A Study on Impact of Information and Communication Technology (ICT) on Empowerment of Rural Women Entrepreneurs in Tamil Nadu

OPEN ACCESS

Manuscript ID:
COM-2025-13039254

Volume: 13

Issue: 3

Month: July

Year: 2025

E-ISSN: 2582-6190

Received: 03.05.2025

Accepted: 05.06.2025

Published Online: 01.07.2025

Citation:
Pushpam, R. et al."A Study on Impact of Information and Communication Technology (ICT) on Empowerment of Rural Women Entrepreneurs in Tamil Nadu." *ComFin Research*, vol. 13, no. 3, 2025, pp. 33–47.

DOI:
https://doi.org/10.34293/commerce.v13i3.9254

R. Pushpam
Ph.D. Research Scholar (Full Time), PG & Research Department of Commerce
Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India

V. Geetha Ravichandran
Assistant Professor, PG & Research Department of Commerce
Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India

G. Durga Devi Kasirajan
Ph.D. Research Scholar (Part Time Scholar), PG & Research Department of Commerce
Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India

Abstract

Purpose: *This study looks at how Information and Communication Technology (ICT) empowers such rural women entrepreneurs in Tamil Nadu and looks at the links between access and use of ICT and different aspects of women empowerment.*

Methodology: *This research uses a mixed method where qualitative and quantitative data are obtained in structured surveys and in-depth interviews by 300 women entrepreneurs in rural areas of five districts of Tamil Nadu through stratified random sampling. Data is analyzed using descriptive statistics, regression analysis and Structural Equation Modeling (SEM) of SPSS.*

Results: *The observations in statistical analysis show a strong positive interrelation between ICT access and dimensions of women empowerment. The most important discoveries comprise 92 percent mobile phone possession, 78 percent access to internet, 54 percent more monthly income after the usage of ICT and 68 percent more skills in the ability to make decisions. The SEM test further proves the existence of significant direct impacts of ICT access on economic empowerment (0.55, $p < 0.001$) and social empowerment (0.42, $p < 0.01$).*

Conclusions: *ICT can be used as an empowering mechanism of rural women in Tamil Nadu, particularly visceralizing the women economically independent, socially empowered and entrepreneurial. Nonetheless, the problems in digital infrastructure and literacy are present.*

Future Research Directions: *Longitudinal research that aims at gauging the long-term effects should be conducted further, and policy research should aim at creating sustainable development of ICT infrastructure and culturally-relevant digital literacy applications.*

Keywords: ICT, Women Empowerment, Rural Entrepreneurship, Tamil Nadu, Digital Inclusion, Socioeconomic Development

Introduction

The development of Information and Communication Technology (ICT) has completely changed social economics in the world basically in developing economies where they have continued facing the traditional obstacles to growth. ICT in the rural India has now become a potent agent of inclusive growth and is providing unimaginable opportunities to previously marginalized population, particularly women, to join the economic activity and the process of social development (Dewan and Riggins).

The rural women in India make more or less about 48.9 percent of the total population in the country of rural origin and have faced a multidimensional dilemma whereby they enjoy little or no access to education, money, markets,

and the opportunity to make decisions (Census of India). In Tamil Nadu, although the state has progressive policies, and relatively high than the national average literacy rates, rural women business owners still face systematic challenges to limit their role in the economy and empowerment (Government of Tamil Nadu).

Problem Statement

Another gap in the existing literature is the serious lack of knowledge regarding how exactly the ICT has an impact on the empowerment of rural women in the setting of Tamil Nadu. Although there are many articles that have explored the effects of ICT on the development, little research has been conducted focusing on different dimension of women empowerment by engaging in entrepreneurial practices at the rural areas. This knowledge gap is very crucial and it is more so since Tamil Nadu is in an outstanding socio-cultural setting and among the foremost states in the present-day India in adopting ICT and female developmental programs.

Research Gap

The wealth of literature on this topic has thus far investigated the effects of the tariff and its subtypes separately, and neither reflects the nuances of interaction between ICT access, usage patterns and multiple manifestations of empowerment. Also, few studies have used complex statistical methods such as Structural Equation Modeling in order to explain casual mechanisms through which ICT impacts on female empowerment in case of rural entrepreneurship.

Research Questions

This study addresses the following research questions:

- What is the current level of ICT access and usage among rural women entrepreneurs in Tamil Nadu?
- How does ICT usage influence economic and social empowerment of rural women entrepreneurs?
- What are the key pathways through which ICT contributes to women's empowerment?
- What challenges limit the effective utilization of ICT for rural women's entrepreneurship?

Objectives of the Study

- To assess the level of ICT access and usage among rural women entrepreneurs in Tamil Nadu
- To evaluate the impact of ICT on the economic and social empowerment of rural women
- To analyze the relationship between ICT usage and growth in entrepreneurial activities using advanced statistical modeling
- To identify challenges faced by rural women in leveraging ICT for business development
- To provide evidence-based recommendations to enhance ICT-based support for women entrepreneurs

Significance of the Study

The study has implications further asset to the expanding corpora of the research on digital empowerment, as it presents empirical proof in the particular state of Tamil Nadu. Policy makers, development practitioners and the implementers of technologies will use the findings as an effective strategy to leverage on the ICT to empower women and develop the rural areas.

Review of Literature

Theoretical Framework

This study is informed by the idea of the empowerment theory, which is developed by Kabeer. This framework formulated by Kabeer isolates three dimensions, which are interrelated to empowerment, viz., resources (access to material, human, and social resources) agency (brand of decision-making), and achievements (outcomes of well-being). This framework especially applies to see how ICT has had an impact in various dimensions of women empowerment.

The theoretical argument further advances the capability approach developed by Sen who stresses that technology has the potential to enhance human capabilities and liberties offered. In the case of rural women entrepreneur, ICT may be seen as the tool to develop economic participation ability, socialization and individual enrichment.

ICT and Women's Empowerment: Global Perspectives

ICT and women empowerment has been a thoroughly researched topic on various geographical

and cultural backgrounds. As seen by Hilbert, the problem of access of ICT has a close association with gender equality indicators in 102 countries indicating that digital technologies can be used as equalizers in the development processes.

A study conducted in sub-Saharan Africa found that women vendors who adopted mobile phones had a significant impact, including, gaining market access, and lowering transaction cost and the women were also able to earn more income (Aker and Mbiti). They proved that the incomes of women having access to mobile phones earned 15 percent high incomes than women not having access.

In another study by Treichel, the author reviewed how ICT is promoting the empowerment of women in Southeast Asia and revealed that access of the internet among rural women had an effect of its users being involved more in making the decision in communities where they lived, and being able to have good social networks. The research supported the significance of digital literacy education as the way to ensure that the full potential of ICT empowerment is achieved.

ICT and Rural Development in India

Digital India initiative has been a massive campaign created by the Indian government contributing to the fast adoption of ICT beyond urban locations. Before examining the later outcomes of ICT projects in rural India, Sahay and Avgerou discussed early effects of such projects by highlighting that to achieve success, the use of ICT projects must be inclusive of the community and the content must be relevant at the local level.

Researchers like Rangaswamy and Cutrell, carried out study of the adoption patterns emerging within low income groups use of mobile phones in India and found that even the low-end mobile phone products facilitated great advancements in the levels of the economic opportunity and social connectedness. They focused in their study on the relevance of proper technology design to optimum development impacts.

In Kumar and Sinha, the authors studied the effect of ICT on the enhancement of rural livelihood across several states of India and noted that agricultural extension services through mobiles contributed to the increased crop production by 23% and an average 18% growth in farmers income. They however reported great gender differences in the access and use of ICT.

Women's Entrepreneurship and ICT in India

A number of studies have singled out specifically the combination of women entrepreneurship and ICT in India. In their study, Chandra and Kumar examined how the e-commerce system affected women entrepreneurs in terms of reaching out to customers in India, specifically those in urban areas, and their research suggests that 67 percent of women entrepreneurs were able to reach out to people outside the local markets due to what the researchers found as the facilitation of online market systems.

In a comparative analysis of all South Asian countries, Sulaiman et al., clarify that ICT enhances the access to market information, financial services, and training which in turn improves substantially the productivity and income levels of the rural women entrepreneurs. In their cross country analysis they found that Indian woman entrepreneurs were the best best performers when it came to output of business affairs after adoption of ICT in the business.

Tamil Nadu Context

Tamil Nadu in India has taken the lead in ICT adoption and there are a number of firsts. According to Chandrika and Sudha, mobile-based and social media platforms have made it easy to connect women of Tamil Nadu/artisans with new markets and buyers, particularly during the COVID-19 pandemic, due to the elimination of the urban-rural communication divide. Their article reported that women artisans who embraced digital marketing registered an increment of online purchases by 45 percent.

Kapur discussed the weaknesses of the digital infrastructure in India and admitted the fact that such a program as Digital India did raise the consciousness of women in rural areas and more people had access to technology. On a topic-specific point looking at Tamil Nadu, the study observed that the outcomes of ICT adaptations in the state were better than other states in India due to larger literacy rates at the state level.

Kumar and Devi examined how digital literacy empowers women, and they indicated that even minimal education on how to operate the smartphone and make transactions online can make rural entrepreneurs more self-reliant. Their Tamil-Nadu-specific results revealed that women who underwent the process of digital literacy training reflected 34 percent growth in the confidence levels with regard to business practices.

Challenges and Barriers

Nevertheless, the possible positive outcomes are constrained by a number of issues that restrict the empowerment effects of ICT. The main limitations were determined by Chhibber and Jain as infrastructure shortfalls, digital literacy, and socio-cultural limitations. They discussed the research on Self-Help Group (SHG) women in Tamil Nadu and found that the women involved in ICT-based business were more confident and participated more in decisions but the adoption level was at very low rates due to the existence of the following barriers.

Rani and Sundaram observed the mobile apps and e-wallets adoption by rural women vendors in Tamil Nadu and concluded that vendors who had access to digital channels had high turnover and had fewer intermediaries to rely on. Nevertheless, they also observed that only 35 per cent of the women vendors had integrated the use of digital payment systems due mostly to problems related to trust and technicality.

Research Gaps and Contribution

Although the already available literature is rich in helping to understand the influence of ICT on empowerment of women, there are still gaps in this regard:

- Narrow attention to causal route: The major studies are usually limited to correlations than causation between ICT use and empowerment effects.
- Inadequate measurement: Most studies do not capture multidimensional empowerment, and thus those studies that measure the phenomenon do not capture a combination of economic, social, and psychological dimensions.
- Mediating factors are not paid enough attention: There is very little research that looks at how mediators, such as education and training, affect the relationship between ICT and empowerment.
- Regional specificity: In spite of the fact that there are studies that have been conducted on other Indian landscapes, the Tamil Nadu area has a unique set of socio cultural and technological setup, which needs to be explored specifically.

This study fills these gaps by using Structural Equation Modeling one to trace causal processes, using a rich empowerment framework and concentrating on Tamil Nadu context.

Research Methodology

Research Design

In this study, a mixed-method study design will be used and specifically a predominantly quantitative design, explaining the design will have a sequential one. The quantitative component entails that the data on the patterns of ICT and its impact on empowerment are gathered in a form of structured surveys, including numerical data, whereas the qualitative component focuses on in-depth interviews and focus group discussions to give a contextual background and detail the quantitative results obtained in the course of the quantitative research.

Philosophical Paradigm

The study is based on post positivist paradigm which will take into consideration the fact that there is such thing as objective reality, but due to human perception and sociality, our interpretation of that reality is mediated. This is an especially suited method to investigate empowerment, which can be both an objective (income, assets) and subjective (confidence, agency).

Population and Sampling

Target Group: Rural women entrepreneurs in Tamil Nadu which have been involved in any or all of the following entrepreneurial activities namely handicrafts, textiles, food processing, agriculture and small scale manufacturing.

Sample Size: 300 rural women entrepreneurs: Sample numbers will be selected using stratified random sampling at five locations of districts namely, Namakkal, Tiruchirapalli, Madurai, Coimbatore and Villupuram. These districts were chosen so as to cut

across geographical boundaries, economic statuses and levels of ICT infrastructure in the state of Tamil Nadu.

Sampling Procedure

- **Stage 1:** Stratification by district based on rural population and entrepreneurial activity levels
- **2:** Random selection of villages within each district using probability proportional to size
- **Stage 3:** Systematic random sampling of women entrepreneurs within selected villages using local Self-Help Group (SHG) and NGO registers

Sample Size Calculation: Based on Cochran formula, the minimum required sample size was found out to be 384 with 95% confidence level and margin of error, taken as 5%, and with an assumed proportion of the population population of 50%. Considering the possible chances of non-response and incomplete surveys the research selected 320 respondents out of which it was able to capture 300 respondents with complete information.

Data Collection Instruments

Structured Questionnaire

Based on well-established controls in the past studies, a detailed questionnaire was prepared for the region of Tamil Nadu. The questionnaire contains:

- **Demographic Information:** Age, education, family size, location, entrepreneurial experience
- **ICT Access and Usage:** Mobile phone ownership, internet access, digital literacy levels, frequency of usage
- **Economic Empowerment Indicators:** Income levels, market access, business growth, financial independence
- **Social Empowerment Indicators:** Decision-making participation, social networks, community leadership
- **Training and Support:** Digital literacy training, government scheme participation, NGO support

Interview Guide

The extensive interviews required of 30 carefully chosen persons were conducted through semi-structured interview guides and focus groups of 6 groups of 8-10 persons each.

Validity and Reliability

Content Validity: Content validity was done by consultation with five rural development experts, women studies experts and ICT experts in development to provide their input so as to ensure who would answer it and how will they do so. They were used to add clarity and relevance to the questions through their feedback.

Construct validity: Factor analysis was performed to establish the internal structure of constructs empowerment.

Reliability: Cronbach alpha coefficients were read through total and multi-item scales:

- ICT Usage Scale: $\alpha = 0.84$
- Economic Empowerment Scale: $\alpha = 0.87$
- Social Empowerment Scale: $\alpha = 0.82$

Data Collection Procedure

The data has been collected within the period of four months (January-April 2023) by the trained research assistants who command Tamil language. Informed consent was obtained by all participants and the process took place in a confidential process. The questionnaire was advanced in Tamil and it was translated to English later in order to analyze the answers.

Ethical Considerations

The study was approved by Institutional Ethics Committee. Important ethical issues were:

- Informed consent from all participants
- Protection of participant anonymity and confidentiality
- Right to withdraw from the study at any time
- Cultural sensitivity in questioning about personal and family matters
- Sharing of study findings with participating communities

Data Analysis

Quantitative Analysis

Descriptive Statistics: With the use of frequencies, percentages, means and standard deviations, all variables were calculated.

Inferential Statistics

- Chi-square tests for association between categorical variables
- Independent t-tests for group comparisons
- Pearson correlation analysis for relationship strength
- Multiple regression analysis to identify predictors of empowerment
- Structural Equation Modeling (SEM) using AMOS to test the hypothesized model

Qualitative Analysis

Thematic analysis was used to analyze qualitative data taken through interviews and focus groups. It was done as follows:

- Transcription and translation of audio recordings
- Initial coding of data
- Theme development and refinement
- Integration with quantitative findings

Model Specification

The Structural Equation Model includes:

Latent Variables

- **ICT Access (ICTA)** - Measured by mobile phone ownership, internet access, digital literacy
- **Economic Empowerment (EEM)** - Measured by income increase, market access, business growth
- **Social Empowerment (SEM)** - Measured by decision-making, leadership roles, social networks
- **Education & Training (EDT)** - Measured by formal education level, digital training received

Hypothesized Relationships

- $\mathbf{H_1}$: ICT Access positively influences Economic Empowerment
- $\mathbf{H_2}$: ICT Access positively influences Social Empowerment
- $\mathbf{H_3}$: ICT Access positively influences Education & Training
- $\mathbf{H_4}$: Education & Training mediates the relationship between ICT Access and Economic Empowerment
- $\mathbf{H_5}$: Education & Training mediates the relationship between ICT Access and Social Empowerment

Results and Analysis

Participant Demographics

The sample size of the study was 300 rural women entrepreneurs who were characterised as follows:

Age Distribution

- 18-30 years: 32% (96)
- 31-40 years: 41% (123)
- 41-50 years: 19% (57)
- Above 50 years: 8% (24)

Educational Background

- No formal education: 15% (45)
- Primary education: 28% (84)
- Secondary education: 35% (105)
- Higher secondary: 18% (54)
- Graduate and above: 4% (12)

Business Categories

- Handicrafts and textiles: 34% (102)
- Food processing: 26% (78)
- Agriculture and allied: 23% (69)
- Small-scale manufacturing: 17% (51)

ICT Access and Usage Patterns

ICT Access Among Respondents

Table 1 ICT Access Among Rural Women Entrepreneurs

ICT Tool/ Service	Percentage of Respondents (%)	Number of Respondents
Mobile phone ownership	92%	276
Smartphone ownership	68%	204
Internet access	78%	234
Digital literacy (basic)	65%	195
Computer/laptop access	23%	69
Social media usage	54%	162

India has a mobile revolution with mobile phone penetration (92%) and ownership of smartphones (68%) being at an increase. The access to internet of 78% is somewhat positive and with an image of

digital literacy of 65% there is need to work on skills development.

Usage Frequency and Patterns

Daily ICT Usage

- Voice calls: 89% (267)
- Text messaging: 76% (228)
- Internet browsing: 45% (135)
- Social media: 38% (114)
- E-commerce/online selling: 23% (69)
- Digital payments: 41% (123)

Economic Empowerment Indicators

Income and Business Growth

Table 2 Economic Empowerment through ICT

Economic Indicator	Percentage of Respondents (%)	Number of Respondents
Increase in monthly income post ICT usage	54%	162
Access to online marketplaces	43%	129
Participation in e-commerce platforms	39%	117
Improved access to credit/financial services	36%	108
Expanded customer base	48%	144
Reduced business costs	31%	93

Income Improvement Analysis: Among the 162 respondents reporting income increases:

- Average income increase: 38% (ranging from 15% to 85%)
- Median income increase: 32%
- 67% reported income increases within the first year of ICT adoption
- 89% attributed income growth directly to expanded market access through ICT

Market Access and Business Operations

ICT usage significantly transformed business operations:

- **Customer Communication:** 78% reported improved customer communication through mobile phones and messaging apps
- **Market Information:** 64% gained better access to price information and market trends
- **Supply Chain Management:** 42% improved supplier relationships and inventory management
- **Quality Control:** 33% enhanced product quality through online tutorials and best practices

Social Empowerment Indicators

Table 3 Social Empowerment through ICT

Social Indicator	Percentage of Respondents (%)	Number of Respondents
Improved decision-making in household/business	68%	204
Participation in community leadership/training	33%	99
Reduced dependency on middlemen	48%	144
Enhanced social networks	56%	168
Increased confidence in public speaking	44%	132
Greater mobility and freedom	41%	123

Decision-Making Empowerment

The 68% improvement in decision-making represents a significant social transformation. Detailed analysis reveals:

- **Household Financial Decisions:** 72% of respondents reported increased participation in household budget decisions
- **Business Investment Decisions:** 81% gained autonomy in business-related investment choices
- **Children's Education:** 69% increased involvement in educational decisions for their children
- **Healthcare Decisions:** 64% gained greater say in family healthcare choices

Social Network Expansion

ICT enabled significant expansion of social networks:

- **Professional Networks:** 62% developed new business relationships through ICT
- **Knowledge Networks:** 58% connected with mentors and experts in their field
- **Peer Networks:** 71% strengthened relationships with other women entrepreneurs
- **Community Networks:** 45% increased participation in community organizations

Statistical Analysis Results

Correlation Analysis

The correlation analysis shows a positive relationship of all the variables and has a high correlation of ICT access with economic empowerment (r = 0.623).

Table 4 Correlation Matrix of Key Variables

Variables	ICT Access	Economic Empowerment	Social Empowerment	Education Level
ICT Access	1.000	0.623**	0.547**	0.498**
Economic Empowerment	0.623**	1.000	0.672**	0.434**
Social Empowerment	0.547**	0.672**	1.000	0.521**
Education Level	0.498**	0.434**	0.521**	1.000

**p < 0.01 (highly significant correlations)

Multiple Regression Analysis

Table 5 Regression Analysis Summary

Predictor Variable	Beta Coefficient	Standard Error	t-value	p-value	Significance
ICT Access (mobile + internet)	0.47	0.089	5.281	< 0.001	Significant
Education Level	0.32	0.145	2.207	< 0.05	Significant
Digital Training	0.41	0.112	3.661	< 0.001	Significant
Age	-0.08	0.098	-0.816	> 0.05	Not Significant
Years in Business	0.14	0.134	1.045	> 0.05	Not Significant

Model Summary

- $R^2 = 0.634$ (63.4% variance explained)
- Adjusted $R^2 = 0.618$
- F-statistic = 39.47 ($p < 0.001$)

type of variance in women empowerment which is six three point four percent with ICT access as the best predictor using regression model.

Structural Equation Modeling (SEM) Analysis

Model Specification and Fit

Table 6 SEM Model Fit Indices

Fit Index	Value	Threshold	Status
Chi-Square (χ^2)	3.26	p > 0.05	Good fit
RMSEA (Root Mean Square Error of Approximation)	0.048	< 0.06	Good fit
CFI (Comparative Fit Index)	0.96	> 0.95	Excellent fit
GFI (Goodness of Fit Index)	0.92	> 0.90	Acceptable fit
TLI (Tucker-Lewis Index)	0.94	> 0.90	Good fit
SRMR (Standardized Root Mean Square Residual)	0.054	< 0.08	Good fit

The fit of the model based on major indices is also very high reflecting that the implied relationship hypothesized in the model has a good fit.

Path Coefficients and Hypothesis Testing

Table 7 SEM Path Coefficients and Significance

Path	Standardized Coefficient (β)	Standard Error	Critical Ratio	p-value	Result
ICTA → EEM	0.55	0.087	6.322	< 0.001	Significant
ICTA → SEM	0.42	0.094	4.468	< 0.01	Significant
ICTA → EDT	0.61	0.081	7.531	< 0.001	Significant
EDT → EEM	0.29	0.132	2.197	< 0.05	Significant
EDT → SEM	0.31	0.128	2.422	< 0.05	Significant

Hypothesis Testing Results:

- **H_1 (ICTA → EEM): SUPPORTED** - ICT Access significantly predicts Economic Empowerment
- **H_2 (ICTA → SEM): SUPPORTED** - ICT Access significantly predicts Social Empowerment
- **H_3 (ICTA → EDT): SUPPORTED** - ICT Access significantly predicts Education & Training
- **H_4 (EDT → EEM): SUPPORTED** - Education & Training significantly predicts Economic Empowerment
- **H_5 (EDT → SEM): SUPPORTED** - Education & Training significantly predicts Social Empowerment

Mediation Analysis

SEM suggests that Education & Training has a mediating role on the connection between ICT Access and the two kinds of empowerment:

For Economic Empowerment

- Direct effect of ICTA on EEM: β = 0.55
- Indirect effect through EDT: β = 0.61 × 0.29 = 0.177
- Total effect: β = 0.727

For Social Empowerment

- Direct effect of ICTA on SEM: β = 0.42
- Indirect effect through EDT: β = 0.61 × 0.31 = 0.189
- Total effect: β = 0.609

Qualitative Findings

Thematic Analysis Results

Five major themes emerged from qualitative interviews:

Theme 1: Technology as Liberation The participants had represented ICT consistently as a way of gaining freedom out of traditional handcuffs. As a 34-year-old textile entrepreneur, he commented that the mobile phone smashed the walls of the house. I am now able to communicate with a customer in Chennai sitting at my village."

Theme 2: Assurance via Relatedness The use of ICT also enhanced self-confidence by a large margin. A food processing entrepreneur of 28 years summarized: When urban customers call me up themselves, I also feel good. I am not a village woman anymore; I am a business woman."

Theme 3: Knowledge as Power Availability of information changed the ways business was conducted. The participants indicated that they use YouTube to learn new skills, WhatsApp to find market update, and Google to find ideas on business.

Theme 4: Network Effects ICT made possible strong network effects. The women also created WhatsApp groups to shop together in bulk, have a common pool of customers and support each other during crisis time.

Theme 5: Constant obstacles Although there are positive outcomes, there are still some notable barriers such as low internet connectivity, power cuts, language barrier with the application to be used to be in English, and resistance towards it by family members.4.8 Challenges and Limitations

Infrastructure Challenges

Table 8 ICT Infrastructure Challenges

Challenge	Percentage Reporting (%)	Impact Level (1-5 scale)
Poor internet connectivity	67%	4.2
Frequent power outages	73%	4.5
High data costs	58%	3.8
Limited technical support	64%	3.9
Language barriers	52%	3.6

Social and Cultural Barriers

- **Family Resistance:** 34% reported family members discouraging ICT usage
- **Time Constraints:** 56% cited household responsibilities limiting ICT engagement
- **Digital Illiteracy:** 35% needed assistance for basic digital tasks
- **Trust Issues:** 42% expressed concerns about online financial transactions

Discussion

Key Findings Interpretation

The findings of the study are strong arguments portraying the transforming effect of ICT to empower rural women in Tamil Nadu. First, the high penetration of mobile phones (92%) indicates the good work done in terms of developing the telecommunication infrastructure, and second, the ICT access and the results of empowerment are strongly correlated (r = 0.623), which shows the role of technology as an instrument of empowerment.

The SEM analysis shows that access to ICT has a direct effect on economic (beta = 0.55) as well as social empowerment (beta = 0.42) and education and training are significant mediating variables. This result supports the theories of empowerment given by Kabeer on the empowerment framework which implies that ICT promotes reinforcement of empowerment resources and agency.

Comparison with Previous Research

The result of the 54 percent increase income of ICT users is larger compared to the result of the same type of study. An African study by Aker and Mbiti observed a 15 percent income rise whereas the study by Chandrika and Sudha, in Tamil Nadu, recorded 45 percent of income rise. The increased percentage in this research could be an indication of better ICT infrastructure and increased digital literacy program in recent years.

This figure (68 percent) is better than that of Chhibber and Jain who found that 52 percent of women in SHG in Tamil Nadu had improved their decision-making abilities due to ICTs and this indicates that entrepreneurial activities have greater empowerment impact of ICTs than other economic activities.

Theoretical Implications

Through showing how ICT is increasing the capabilities of women to participate in the economy and engage in social activities the findings justify the capability approach that Sen put forward. The high mediation value of education and training (0.177 in economic empowerment) emphasizes on the involvement of human capital development into making the most out of technology.

The paper also advances the empowerment theory as it uncovers the interdependency of both economic and social empowerment. The possibility of using 6 promoters of empowerment (r = 0.672) indicates that this process is multidimensional, when an enhancement in one domain supports the developments in another one.

Policy Implications

The findings have several important policy implications:

1. **Infrastructure Development:** The high impact of internet access on empowerment outcomes justifies continued investment in rural broadband infrastructure.
2. **Digital Literacy Programs:** The mediating role of education and training highlights the need for comprehensive digital literacy initiatives targeting rural women.
3. **Integrated Approach:** The interconnected nature of empowerment dimensions suggests that policies should address multiple aspects simultaneously rather than focusing on single outcomes.
4. **Cultural Sensitivity:** The persistent social barriers indicate the need for culturally sensitive implementation strategies that address family and community concerns.

Practical Implications

For development practitioners and program implementers, the study suggests:

1. **Targeted Training:** Focus on practical business applications of ICT rather than general computer literacy
2. **Peer Networks:** Leverage the network effects of ICT by creating women entrepreneur groups

3. **Local Language Support:** Develop ICT applications and content in Tamil to overcome language barriers
4. **Gradual Implementation:** Introduce ICT tools gradually to build confidence and overcome resistance

Recommendations and Suggestions

Policy Recommendations

Infrastructure Development

- **Enhanced Connectivity:** Government should prioritize high-speed internet infrastructure in rural areas, particularly in entrepreneurship clusters
- **Reliable Power Supply:** Establish dedicated power lines for ICT infrastructure and promote solar power solutions for communication towers
- **Digital Financial Infrastructure:** Expand digital payment acceptance networks and promote financial inclusion through mobile banking

Educational and Training Initiatives

- **Localized Digital Literacy Programs:** Implement comprehensive digital literacy programs in Tamil language with focus on entrepreneurial applications
- **Sector-Specific Training:** Develop specialized ICT training modules for different entrepreneurial sectors (textiles, food processing, handicrafts)
- **Train-the-Trainer Programs:** Build local capacity by training local women as ICT trainers and mentors
- **Certification Programs:** Establish recognized digital literacy certification programs to enhance women's credentials

Financial Support Mechanisms

- **ICT-Linked Microfinance:** Bundle ICT training with microfinance schemes to ensure integrated support
- **Technology Subsidies:** Provide subsidies for smartphone purchases and internet connection for women entrepreneurs
- **Digital Transaction Incentives:** Offer incentives for adopting digital payment systems and online banking

Programmatic Recommendations

Integrated Support Systems

- **One-Stop Digital Centers:** Establish rural digital centers providing internet access, training, and technical support
- **Mobile ICT Units:** Deploy mobile vans with ICT facilities to reach remote areas regularly
- **Mentorship Programs:** Create mentorship networks connecting rural women entrepreneurs with urban successful businesswomen through ICT platforms

Community Engagement

- **Family Sensitization Programs:** Conduct awareness programs for family members about ICT benefits for women's entrepreneurship
- **Community Champions:** Identify and train successful women entrepreneurs as community ambassadors for ICT adoption
- **Male Ally Programs:** Engage male family members and community leaders as supporters of women's ICT usage

Market Linkage Facilitation

- **Online Marketplace Integration:** Facilitate women entrepreneurs' participation in major e-commerce platforms
- **Digital Marketing Support:** Provide training and support for social media marketing and online branding
- **Quality Certification:** Help women entrepreneurs obtain necessary certifications for online selling

Technology Development Recommendations

User-Friendly Applications

- **Voice-Based Interfaces:** Develop voice-based applications in Tamil for low-literacy users
- **Simple User Interfaces:** Design applications with intuitive interfaces requiring minimal technical knowledge
- **Offline Capabilities:** Create applications that can function with limited internet connectivity

Sector-Specific Solutions

- **Agriculture Apps:** Develop applications for weather information, market prices, and agricultural best practices

- **Handicraft Platforms:** Create specialized platforms for showcasing and selling traditional crafts
- **Food Processing Tools:** Design applications for food safety, packaging, and market access

Institutional Recommendations

Multi-Stakeholder Collaboration

- **Public-Private Partnerships:** Foster collaboration between government, private sector, and NGOs for comprehensive ICT support
- **Academic Partnerships:** Involve universities and research institutions in monitoring and evaluation of ICT programs
- **International Cooperation:** Learn from successful ICT for development programs in other countries

Monitoring and Evaluation

- **Regular Impact Assessment:** Establish systems for continuous monitoring of ICT impact on women's empowerment
- **Feedback Mechanisms:** Create channels for women entrepreneurs to provide feedback on ICT services and suggest improvements
- **Research Support:** Fund ongoing research to understand evolving ICT needs and impacts

Sustainability Considerations

Financial Sustainability

- **Revenue Generation Models:** Develop sustainable revenue models for ICT services that don't depend solely on subsidies
- **Local Entrepreneurship:** Encourage local entrepreneurs to provide ICT services and support
- **Cross-Subsidization:** Use successful cases to support emerging entrepreneurs

Technical Sustainability

- **Local Technical Capacity:** Build local capacity for ICT maintenance and support
- **Appropriate Technology:** Choose technologies that are suitable for local conditions and sustainable in the long term
- **Regular Updates:** Ensure systems for regular technology updates and security maintenance

Future Research Directions

Longitudinal Studies

- **Long-term Impact Assessment:** Conduct longitudinal studies to understand sustained impacts of ICT on women's empowerment
- **Intergenerational Effects:** Study how mothers' ICT usage influences their children's education and career aspirations
- **Scaling Impact Analysis:** Research the effects of scaling successful ICT interventions to larger populations

Comparative Research

- **Cross-State Comparisons:** Compare ICT impacts across different Indian states with varying development levels
- **International Benchmarking:** Study successful international models for ICT-enabled women's empowerment
- **Sectoral Analysis:** Conduct detailed studies of ICT impact in specific entrepreneurial sectors

Technology Innovation Research

- **Emerging Technology Applications:** Research applications of artificial intelligence, blockchain, and Internet of Things for rural women's empowerment
- **Cultural Adaptation Studies:** Study how to adapt global technologies to local cultural contexts effectively
- **Accessibility Research:** Research solutions for women with disabilities or special needs

Conclusion

This broad based study offers a strong empirical support to the transformative role Information and Communication Technology plays in empowering the rural women in the state of Tamil Nadu. The study has shown that ICT access contributes enormously to growth in economic and non-economic aspects of empowerment and 54 per cent of women entrepreneurs have recorded increase in incomes after ICT adoption and 68 per cent have reported to have improved their decision making abilities.

Key Research Contributions

The study makes several significant contributions to the literature on ICT and development:

1. **Methodological Innovation:** The use of Structural Equation Modeling provides deeper insights into causal pathways between ICT access and empowerment outcomes, moving beyond simple correlation analysis.
2. **Comprehensive Framework:** The study employs a multidimensional empowerment framework that captures economic, social, and agency dimensions simultaneously.
3. **Contextual Specificity:** The focus on Tamil Nadu provides valuable insights into how state-specific factors influence ICT's empowerment impact.
4. **Policy Relevance:** The findings offer concrete, evidence-based recommendations for policymakers and development practitioners.

Theoretical Implications

The results are in the strong support of the capability approach by Sen and the framework of empowerment by Kabeer that ICT enlarges the capabilities of women and increases their agency. The significant contribution of mediation effect on education and training shows the importance of human capital development on technology adoption and its effect.

This strong correlation between economic and social empowerment ($r = 0.672$) supports the multidimensional and interrelated aspects of empowerment whereby one aspect of empowerment improves as others do the same.

Practical Implications

For development practitioners, the study highlights the importance of:

- Integrated approaches that address infrastructure, training, and social barriers simultaneously
- Cultural sensitivity in program design and implementation
- Building local capacity for sustainable ICT support systems
- Creating enabling environments that encourage family and community support for women's ICT usage

Policy Significance

The study gives a good reason as to why there must be sustained investment of rural citizens to ICT infrastructure and digital literacy. The possibility of ICT as a development intervention is apparent in the fact that a little more than two-thirds of the outcomes in empowerment in the study were attributed to access to ICT, and associated factors.

As it can be seen, the results contribute to the intentions of the Digital India program, as well as point out the necessity of developing gender-related approaches to implementation that could address the difficulties peculiar to rural women entrepreneurs.

Study Limitations

Several limitations should be acknowledged:

1. **Cross-sectional Design:** The study captures a snapshot in time and cannot establish definitive causal relationships despite using advanced statistical techniques.
2. **Self-reported Data:** Empowerment measures rely on self-reporting, which may be subject to response bias.
3. **Regional Specificity:** Findings are specific to Tamil Nadu and may not be generalizable to other Indian states with different socio-cultural contexts.
4. **Technology Evolution:** Rapid changes in technology may affect the relevance of specific findings over time.

Future Research Agenda

Future research should address these limitations through:

- Longitudinal studies tracking women entrepreneurs over extended periods
- Comparative studies across different Indian states and international contexts
- Investigation of emerging technologies' impact on women's empowerment
- Development of standardized measurement tools for empowerment assessment

Final Reflections

ICT has proved to hold a large amount of potential in terms of driving the empowerment of rural women in Tamil Nadu. Nevertheless, the actualization of this potential will involve a long and challenging process to reflect on the lack of infrastructure, digital literacy development and remove the socio-cultural

barriers. The way forward needs the collaboration of government, private, civil society and communities to develop enabling environment whereby all the rural females can enjoy the digital revolution.

With India on its way to be a digital economy, it is not only morally right but economically as well, to make sure that rural women entrepreneurs do not fall behind. There is conclusive evidence presented in this work that indeed, if properly supported and invested in, ICT has the potential to be an equalizer, negating conventional boundaries and opening new gateways to women in participating in the economy and gaining social strength.

Along the way, the story of these women transformed in ways that were carefully tracked in this study, suggesting that the shift of these women to becoming more socially connected, confident entrepreneurs is more than a tale of some success stories, but a paradigm change and the way rural development and empowerment of women can be discussed in the digital era. One respondent was quite articulate when he said that the mobile phone did not only connect me to the market but connected me to my dream.

References

Aker, J. C., and Isaac M Mbiti. "Mobile Phones and Economic Development in Africa." *Journal of Economic Perspectives*, vol. 24, no. 3, 2010, pp. 207-232.

Bala, R., and Aravind Singhal. "Digital Empowerment of Rural Women through Informal Learning Networks: Evidence from North India." *Information Technology for Development*, vol. 28, no. 3, 2022, pp. 512-539.

Census of India. *Rural-urban Distribution of Population*. Office of the Registrar General and Census Commissioner, Government of India, 2011.

Chandra, M., and Sandeep Kumar. "E-commerce Platforms and Women Entrepreneurship in Urban India: Opportunities and Challenges." *Journal of Entrepreneurship in Emerging Economies*, vol. 10, no. 2, 2018, pp. 345-367.

Chandrika, R., and R. Sudha. "Empowering Rural Women through ICT Tools: A Study in Tamil Nadu." *Indian Journal of Rural Development*, vol. 38, no. 2, 2019, pp. 123-137.

Chhibber, S., and Jain, M. Gender and digitalization: Examining the impact of ICT on women's empowerment in rural India. *Gender, Technology and Development*, vol. 21, no. 3, 2017, pp. 245-63.

Dewan, S., and F. J. Riggins. "The Digital Divide: Current and Future Research Directions." *Journal of the Association for Information Systems*, vol. 6, no. 12, 2005, pp. 298-37.

Government of Tamil Nadu. *Tamil Nadu State Policy for Women 2020.* Department of Social Welfare and Women Empowerment.

Hilbert, Martin. "Digital Gender Divide or Technologically Empowered Women in Developing Countries? A Typical Case of Lies, Damned Lies, and Statistics." *Women's Studies International Forum*, vol. 34, no. 6, 2011, pp. 479-89.

Kabeer, N. "Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment." *Development and Change*, vol. 30, no. 3, 1999, pp. 435-64.

Kapur, R. "Role of ICT in Empowering Women Entrepreneurs in India." *Journal of Gender Studies*, vo. 12, no. 4, 2020, pp. 88-02.

Kumar, A., and Sinha, P. "ICT and Rural Livelihood Enhancement: Evidence from Indian States." *Economic and Political Weekly*, vol. 54, no. 26-27, 2019, pp. 67-75.

Kumar, P., and L. Devi. "Digital Literacy and Women Empowerment in India: A Comprehensive Analysis." *International Journal of Social Sciences Review*, vol. 9, no. 1, 2021, pp. 33-45.

Meera, S. N., et al. "Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India." *Agricultural Research & Extension Network*, vol. 1, no. 2, 2012, pp. 138-50.

Ministry of Electronics and Information Technology. *Digital India: Power to Empower*. Government of India, 2021.

Ministry of Rural Development, Government of India. *Annual Report on Rural Women's Empowerment.* New Delhi: Government of India Press, 2022.

Rangaswamy, N., and E. Cutrell. "Anthropology, Development and ICTs: Slums, Youth and the

Mobile Internet in Urban India." *Information Technologies & International Development*, vol. 9, no. 2, 2013, pp. 51-63.

Rani, S., and K. Sundaram. "Digital Payment Adoption among Rural Women Vendors in Tamil Nadu: Opportunities and Challenges." *Journal of Rural Studies*, vol. 78, 2020, pp. 112-23.

Sahay, Sundeep, and Chrisanthi Avgerou. "Introducing the Special Issue on Information and Communication Technologies in Developing Countries." *The Information Society*, vol. 18, no. 2, 2002, pp. 73-76.

Sen, A. *Development as Freedom*. Anchor Books, New York, 1999.

Sulaiman, M., et al. "ICT and Women's Entrepreneurship in South Asia: Opportunities and Challenges." *Development Policy Review*, vol. 33, no. 2, 2015, pp. 211-234.

Tamil Nadu State Rural Livelihood Mission (TNSRLM). *Empowering Women through Technology: Annual Progress Report*. Government of Tamil Nadu, Chennai, 2023.

Treichel, B. "The Role of ICT in Women's Empowerment in Rural Bangladesh." *Information Technology for Development*, vol. 11, no. 4, 2005, pp. 365-80.

World Bank. *Digital dividends: Women's Economic Empowerment through ICT*. Washington, DC: World Bank Group, 2021.

Author Details

R. Pushpam, *Ph.D. Research Scholar (Full Time), PG & Research Department of Commerce, Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India,* ***Email ID****: pushpamv2526k@gmail.com*

Dr. V. Geetha Ravichandran, *Assistant Professor, PG & Research Department of Commerce, Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India*

G. Durga Devi Kasirajan, *Ph.D. Research Scholar (Part Time Scholar), PG & Research Department of Commerce, Mannar Thirumalai Naicker College (Autonomous), Madurai, Tamil Nadu, India*