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BRIDGING THE GENDER DIVIDE: EMPOWERING WOMEN THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY IN SOUTH PUNJAB, PAKISTAN

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KEYWORDS	ABSTRACT
Information and Communication Technology, Women Empowerment, Digital Literacy, ICT Access, Digital Divide, South Punjab, Pakistan	This study examined the role of Information and Communication Technology (ICT) in determining women's empowerment across social, cultural, educational, and economic dimensions. Using a quantitative research design, the study collected data from N=384 women through multistage sampling. The study analyzed data using two software packages: SPSS and Partial Least Squares Structural Equation Modeling (PLS-SEM-4). The findings indicated a generally high level of ICT-related empowerment, with an overall mean agreement of 79.24%. The PLS-SEM findings showed that ICT access and digital literacy had a strong, significant positive effect on educational empowerment ($\beta = 0.729$, $p < .001$) and social empowerment ($\beta = 0.606$, $p < .001$). However, the direct relationship between ICT access/digital literacy and economic empowerment was statistically insignificant ($\beta = 0.100$, $p = .156$). Mediation analysis further showed significant indirect effects through educational empowerment ($\beta = 0.210$, $p < .001$) and social empowerment ($\beta = 0.271$, $p < .001$), whereas the indirect pathway through economic empowerment was also insignificant ($\beta = 0.064$, $p = .335$). Overall, the model explained 51.5% of the variance in women's overall empowerment process. In conclusion, social, economic, and institutional interventions can drive women's empowerment and help bridge the digital divide in South Punjab, Pakistan.
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Introduction

Information and Communication Technologies (ICTs) have become increasingly embedded in individuals' social, cultural, economic, and civic lives (Asimakopoulous et al., 2025). Rapid digitalization has transformed the ways people acquire knowledge, access services, seek

employment, and participate in decision-making (Boateng et al., 2023). For women, access to ICT can create opportunities to expand their abilities, capabilities, strengths, and autonomous decision-making in their households and social circles (Debbarma & Chinnadurai, 2023). Therefore, ICT is not just a digital resource but a powerful tool that can combat barriers to women's decision-making (Ates et al., 2025).

Women's empowerment is closely linked with the ability to access and use digitalization and to develop the resources and persuasion needed to achieve valued goals (Mpofu, 2023). From the capability perspective, technology becomes empowering when individuals can convert the available resources into meaningful opportunities and freedoms (Qureshi et al., 2025). In this regard, ICT can facilitate access to educational materials, employment opportunities, social networking, entrepreneurship, and access to educational rights (Fahmi & Savira, 2023). The aforementioned theoretical foundations also show that ICT can expand women's choices, opportunities, financial independence, employment, and decision-making. Despite digital technologies, social and structural inequalities shape women's use of digitalization (Altwaijri et al., 2024; Chatterjee et al., 2020). The digital gender divide is not limited to device ownership, internet access, and usage; it also concerns digital skills, effective usage, affordability, safety, security, and the meaningful benefits derived from ICT access and usage (Raihan et al., 2025).

In developing countries, women's empowerment is a global priority (Soharwardi & Ahmad, 2020). In Pakistan, gender norms, family expectations, economic constraints, income inequality, the rural-urban divide, and women's patriarchal socialization scripts can hamper access to and use of ICT (Hassan et al., 2024; Ullah & Shah, 2026). Women's ICT empowerment depends not only on technological availability but also on women's ability to use technology independently in their social environment (Bailur et al., 2018).

Existing evidence also suggests that ICT does not produce the same levels of empowerment across various domains (Mackey & Petrucka, 2021). Although women gain empowerment through digitalization, not all women have equal access to, or rights to use, ICT resources. Gender discrimination is at its peak, which deprives women of their educational, economic, social, and cultural rights (Bibi, 2019). These barriers include orthodox cultural restrictions and gender biased divide in women's use of digitalization (Adeyeye, 2021). Previous studies reported diversified barriers to women's empowerment such as family restrictions, high internet costs, safety concerns, rural-urban disparity, and inadequate digital skills. In this context, various enabling and constraining ICT-related factors affect women in South Punjab (Pakistan) (Majid et al., 2025; Naveed et al., 2026).

This issue is significant in South Punjab, where the population mostly resides in rural areas and persistent socio-cultural inequalities limit women's access to education, employment, entrepreneurship, and social networking. At the same time, women face various constraints in using digitalization (Saleem et al., 2025). Based on these theoretical underpinnings, the present study shows that ICT access and usage is a multidimensional process through which women's educational, economic, social, and cultural empowerment can be ensured (Awan, 2016).

Accordingly, the present study investigates the role of digitalization in empowering women across economic, educational, social, and cultural dimensions in the underprivileged study area of South Punjab, Pakistan (Ahmed et al., 2026). The findings are intended to contribute to the broader discussion on bridging the gender digital divide and to inform policies and interventions to strengthen women's digital inclusion, capabilities, and opportunities in researched locale.

In light of the above-mentioned rationale of the study and sociological significance, the subsequent research objectives were formulated: 1) To find out the demographics of the women who have access to and use ICT in the study area, 2) To put forth the ICT access, usage patterns, and perceived barriers among women, iii) To find out the ICT access, digital inclusion, and women's empowerment, and iv) To put forth recommendations for overcoming the gender based barriers and enhancing women's empowerment through usage of ICT.

Theoretical Framework

Capability Approach

Sen put forth the capability approach, which focuses on people's abilities to live the lives they value and achieve their basic rights (Sen, 1999). In light of this theoretical approach, ICT is not a technological resource; rather, it is the use of abilities and capabilities to access education, economic gains, and decision-making power through attaining contemporary digital skills. This theory applies to the present study, as women in South Punjab (Pakistan) face conservative norms that limit their access to digitalization. The study area also considers women's empowerment as freedom from traditional values; therefore, women face various barriers to gaining capability through digitalization. The present study also found that access to and effective use of ICT can expand choices related to education, employment, entrepreneurship, financial opportunities, and social networking.

Gender and Development (GAD) Perspective

The Gender and Development (GAD) perspective emerged in the 1980s, particularly through the work of Caroline Moser and other feminist development scholars. The theoretical perspective offers a gender-specific approach to address structural inequalities, social norms, and institutional barriers to women's empowerment. The approach also suggests that the gender divide is both technological and social. Therefore, the hurdles to women's empowerment depend on various factors, including social norms, cultural expectations, traditional values, misogynistic attitudes towards women's freedom, lack of digital literacy, economic barriers, inadequate access to digital infrastructure, and inadequate access to education and employment. Applying the GAD approach to ICT revealed that providing women with technological devices and internet services can help empower them.

Digital Divide Theory

Jan van Dijk put forth this theory in 2005, and it explains inequality in access to and use of ICT across social groups (Van Dijk, 2005). The traditional digital divide concerns whether individuals have access to technological devices and the internet. This study focuses on digitalization, building digital skills through ICT access, and the benefits of digital use. The application of this theory revealed that the women of South Punjab (Pakistan) have limited access to technology, which is the major reason for the deprivation of opportunities for empowerment. Due to this digital divide, the women lack education, have inadequate access to and expertise in the use of digitalization, and face gender segregation in the need for digital skills.

Technology Acceptance Model (TAM)

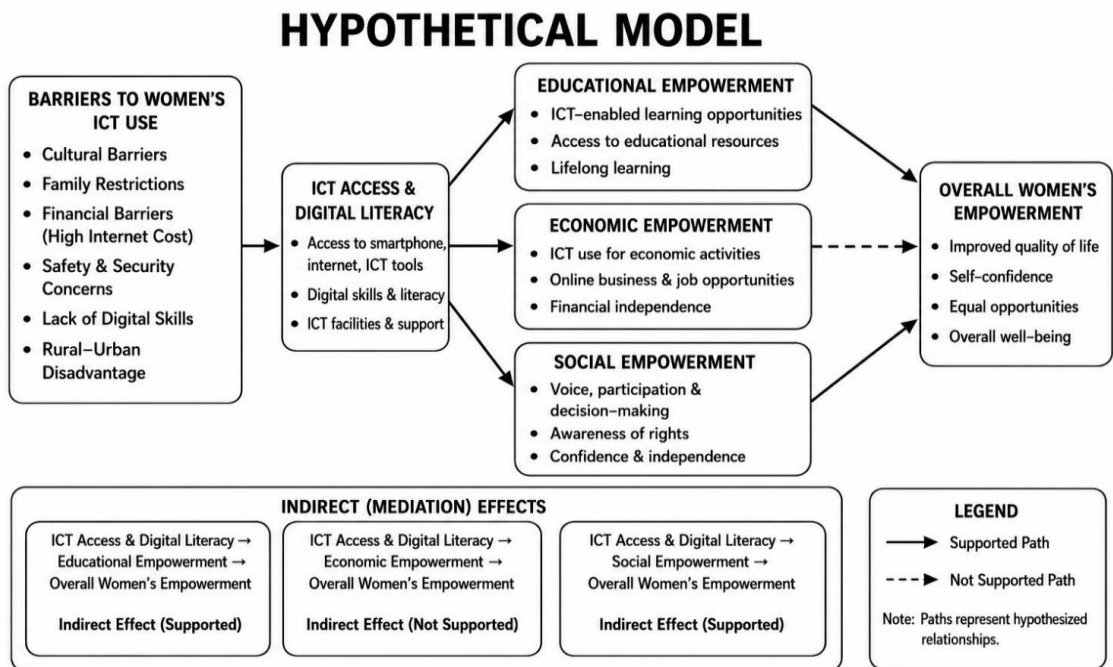
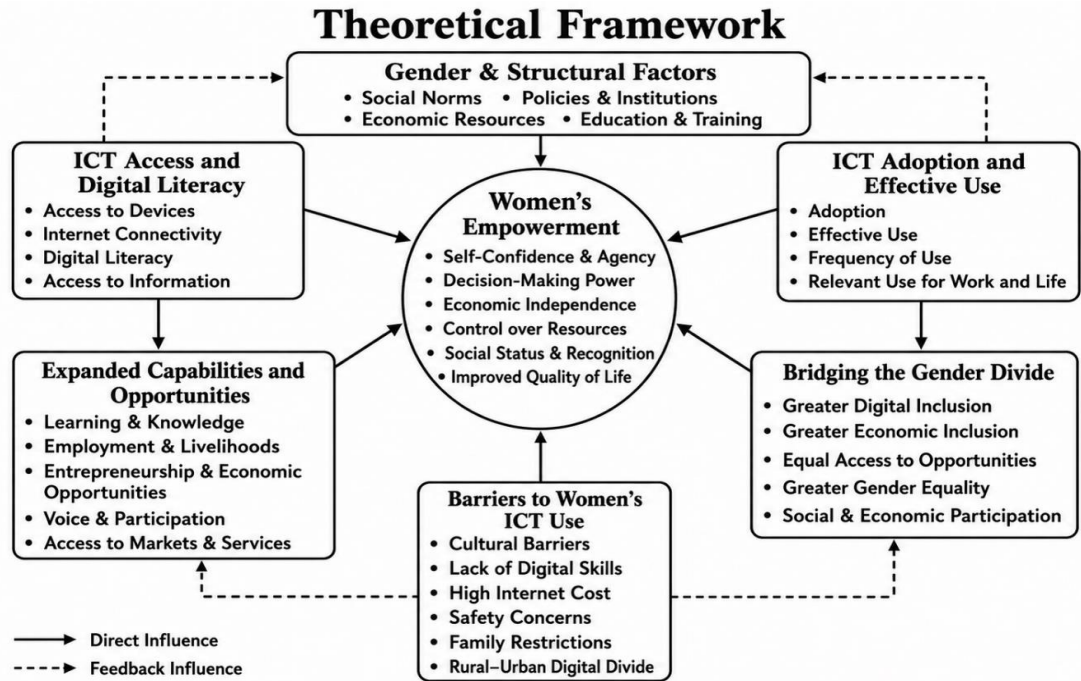
Fred Davis developed the Technology Acceptance Model to explain why people adopt or reject technology (Davis, 1989). This model focuses on people's willingness to use new technological innovations. The model also identifies barriers related to gender, family restrictions, economic problems, safety concerns, and rural-urban disparity that influence technology acceptance. The major reasons for women to use ICT include: i) education, ii) employment, iii) business and entrepreneurship, iv) accessing information, v) communication, and vi) learning to operate. TAM is particularly useful when the study measures women's adoption, frequency, or acceptance of ICT rather than simply measuring the digitalization availability.

Integrated Theoretical Framework

The four models above provide the theoretical foundation for the present study. Digital divide theory explains unequal access to, skills with, and benefits from ICT. The Technology Acceptance Model explains the adoption and effective use of ICT. Gender and development perspectives explain the social and structural context in which gender, social norms, and power relations influence women's access to and use of ICT. The capability approach explains the ultimate outcome: how ICT expands women's capabilities, choices, and opportunities toward empowerment.

Hypothetical model construction

Based on the theoretical framework above and the literature review, we developed the following hypothetical model. This model integrates theoretical arguments about access to and effective use of ICT, which can expand women's capabilities, opportunities, participation, and empowerment. The model depicts various dimensions, including ICT access and digital literacy; educational, economic, and social empowerment of women through ICT; and barriers to using ICT for empowerment. These variables contributed to overall women's empowerment in the study context. The direct, indirect, and mediation paths are also shown, along with the direction of the hypotheses.



Methods and Materials

Research Design

The present study used a quantitative research design. This design was used because the researcher needed to collect quantitative data to address the formulated research questions and hypotheses.

Universe and target population

The universe of the present study was all the women in South Punjab (Pakistan). The target population was women with access to and use of ICT resources.

Sampling procedure

The researchers used a multistage sampling technique to collect a sample of $n=384$ respondents in the study area. In the first stage, the researchers selected one division, i.e., Dera Ghazi Khan, out of the three divisions of South Punjab. In the second stage, the researchers selected two districts from this division: Dera Ghazi Khan and Layyah, out of four districts. In the third stage, the researchers selected women from Layyah, Choubara, and Karor LAL Esan. In the fourth stage, the researchers selected women from various professions, including students, working women in government and non-government sectors, housewives, and women entrepreneurs.

Data Collection Tool

A semi-structured questionnaire was the primary data collection tool. The tool comprised the following sections:

- i) Demographics of the respondents (ICT access and usage),
- ii) Empowerment indicators (educational, economic, social, and cultural)
- iii) ICT access, digital inclusion, and women's empowerment
- iv) Recommendations to elevate the empowerment of women by the usage of ICT

Data Analysis

Data were analyzed using SPSS Version 21 and PLS-SEM-4. Univariate analysis (frequencies and percentages), descriptive statistics, and the hypothetical path model were used to evaluate the relationships among the study variables.

Ethical considerations

The researchers adhered to ethical considerations, including voluntary participation, maintaining data privacy and confidentiality, obtaining informed consent from respondents, and avoiding harm to participants.

Results

Table-I: Demographic characteristics of the respondents (N=384)

Variables	Categories	Frequency (Percentage)
Age	> 25 years	191 (49.7)
	25-35 years	97 (25.3)
	<35 years	96 (25.0)
Marital status	Married	137 (35.7)
	Unmarried	238 (61.9)
	Divorced	01 (0.3)
	Widowed	08 (2.1)
Education level	Illiterate	11 (2.9)
	Primary	15 (3.9)
	Secondary	57 (14.8)
	Tertiary	301 (78.4)
Employment status	Unemployed (Not registered)	98 (25.5)
	Student (Unemployed)	134 (34.9)
	Homemaker (Unemployed)	28 (7.3)
	Employed (Government)	68 (17.7)
	Employed (Private)	56 (14.6)
Monthly household income	>25,000 PKR	111 (28.9)
	25,000-50,000PKR	126 (32.8)
	<50,000 PKR	147 (38.3)
Area of residence	Urban	220 (57.3)
	Rural	164 (42.7)

Demographics of the respondents

Table I shows that n=191 (49.7%) respondents were under 25 years old. The other two categories had nearly the same number of respondents: 25-35 years (n=97, 25.3%) and <35 years (n=96, 25.0%). Results showed that n=238 (61.9%) respondents were unmarried, while n=137 (35.7%) were married. An insignificant number of respondents, i.e., n=01 (0.3%), were divorced, while n=08 (2.1%) were widowed. The education level showed that n=301 (78.4%) respondents were educated up to the tertiary level, while only n=11 (2.9%) were illiterate. Employment status indicated that most respondents were unemployed (n=98, 25.5%). The study also included employed respondents who sought empowerment through ICT. Of these, n=68 (17.7%) were government employees, while n=56 (14.6%) were private employees. The monthly income level shows that n=147 (38.3%) respondents had a monthly income of greater than 50,000PKR, while n=126 (32.8%) respondents had a monthly income of 25,000-50,000PKR. The area of residence shows that n=220 (57.3%) respondents belonged to urban areas, while n=164 (42.7%) belonged to rural areas.

Table-II: ICT access, usage patterns, and perceived barriers among respondents (N=384)

Variables	Categories	Frequency (Percentage)
Own a smartphone	Yes	351 (91.4)
	No	33 (8.6)
Regular internet access	Yes	344 (89.6)
	No	40 (10.4)
Time spent on the phone	>3 hours	145 (37.8)
	3-5 hours	123 (32.0)
	<5 hours	116 (30.2)

ICT access, usage patterns, and perceived barriers among respondents

Table II showed that n=351 (91.4%) respondents owned a smartphone, while n=33 (8.6%) did not. The data also showed that n=344 (89.6%) respondents had regular internet access, while n=40 (10.4%) did not. They used an internet cafe or other borrowed internet access. The data also showed that n=145 (37.8%) respondents spent less than 3 hours on their phone, while n=123 (32.0%) spent 3-5 hours on their phone. The data also showed that n=116 (30.2%) respondents spent more than 5 hours on their phone.

Table-III: ICT access, digital inclusion and women's empowerment (N=384)

Serial #	Items	Agreed respondents' Frequency (Percentage)
ICT access and digital literacy		
1	Ensuring regular and reliable access to ICT tools (mobile, internet, computer)	313 (81.5)
2	Searching for information online without assistance	183 (47.6)
3	Understanding how to protect my privacy while using digital platforms	321 (83.6)
4	Supporting the family by using ICT	322 (83.8)
5	Facilitating the availability of ICT in my area	271 (70.6)
6	Believing digital literacy is essential for women today	310 (80.7)
ICT-enabled education and learning opportunities		
7	Improving ICT access to educational resources	329 (85.7)
8	Using online platforms to improve my knowledge and skills	321 (83.6)
9	Providing equal ICT learning opportunities for women	232 (60.4)
10	Helping digital technology for women to continue their education after marriage	295 (73.2)
11	Increasing ICT resources to increase women's academic confidence	281 (73.2)
12	Reducing online learning barriers for women in rural areas	309 (80.5)
13	Encouraging ICT lifelong learning among women	333 (86.7)
ICT and economic empowerment		

14	Using ICT for helping women to find better job opportunities	313 (81.5)
15	Starting small-scale online businesses by using ICT	329 (85.7)
16	Using social media platforms for promoting women's online selling of products	312 (81.3)
17	Making online banking financial transactions easier for women	271 (70.6)
18	ICT helps women earn income from home	260 (67.7)
19	Increasing digital skills and employment opportunities for women	256 (66.7)
20	Reducing ICT financial dependence on others	300 (78.1)
ICT voice, Social Participation and Social Empowerment		
21	Increasing ICT women's participation in household decision-making	324 (84.4)
22	Women using ICT are more aware of their legal rights	336 (87.5)
23	Using ICT for financial decisions	317 (82.5)
24	Improving access to information for women's confidence in decision-making	332 (86.4)
25	Encouraging ICT for women to participate in local leadership roles	294 (76.6)
26	Feeling that women are more independent because of digital access	246 (64.1)
Barriers to women's ICT use		
27	Cultural barriers limit women's use of ICT	304 (84.4)
28	Lack of digital skills prevents women from using ICT effectively	284 (73.9)
29	High internet costs are a barrier for women	286 (74.5)
30	Safety concerns discourage women from using online platforms	283 (73.7)
31	Family restrictions limit women's digital access	309 (80.5)
32	Women in rural areas have less access to ICT compared to urban areas	330 (85.9)
Overall Impact of ICT on women's empowerment		
33	ICT plays an important role in empowering women	307 (79.9)
34	ICT has improved the overall quality of life for women	332 (86.4)
35	Digital technology has increased women's self-confidence	323 (84.1)
36	ICT has created more equal opportunities for women	274 (71.3)
37	I believe ICT will continue to strengthen women's empowerment in the future	264 (68.7)

ICT access, digital inclusion and women's empowerment

As evident from Table III, n=313 (81.5%) respondents agreed that they have regular and reliable access to ICT (such as mobile, internet, and computer). In addition, n=322 (83.6%) respondents agreed that their family supports ICT use. Moreover, n=310 (80.7%) females also reported that digitalization played an imperative role in women's empowerment.

The data also revealed that n=333 (86.7%) respondents agreed that ICT encourages lifelong learning among women, while n=329 (85.7%) respondents agreed that ICT has improved their access to educational resources. n=321 (83.6%) women agreed that they use online platforms to improve their knowledge and skills. Respondents also said ICT provides learning opportunities (agreed: n=232, 60.4%) and increases women's academic confidence (agreed: n=281, 73.2%).

Statistical analysis also confirmed ICT's role in economic empowerment. In this regard, it was evident that ICT can help them to start an online business (agreed: n=329, 85.5%). In addition, n=313 (81.5%) women agreed that ICT helped them to get better job opportunities, and n=312 (81.3%) agreed that it also helps women use social media to promote their products. The major finding was that n=300 (78.1%) women argued that ICT reduces their financial dependence on others. In addition, it was also evident that there are two advantages associated with ICT in the economic empowerment of women, i.e., i) ICT helps women to earn income from home (n=260, 67.7%), and digital skills increase the employment opportunities for women (n=256, 66.7%).

The above table also shows that the women who used ICT were more aware of their legal rights (agree: n=336, 87.5%). The data also supported women's social participation: n=324 (84.4%) respondents agreed that ICT increases women's participation in household decision-making, while n=317 (82.5%) women agreed that ICT also helps them make informed financial decisions. In addition, household decision-making through ICT (agreed: n=332, 86.4%) helped women participate in leadership roles (agreed: n=294, 76.6%) and feel more independent (agreed: n=246, 64.1%).

Although ICT helps to empower women, they still face barriers to accessing and using it. The most commonly reported barrier among n=330 (85.9%) women was living in rural areas, which hampers their access to ICT. In addition, family restrictions (Agreed: n=309, 80.5%), cultural context (n=304, 84.4%), and lack of digital skills (n=284, 73.9%) also became stumbling blocks to ICT access and usage for women's empowerment. The data also showed that high internet costs and safety concerns for women on online platforms were major barriers that hamper women's empowerment through ICT. In this regard, n=286 (74.5%) and n=283 (73.7%) respondents agreed on these statements, respectively.

The data also revealed that ICT plays an essential role in women's overall empowerment. In this regard, n=332 (86.4%) respondents argued that ICT has improved women's overall quality of life. Additionally, n=323 (84.1%) women argued that ICT boosted their self-confidence. Other associated advantages of ICT included overall empowerment of women (agreed: n=307, 79.9%), equal opportunities for development (agreed: n=274, 71.3%), and strengthening women's future by empowering them (agreed: n=264, 68.7%).

Table-IV: Descriptive analysis of usage of ICT and women's empowerment (N=384)

Dimension	Mean agreement (%)	Minimum	Maximum	Interpretation
ICT Access & Digital Literacy	77.75	75.52	81.09	High
ICT-Enabled Education & Learning	79.99	79.48	80.47	High
ICT & Economic Empowerment	80.36	79.64	80.94	High
ICT Voice & Social Participation	79.14	78.13	80.05	High
Barriers to Women's ICT Use	78.32	77.40	79.69	High

Overall ICT Impact on Empowerment	79.99	78.39	81.09	perceived barriers High
Overall Average	79.24	—	—	High

Role of ICT in women's empowerment

Table III depicts the highest level of agreement across all dimensions, with a mean value of 79.24%. The table also shows that ICT and economic empowerment had the highest mean agreement (80.36%), followed by ICT-enabled education, learning, and overall ICT impact on empowerment (both at 79.99%). In addition, ICT voice and social participation also showed a high level of agreement (79.14%), while ICT access and digital literacy showed a low level of mean agreement (77.75%). The 78.3% value for barriers in ICT usage indicated that respondents continued to perceive substantial barriers related to women's ICT access and usage.

PLS-SEM model depicting women's empowerment through ICT access and usage

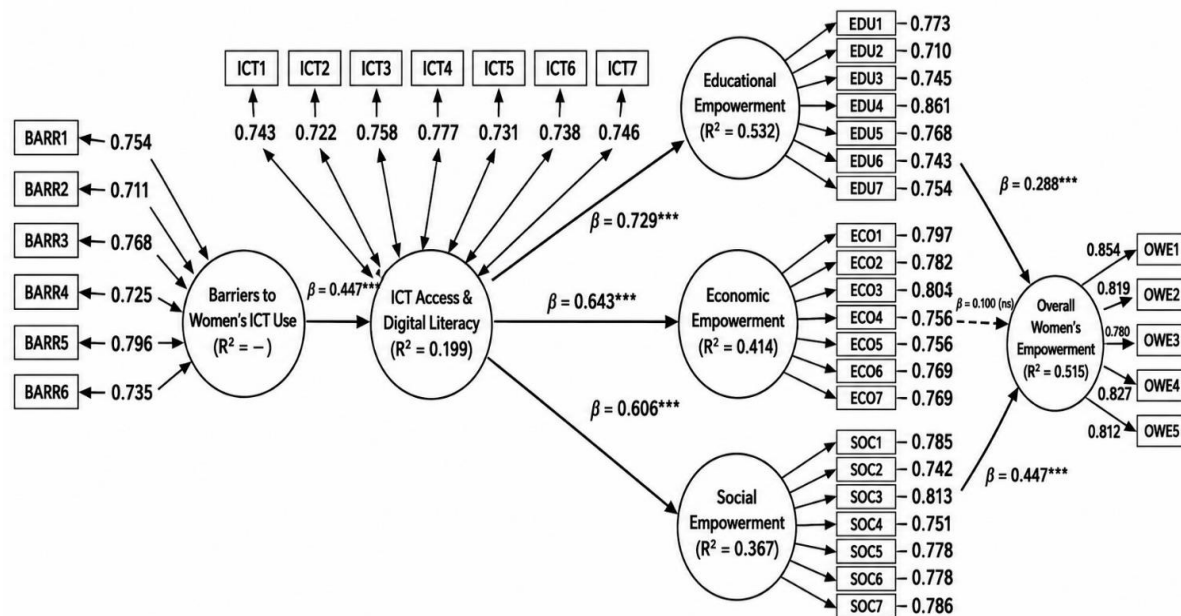


Fig. 2: Hypothetical testing model

Hypothetical testing model

The empirically tested PLS-SEM-4 model was used to hypothetically test relationships among variables such as ICT use, ICT access, digital literacy, educational empowerment, economic empowerment, social empowerment, and overall women's empowerment.

Measurement model

The measurement model demonstrates the indicator reliability. The standardized factor loadings for all the variables were acceptable and were included. The loading values ranged from 0.711 to 0.796 for the barriers related to women's ICT, and all six indicators contributed adequately to measuring the construct. For the construct of ICT access and digital literacy, loadings were also acceptable, ranging from 0.722 to 0.777. As indicated, educational empowerment is also determined through ICT use, and the factor loadings ranged from 0.710 to 0.861. In addition, the indicators of economic empowerment were also acceptable, ranging from 0.756 to 0.833. The seven indicators of social empowerment and women's empowerment were also included as they were in the acceptable factor loading range, i.e., (social empowerment: 0.742 to 0.813) (women's empowerment: 0.780 to 0.854).

Although the theoretical explanation argued that women's ICT access and barriers to ICT usage have a negative relationship, the data show a positive relationship ($\beta = 0.447$, $p < .001$). This is because the study context shows that women with more ICT access also faced socio-cultural barriers related to protection, disclosing their identity, and freely contacting the male gender. Therefore, this relationship was positive in the given structural context.

The model also shows that ICT access and digital literacy have a positive, strong, and statistically significant relationship with educational empowerment ($\beta = 0.729$, $p < .001$). This means that women with access to ICT become more aware of digitalization and become more educationally empowered. This empowerment also helped them to earn money and become economically independent. The model explained 41.4% of the variance in the study context. In addition, digital literacy is directly, positively, and significantly related to social empowerment ($\beta = 0.606$, $p < .001$) of the respondents in the study area. ICT access increases women's voice, their decision-making powers in the household context, and awareness of their educational rights, confidence, and independence in making lifelong decisions.

The model also shows that women's economic empowerment is not significantly related to digital literacy in the study area ($\beta = 0.100$, $p = .156$). This means that, with educational and social empowerment, women do not need economic empowerment through ICT use. This is because the study area has many social and cultural barriers that prevent women from using ICT sources to their fullest potential to achieve economic development. In addition, the model showed a direct, significant, and positive relationship between the said constructs and overall women's empowerment in the study area.

The R^2 value shows that social, educational, and economic empowerment, along with ICT usage and access, explain 51.5% of the variance in women's overall empowerment.

Mediation analysis

The model above shows the mediation pathway between ICT and women's overall empowerment through three different variables: educational empowerment, economic empowerment, and social

empowerment. It indicates that the indirect effect through educational empowerment was $\beta = 0.210$, $p < .001$. This indirect path is presented as ICT $\rightarrow$ Educational Empowerment $\rightarrow$ Overall Women's Empowerment. The indirect effect through educational empowerment is: $\beta = 0.210$, $p < .001$. This indicates a significant indirect pathway. Therefore, educational empowerment significantly mediates the relationship between digital literacy and overall women's empowerment.

As indicated by the PLS-SEM model, the indirect pathway through economic empowerment is insignificant ($\beta = 0.064$, $p = .335$). This indicates that ICT access and usage are not the ultimate determinant of women's economic empowerment. The major reasons reported were socio-cultural barriers.

The model also shows that, with social empowerment as the mediator, ICT access and usage became the primary factors for overall women's empowerment ($\beta = 0.271$, $p < .001$). This means that ICT access and usage are directly related to adequate voice, social participation, and various sociocultural barriers related to women's empowerment. ICT access and digital literacy $\rightarrow$ Social empowerment $\rightarrow$ Overall women's empowerment.

Model demonstration

The model showed that ICT access and digital literacy relate to educational, economic, and social empowerment. However, the three dimensions of empowerment do not contribute equally to overall women's empowerment. In this model, ICT access and digital literacy significantly and positively influence educational and social empowerment, while they do not directly and significantly determine economic empowerment. Overall, the model shows that ICT access and digital literacy contribute to women's educational and social empowerment in Southern Punjab. In contrast, the study finds that various socio-cultural barriers hamper economic empowerment in the study area.

Table-V: Explanatory power of the model

Endogenous Construct	R ²	Interpretation
ICT Access & Digital Literacy	0.199	19.9% variance explained
Educational Empowerment	0.532	53.2% variance explained
Economic Empowerment	0.414	41.4% variance explained
Social Empowerment	0.367	36.7% variance explained
Overall Women's Empowerment	0.515	51.5% variance explained

Model fit

The model reports an SRMR of 0.046, indicating a relatively small discrepancy between the observed and model-implied correlations. The reported NFI of 0.941 also indicates strong comparative model fit, i.e., $d_ULS = 0.723$, $d_G = 0.412$, $\chi^2/df = 1.842$

Discussion

The present study provides empirical evidence about bridging the gender divide in the underdeveloped region of South Punjab (Pakistan) by the use of ICT sources. The overall mean agreement of 79.24% indicated a high perception of ICT-enabled empowerment among 384 respondents. PLS-SEM results showed that ICT access and digital literacy are strongly and significantly related to educational empowerment ($\beta = 0.729$, $p < .001$) and social empowerment ($\beta = 0.606$, $p < .001$). However, the relationship with economic empowerment was statistically insignificant ($\beta = 0.100$, $p = .156$). Previous empirical evidence from international and Pakistani contexts indicated that digital technology does not produce uniform empowerment; rather, it depends on the social, cultural, and contextual factors that shape how women are allowed to use digitalization (Jamil, 2021; Pei et al., 2024). These findings are also consistent with the capability approach, which holds that resources become empowering when an individual can convert them into meaningful opportunities, choices, and prospects for empowerment (Abubakar et al., 2017).

As mentioned, the study area deprived women of opportunities to engage in digitalization and empowerment. Still, the findings indicated that the digital divide has become less severe in the study area, with smartphone ownership among women at 91.4% and regular internet access at 89.6%. This expansion in ICT access and usage suggested that the digital gender divide had disappeared. The findings also showed that 47.6% of women could search for information online without assistance, indicating that digital skills are also necessary despite physical access to ICT sources. A previous study by Mariscal et al. (2019) emphasized that women's access and expertise have increased over the past decade amid digitalization. These digital skills lead to productivity and empowerment. However, women still face gender inequality in accessing and using digital fluency and technology meaningfully. Supporting these findings, another empirical study in Bangladesh conducted by Biswas et al. (2022) examined 200 Bangladeshi women farmers' use of smartphone technologies, training, access, and utilization of these digital technologies. This study also found that when women gain economic empowerment, their families and social circles are more likely to accept them. Still, they face various barriers to achieving financial independence through digitalization in developing countries.

The study also found that women in the disadvantaged area of South Punjab (Pakistan) reported that, through the use of ICT sources, they became 85.7% more educationally empowered. Women also reported that using online platforms improves knowledge and skills (83.6%) and encourages lifelong learning (86.7%). The PLS-SEM results confirmed that ICT access and digital literacy are positively associated with women's educational empowerment in the study area ($\beta = 0.729$, $p < .001$). In addition, educational empowerment is the mediator between ICT sources and women's overall empowerment ($\beta = 0.210$, $p < .001$). Consistent with the present study's findings, Khan & Ghadially (2010) showed that ICTs encompass four dimensions of empowerment: educational, social, psychological, and economic. Data collected from 155 Muslim women and men in Mumbai revealed a gender-based comparison of ICT usage and empowerment. The findings show that women benefited more from digital access, such as internet access and cybercafe training. Another study from Pakistan, conducted by Fatima et al. (2025),

demonstrated ICT's role in empowering women across economic, political, and social domains. Another study by Qamar et al. (2021) found that ICT played a pivotal role in women's educational empowerment. This empowerment indicated that women can acquire knowledge, skills, and choices related to digital access and broader empowerment in South Punjab, Pakistan. The paper also found that educational empowerment is linked to political sensitization, overcoming barriers to ICT access and use, and improving digital literacy.

Another major finding linked ICT to social empowerment. The results indicated a direct, positive relationship between ICT access and social empowerment ($\beta = 0.606$, $p < .001$). The findings showed that ICT increases awareness of legal rights, builds confidence in decision-making by providing access to information, increases participation in ICT use, and increases women's participation in decision-making. An overwhelming percentage of women (87.5%, 86.4%, 84.4%, and 76.6%) agreed on these social empowerment indicators, respectively. The present study's findings are supported by a previous national study by Rahman et al. (2025), which found that ICT use significantly influences women's empowerment. The study also noted that women's household decision-making, maintenance of social relations, and access to decision-making and leadership roles were major social empowerment measures through ICT use. Another empirical study by Noor et al. (2021) reported a positive and significant relationship between women's ICT usage and their decision-making power. It also strengthens the present study's findings on ICT usage and women's social empowerment. Another study by Zhang & Lu (2021) in China found that ICT use through cell phones strengthens women's social empowerment through improved decision-making. In addition, Singh et al. (2025) reviewed 93 empirical studies on the gender divide and found that access to digitalization is not enough.

The present study also found that women in South Punjab (Pakistan) reported that ICT access and usage are insignificantly related to their economic empowerment. The descriptive analysis showed that respondents highlighted ICT's role in economic potential. For example, 85.7% of respondents agreed that women started small businesses, while a significant majority of respondents agreed that they use ICT to get better job opportunities (agreed: 81.5%) and reduce financial dependence on their families (agreed: 78.1%). However, the structural model shows that ICT access and digital literacy did not significantly predict economic empowerment ($\beta = 0.100$, $p = .156$). In alignment, the mediated economic pathway was also insignificant ($\beta = 0.064$, $p = .335$). Previous studies conducted in Bangladesh provide results that are both consistent with and divergent from the present study. The empirical evidence concluded that ICT access and usage are the primary factors that determine women's involvement in the decision-making process. However, the paper also shows that ICT access alone, through mobile phone use, is not the only determinant of women's economic empowerment. Another study among 150 rural female agricultural entrepreneurs found significant improvements in women's social, economic, and psychological empowerment, but its results diverged from ours (Nandi & Duvander, 2025; Rahman et al., 2023). Another empirical study by Sekabira & Qaim (2017) in Uganda also found results opposite to our present findings. The study found that mobile phone usage for ICT access is positively related to household income, economic empowerment, and food security. Another study from Pakistan has a convergent relationship with the present study findings. In this study,

Hassan et al. (2018) show that ICT access and usage are negatively related to economic empowerment. The major reasons behind this are the patriarchal structure, religious obligations, gender-sensitive content, harassment issues, and culturally non-supportive behavior for women's use of digitalization.

A key conceptual contribution of this study is the distinction between ICT access and meaningful ICT use. Although smartphone ownership was high (91.4%) and 89.6% of respondents reported regular internet access, they still reported substantial barriers. Moreover, only 47.6% indicated that they could independently search for information online. This supports the contemporary interpretation of Digital Divide Theory, which holds that inequalities increasingly concern not only whether people possess technology but also how effectively they can use it and what benefits they can derive. The positive relationship reported between ICT access/digital literacy and barriers ($\beta = 0.447$, $p < .001$) also warrants interpretation. The study explains that women with greater ICT access may simultaneously experience greater concerns about privacy, protection, and gendered interactions. Majid & Mustafa (2022) argued that women's digital access and usage in Pakistan depend on their use of digital spaces under social and gendered conditions. Another study by Majid (2025) showed that digital technology and social media usage in Pakistan provide occupational opportunities, though women face substantial challenges. Another study by Hassan et al. (2018) also found that women in Pakistan faced gender segregation in accessing and using digitization processes.

Conclusion

In conclusion, ICT is a major tool in digitalization that can determine and enhance women's empowerment in underdeveloped regions like South Punjab (Pakistan). ICT is not only related to technological advancement, the internet, and digitalization, but also strengthens women's decision-making abilities and capabilities. Women use ICT for employment, online opportunities, online banking, and income generation, but the relationship between ICT usage and economic empowerment is insignificant. The major barriers to ICT access and usage were reported as rural residence, cultural restrictions, family restrictions, inadequate digital skills, and high internet costs. Overall, the PLS-SEM model explained 51.55% of the variance in overall women's empowerment. The findings supported the central argument of the capability approach: technology becomes meaningful when it expands people's substantive opportunities and choices. Moreover, this is consistent with the Gender and Development and Digital Divide perspectives because social norms, unequal access, and institutional barriers shape women's ability and capability to benefit from ICT. In conclusion, ICT has the significant potential to bridge the gender divide in South Punjab, Pakistan.

Recommendations

The following recommendations were proposed to strengthen women's empowerment through access to and use of ICT resources.

1. Improved internet access and connectivity, along with mobile coverage and digital infrastructure in rural areas, must be ensured so that women can be equipped with digital skills.
2. Various government-supported free digitalization programs must be launched for women, especially those from rural backgrounds. It will strengthen their digital literacy, communication skills, privacy protection, cybersecurity, e-learning, and digital entrepreneurship.
3. Government institutions, NGOs, community organizations, and universities should support the online learning programs for women to ensure their empowerment.
4. Digital training, along with entrepreneurship programs, market linkages, e-commerce training, and employment opportunities, can convert digital skills into economic benefits.
5. Awareness programs and community-based interventions can be helpful in addressing the cultural barriers regarding women's restrictions on using digitalization to empower themselves.
6. Digital initiatives must be integrated into broader programs addressing women's education, empowerment, legal awareness, leadership, and decision-making.

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