iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** VIII **Month of publication:** August 2026

DOI: https://doi.org/10.22214/ijraset.2026.84716

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue VIII Aug 2026- Available at www.ijraset.com

The Role of Information Communication Technology (ICT) in Improving the Socio-Economic Status of Rural Women Entrepreneurs in Mathura District

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Abstract: ***Information and Communication Technology (ICT) acts as a transformative tool for rural women entrepreneurs by boosting income, enhancing skills, and expanding market access through digital banking, social media marketing, and mobile technology. Studies indicate that ICT adoption leads to increased confidence, better decision-making capabilities, and improved socio-economic status. Despite barriers like limited digital literacy and infrastructure, ICT empowers women to overcome traditional social Methodology. The study employs a descriptive research design of quantitative approach. The primary focus is on understanding how digital platforms influence rural women entrepreneurs, their literacy levels, challenges, and outcomes.***

While the integration of ICT has successfully turned localized, small-scale crafts or farming initiatives into profitable digital enterprises, a significant gap remains. The gender digital divide driven by lower literacy rates among women in rural areas, lack of physical infrastructure, and cultural resistance means that millions of women are still left in the dark.

Keywords: digital banking, social media marketing, rural women entrepreneurs, literacy levels, challenges, and outcomes.

I. INTRODUCTION

Information and Communication Technology (ICT) refersto any communication device or application including cellular networks, the internet, smartphones, and software used to access, store, transmit, and manipulate information. Information and Communication Technology (ICT) encompassing computers, mobile phones, the internet, and social media has emerged as a vital driver for empowering rural women entrepreneurs. In many developing economies, rural women face significant barriers to business, including limited access to markets, financial services, and technical knowledge. ICT provides a platform to bridge these gaps, transforming home-based or local enterprises into more sustainable and profitable ventures. This paper examines how ICT tools enhance the socio-economic status of rural women by improving business efficiency, social participation, and financial independence. In the evolving landscape of the global economy. Information and Communication Technology (ICT) has emerged as a formidable catalyst for rural development. While urbanization often takes the spotlight, the true frontier of economic transformation lies in the rural heartlands, where women entrepreneurs are increasingly leveraging digital tools to break traditional barriers.

Information and Communication Technology (ICT) has emerged as a powerful tool for social and economic transformation in the twenty-first century. In developing economies like India, ICT is increasingly being recognized not merely as a driver of technological progress but also as an enabler of inclusive development. Among the various sections of society, rural women represent one of the most vulnerable yet dynamic groups, whose empowerment is critical for sustainable growth. Empowering rural women through ICT ensures that they gain improved access to knowledge, skills, resources, and markets, thereby enhancing their participation in decision-making, income generation, and community development.

Information and Communication Technology (ICT) transformrural enterprises in Mathura by opening up direct market access, digital banking, and skill development. For women, it increases household decision-making power and financial independence, though digital illiteracy and poor rural infrastructure remain barriers. Rural women in India represent a vast, untapped source of entrepreneurial potential. In regions like Mathura (Uttar Pradesh), traditional livelihoods have centred heavily around agriculture, handicrafts, and dairy farming. The proliferation of mobile internet, digital wallets (like UPI), and social commerce (WhatsApp, Instagram) has begun to dismantle geographical and social barriers for these women.

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Despite the growth of the "Digital India" campaign, rural women in the Mathura district face localized patriarchal norms, restricted physical mobility, and a gender-based digital divide that restricts their market reach. Existing studies on Mathura highlight a strong reliance on micro-enterprises, particularly dairy farming, handloom/textiles (e.g., Kanha dress-making/embroidery), and local retail.

In developing economies, rural women entrepreneurs represent a massive, largely untapped engine for economic growth. However, they traditionally face a steep uphill battlegeographic isolation, restricted access to local markets, limited financial resources, and deeply entrenched social barriers.In recent years, Information and Communication Technology (ICT) has emerged as a powerful tool to level the playing field. From basic mobile phones and mobile banking apps to social media platforms and digital marketplaces, ICT bridges the gap between rural isolation and global opportunities. By dismantling traditional barriers to entry, technology does more than just help these women run businesses, it fundamentally shifts their socioeconomic standing.

Government initiatives such as Digital India, National Rural Livelihood Mission, e-SaksharBharat, and Common Service Centres (CSCs) have been instrumental in bringing digital tools to rural households. Additionally, non-governmental organizations, microfinance institutions, and private enterprises are increasingly leveraging ICT to provide women with training, entrepreneurial opportunities, and access to online markets. These initiatives not only enhance economic empowerment but also foster social empowerment by giving women a stronger voice in family and community decisions. Despite its transformative potential, the adoption and effective utilization of ICT by rural women are influenced by factors such as digital literacy, affordability, infrastructural availability, and societal acceptance. Understanding the extent to which ICT impacts rural women's empowerment is therefore crucial for designing policies and strategies that are inclusive and sustainable.

In the landscape of global development, rural women entrepreneurs represent a powerful, yet historically underutilized, engine for economic growth. Across developing and emerging economies, women in rural areas drive local economies through agriculture, handicrafts, and micro-enterprises. However, their potential has traditionally been stifled by systemic barriers: geographic isolation, lack of formal education, restricted access to financial institutions, and deeply entrenched patriarchal social norms. These challenges limit their ability to scale businesses, secure fair pricing, and achieve financial independence.

The rapid advancement of Information and Communication Technology (ICT) over the past few decades has emerged as a disruptive catalyst capable of dismantling these traditional barriers. ICT encompassing mobile technologies, internet connectivity, digital banking, social media platforms, and e-commerce applications acts as an equalizer. For a rural woman entrepreneur, a smartphone is no longer just a communication tool it is a virtual marketplace, a bank account, and a gateway to global knowledge with the integration of digital tools into rural enterprises fundamentally shifts the socio-economic dynamics of female entrepreneurship such as:

Economic Empowerment: Digital financial services (like mobile money) allow women to bypass traditional banking hurdles, secure credit, and safely manage revenues. E-commerce platforms eliminate exploitative local middlemen, enabling direct-to-consumer sales that maximize profit margins.

Social Transformation: Beyond financial gains, ICT fosters social empowerment. Access to information enhances digital literacy, boosts self-confidence, and elevates a woman's decision-making power both within the household and the broader community. Furthermore, digital networks provide vital spaces for mentorship, peer support, and collective bargaining.

Despite these promising avenues, the transition to a digital rural economy is not seamless. A pronounced "digital gender divide" persists, characterized by lower rates of mobile ownership, poorer internet infrastructure, and limited technical literacy among rural women compared to their urban or male counterparts. Consequently, understanding the precise impact of ICT on rural women's entrepreneurship requires a nuanced approach. This study investigates how digital tools act as instruments of empowerment, examines the systemic bottlenecks hindering widespread adoption, and explores how closing the digital divide can catalyse sustainable socio-economic development at the grassroots level.

II. OBJECTIVES

1) Measure the adoption rate of smartphones and digital payments among rural women entrepreneurs in Mathura blocks (e.g., Govardhan, Farah, Chaumuha).
2) Analyse how ICT impacts income growth and business expansion with identification of barriers like network connectivity and patriarchal constraints.
3) To analyse how ICT adoption impacts both the economic (income, market access) and social (decision-making power, agency) status of rural women entrepreneurs in the Mathura district.
4) inclusion of financial institutions to enhance ICT accessibility and maximize its benefits for rural women entrepreneurs

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III. REVIEW OF LITERATURE

Dewan & Riggins (2005) reported that ICT closes information gaps, which is critical for market access and decision-making.

Chib & Chen (2011) found that ICT interventions improve access to health, education, and government services for marginalized women.

Agarwal & Kumar (2017) highlighted mobile penetration as a key enabler of financial independence among rural Indian women.

Omar (2017) examined how the elements of digital inclusion and the support network relate to the empowerment of female internet entrepreneurs. The findings showed that 76% of the participants relied on What's App as their primary online tool for conducting business. Interacting with their suppliers and consumers online and enhancing their interpersonal or social ties. Through network connection and communication, the firms has grown successfully.

Patil & Khandare (2018) demonstrated how ICT training improved women's self-confidence and political participation in gram sabhas.

Sarkar (2019) stated that digital literacy enables rural women to break isolation and engage in entrepreneurial activities.

Saranya et al. (2021) emphasized that women need the essential knowledge and skills to overcome barriers in achieving successful entrepreneurship. The study highlighted the importance of entrepreneurial traits, leadership qualities, and innovative thinking for women entrepreneurs. It noted that digital skills are vital for sustainable development and socioeconomic progress. The Indian government aims to empower society through digital technology initiatives. However, awareness among rural women remains a key challenge. The study explored rural women entrepreneurs' understanding of digital technologies and their role in enhancing entrepreneurial opportunities.

Hema Yadav et al. (2022) examined how rural entrepreneurship creates economic opportunities for women, contributing to poverty reduction and national growth. The study emphasized that women's entrepreneurship is vital for rural development in India. In the digital era, possessing technological skills is essential for success. However, the growing digital divide poses challenges to social and economic inclusion. The research reviewed initiatives promoting digital inclusion among rural women. Using literature analysis and case studies, it identified strategic interventions for women's empowerment. Findings revealed that digital entrepreneurship significantly enhances rural women's business growth and empowerment opportunities.

Anushree Srivastva (2023) highlights the importance of digital literacy, its degree, and how it supports women entrepreneurs. To find out how increasing levels of digital literacy help women in Uttar Pradesh cultivate an entrepreneurial mindset, a survey was given to women in the state. To ascertain the impact of demographic traits on digital literacy, women from a variety of socioeconomic backgrounds were selected using a random sampling technique. Furthermore, it was found that women's entrepreneurship was enhanced by digital literacy. By introducing customized goods and services, the government would presumably strengthen women by encouraging resilience, empowering them to be self-reliant and independent, and enhancing their confidence

IV. RESEARCH METHODOLOGY

A comprehensive research methodology for studying the impact of Information and Communication Technology (ICT) on rural women entrepreneurs typically employs a mixed-methods approach. This design combines structured quantitative surveys to measure income changes and technology adoption with in-depth qualitative interviews to capture socio-cultural empowerment and personal experiences.

Research in similar regions of Uttar Pradesh shows that women regularly using ICT for business report increased monthly income and greater confidence. It highlights that digital platforms offer low-risk, home-based opportunities, though government schemes remain underutilized due to implementation gaps. A structured questionnaire was framed and the demographic details, digital literacy, awareness of online tools, use of platforms, perceived usefulness, challenges, training status, income change, and empowerment details were collected.

V. RESULT AND DISCUSSION

Table 1.Socio-Cultural & Patriarchal Constraints

Activity	Barriers
Restricted Device Access	Phone priority for male in family
Domestic Burden	Triple burden of housework, care & business task
Mobility & Social Norms	Restricted physical movement, market access & network opportunity

Table 2.Smartphone & Infrastructure Penetration by some blocks

In rural Mathura, semi-tourist and highway-adjacent blocks (e.g., Govardhan and Chaumuha) show higher smartphone penetration compared to predominantly agricultural blocks like Farah.

Parameter matric	Govardhan Block	Chaumuha Block	Farah Block
Personal smart phone	~68%	~62%	51%
4G internet connectivity access	82%	78%	68%
Basic digital Literacy	58%	52%	42%

However, Govardhan's higher adoption is heavily driven by temple economy micro-vendors (pooja items, handicrafts, guest stays), whereas Chaumuha benefits from proximity to educational/industrial hubs along NH-19.

Table 3.Adoption Rate of Digital Payment Modes

Among rural female micro-entrepreneurs who own or share a smartphone, payment tool adoption is dominated by UPI and biometric-based banking (AePS).

Digital payment methods	Govardhan	Chaumuha	Farah
UPI (Phonepe ,Google Pay, Paytm	62%	55%	41%
Adhar Enabled Payment system(AePS)	48%	44%	52%
Net Banking	18%	14%	09%
Cash only Transaction (No Digital)	22%	31%	42%

Challenges in ICT Adoption for Rural Women

Addressing these challenges is not just a matter of gender equality; it is a critical strategy for comprehensive rural development. When you empower a rural woman entrepreneur through technology, she reinvests an overwhelming majority of her income back into her family's education, health, and community, creating a powerful multiplier effect.Despite its benefits, the adoption of ICT by rural women entrepreneurs faces several challenges, including:

1) Technological & Infrastructural Barriers

- Unreliable Connectivity & Power Supply: Frequent power outages and poor 4G/5G coverage in deep rural pockets of Mathura disrupt online transactions, order processing, and communication.
- High Cost of Hardware & Data: Purchasing smartphones, tablets, or computers and maintaining continuous mobile internet data packages remain cost-prohibitive for small-scale rural women micro-entrepreneurs.
- Cybersecurity & Online Fraud Concerns: Fear of online financial scams, phishing, and unauthorized transactions acts as a major psychological deterrent against using digital payment wallets (UPI, Paytm, PhonePe) and net banking.

2) Digital Literacy & Skill Gaps

- Language & Interface Barriers: Most e-commerce applications, government portals, and software interfaces operate predominantly in English or formal Hindi, making navigation difficult for women with limited formal literacy.
- Lack of Specialized Digital Training: While basic smartphone usage (calls, WhatsApp) is common, there is a lack of structured training on advanced ICT tools such as inventory management apps, digital marketing, SEO, and formal online accounting.
- Dependence on Intermediaries: Due to digital illiteracy, women entrepreneurs often rely on male family members or local internet kiosks (Common Service Centres) to operate digital channels, limiting their personal control over business operations.

VI. RECOMMENDATIONS AND SUGGESTIONS

1) Expand broadband infrastructure and mobile networks in rural regions and implement customized digital literacy programs for women in vernacular languages with the enlargement of women-centric content and services on ICT platforms.

2) Integrate ICT training into self-help groups and government skill schemes and encourage public-private partnerships to fund rural ICT access and innovation.

3) Implementing targeted training to improve digital literacy and business-specific ICT skills.Governments must invest in reliable, low-cost internet connectivity in rural area and establishing local support centres where women can access and learn to use technology.

4) Developing gender-sensitive policies that promote digital inclusion and encourage women to participate in the digital economy with Establishment of community-level digital boot camps through local organizations (like Krishi Vigyan Kendras (KVKs) or vocational centres in Mathura)

5) Better promotion of initiatives like *Mahila E-Haat* and the *National Rural Livelihoods Mission (NRLM)* to link local crafts directly with national e-commerce portals and developing business-tracking and financial apps with voice-assisted Hindi interfaces to assist semi-literate entrepreneurs.

VII. CONCLUSION

ICT is a vital instrument for elevating the socio-economic status of rural women entrepreneurs. It provides the necessary tools for economic independence and fosters social empowerment by connecting women to the broader economy. While challenges in infrastructure and literacy persist, fostering an environment of digital inclusivity is essential to fully realize the potential of women in rural entrepreneurship.

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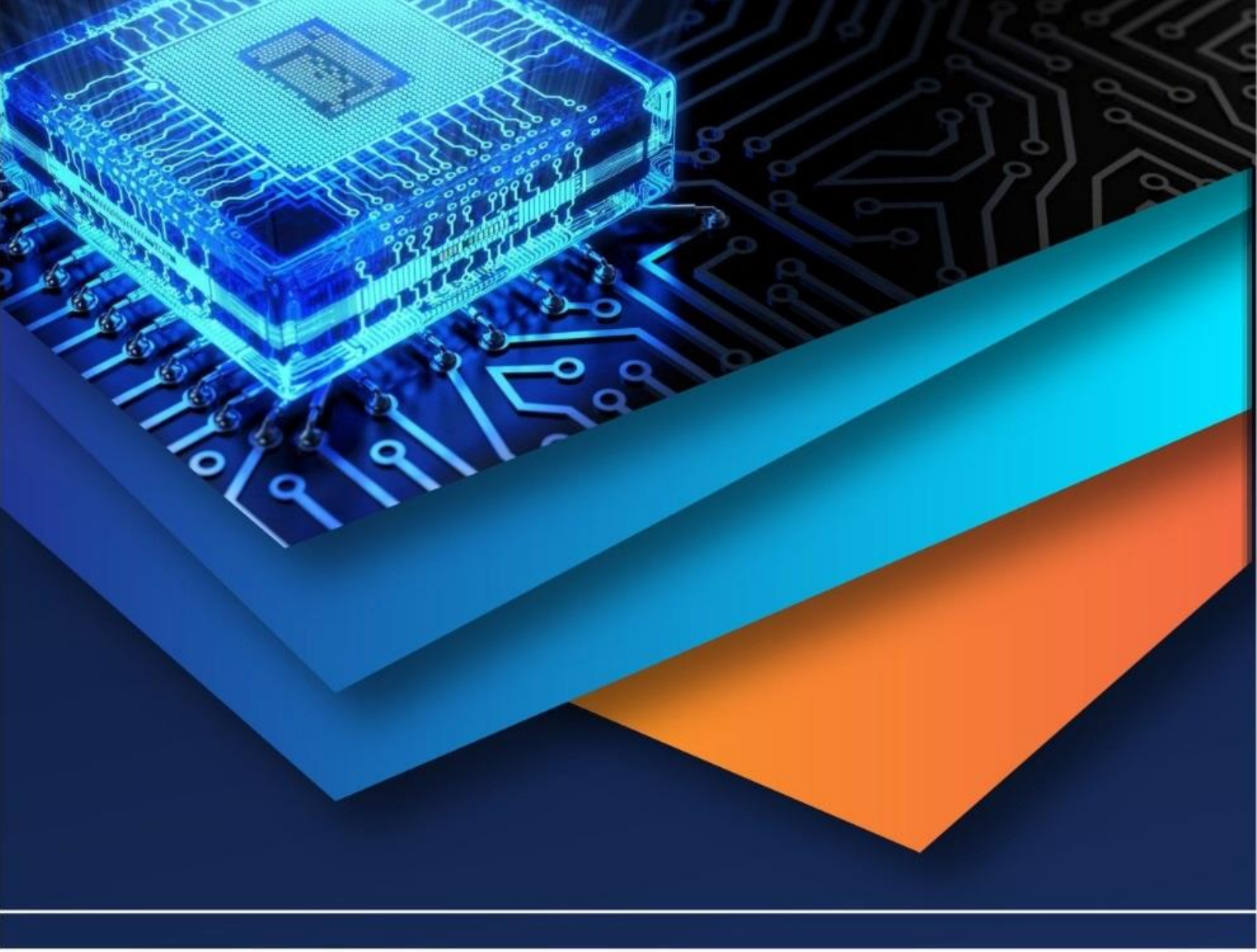

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