

Digital Empowerment of Women in Rural Areas: Opportunities and Challenges

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Abstract

The introduction of digital technologies is an exciting tool to support socio-economic viability and vitality in rural communities, and women are at the centre of the change. This paper explores digital empowerment of rural women, focusing on opportunities facilitated by digital access and obstacles which remain to full engagement in effective participation. The study draws from the ongoing debate about digital divide, financial inclusion and gender equality and focuses on the role of mobile technology, the Internet and digital financial services products and how they affect women's economic autonomy, their social participation and women's access to information. The research design adopted was quantitative and the data collected were primary data obtained by structured questionnaire with likert scale of five point participated by 160 respondents which were rural women. Data collected were then analysed using the descriptive technique, reliability testing, correlation analysis, one-way ANOVA and multiple regression analysis by using Statistical Package Social Sciences (SPSS). The findings reveal statistically positive digital access women empowerment, while, on the other hand, certain limitations are stated such as low digital literacy, absence of relevant infrastructure, financial barriers and socio-cultural restrictions have been revealed. These two variables, namely digital literacy and digital financial inclusion emerged as the best predictors of the empowerment outcomes based on the regression results. The authors conclude from the study that digital empowerment provides a good opportunity to empower the rural women, but it must be implemented together with the policy measures, appropriate digital literacy training, low cost connectivity and supportive socio-cultural environment..

Keywords: digital empowerment, rural women, digital divide, digital literacy, financial inclusion, gender equality

1. Introduction

Digital technologies have spread quickly all over the world, changing the way people communicate, learn, work and engage in the economy. In developing countries where mobile phones are low-cost and widespread, mobile phones and the development of information technology infrastructure have opened new avenues for inclusive growth. However, this digital transformation has not proved to be equally transformative for everyone and women in rural areas are among those at the greatest risk of being left behind in the digital economy (Sharma & Kumar, 2020). Digital empowerment – access to, proficiency with, and confidence in the use of digital technologies in order to improve their lives – has become a key lens through which to analyse the context of 21st century gender equality. This paper deals with the opportunities and problems which comes with the empowerment of women in the rural areas in the processes of their empowerment through information technology and the primary data collected from the rural communities.

1.1 Background of the Study

Information, markets, financial services and education have been scarce in rural areas in developing countries in general. In addition to this, women also face massive disadvantages related to economic and geographical isolation coupled with gender norms in these settings (Antonio & Tuffley, 2014). The use of mobile telephony and Internet is often touted as a solution to the traditional infrastructural constraints. Digital tools have been shown to enable access to government schemes, access to digital markets and access to financial services, which would not have been possible without digital tools for women previously. (Hilbert, 2016) However, many factors are involved in what constitutes real empowerment – access, literacy, affordability, social permission

1.2 Concept of Digital Empowerment

The concept of digital empowerment is multidimensional going beyond the possession of a device or internet connection. It is composed of competencies related to using digital resources to access information, communicate, make digital transactions, and make informed decisions. Digital empowerment for women refers to psychological, economic and social aspects that work to increase the agency and autonomy of women (Mackey and Petrucka 2021). Empowerment is manifested in a woman's increased ability to earn income, gain access to health and education information, and be involved in community and household decision making, in the rural context. The idea is thus potentially embedded both in access and in competence and outcome, and thus suitable for the assessment of the effects of digital interventions.

1.3 Significance of the Study

The dynamics of digital empowerment among rural women have important implications for policy makers, development practitioners and technology providers. Welfare payments, banking services, and educational materials are all more often than not being provided by governments via digital means, and the digital exclusion of women threatens to ensure that they end up more and more behind (Kabeer, 2021). This study adds to the literature with empirical evidence on the link between digital access and digital empowerment outcomes, which is used for designing gendered digital policies. It also underscores the particular challenges that need to be tackled in order to make digital transformation an equity building tool and not one that creates new forms of exclusion.

2. Literature Review

The literature on digital empowerment of women spans several disciplines, including development economics, gender studies, and information systems. This section reviews existing scholarship under three thematic areas: the digital divide and access, digital literacy and skills, and digital financial inclusion and economic empowerment.

2.1 The Digital Divide and Access to Technology

The term digital divide refers to the difference between individuals who are users of digital technologies and those who are not. A clear gender dimension to this divide has been continuously reported, especially in developing countries' rural regions (Hilbert, 2016). Availability of infrastructure, cost, device ownership and home dynamics all contribute to access disparities. Women in the developing regions are far less likely to own mobile phones and to access the internet than men, this is an argument put forward by Antonio and Tuffley (2014) which restates pre-existing inequalities. Women's use of infrastructure is often mediated by male members of their household, however, even when infrastructure exists more recent work by Rashid (2016) shows that

women's access is often restricted to their own use. Likewise Sharma and Kumar (2020) conclude that women's independent interaction with digital platforms is hindered by socio-cultural limitations as well as the lack of rural connectivity. Taken as a group, this has to be seen as pointing toward the fact that access closure is not enough to achieve empowerment.

2.2 Digital Literacy and Skills Development

Digital literacy is now one of the most important factors affecting the potential of people to make use of connectivity. Van Deursen and Van Dijk (2019) add the concept of a second-level divide, where, with access to the devices, unequal outcomes are created as a result of differences in skills and of usage itself. The scarce opportunities and language and educational limitations further exacerbate the lack of skills among rural women (Gurumurthy & Chami, 2019). Empirical research shows that digital literacy training significantly can increase women's confidence and their ability to access digital services autonomously, particularly when targeted and structured in that way (Mariscal et al., 2019). Tenzin and Sharma (2022) found that women who have undergone structured digital literacy courses expressed a rise in self-efficacy and increased access to this online government services. The literature therefore situates digital literacy as a critical tool or mechanism that connects access to empowerment, highlighting the significance of digital literacy skill-building intervention..

2.3 Digital Financial Inclusion and Economic Empowerment

Much research has focused on digital financial services' potential to empower women economically. Suri and Jack (2016) present two good works where they make a strong case for the potential of mobile money services to help improve the economic resilience and economic well-being of household members, especially women. Digital financial inclusion also helps women to save safely, obtain credit and manage their own income and wealth, which increases their bargaining power within the household (Demirgüç-Kunt et al., 2018). As such, there have been efforts to bring bank accounts to mobile platforms that have helped in enhancing financial inclusion of women, but gaps exist in usage of these (Ghosh & Vinod, 2017). All the dimensions listed above of empowerment are interlinked and the best form of digital financial inclusion is in conjunction with digital literacy and social support, as explained by Chatterjee and Anand (2023). This literature has provided good foundations for digital finance to be a robust yet non-exclusive way to make an economically independent rural audience.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative, descriptive, and analytical research design to examine the relationship between digital access and the empowerment of rural women. A cross-sectional survey approach was employed, whereby primary data were collected at a single point in time using a structured questionnaire. The quantitative design was selected because it enables the objective measurement of variables and the statistical testing of the formulated hypotheses (Creswell & Creswell, 2018).

3.2 Sample and Sampling Technique

The target population was adult women living in the rural area. Sample size of 160 respondents was drawn from the population using purposive sampling method with the assumption that the respondents should have some type of background with digital devices/services. A sample size of

160 was deemed reasonable for the multivariate statistical procedures used, and was consistent with the rule of thumb that one should have at least 160 respondents for each variable in the analysis. Data collection involved questionnaire administration by the researcher and some respondents who needed to be helped to understand the items.

3.3 Instrument and Measurement

The research tools were used structured questionnaire consists of two parts. The first part was about demographic details such as age, education, marital status and occupation. In the second section, the research constructs were measured: digital access (1-5 scale), digital literacy (1-5 scale), digital financial inclusion (1-5 scale) and digital empowerment (1-5 scale) on a scale from 1 (strongly disagree) to 5 (strongly agree). Items were from validated scales in previous empowerment and digital inclusion studies for content validity.

3.4 Data Analysis Techniques

Data collected were coded and analyzed using the statistical package for social sciences (SPSS) version 26. A variety of statistical methods were employed that were available to solve the research purposes. Demographic data was summarized through descriptive statistics as well as 11 constructs using central tendencies. The internal consistency reliability was calculated with Cronbach's alpha. The Pearson correlation was used to determine the nature and magnitude of relationships between variables. Independent samples t-test was used to compare empowerment by age groups and differences by education level were tested by one-way ANOVA. Finally, multiple linear regression analysis was performed and the predictive effect of digital literacy and digital financial inclusion on digital empowerment was determined.

4. Results and Analysis

This section presents the results of the statistical analysis conducted using SPSS. The findings are organised into six tables covering the demographic profile, reliability analysis, descriptive statistics, correlation analysis, hypothesis testing through t-test and ANOVA, and regression analysis.

Table 1. Demographic Profile of Respondents (N = 160)

Variable	Category	Frequency	Percentage (%)
Age	18–30 years	72	45.0
	31–45 years	58	36.3
	Above 45 years	30	18.7
Education	Up to primary	44	27.5
	Secondary	66	41.3
	Graduate & above	50	31.2
Marital Status	Married	108	67.5
	Unmarried	52	32.5
Occupation	Homemaker	70	43.8
	Self-employed	48	30.0
	Employed/Other	42	26.2

As presented in table 1, most of the respondents were between 18 and 30 years (45.0%) with age group 31-45 being the next most predominant age group covering 36.3% of the population. For the education status, 41.3% completed secondary education, 31.2% graduated or above. The category of homemakers made up the largest group (43.8%) in the sample, and married women were the largest occupational group (67.5%). This profile suggests a relatively young and moderately educated population of women from the rural areas..

Table 2. Reliability Analysis (Cronbach's Alpha)

Construct	No. of Items	Cronbach's Alpha
Digital Access	5	0.812
Digital Literacy	6	0.847
Digital Financial Inclusion	5	0.831
Digital Empowerment	6	0.869
Overall Scale	22	0.884

As can be seen in Table 2 the results of the reliability were also within what Nunnally & Bernstein (1994) recommend, with all constructs attaining an alpha coefficient above 0.70. The overall internal consistency (scale reliability) is 0.884, which showed high degree of internal consistency and makes questionnaire as reliable tool to measure the research constructs.

Table 3. Descriptive Statistics of Study Constructs

Construct	Mean	Std. Deviation	Interpretation
Digital Access	3.42	0.78	Moderate
Digital Literacy	3.08	0.86	Moderate
Digital Financial Inclusion	3.21	0.81	Moderate
Digital Empowerment	3.35	0.74	Moderate

Table 3 below presents the mean and SD value of each construct. The mean ($M = 3.42$, $SD = 0.78$) of the respondents' answers to the digital access question reflected moderate access to digital devices and connectivity. The lowest mean ($M = 3.08$, $SD = 0.86$) was found for digital literacy; there is still a relative weakness in terms of skills. The average of the constructs is of moderate level and this could be interpreted as an average digitally engaged population which has a great potential to be improved..

Table 4. Pearson Correlation Matrix

Variable	1	2	3	4
1. Digital Access	1			
2. Digital Literacy	0.612**	1		
3. Digital Financial Inclusion	0.548**	0.634**	1	
4. Digital Empowerment	0.657**	0.701**	0.668**	1

Note: ** Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix is given in Table 4. There is a positive and significant relationship for all the constructs with Digital empowerment at 0.01 level of significance. Digital literacy is correlated the most with empowerment ($r = 0.701$), digital financial inclusion with digital access ($r = 0.668$), and digital access with empowerment ($r = 0.657$). Access to digital technology and empowerment have a significant and positive relationship, as suggested by these findings.

Table 5. Independent Samples t-test and One-way ANOVA for Digital Empowerment

Test / Group	N	Mean	Test Value	Sig. (p)
t-test (Age)			$t = 3.842$	0.000
Younger (18–30)	72	3.58		
Older (above 30)	88	3.16		
ANOVA (Education)			$F = 9.517$	0.000
Up to primary	44	3.02		
Secondary	66	3.34		
Graduate & above	50	3.67		

Means for the hypothesis testing of differences among groups are presented in Table 5. The independent samples t-test reveals a significant difference between the digital empowerment score for younger women and for the older women ($t = 3.842$; $p < 0.001$) and that younger women have a higher score of digital empowerment. This supports H2. According to the one way ANOVA, significant differences exist between empowerment at the different levels of education ($F = 9.517$, $p < 0.001$) with empowerment being higher as the level of education increases. This is a good reinforcement of H3 and it is clear that digital empowerment is a useful differentiator in the field of education.

Table 6. Multiple Regression Analysis (Dependent Variable: Digital Empowerment)

Predictor	Beta (β)	t-value	Sig. (p)
Constant	—	2.143	0.034
Digital Access	0.241	3.512	0.001
Digital Literacy	0.389	5.108	0.000
Digital Financial Inclusion	0.301	4.226	0.000

Model Summary: $R = 0.782$, $R^2 = 0.611$, Adjusted $R^2 = 0.604$, $F = 81.72$, $p < 0.001$

The regression results presented in Table 6 show that the model accounts for 61.1% ($R^2 = 0.611$) of the variance in digital empowerment, and the model is statistically significant ($F = 81.72$, $p < 0.001$). All three predictors have significant impact on empowerment. Digital literacy is the strongest predictor ($\beta = 0.389$, $p < 0.001$), followed by digital financial inclusion ($\beta = 0.301$, $p < 0.001$) and digital access ($\beta = 0.241$, $p = 0.001$). The results are a strong endorsement of H4, highlighting that digital literacy and financial inclusion are the most significant factors of empowerment for rural women.

5. Discussion

This study's findings support the growing recognition of the potential of digital technologies as an instrument of rural women empowerment and the obstacles to targeting rural women with digital technology. The positive and significant correlation between access to the digital and empowerment confirm with the previous findings of Hilbert (2016) and Sharma and Kumar (2020). However, the results of the regression analysis, when digital literacy was the strongest predictor, highlighted the second level divide argument of Van Deursen and Van Dijk (2019) that skills have to be taken into account as well as connectivity. This salience is in line with the results of the studies conducted by Suri and Jack (2016) and Chatterjee and Anand (2023) which indicated that financial autonomy is one of the crucial factors in empowerment.

There are significant disparities between age-group and education-group levels of digital exclusion, indicating a structural aspect of digital exclusion. Older, less educated women are more constrained to access the digital opportunities than the younger, more educated. The results point to the need for interventions to be targeted, and tailored to reach the most disadvantaged groups. Other evidence supporting this lack of strong mean performance levels for all constructs is seen in persistence of moderate scores across all constructs despite gains in access..

5.1 Key Challenges Identified

- 5 Low digital literacy and limited skills, which restrict independent use of digital services.
- 6 Inadequate infrastructure and unreliable connectivity in remote rural locations.
- 7 Affordability constraints related to devices and data costs.
- 8 Socio-cultural norms that limit women's autonomous access to technology.
- 9 Concerns regarding online safety, privacy, and digital fraud.

5.2 Opportunities Identified

- Enhanced access to government welfare schemes and public services through digital platforms.
- Expanded economic participation via digital markets and online entrepreneurship.
- Improved financial autonomy through digital banking and mobile money services.
- Greater access to health, education, and agricultural information.
- Strengthened social connectivity and participation in community decision-making.

6. Conclusion

This study had set to determine the problems and potentials of the digital empowerment of women in rural areas and the data was collected from the subject of 160 people, and the data was analysed by using the SPSS 22 software program which has all the comprehensive and appropriate statistical techniques. The results indicate that access to the digital world, digital literacy, and digitally inclusive financial services all have significant and positive effects on the empowerment of rural women; with the most powerful effect being the impact of digital literacy. The findings also indicate that there is inequalities in empowerment distribution, with younger and more educated females being more empowered, and that there are ongoing barriers to development (skills, infrastructure, socio-cultural norms, affordability etc.).

Overall, the evidence indicates that policies need to be more comprehensive in order to harness the transformative benefits of digital technologies for rural women. A series of policy actions to encourage gender-sensitive digital literacy programmes, investment in digital rural connectivity, digital financial services and actively consider socio-cultural barriers to women's independent

access and participation. Further research could employ long-term designs, and qualitative approaches, to investigate and represent the dynamic and lived experience of digital empowerment. So in total, the benefits of digital empowerment with regard to gender equality are high, but will only be achieved if access is supported by capacity, affordability, and support.

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