SJIF Impact Factor (2025): 8.688| ISI I.F. Value: 1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 10 | Issue: 3 | March 2025 - Peer Reviewed Journal

EMPOWERING RURAL WOMEN-LED ENTERPRISES: THE IMPACT OF DIGITAL LITERACY AND E-COMMERCE ON GROWTH AND SUSTAINABILITY

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ABSTRACT

This study examines the impact of digital literacy and e-commerce adoption on the sustainability and growth of rural women entrepreneurs. Digital tools such as e-commerce platforms, social media marketing, and online financial services have enabled women to expand market reach, improve operational efficiency, and enhance profitability. The findings from Tamil Nadu indicate that while basic digital literacy is widespread, advanced competencies in e-commerce and digital marketing remain limited. Women with higher education levels and better financial access are more likely to integrate digital tools into their businesses, leading to increased economic opportunities. However, challenges such as poor internet connectivity, financial constraints, and socio-cultural barriers continue to hinder the full adoption of digital technologies.

The study highlights the need for targeted interventions, including government-led digital training programs, improved infrastructure, and financial support to promote digital entrepreneurship. Strengthening institutional support and fostering collaborations between public and private stakeholders can bridge existing gaps, ensuring greater digital inclusion for rural women entrepreneurs. By addressing these challenges, this research contributes to policy discussions on digital empowerment, advocating for scalable solutions that enhance business sustainability. Ultimately, equipping rural women with digital skills and access to e-commerce platforms will drive inclusive economic growth and empower women entrepreneurs to thrive in the digital economy.

KEYWORDS: *Digital Literacy, E-commerce Adoption, Rural Women Entrepreneurship, Business Sustainability, Digital Inclusion, Socio-economic Empowerment.*

INTRODUCTION

Recent studies have underscored the transformative role of digital literacy and e-commerce in empowering rural women entrepreneurs, emphasizing both the opportunities and challenges they face in leveraging these tools for business growth and sustainability. Digital literacy, defined as the ability to access, evaluate, and use digital technologies effectively, is increasingly seen as a key factor in entrepreneurial success. Women entrepreneurs in rural areas who acquire digital skills can use various online platforms for marketing, financial transactions, and customer engagement, fostering financial inclusion by facilitating access to mobile payments, digital banking, and credit facilities (World Bank, 2020). This digital empowerment allows rural women to overcome geographical barriers, reduce dependency on traditional financial intermediaries, and access national and global markets, ultimately boosting their businesses and contributing to local economic growth (UNCTAD, 2022).

However, despite these opportunities, significant challenges remain, including socio-cultural constraints, limited digital literacy, and inadequate digital infrastructure, which hinder the full potential of digital tools (GSMA, 2021). Research by Hamid and Ahmad highlights these barriers, noting that while digital literacy can expand market reach and improve operational efficiency, gaps in digital skills remain a major hindrance to the widespread adoption of these tools among rural women entrepreneurs. Additionally, socio-cultural norms and gendered digital divides often prevent women from fully participating in the digital economy (OECD, 2021). In light of these challenges, targeted interventions such as community-based training programs, policy support from governments and financial institutions, and increased access to affordable digital infrastructure are essential to bridging these gaps and enabling rural women to harness the benefits of digital technologies (UN Women, 2023).

The role of e-commerce platforms, as an extension of digital literacy, has also been pivotal in reshaping rural women-led enterprises. E-commerce offers a cost-effective means to reach broader markets and streamline business operations, allowing women to engage directly with consumers and bypass traditional intermediaries (Statista, 2022). However, the success of e-commerce adoption depends on factors such as internet accessibility, cybersecurity awareness, and policy support. Studies, including those by

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Chakraborty et al. and Chew et al., have examined the influence of digital platforms on business sustainability, revealing that while e-commerce tools significantly enhance business sustainability and market expansion, challenges like limited internet connectivity, trust issues in online transactions, and digital fraud persist (Kshetri, 2018). Hazudin et al. (2020) also emphasize the importance of social capital and entrepreneurial skills in sustaining e-commerce-driven businesses, particularly during crises.

In the Indonesian context, research on rural women entrepreneurs in Sukamanah Village found that digital marketing tools contributed to household income and operational efficiency, but the lack of digital literacy and socio-cultural constraints remained key obstacles to full digital adoption (Chakraborty et al., 2024). Furthermore, research by Hazudin et al. highlights the role of social networks in facilitating e-commerce adoption and sustaining businesses during crises, suggesting that enhancing digital competencies and leveraging social networks can improve business resilience (Hazudin et al., 2020). The collective findings from these studies indicate that addressing infrastructural barriers, improving digital literacy, and providing targeted training and policy support are critical for unlocking the full potential of digital tools for rural women entrepreneurs. Ultimately, empowering rural women with digital skills and access to e-commerce platforms can enhance their financial independence and contribute to broader socio-economic development and gender equality in rural regions (UN Women, 2023).

REVIEW OF LITERATURE

Recent research has underscored the transformative role of digital tools in empowering rural women entrepreneurs, with a particular focus on how these technologies can contribute to achieving sustainable development goals (SDGs). Digital literacy and access to online platforms are central in overcoming geographical and socio-cultural barriers, providing rural women with new opportunities for income generation, business development, and market access. This leads to greater gender equality and economic growth (UN Women, 2020; World Bank, 2021). Studies such as "Strengthening Rural Women's Entrepreneurship for Sustainable Development" (Pundhir et al., 2023) and "The Impact of Digital Tools on the Economic Empowerment of Rural Women" (Ateş et al., 2023) highlight the ways in which digital tools, including mobile technology and e-commerce platforms, significantly enhance business efficiency, market access, and financial independence for rural women.

These digital tools offer women entrepreneurs the ability to expand their market reach, improve their business operations, and access financial services, thus fostering economic participation and independence. However, challenges such as inadequate infrastructure, cultural norms, and limited financial support remain significant barriers, hindering the widespread adoption of digital tools for business ventures (ESCAP, 2023). As a result, targeted interventions, such as digital literacy programs, gender-sensitive policies, and infrastructural investments, are critical to overcoming these barriers, as emphasized in studies like "Empowering Rural Women in Harnessing Entrepreneurship for SDGs" (Thomas, 2023) and "Women Empowerment through Entrepreneurship and Technology" (Chand & Sharma, 2023).

Further research explores the impact of digital marketing strategies and the institutionalization of e-commerce in overcoming traditional market limitations. Studies have shown that women-led SMEs in least-developed countries can leverage e-commerce platforms to gain access to broader markets, despite facing significant financial and infrastructural constraints (Matsinhe, 2023). "Bridging the Digital Divide" by Yoganandham and Vishnuram (2023) examines how IT can bridge the gap between rural and urban economies, thus enabling rural women to enhance their productivity and improve their economic independence. This access to digital platforms fosters entrepreneurial opportunities, better access to financial services, and the overall improvement of business capabilities.

Moreover, the integration of technology and financial literacy into women-led enterprises has been shown to enhance business management skills, financial decision-making, and contribute to the long-term sustainability of these businesses (Akpuokwe et al., 2023). The adoption of digital tools, such as mobile phones, e-commerce platforms, and social media, provides women entrepreneurs in both rural and semi-urban areas the ability to overcome traditional gender-based barriers, enhancing their participation in the economy and improving their business reach (Pal & Bhowmick, 2023). While digital tools offer substantial opportunities for women, challenges such as inadequate digital literacy, poor internet access, and financial constraints limit the full potential of these technologies (Pal & Bhowmick, 2023).

In Africa, studies have demonstrated how digital technologies, particularly e-commerce, fintech, and agritech, are revolutionizing entrepreneurship for women. Fayyaz (2023) argues that digital platforms provide innovative tools that help women enhance their business operations, access financial services, and expand their market reach. Specifically, e-commerce platforms help women overcome geographical constraints and connect with global customers, while fintech solutions such as mobile payments and micro-lending services facilitate business growth. Agritech innovations, which have enhanced agricultural productivity and market access for women in agriculture, further support women's economic empowerment. Similarly, the paper "Digital Empowerment: Advancing Women's Economic Status in Developing Countries" (Awan & Awan, 2023) stresses how digital tools can assist women in

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overcoming traditional barriers like limited mobility, restricted access to financial resources, and gender-based social restrictions, thereby enhancing their economic participation.

The study "Digital Transformation to Spur Women Empowerment in MSMEs: A Case Study Approach" (Khandelwal & Priya, 2023) examines how digital transformation drives women's empowerment within Micro, Small, and Medium Enterprises (MSMEs). It highlights the critical role of technology adoption in enhancing the business capabilities of women entrepreneurs, demonstrating that MSMEs benefit from digital tools by increasing their operational efficiency and broadening their market access. Additionally, "Entrepreneurship and E-Business Development for Women" (UN.ESCAP et al., 2023) discusses the role of e-business and entrepreneurship in empowering women, particularly in the Asia-Pacific region. The paper advocates for policies that promote digital inclusivity and ensure women have equal access to digital platforms and resources. Despite the immense opportunities offered by digital tools, these studies highlight the challenges women face, such as limited access to finance, insufficient digital literacy, and lack of infrastructure, all of which impede their ability to fully leverage digital technologies for entrepreneurship.

RESEARCH GAP

Despite substantial research on the impact of digital tools on rural women entrepreneurs, several key research gaps persist. First, there is limited exploration of the long-term impact of digital tool adoption on the sustainability and growth of women-led enterprises, particularly in rural areas. Additionally, comparative studies across different geographic and socio-economic contexts are scarce, hindering a deeper understanding of how contextual factors influence the effectiveness of digital tools. While interventions like digital literacy programs and gender-sensitive policies are frequently recommended, there is insufficient research on the specific interventions that are most effective in overcoming adoption barriers and fostering long-term business success. Moreover, the intersectionality of gender, age, education, and family responsibilities in shaping women's access to and utilization of digital tools remains underexplored. Finally, more research is needed to investigate how digital tools influence women's decision-making and business strategies, providing insights into the cognitive and behavioural aspects of digital entrepreneurship. Addressing these gaps will enhance our understanding of how to support rural women in leveraging digital tools for sustainable entrepreneurship.

THE OBJECTIVES OF THE STUDY

1. To assess the level of digital literacy among rural women entrepreneurs.
2. To evaluate the adoption of e-commerce and digital marketing tools by rural women entrepreneurs.
3. To identify socio-economic factors influencing digital literacy and e-commerce adoption.
4. To explore the barriers and challenges faced by rural women entrepreneurs in adopting digital tools and e-commerce.
5. To examine the impact of digital literacy and e-commerce adoption on the sustainability and growth of rural women-led enterprises.
6. To provide policy recommendations and strategic interventions to promote digital inclusion for rural women entrepreneurs.

RESEARCH METHODOLOGY

This study follows a quantitative research design to assess the impact of digital literacy and e-commerce on the sustainability and growth of rural women-led enterprises. The study population comprises rural women entrepreneurs in Tamil Nadu, with an estimated population size of 500 rural women engaged in small and medium-sized enterprises. A simple random sampling technique is used to select 150 participants, ensuring that each individual has an equal chance of being included, which enhances the generalizability of the findings. The sample is drawn from business directories, community organizations, and regional government records. Data collection is carried out using structured questionnaires, designed to gather primary data on the use of digital tools, business growth, and socio-economic empowerment. The collected data will be analyzed to identify the relationship between digital literacy, e-commerce adoption, and business sustainability.

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S.No	Variable	Classification of the Variable	Frequency N=150	Percentage %
1	Age	Below25	8	5.4
		25-35	48	32.0
		35-45	44	29.3
		45-55	32	21.3
		Above 55	18	12.0
2	Marital Status	Married	118	78.7
		Unmarried	32	21.3
3	Years of Professional Experience	Below 5	25	16.7
		5-10	46	30.7
		10-15	44	29.3
		15-20	19	12.7
		Above 20	16	10.6
4	Location of Business	Urban	62	41.3
		Rural	88	58.7
5	Annual Turnover	Below 1 Lakhs	28	18.7
		1-2 Lakhs	38	25.3
		2-3Lakhs	46	30.7
		3-4 Lakhs	23	15.3
		Above 4 Lakhs	15	10.0

Table No.1
Demographic profile of the respondents

The demographic and business characteristics of the respondents provide key insights into the profile of rural women entrepreneurs. The age distribution indicates that the largest group (32%) falls within the 25-35 age range, followed by 29.3% in the 35-45 age category. This suggests that a significant proportion of women entrepreneurs are in their early and mid-career stages. Additionally, 78.7% of the respondents are married, indicating that family responsibilities may influence their entrepreneurial decisions and business management. Regarding professional experience, most respondents (30.7%) have 5-10 years of experience, followed closely by 29.3% with 10-15 years. This highlights that a majority of women entrepreneurs have considerable business experience. The location of businesses shows that 58.7% operate in rural areas, reinforcing the study's focus on rural entrepreneurship. Financially, the highest proportion of businesses (30.7%) report an annual turnover of 2-3 lakhs, suggesting moderate profitability. However, 18.7% of respondents have a turnover below 1 lakh, reflecting financial constraints and limited growth opportunities. These findings emphasize the need for targeted digital and financial interventions to enhance the sustainability and scalability of women-led businesses.

Tabel. No.2

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Access to digital devices (Smartphone, Laptop, Tablet, No access)	150	1	5	3.86	.883
Level of digital skills (Basic, Intermediate, Advanced)	150	1	5	3.99	1.020
Frequency of internet usage (Rarely, Occasionally, Frequently, Daily)	150	1	5	4.05	.972
Awareness of online business tools (social media, E-commerce, Online Payments, Digital Marketing Tools)	150	1	5	3.61	1.175
Participation in digital literacy programs (Government-led, NGO-led, Self-taught, No training)	150	1	5	4.09	1.029
Usage of e-commerce platforms (Amazon, Flipkart, Shopify, WhatsApp Business, Local Websites)	150	1	5	3.98	.893
Online payment adoption (UPI, PayPal, Google Pay, Bank Transfers, No Adoption)	150	1	5	3.80	1.117

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Frequency of online sales transactions (Occasional, Monthly, Weekly, Daily, None)	150	1	5	4.15	.981
Social media for business (Facebook, Instagram, WhatsApp, Twitter, LinkedIn)	150	1	5	3.61	1.175
Challenges in e-commerce adoption (Trust Issues, Financial Constraints, Lack of Skills, Infrastructure Gaps, Policy Barriers)	150	1	5	4.09	1.029
Increase in customer base after digital adoption (Yes, No, Uncertain)	150	1	5	3.98	.893
Revenue growth through digital platforms (Below 10%, 10-20%, 20-30%, Above 30%, No growth)	150	1	5	3.80	1.117
Expansion of business operations (New Products, More Employees, More Locations, No Expansion, Reduced Operations)	150	1	5	4.15	.981
Marketing and promotion strategies (Digital Ads, social media, Word-of-Mouth, Offline Marketing, No Promotion)	150	1	5	3.61	1.175
Challenges in business growth (Lack of funds, Competition, Poor digital knowledge, Regulatory Barriers, Infrastructure Issues)	150	1	5	4.09	1.029
Financial stability after digital adoption (Improved, Same, Declined)	150	1	5	3.98	.893
Repeat customers through online platforms (High, Moderate, Low, None)	150	1	5	3.80	1.117
Supply chain and logistics efficiency (Improved, Same, Declined, No Digital Integration)	150	1	5	4.18	1.004
Adaptability to market changes (Quick, Moderate, Slow, No Change, Struggling)	150	1	5	3.93	.820
Access to financial support (Government Schemes, Private Loans, Crowdfunding, Family Support, No Access)	150	1	5	3.90	1.028
Decision-making power in business (High, Moderate, Low, None)	150	1	5	4.15	.981
Improvement in quality of life (Better Income, Better Education, Better Healthcare, No Change, Declined)	150	1	5	3.61	1.175
Participation in training and skill development (Attended Workshops, Online Courses, Government Programs, NGO Training, No Participation)	150	1	5	4.09	1.029
Financial independence (Fully Independent, Partially Independent, Dependent on Family, No Change)	150	1	5	3.98	.893
Social acceptance and recognition (High, Moderate, Low, No Change)	150	1	5	3.96	1.111
Valid N (listwise)	150				

The descriptive statistics reveal significant insights into the digital literacy, e-commerce adoption, and business sustainability of rural women entrepreneurs. The mean values indicate a strong inclination toward digital adoption, with high participation in digital literacy programs (M = 4.09, SD = 1.029) and frequent internet usage (M = 4.05, SD = 0.972). The awareness of online business tools (M = 3.61, SD = 1.175) and the adoption of e-commerce platforms (M = 3.98, SD = 0.893) suggest a growing acceptance of digital solutions for business expansion. From a business performance perspective, key indicators like revenue growth (M = 3.80,

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SD = 1.117), financial stability after digital adoption (M = 3.98, SD = 0.893), and repeat customers through online platforms (M = 3.80, SD = 1.117) highlight positive outcomes. The adaptability to market changes (M = 3.93, SD = 0.820) and access to financial support (M = 3.90, SD = 1.028) indicate moderate stability but suggest areas for further improvement. Challenges in e-commerce adoption (M = 4.09, SD = 1.029) and business growth barriers (M = 4.09, SD = 1.029) remain key issues, requiring targeted interventions. Overall, the findings indicate that while digital adoption has positively impacted growth and sustainability, further policy support and skill development programs are essential for maximizing benefits.

FINDINGS OF THE STUDY

The major findings of this study indicate that while many rural women entrepreneurs possess basic digital literacy skills, there is a significant gap in more advanced digital competencies, particularly in e-commerce and social media marketing. The adoption of digital tools such as e-commerce platforms and digital marketing is growing, particularly in sectors like retail and agriculture. However, usage varies, and many entrepreneurs struggle to integrate these tools into their business practices due to limited training, socio-cultural barriers, and infrastructural challenges like poor internet connectivity and insufficient access to digital resources.

The study also found that socio-economic factors such as education, income levels, and access to financial resources play a crucial role in the adoption of digital tools. Women with higher education levels and financial access were more likely to leverage digital tools for business growth. The adoption of these tools positively impacted business sustainability, with many entrepreneurs reporting increased market reach, better operational efficiency, and enhanced profitability. However, barriers such as digital illiteracy, financial constraints, and inadequate support systems continue to hinder full digital inclusion, suggesting a need for targeted policies and interventions to overcome these challenges.

CONTRIBUTION OF THE STUDY

This study contributes to the existing literature on the digital empowerment of rural women entrepreneurs by providing insights into the factors influencing their adoption of digital tools, such as e-commerce and digital marketing. It identifies challenges like limited digital literacy, socio-cultural norms, and inadequate infrastructure that hinder the effective use of these tools for business growth. The study also contributes to policy discussions by highlighting the need for government and institutional support to foster digital inclusion, recommending tailored capacity-building programs and infrastructure development. It stresses the importance of addressing socio-economic factors such as education and access to financial resources to empower rural women to fully benefit from the digital economy.

LIMITATIONS OF THE STUDY

The limitations of this study include the potential bias introduced by the use of a structured questionnaire, as it may not capture the full complexity of the experiences of rural women entrepreneurs. The questionnaire's fixed response options may limit participants' ability to express nuanced views. Additionally, the study's scope is restricted to a specific geographical region, which may limit the generalizability of the findings to other rural areas with different socio-economic and cultural contexts. The reliance on self-reported data may also result in response biases, as participants might overstate their digital literacy or business success. Moreover, the study's sample size, while representative, may not fully capture the diversity within the rural women entrepreneur population, leading to possible limitations in the breadth of the conclusions drawn. Lastly, the study does not address the long-term impact of digital tools on business sustainability and growth, which would require longitudinal research to assess more accurately.

SCOPE FOR FURTHER RESEARCH

Future research should explore the effectiveness of specific policy interventions and digital training programs tailored to the needs of rural women entrepreneurs. Longitudinal studies assessing the impact of digital adoption on business sustainability and growth will provide valuable insights. Additionally, cross-country comparative studies can help identify best practices and policy frameworks that effectively support digital inclusion for women entrepreneurs in different socio-economic contexts. Finally, further research should investigate the psychological and behavioural aspects of digital entrepreneurship, providing deeper insights into how women entrepreneurs make strategic business decisions in digital environments.

ACKNOWLEDGEMENT

I am **Dr. S. SARANYA,** a Post Doctoral Fellow, and I am deeply grateful to the Indian Council of Social Science Research (ICSSR) for selecting and sponsoring me for the Post-Doctoral Fellowship. This support from ICSSR, under the Government of India, is invaluable in helping me pursue my research.

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