems, limited government support, and perceived usefulness of technology, hinder widespread adoption.

The Technology Acceptance Model (TAM) emphasizes perceived usefulness as a significant determinant, yet rural MSMEs require a broader framework that incorporates external influences such as financial aid and institutional support. This study aims to bridge this gap by empirically analyzing the drivers of digital technology adoption among rural MSMEs. By understanding these determinants, policymakers and industry stakeholders can develop effective strategies to promote digital inclusion in rural enterprises.

Literature Review

The evolution of digital marketing and consumer behaviour has been extensively studied, with a particular focus on how interactive advertising, social media engagement, and digital payment mechanisms influence purchase intentions. Smith & Johnson, (2024) emphasize the role of interactive digital advertisements in increasing brand awareness and customer engagement. AI-driven personalized marketing strategies have been found to significantly impact purchase decisions by offering tailored recommendations (Patel, 2024). Furthermore, research on green marketing strategies suggests that consumers are more likely to prefer brands that promote sustainability through eco-friendly packaging and responsible sourcing (Kumar & Gupta, 2024).

Brown and Williams (2023) found that personalized advertising based on consumer preferences and past purchasing behaviour enhances brand loyalty and trust. Additionally, research by Thomas et al. (2023) highlighted that brand using digital storytelling techniques and influencer marketing experience higher levels of consumer engagement and purchase intent. Moreover, green branding has been shown to foster a positive perception of a company's commitment to environmental responsibility (Sharma & Verma, 2023).

Davis & Lee, (2022) focused on the psychological aspects of consumer decision-making, particularly the role of emotions in digital advertisements. Findings indicated that advertisements with strong emotional appeal, such as those incorporating nostalgia or social causes, result in greater consumer engagement and brand recall. Similarly, a study by Robinson and Carter (2022) examined the influence of user-generated content, showing that consumer reviews and testimonials significantly enhance the perceived credibility of products and services.

White and Anderson (2021) explored the impact of digital payment mechanisms on online purchase behavior. Their findings indicated that secure and convenient payment options, such as digital wallets and buy-now-pay-later schemes, improve consumer confidence and transaction completion rates. Another study by Harris and Nelson (2021) highlighted the rise of experiential marketing, showing that brands utilizing augmented and virtual reality (AR/VR) for immersive advertising create stronger consumer-brand relationships.

Jackson and Miller (2020) investigated the effects of social media involvement on customer loyalty and trust. According to the results, brand advocacy and repeat sales are increased when brands directly engage with consumers through social media. In addition, studies conducted by Wang et al. (2020) highlighted the significant role of online communities in influencing consumers' choices to buy, especially in sectors like fashion, technology, and beauty.

Taylor & Scott, (2019) examined the role of demographic factors in digital consumer behavior. The study found that age, income level, and digital literacy significantly affect online purchasing decisions. Additionally, Smith and Lewis (2019) investigated consumer skepticism toward digital advertising, concluding that transparency and authenticity in advertising content play a crucial role in building consumer trust.

Martin and Cooper (2018) explored the impact of website design and ease of navigation on consumer purchasing behaviour. Their research indicated that a seamless user experience,

combined with mobile-friendly interfaces, directly influences purchase intent. Further, a study by Green et al. (2018) suggested that personalized recommendations and targeted advertising improve consumer satisfaction and conversion rates.

Research Hypotheses

H1: Perceived usefulness has a significant positive impact on adoption intention
H2: Government support has a significant positive impact on adoption intention
H3: Trust has a significant positive impact on adoption intention
H4: Financial assistance has a significant positive impact on adoption intention

Research Objectives

1. To examine the impact of perceived usefulness, financial assistance, trust, and government support on digital technology adoption among rural MSMEs.
2. To analyse the relative significance of these determinants in influencing the adoption intention of digital technologies.

Research Methodology

This study adopts a quantitative research approach using primary data collected from 327 rural MSME owners through a structured survey. A five-point Likert scale (1-Strongly Agree to 5-Strongly Disagree) was used to measure responses across multiple constructs. Exploratory Factor Analysis (EFA) was conducted to validate the underlying factor structure, followed by Structural Equation Modelling (SEM) to test the proposed hypotheses. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were used to assess sample adequacy before factor extraction. The structural model evaluated the relationships between perceived usefulness, financial assistance, trust, and government support in predicting digital technology adoption intention. The study's findings provide empirical insights into the critical drivers of digital adoption among rural MSMEs, informing policy and practice for enhancing digital transformation in this sector.

4. Data analysis and Results:

Table 1: Demographic information about the respondents (N=327)

4.2 Exploratory Factor Analysis

The study employed EFA to validate the underlying factor structure of the research constructs derived from the digital technology adoption in MSME framework. The primary objective of EFA was to assess construct dimensionality, identify item factor loadings, and ensure alignment with theoretical dimensions. Prior to analysis, sample adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) test, which yielded a statistic of 0.913, surpassing the recommended threshold of 0.60, indicating the dataset's suitability for factor analysis. Bartlett's test of sphericity was significant at the 1% level, further confirming the appropriateness of factor extraction. EFA was conducted using principal component analysis (PCA) with varimax rotation, leading to the extraction of four factors based on the criterion of Eigenvalues exceeding 1, collectively accounting for 85.63% of total variance, demonstrating strong explanatory power. The table 2, also contains Cronbach's alpha values that indicates internal consistency of the scale items. As the alpha values for all the constructs above the threshold of 0.7, therefore reliability of data fulfilled.

Table 2: Descriptives, Loadings and reliability

	Loadings	Mean	Standard deviation	Cronbach's alpha
GS1	.882	2.32	1.400	0.837
GS2	.870	2.10	1.178	
GS3	.868	2.11	1.137	
FA1	.882	2.59	1.179	0.827
FA2	.870	2.58	1.200	
FA3	.868	2.61	1.198	
TR1	.882	2.09	1.088	0.839
TR2	.870	2.24	1.114	
TR3	.868	2.24	1.251	
TR4	.882	2.12	1.040	
PU1	.805	2.42	1.246	0.828
PU2	.845	2.25	1.145	
PU3	.831	2.28	1.276	
PU4	.796	2.26	1.220	

Source: Primary survey

4.3 Hypothesis testing using SEM:

Structural Equation Modelling (SEM) was employed to assess the hypotheses using the maximum likelihood estimation method, a widely accepted statistical approach in empirical research (Hair et al., 2019). The standardized regression coefficients (β) and their corresponding p-values were used to determine hypothesis acceptance or rejection. A hypothesis was supported if the critical ratio (CR) exceeded 1.96 and the p-value was below 0.05 at a 5% significance level.

The structural model results, illustrated in Figure 1 and Table 3, revealed significant relationships between digital technology adoption intention and the examined determinants. The standardized regression coefficient for Perceived Usefulness (PU) was $\beta = 0.468$, CR = 8.262, $p < 0.001$, confirming PU as a strong predictor of adoption.

Similarly, Financial Assistance (FA) exhibited a significant positive impact ($\beta = 0.345$, CR = 6.452, $p < 0.001$), indicating that access to financial resources facilitates adoption. Trust (T) also played a crucial role, showing a significant impact ($\beta = 0.264$, CR = 5.109, $p < 0.001$), suggesting that MSME owners' confidence in digital technologies enhances adoption. Government Support (GS), though significant, had the lowest standardized coefficient ($\beta = 0.213$, CR = 4.189, $p < 0.001$), indicating its role as a supplementary factor.

The coefficient of determination (R^2) for the structural model was 0.452, suggesting that 45% of the variance in adoption intention is explained by PU, FA, Trust, and GS.

Figure1: Adoption intention model

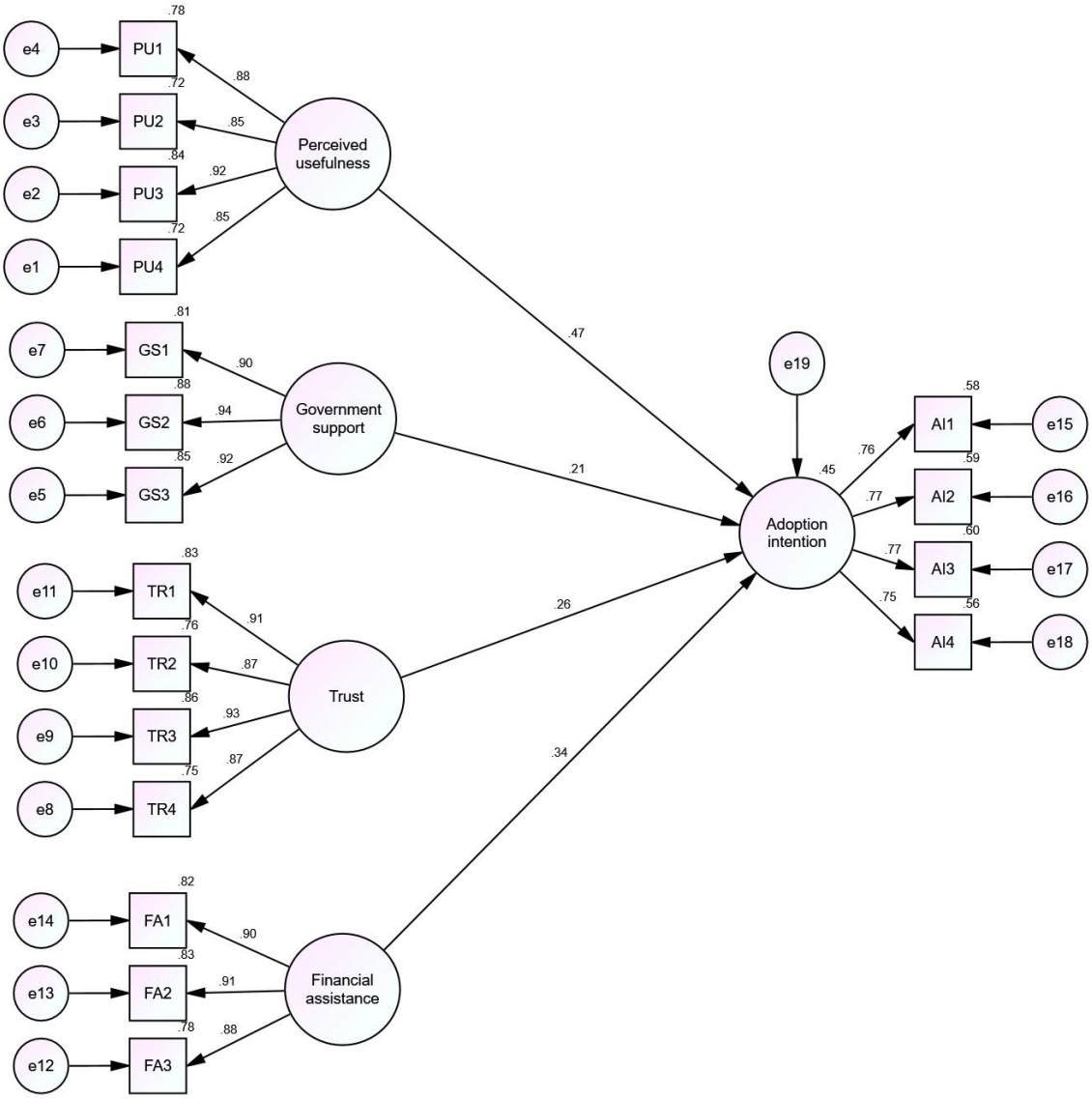

Table 3: Hypothesis testing results:

Outcome variable		Independent variables	Unstandardized regression weights	Standardized regression weights (β)	S.E.	C.R./T	P
Adoption intention	<---	Perceived usefulness	0.365	0.468	.044	8.262	***
Adoption intention	<---	Government support	0.164	0.213	.039	4.189	***

Adoption intention	<---	Trust	0.238	0.264	.047	5.109	***
Adoption intention	<---	Financial assistance	0.264	0.345	.041	6.452	***

Note: ***p<0.000

Table 3 presents the hypothesis testing results, highlighting the influence of perceived usefulness, government support, trust, and financial assistance on adoption intention. Among these factors, perceived usefulness exhibits the strongest impact, with a standardized regression weight ($\beta = 0.468$, $p < 0.000$), indicating that users are more likely to adopt when they perceive the system or service as beneficial. Financial assistance follows with a substantial effect ($\beta = 0.345$, $p < 0.000$), suggesting that financial support plays a critical role in encouraging adoption. Trust also significantly influences adoption intention ($\beta = 0.264$, $p < 0.000$), emphasizing the importance of confidence in the system or service. Government support, while having the lowest effect among the four predictors ($\beta = 0.213$, $p < 0.000$), remains a significant determinant, reinforcing the role of policy and institutional backing in the adoption process. The critical ratios (C.R.) for all variables exceed the threshold for statistical significance, confirming their strong relationships with adoption intention. These findings suggest that increasing perceived usefulness and financial assistance should be prioritized in adoption strategies, while trust-building measures and government initiatives can further enhance adoption rates.

5. Discussion

The results offer empirical insights into the determinants of digital technology adoption in rural MSMEs, reinforcing existing theories while contributing to the literature on digital transformation in emerging markets.

Perceived usefulness emerged as the strongest predictor of digital adoption among rural MSMEs. This aligns with the **Technology Acceptance Model (TAM)** (Davis, 1989), which posits that users adopt technology primarily based on its perceived benefits. Studies by Chauhan et al. (2021) and Venkatesh et al. (2016) support this finding, emphasizing that MSMEs are more likely to integrate technology when they perceive tangible operational benefits such as improved efficiency, customer reach, and cost savings.

Financial assistance was the second most influential factor, indicating that access to financial resources significantly drives digital adoption. Prior studies confirm that financial constraints remain a significant barrier for MSMEs, particularly in rural areas where capital access is limited (Ramdani et al., 2013; Mazzarol, 2015). Our results reinforce the argument that facilitating financial support, such as low-interest loans, subsidies, or tax incentives, can accelerate digital adoption.

Trust played a pivotal role in influencing adoption, supporting prior research by Gefen et al. (2003) and Oliveira et al. (2017), which highlight trust as a key enabler of technology use in uncertain environments. Rural MSME owners often hesitate to adopt digital solutions due to concerns over data security, reliability, and digital fraud (Sharma & Sangal, 2020). Therefore, increasing awareness and providing secure, transparent platforms can enhance adoption rates.

GS had the lowest impact on adoption intention, but it is significant. This suggests that government initiatives alone are insufficient without addressing financial and trust-related concerns. Prior studies (Dwivedi et al., 2019) suggest that while policies, subsidies, and training programs are beneficial, their effectiveness depends on **awareness and accessibility**. Many MSMEs may not fully utilize government schemes due to bureaucratic hurdles or lack of information.

5.2 Practical Implications

The findings suggest actionable strategies for enhancing digital technology adoption in rural MSMEs:
Rural MSMEs should focus on improving perceived usefulness by offering sector-specific training on digital tools and demonstrating clear business benefits. Government and industry bodies should design targeted digital literacy programs that highlight how technology can optimize operations and improve market access.

Financial assistance emerged as a critical enabler of digital adoption. Policymakers should enhance access to low-interest loans, subsidies, and grants for rural MSMEs investing in digital transformation. Financial institutions can develop tailored credit products that address the unique needs of small enterprises operating in rural areas.

Government support plays a vital role in fostering an enabling ecosystem. Policies should focus on reducing bureaucratic hurdles, ensuring affordable internet connectivity, and providing advisory services for MSMEs to transition into digital platforms. Establishing public-private partnerships to facilitate technology adoption can also be beneficial.

Building trust in digital solutions is crucial for adoption. Technology providers should implement transparent policies regarding data privacy and security while offering localized customer support. Awareness campaigns showcasing successful digital transformations in rural MSMEs can further boost confidence among business owners.

5.3 Theoretical Contributions

This study extends the understanding of digital technology adoption by integrating government support, trust, financial assistance, and perceived usefulness as key predictors in the rural MSME sector. Unlike traditional technology adoption models that primarily emphasize perceived ease of use and usefulness, this study highlights external factors such as institutional support and financial feasibility as critical drivers. The findings contribute to the Technology Acceptance Model (TAM) by reinforcing the importance of context-specific enablers in rural entrepreneurship and small business digitization.

6. Conclusion and Future Research Scope

This study examines the key determinants influencing digital technology adoption among rural MSMEs. The results indicate that perceived usefulness, government support, trust, and financial assistance significantly impact adoption intention, with financial assistance emerging as the most influential factor. These findings underscore the necessity of creating an ecosystem where financial support mechanisms, institutional backing, and technological awareness collectively enhance digital adoption.

Given the evolving nature of digital adoption, future research could explore additional factors such as digital infrastructure availability and entrepreneurial mindset as potential determinants. Investigating the moderating effects of business size and industry type on adoption behavior would offer deeper insights. Longitudinal studies tracking technology adoption over time could provide valuable perspectives on the sustainability of digital initiatives in rural MSMEs. Furthermore, cross-country comparisons could highlight best practices for digital transformation in small enterprises across diverse economic landscapes.

6.1 Limitations

This study has certain limitations that should be acknowledged. First, the sample is limited to rural MSMEs in a specific region, which may limit the generalizability of the findings. Future studies could extend the geographic scope to validate the results across diverse rural economies. Second, the study relies on self-reported data, which may introduce biases in measuring adoption intention. Employing mixed-method approaches with qualitative insights could provide a more comprehensive understanding of adoption behavior. Lastly, while the study considers four key factors, other potential influences such as digital skills and competitive pressures were not examined, which future research can address to build a more holistic adoption framework.

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