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FROM ACCESS TO AGENCY: HOW SMART TECHNOLOGIES SHAPE RURAL WOMEN'S ENTREPRENEURSHIP IN JHARKHAND, INDIA

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ABSTRACT

Digital inclusion intervention programs usually presuppose that gaining access to technology solely equates to empowerment. However, for rural women entrepreneurs, working in thoroughly gendered and resource-deprived environments, access does not suffice to produce any substantial difference. Building on our previous study, *"Exploring Gender Dynamics and Empowerment in Rural Indian Social Entrepreneurship,"* this paper re-positions the role of smart technologies by redirecting the analytical spectrum from access to agency—the capacity to make strategic choices and act upon them under structural constraints. Based on a mixed-methods study in selected rural districts of Jharkhand, India, the paper evaluates the interaction of smart technologies—including digital payment systems, AI-based platforms, e-commerce technologies, and digitised SHG systems—with social norms, institutional support, and learning processes in building women's entrepreneurial agency. Drawing on survey results, semi-structured interviews, and case studies (Karya.ai, Lal10, e-Shakti by NABARD, Udyamini/SoochnaPreneur), the study concludes that empowerment is an incremental process involving capacity-building, confidence formation, social legitimacy, and negotiated autonomy within households and communities. Smart technologies facilitate agency when anchored in supportive socio-cultural and institutional ecosystems. The findings advance the literature on gender and entrepreneurship and offer practical implications for conceptualizing

technology-enabled empowerment as a dynamic process of agency formation rather than an outcome inherent in mere access.

KEYWORDS: Agency Formation; Digital Empowerment; Rural Women Entrepreneurs; Smart Technologies; Gender and Entrepreneurship; Jharkhand.

INTRODUCTION

Digital technologies are becoming a discursive instrument of women empowerment **(Chakravarty, Prasad, & Verma, 2024)** that is increasingly being framed through policy and development discourse. Mobile banking, digital marketplaces and AI-enhanced advisory platforms are actively advertised as a solution to the long-standing barriers faced by rural women entrepreneurs, such as limited mobility, market isolation, and financial exclusion. Although these technologies have created accessibility and availability of information and services, there is evidence that having access in itself does not necessarily lead to empowerment or entrepreneurial agency.

The entrepreneurial activities of the women in rural India are rationalized into the structures of the patriarchal society that governs the mobility of women, the decisions they can make, and the control they have over available resources. Although women have access to smartphones, online platforms, digital payment systems, or Internet in essence, their autonomy in the usage of these technologies is usually subject to mediation by domestic power dynamics, literacy levels, and social practices. Therefore, the determinant question does not lie in the mere accession to technology by rural women, but in whether and how such accessibility is translated into agency.

The state of Jharkhand presents an imperative background, marked by high levels of rural poverty, low rates of female literacy, high male-out migrations, and deeply entrenched gender norms, combined with the growing infiltration of digital technologies and persistent gender inequalities.

This paper contends that smart technologies have a productive contribution to women's entrepreneurship, not merely by widening the access, but also by enabling agency formation through capability-building, confidence, social recognition, and institutional legitimacy. By shifting the analytical focus from access to agency, the study expands the body of literature on digital empowerment.

Literature Review

The discourse on rural women's entrepreneurship in India has historically been framed through narratives of limitation and marginality. Early studies positioned rural women—particularly those in economically backward states such as Jharkhand—as contributors to household subsistence rather than as independent economic agents **(Kabeer, 2002; Agarwal, 2003)**. Entrepreneurship, in this context, emerged largely as a coping mechanism, shaped by poverty, agrarian distress, and lack of formal employment rather than by opportunity or innovation **(Sharma & Varma, 2008)**.

In Jharkhand, these constraints manifest through limited or no land ownership, exclusion from decision-making within households and cooperatives, persistent wage disparities (earning roughly 82 paise for every male rupee), low levels of female literacy, high rates of male-out migration and restricted access to credit, inputs, and technology, being further exacerbated by insufficient digital literacy and sporadic coverage of internet connectivity. Women's enterprises have traditionally remained informal, small-scale, and home-based, with restricted access to markets, finance, and institutional support. Against this backdrop, the advent of smart technologies has the capacity to transform women from unseen laborers to perceived entrepreneurs curbing information asymmetries, increasing market connectiveness, and improving access to financial services. **[Wikipedia statistics entry on women in agriculture (2025)]**

The initial wave of literature on digital inclusion emphasizes access as the foundational challenge. Studies consistently highlight a pronounced gender digital divide in rural India, with women having lower ownership of mobile phones, reduced internet usage, and limited digital literacy compared to men **(GSMA, 2020; UNESCO, 2018)**. In underdeveloped regions (like Jharkhand), the presence of incesssant obstacles to their entrepreneurial capabilities include but are not confined to inadequate access to finance, frail infrastructure, tenacious gender conventions, and insufficient institutional frameworks **(Khan et al., 2017; Garcia & Wang, 2019)**.

Government initiatives such as Digital India, Jan Dhan–Aadhaar–Mobile (JAM) trinity, and the digitization of Self-Help Groups (SHGs) have sought to address this gap by enabling women's access to smartphones, bank accounts, and digital payment systems **(Social Research Foundation, 2023)**. Scholars argue that this phase represents a necessary but

insufficient condition for empowerment, as access alone does not guarantee meaningful participation or control **(Bukht & Heeks, 2018)**.

The literature begins to reveal transformative potential when access is accompanied by capability-building. Studies on digital literacy and SHG-based entrepreneurship demonstrate that women who are trained to use smart technologies for business-related activities—such as digital bookkeeping, online marketing, and customer communication—are better positioned to expand their enterprises **(Pandhare et al., 2024)**.

Mobile phones and social media platforms such as WhatsApp and Facebook have been identified as particularly significant for rural women entrepreneurs, as they lower entry barriers to markets and reduce dependence on intermediaries **(Rangaswamy & Cutrell, 2012)**. In tribal and rural contexts similar to Jharkhand, digital tools enable women to access price information, coordinate production, and receive payments directly, thereby enhancing efficiency and autonomy **(Swaminathan et al., 2012)**. At this stage, technology begins to function not merely as an informational tool, but as an entrepreneurial resource, reshaping everyday business practices and decision-making processes.

Capacity-building remains a recurring theme across this literature. According to **Martinez et al. (2018)**, mentorship, training, and networking programs proved to be significantly effective in boosting the confidence among women and their capacity to integrate and customize contemporary technologies in their businesses. Such interventions, in conjunction with policy reforms and gender-responsive institutional structures **(Singh & Gupta, 2020)**, form an enabling configuration within which smart technologies serve not merely to execute, but and even more notably to catalyze empowerment.

More recent papers shift focus from economic outcomes to the question of agency—defined as the ability to make strategic life choices in contexts of constraint **(Kabeer, 2002)**. Studies indicate that digital entrepreneurship contributes to increased self-confidence, bargaining power within households, and social recognition for rural women **(Suri & Jack, 2016; Li and Gupta, 2019)**.

In settings where women's physical mobility is restricted, smart technologies create forms of virtual mobility, allowing women to engage with markets and institutions beyond their immediate geography **(Tenhunen, 2018)**. Authors document how women entrepreneurs

increasingly negotiate household roles, control income, and participate in community decision-making as their digital engagement deepens **(Datta & Gailey, 2012)**.

However, the literature also underscores the ambivalent nature of technology. Without supportive social norms and institutional safeguards, digital tools can reinforce existing inequalities. Male appropriation of digital income, surveillance of women's online activities, language barriers, and platform exclusion remain persistent challenges **(D'Ignazio & Klein, 2020; Chen et al., 2018)**. Thus, agency is not an automatic outcome but a contested and negotiated process.

Despite increasing academic and policy-oriented body of India-centric scholarship on women, technology, and entrepreneurship, scholars note a significant geographical and contextual gap. Much of the existing literature focuses on relatively developed states, leaving regions like Jharkhand underrepresented. Given Jharkhand's high tribal population, dependence on SHG-based livelihoods, and uneven digital infrastructure, there is a pressing need for localized studies that capture how smart technologies intersect with gender, culture, and rurality, as illustrated by the example of poultry farming cooperatives in Jharkhand by the **Ecineq Working Paper (2025)**. Besides economic benefits, micro-entrepreneurial activities promote self-confidence, initiative, and the willingness to defy the constraining gender norms.

Understanding this transition—from access to agency—within Jharkhand's specific socio-economic landscape offers an opportunity to move beyond generalized narratives and contribute to more inclusive policy and theoretical frameworks.

Collectively, the literature suggests that smart technologies shape rural women's entrepreneurship through a progressive journey: access enables entry, capability facilitates participation, and agency signifies transformation. While technology opens new economic pathways, its emancipatory potential is realized only when embedded within supportive ecosystems of training, social acceptance, and institutional backing **(Heeks & Shekhar, 2019)**.

By focusing on rural women entrepreneurs in Jharkhand, this study positions itself within this evolving body of scholarship, seeking to understand not merely how women use technology, but how technology reshapes their power, identity, and entrepreneurial agency.

Conceptual Framework

1. Limitations of Access-Centric Approaches

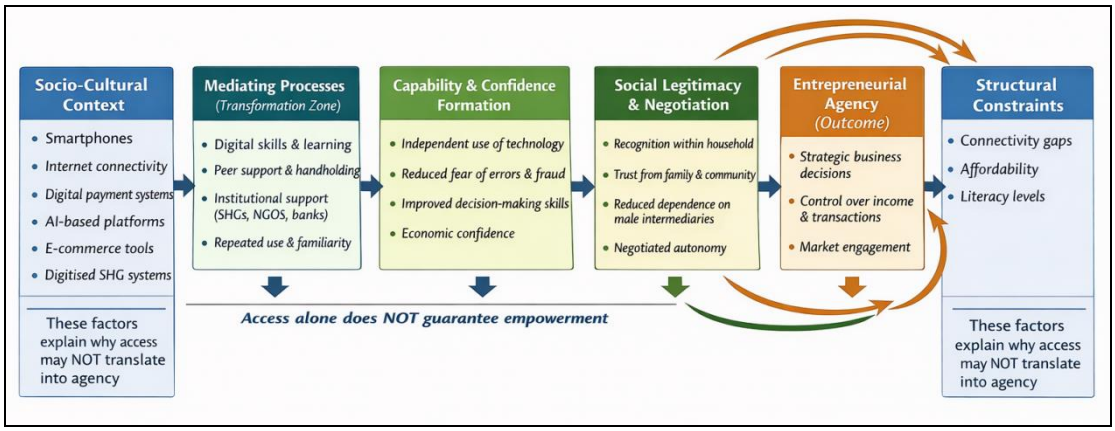
A broad part of the literature on digital inclusion identifies empowerment as the mere access to a device, an Internet connection or a platform. Although access is one of the prerequisites, it is inadequate in settings where women have very-minimal decision making authority, control over earnings, or social authorization to pursue entrepreneurial ventures. The access-centric approaches have a propensity to obscure the social mechanisms through which technology is adopted, negotiated, or resisted.

2. Agency as a Process

Based on the capability approach and feminist political economy, this study formulates the conceptualization of agency as the ability to articulate goals, choose strategically and pursue them within structural constraints. The notion of agency is perceived as relational and processual as opposed to the understanding of being individualistic, and it is constructed by the dynamics of household, community standards, and institutional set-ups.

3. Technology and Agency Formation

Smart technologies have the potential to facilitate agency formation by expanding women's capabilities (skills, knowledge, income), strengthening their confidence and self-esteem, and creating a sense of social legitimacy. Nevertheless, such outcomes are conditional on sustained involvement, education and learning, and enabling ecosystems entailing self-help groups (SHGs), NGOs, and financial entities. Figure 1 presents the conceptual framework guiding this study, illustrating the pathways through which access may—or may not—translate into agency.



(Figure 1: The conceptual framework guiding this study, illustrating the pathways through which access may—or may not—translate into agency.)

METHODOLOGY:

(a) Research Objectives

1. To investigate how smart technologies transcend mere access to enable the establishment of entrepreneurial agency among rural women in Jharkhand, within the confines of prevailing gender norms and socio-economic frameworks.

2. To examine the role of capacity-building, institutional support, and socio-cultural intermediation in determining the degree to which digital technologies translate into meaningful entrepreneurial autonomy among rural women.

(b) Research Design and Methodology

A mixed-method research design combines exploratory and descriptive approaches to understand how smart technologies facilitate entrepreneurial agency among rural women in Jharkhand. Given the recent nature of adoption in tribal and resource-constrained regions, an exploratory approach captures emergent patterns, lived experiences, and context-specific dynamics not yet fully theorized. Semi-structured interviews endorse agency as processual and relational, unravelling variables like confidence, social legitimacy, and intra-household negotiation. The descriptive approach documents patterns of access and usage of smart technologies (digital payments, e-commerce, AI tools, digitised SHG systems) and their impact on entrepreneurial practices, income, market participation, financial inclusion, and decision-making autonomy. Case studies bridge theory and practice, showing scalable models. Blending exploration (depth, novelty) with description (clarity, structure) ensures comprehensive validation of findings.

(c) Study Area

The research was carried out in the districts of Jharkhand, selected based on their distinctive socio-economic and cultural background, a high level of rural population, and the growing rates of digital penetration. Jharkhand is a region characterized by strongly-rooted gender norms and structural imbalances that restrain the visibility of women and their entrepreneurial leadership. Poverty becomes chronic, the level of female literacy is low, there are deeply anchored patriarchal traditions, and high rates of male out-migration which impede the mobility of women, their decision-making abilities, and their capacity to reap the opportunities presented by the burgeoning digital economy.

The rural districts of Jharkhand, therefore, present a typical landscape to evaluate the prospect of smart technologies as a solution to close in gender imbalances and support rural women entrepreneurship and finally, to offer representative insights that can be scaled and implemented in other rural settings within India and other developing countries.

(d) Data Collection Instruments

This study utilizes both primary and secondary sources of data to comprehensively address the research problem. Primary data, gathered through surveys, captures firsthand experiences and perceptions of respondents regarding the adoption, accessibility, and effectiveness of smart technologies in addressing the constraints faced by rural women entrepreneurs in terms of market access, financial inclusion, healthcare provision, and business training. These data provide context-specific insights into how digital access is negotiated and translated into entrepreneurial agency.

Secondary data, including literature reviews and previous research findings along with data from government reports, academic studies, and digital platforms (e.g., apps and websites), etc. offers background information and supports the primary data, enriching the study with broader perspectives and enabling comparisons. The integration of these data sources enhances the study's credibility, reliability, and facilitates a robust analysis of the role of technology in gender dynamics related to entrepreneurship in the rural context. The questionnaire structure includes sections on (a) **demographic information** (gender, age, education level, marital status and locality); (b) **entrepreneurial profile** (nature of enterprise, ownership type, scale of enterprise, years of operation, source of startup capital, and contribution of income to household); (c) **access & use of smart technologies** (technologies used, frequency of use, purpose of use, ease of use, and preferred mode of using technology); (d) **impact of smart technologies** (on income, market access, decision-making autonomy, financial inclusion, healthcare, business efficiency/productivity, and confidence and leadership roles); (e) **barriers & challenges** (issues faced, steps to overcome, reliance on intermediaries, and perceived risks); (f) **support and sustainability** (support received from SHGs and NGOs, Government Programs, Public & Private Organizations, future willingness to adapt more technologies, and ways to improve accessibility and usefulness of technology for rural women entrepreneurs); and (g) **additional comments**.

Alongside the survey, Personal Interviews (PIs) were also carried out with a few respondents (women entrepreneurs, representatives of grass-root organizations including Reserve Bank of India **(RBI)**, Jharkhand Rajya Gramin Bank **(JRGB)**, and National Bank For Agriculture And Rural Development **(NABARD)** along with the leaders of NGOs **Samarthini** and **Udaan**)for additional information and understanding about the context. These interviews were helpful for questions that were difficult to capture through a survey. The PIs were based broadly upon **(**evolution of women's entrepreneurship, motivations for adopting digital tools, impactful technologies, empowerment outcomes, barriers and risks, effective support mechanisms, and institutional and policy recommendations**)**.

Furthermore, we conduct case study analysis of **Karya.ai, Lal10, NABARD's E-Shakti : Pilot Programs, and DEF's Udyamini/SoochnaPreneur Model** to identify the structural and operational constraints donned by rural women entrepreneurs. These cases illustrate how technology-enabled interventions, when embedded within supportive institutional and socio-cultural ecosystems, can facilitate the gradual formation of entrepreneurial agency.

(e) Sampling

In this study, both purposive and convenience sampling techniques are employed to gather relevant data from individuals with sufficient experience and understanding of the research topic. Using Google Forms for surveys offers the advantage of reaching respondents conveniently and allowing them to respond at their convenience, thereby enhancing the quality of responses. Purposive sampling enables the selection of participants who are directly involved in or knowledgeable about the use of smart technologies in women-led rural ventures. This is crucial for exploring nuanced topics within rural women entrepreneurship such as agency formation, which require insight into lived experiences, decision-making dynamics, and socio-cultural negotiations. Given logistical challenges in reaching rural areas, convenience sampling ensures practical and efficient data collection. While the sample size may be modest, it is justified by the focus on obtaining high-quality and detailed information. The combined use of purposive and convenience sampling ensures that the study yields relevant and informative data on on the adoption, accessibility, and impact of smart technologies in rural women's entrepreneurship, contributing significantly to expanding the currently limited body of knowledge on this critical issue.

(f) Data Analysis

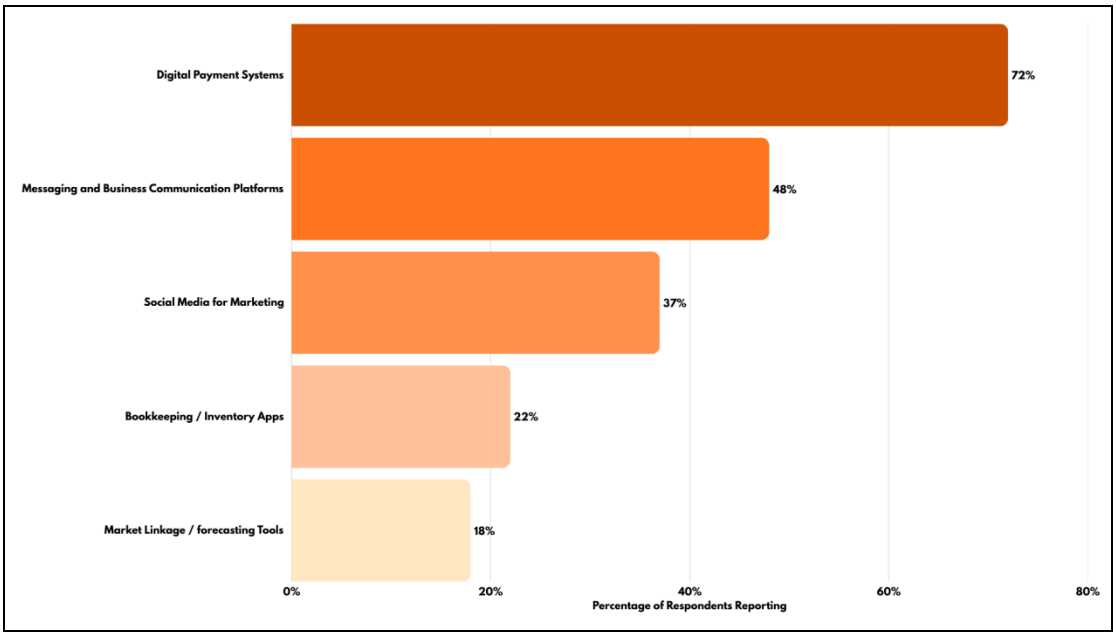
The study employed both quantitative and qualitative methods for data analysis to ensure a thorough examination of how smart technologies contribute to the formation of entrepreneurial agency among rural women in Jharkhand. Quantitative analysis focused on structured questionnaire responses, employing statistical techniques to identify patterns and trends. Meanwhile, qualitative analysis involved a deeper examination of open-ended questionnaire responses, data from participant interviews, and case studies aiming for a nuanced and thematic understanding. This methodological approach of integrating quantitative and qualitative methods facilitated a comprehensive exploration of how access to smart technologies is translated—or constrained—into entrepreneurial agency within specific socio-cultural and institutional contexts.

FINDINGS AND DISCUSSION

This section is a synthesis of the findings based on the questionnaire responses and the personal interviews (PIs) conducted with the representatives of the institutions, leaders of the NGOs, and women entrepreneurs. These results are elaborated on in the following broad dimensions (1) from survival entrepreneurship to strategic engagement with technology, (2) digital payments as the entry point to agency formation, (3) technology, confidence, and social legitimacy, (4) learning-by-doing and the importance of handholding, (5) factors that hinder the adoption of smart technologies, and (6) institutional and ecosystem-level enablers of agency. The sub-sections are based on quantitative evidence supported by qualitative data reflecting statistical patterns as well as lived realities. To further elaborate this knowledge pool, some selected case studies of the people who have been successful beneficiaries of the prominent digital empowerment platforms, including Lal10, Karya.ai, and Pragati App by NABARD are also presented to demonstrate practical changes.

1. From Survival Entrepreneurship to Strategic Engagement with Technology

The data indicate that there is an apparent shift in the entrepreneurial experiences of rural women i.e. from subsistence-based enterprises to strategic and opportunity oriented entrepreneurial endeavors. The majority of the women respondents began to engage in entrepreneurship out of necessity—primarily due to financial strains of the household, unreliable agricultural income, or because there was a lack of formal employment. Nevertheless, as they were exposed to digital tools, the nature of their interaction with markets changed.



(Figure 2: Distribution of adoption levels for various smart technologies)

Women spearheading vegetable stalls, tailoring units, handloom productions, and small-scale trading enterprise reported that given the provided technologies, including UPI payments, WhatsApp Business, Instagram, and digital bookkeeping applications, they have switched to becoming active participants in the market instead of passive sellers. This transition was supported by institutional stakeholders who highlight that women no longer remain mere account holders; but are now running enterprises associated with SHGs and are also able to negotiate business on their own with buyers.

This transition marks a significant observation: the adoption of technology was not aspirational but rather problem-oriented. Women embraced the digital tools when they revealed themselves to overcome material limitations, including payment defaults, reliance on middlemen, fear of theft, lack of price transparency, and constrained access to markets. That is, access to technology arose not as an abstract development goal but rather a reaction to daily insecurities inherent in the entrepreneurial lives of rural women.

2. Digital Payments as the Entry Point to Agency Formation

Digital payment systems (especially UPI) turned out to be the most significant and the most extensively used technological tool across all categories of respondents (as shown in Figure 2). To the women entrepreneurs, UPI essentially changed the manner in which money was received, recorded, and controlled.

The survey narratives show that digital payment minimized the leakage of income in form of informal credit, rounding-off and delayed payment. As an example, women who sold vegetables or other homemade goods highlighted the fact that precise digital payments not only increased the financial accuracy but also boosted their confidence in customer dealings. Notably, some women referred to digital money as a security measure wherein the availability of funds could be accessed in times of medical or household emergency.

The institutional respondents also emphasized that as income is directly channeled to the bank account of women, they acquire more legitimacy in the households. The advent of managing digital payments enabled women to engage in making decisions in regard to reinvestment, education of their children, and savings—and this was a transition from contributory labor to established economic agency.

The findings however also warn against interchangeability of the digital payments with automatic empowerment. Women's agency was still constrained in situations where the phones or bank accounts were under the control of male members of the family. Therefore, having control over digital financial tools—not mere access—became a decisive factor of empowerment.

3. Technology, Confidence, and Social Legitimacy

Table 1: Empowerment Outcomes Resulting from Smart Technology Adoption.

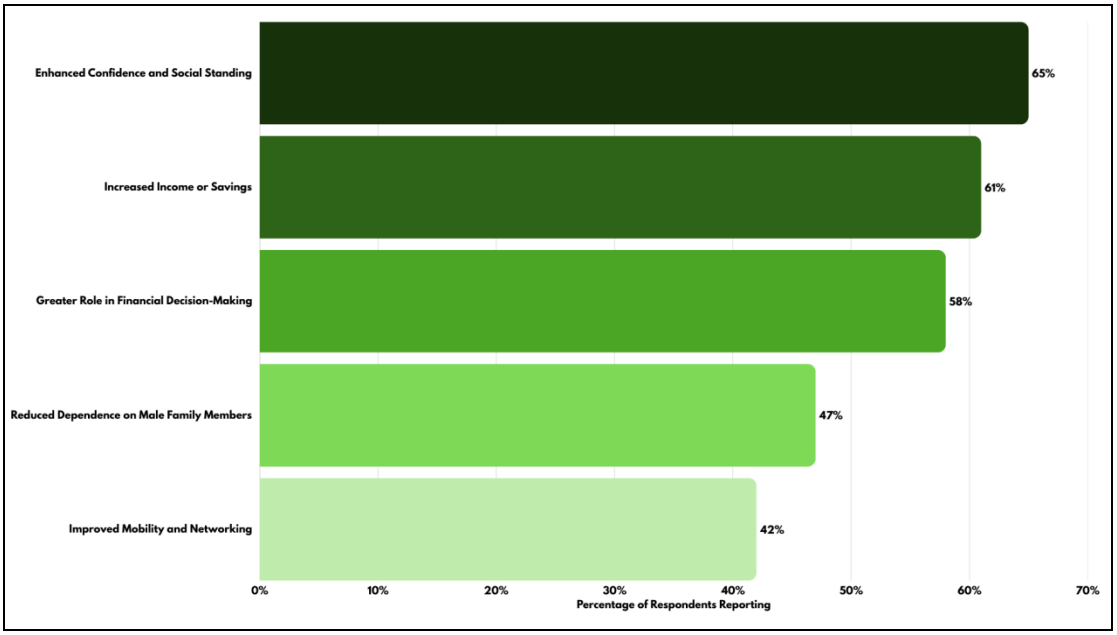
Empowerment Dimension	% Reporting Positive Change
Increased Income or Savings	61%
Greater Role in Financial Decision-Making	58%
Enhanced Confidence and Social Standing	65%
Improved Mobility and Networking	42%
Reduced Dependence on Male Family Members	47%

One major insight that can be drawn based on both the interview and the responses to the survey is how technology as a means is redefining the self-perception and social standing of rural women. Through the narratives, women continuously linked the use of digital tools with elevated confidence and visibility coupled with increased respect, not only in their homes but in society as a whole.

Women who could negotiate prices using their smartphones, been paid with the help of a QR code, or who handled orders reported an increasing sense of agency as entrepreneurs. The

NGO leaders also noted that women who were originally reluctant to speak in a meeting or any other open forum slowly learned to speak out came out as strong representatives in the group when they had the ability to prove their competence digitally and their actual contribution in terms of money. Digital engagement was therefore not merely a technical skill, but also served as a sign of credibility in the social and economic interactions.

More notably, this confidence was not a purely individual psychological phenomenon, but a socially created and reinforced mechanism. Once women began to be seen as economic agents—making payments without male assistance, interacting with purchasers outside their immediate communities, and maintaining digital records—there was a shift in their identity from being looked upon as a helper or supplementary earner to that of an entrepreneur in her own right. Such transformation was mirrored in the dynamics of the household, where families became increasingly consultative of women, especially in financial matters, as well as in the interactions on community level, where other women looked upto them to guide them in the use of digital tools.



(Figure 3: Multi-Dimensional Empowerment Outcomes Associated with Smart Technology Utilization)

Put together, these insights strongly support the main argument of this paper, that entrepreneurial agency is relational and socially negotiated. Instead of being an automatic outcome of technological access, agency is shaped within the course of daily interactions

where digital practices generate recognition, legitimacy, and bargaining power within the established social structures.

4. Learning-by-Doing and the Importance of Hand-holding

The results emphasize that the mode of learning the technology is no less important than the technology itself. Across NGOs, financial institutions, and SHG-based programs, hands-on and experiential training constantly proved to be the most effective method of ensuring sustained adoption of digital tools.

Observational learning was reiterated by women, which involved conducting actual transactions, and receiving peer-based support, as being a more effective approach than a one-time demonstration or textbook explanations. Interventions by NGOs purposely had women make their first digital transaction on their own, proving effective in instilling confidence and eradicating fear of errors.

Institutional stakeholders emphasized steady hand-holding, usually extending over three to six months, especially in initial stages. Without long-term support, digital engagement tends to deteriorate, implying initial use may fail to result in frequent use over time. This strengthens the interpretation that technology-facilitated empowerment is neither immediate nor linear, but contingent upon repeated practice, reinforcement, and social support.

Collectively, these learning dynamics support the conceptual framework that relates agency not as the immediate result of technology but as a progressive process of achieving competence, building confidence, and negotiated autonomy.

5. Persistent Barriers: Infrastructure, Norms, and Digital Risk

Table 2: Major Barriers to Smart Technology Adoption among Rural Women Entrepreneurs.

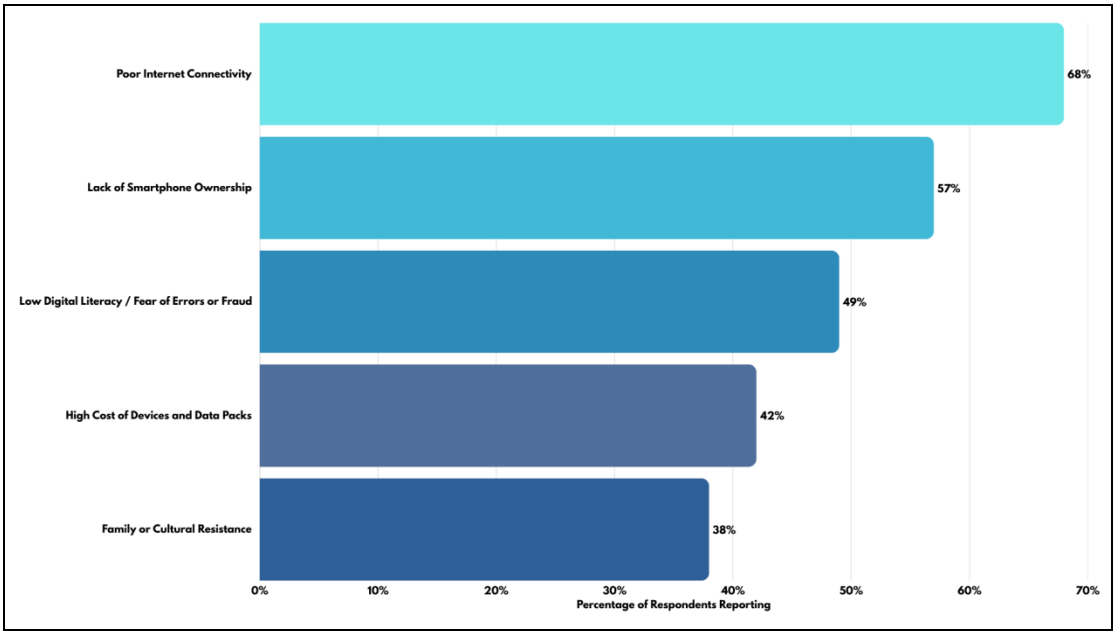
Barrier	% of Respondents
Poor Internet Connectivity	68%
Lack of Smartphone Ownership	57%
Low Digital Literacy / Fear of Errors or Fraud	49%
High Cost of Devices and Data Packs	42%
Family or Cultural Resistance	38%

Regardless of the recorded incidence of benefits, the results exemplify the presence of structural and socio-cultural barriers that greatly inhibit the translation of digital access into substantial entrepreneurial agency.

Infrastructural limitations remain one of the core obstacles. Inadequate network connectivity—especially in haats and tribal regions—was a frequent cause of disruption in digital transactions creating anxiety, delays and distrust in digital systems. The expensive price of smartphones and the recurrent data bills were additional limiting factors to sustained use of smartphones to most of the women, particularly those on the lower economic rungs of the income ladder.

In addition to infrastructure, highly ingrained social norms still mediated the use of technology by women. The use of shared phones, restrictions on women's mobility, and suspicion surrounding women's digital engagement curtailed autonomy and limited independent usage. Several respondents told of being ridiculed, having their family members oppose them and/or keeping eyes on their phone usage, highlighting the idea that digital spaces are not not socially neutral but still defined by the prevailing power dynamics.

These difficulties were also exacerbated by digital risk. Online fraud and financial deception became a pressing issue, particularly affected by women since they are not well-exposed to online literature regarding cyber safety and consumer protection policies. The events of losing money destroyed confidence in the digital platforms and discouraged further experimentation and this underscores the lack of gender responsive digital safety nets.



(Figure 4: Constraints Affecting Smart Technology Integration among Rural Women Entrepreneurs)

Taken together, these results indicate that the introduction of smart technologies can unconsciously imitate or even reinforce already existing disparities introduced in an environment where there are no sufficiently developed social, institutional, and protective measures. This solidifies findings of feminist digital scholarship to be cautious of viewing technology as necessarily emancipatory, and insisting on locating digital interventions through wider lenses of power, protection and integration.

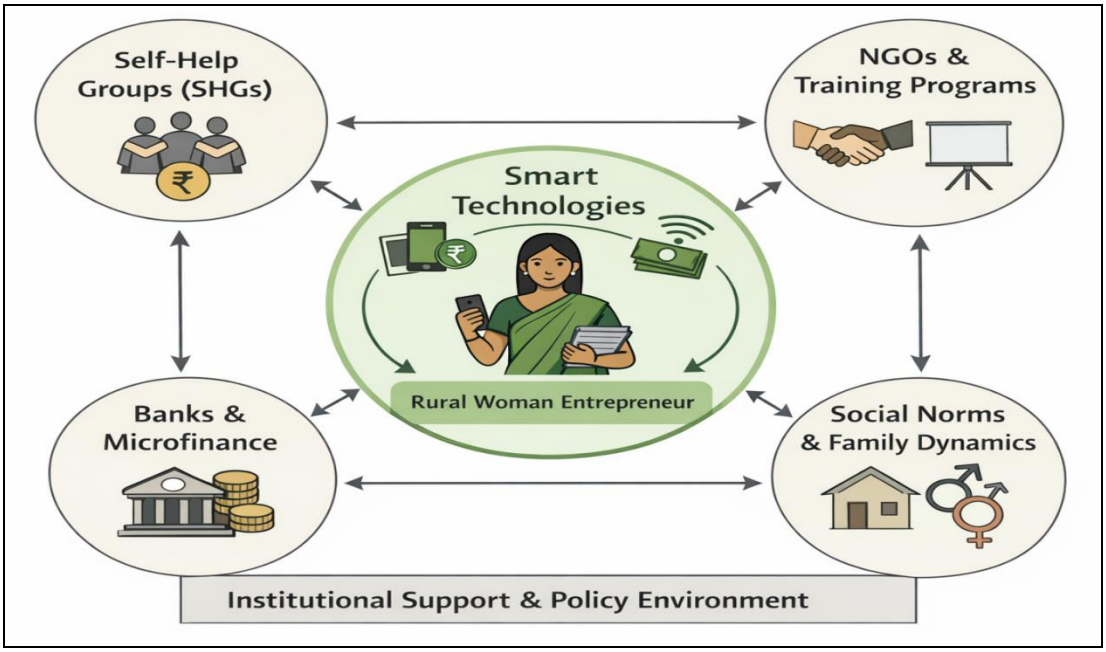
6. Institutional and Ecosystem-Level Enablers of Agency

Among the most prominent findings, women's entrepreneurial agency got strengthened in settings wherein digital technologies were integrated into enabling and coordinated ecosystems. Self Help Groups (SHGs) came into scene as pivotal entry points because they not only provided access to technology but also trust, peer-based learning, and social legitimacy, which reduced barriers to adoption and continued use.

Institutional actors such as NABARD (e-Shakti), banks (BC Sakhi, women banking correspondents), and NGOs performed complementary roles. Digitalization of records improved institutional credibility and access to credit, while NGOs and SHGs promoted capacity-building, contextual learning, and negotiation of social norms. Alignment between these actors was critical in translating technological accessibility into sustainable outputs.

Stakeholders recommended outcome-oriented measures—such as income stability, time saved, autonomy in decision-making, and control over financial resources—over input-based metrics like accounts opened or devices distributed.

Collectively, these evidences drive the main idea that smart technologies do not produce agency on their own. Instead, they are upheld as enablers of agency when incorporated into strong institutional frameworks and socio-cultural support networks that provide women with choice, control, and negotiating power.



(Figure 5: Technology-Enabled Agency Formation Ecosystem)

7. Case Studies of Technology-Driven Empowerment

Case Study 1: Karya.ai (Odisha)

- Micro-tasking platform for AI data annotation enabled women to earn supplementary income from home.
- Example: Swarnalatha Nayak earned ~₹5,000 in her first week, reinvesting in her craft business and gaining digital confidence.
- **Impact:** Economic empowerment, digital literacy, and social recognition.

Case Study 2: Lal10 (Pan-India)

- Digital B2B marketplace for women artisans. Trains women in inventory management, digital marketing, and global buyer engagement.
- Onboarded 700 weavers (550 women) and 45,000+ products digitized.
- **Impact:** Improved income, market access, digital skills, and agency within communities.

Case Study 3: NABARD's e-Shakti (Ramgarh, Jharkhand)

- Digitized SHG records to improve banking linkages, transparency, and financial inclusion.
- Enabled faster loan access, Aadhaar integration, and benefit transfers.
- **Impact:** Enhanced financial agency, record-keeping skills, and SHG credibility.

Case Study 4: DEF Udyamini/SoochnaPreneur (West Bengal)

- Trained rural women as digital enablers (SBMs) to support local entrepreneurs with bookkeeping, marketing, and e-commerce.
- Examples: Women gained income (~₹3,000 → ₹8,000–10,000/month), digital literacy, and social recognition.
- **Impact:** Economic, digital, and social empowerment; women became trainers and community change agents.

These cases highlight the **scalable potential of technology** when combined with human-centered training, local facilitation, and institutional support.

CONCLUSION & SCOPE FOR FUTURE STUDIES

Summing up the empirical findings, this paper shows that the relationship between smart technologies and the entrepreneurial endeavour is neither linear nor deterministic. While access at the digital level might initiate the engagement, it is in the process of ongoing negotiation that entrepreneurial agency is developed; with markets, households, institutions, and even the technological systems themselves.

The process of agency formation among rural women entrepreneurs in Jharkhand is cumulative and inter-twined: experiential learning, improved financial visibility, social recognition, and long-term institutional support. Smart technologies allow women to go beyond restrained involvement towards strategic decision-making and control over economic activities. Conversely, when access is socially encumbered by patriarchal norms, infrastructural gaps, or disjoint capacity-building, empowerment remains partial or cosmetic, and technology may strengthen inequalities.

The results empirically support that smart technologies facilitate empowerment by increasing women's ability to make choices, act, and negotiate within structural restrictions. Practical ramifications call for shifting from access-centric approaches to strategies embracing agency: long-term capacity building integrated into SHGs, female-focused delivery models, addressing connectivity, affordability, and digital security. Coordinated, ecosystem-based policies are essential to establish smart technologies as facilitators of negotiated autonomy.

Scope for Future Studies:

- Scale tested interventions to diverse rural contexts to assess adaptability, inclusivity, and sustainability.

- Conduct long-term, comparative studies to evaluate the enduring socio-economic impacts of digital empowerment.
- Examine gender-sensitive, vernacular, and voice-based digital interfaces to enhance access for low-literacy women.
- Explore emerging digital finance technologies (blockchain, AI-based microcredit) for financial independence.
- Investigate intersections of technology, social norms, and agency to design replicable, scalable frameworks for inclusive rural development.

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