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Digital Entrepreneurship and Women's Economic Empowerment: Evidence from Community-Based Interventions among Poor Household Women in Punjab, Pakistan

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ABSTRACT

Purpose: The research aims at assessing the efficacy of digital entrepreneurship, supported by community-based interventions, in fostering the process of economic empowerment among poor household women in Punjab, Pakistan.

Design /Methodology/Approach: A quantitative survey design was applied where 355 women in low-income-earning families who were actively involved in community-based digital entrepreneurship programs were surveyed in a cross-sectional study. We used a structured questionnaire to assess the digital entrepreneurship participation, economic empowerment (financial autonomy, household decision-making power, and psychological confidence), and three moderators: digital literacy, ICT access, and family support. The direct effects, moderation, quality of measurement model, and predictive relevance were studied using Partial Least Squares Structural Equation Modeling (PLS-SEM) with bootstrapping (5,000 resamples). Newer analyses were multi-group analysis (MGA) and importance-performance map analysis (IPMA).

Findings: Digital entrepreneurship has a strong positive direct influence on the economic empowerment of women ($= 0.54$, $p < 0.001$), and the variance it explains is 63% ($R^2 = 0.63$). This model has high predictive relevance ($Q^2 = 0.41$) and good fit ($SRMR = 0.062$). This relationship is strongly moderated and reinforced by digital literacy ($= 0.14$), ICT access ($= 0.11$), and family support ($= 0.16$). Among rural women, MGA indicates greater impact ($= 0.61$), whereas IPMA highlights family support as an area of high significance but with lower performance.

Implications/Originality/Value: This paper is the first rigorous PLS-SEM evidence on the work of digital entrepreneurship in Pakistan that shows how digital entrepreneurship operates as a multidimensional empowerment mechanism through the facilitation of skills, infrastructure, and family acceptance. The results provide practical lessons to NGOs, policymakers, and development agencies to structure the integrated digital inclusion programs that can promote SDGs 5, 8, and 9. Contextual enablers should be alongside demand-side digital interventions to realise sustainable output of empowerment in conservative, low-income environments.

Keywords: Digital Entrepreneurship; Women's Economic Empowerment; Digital Literacy; ICT Access; Family Support; Community-Based Interventions; Capability Approach; Gender and Technology; Pakistan.

1 Introduction

Creation of access to economic opportunities as well as control over productive resources, are key pillars of women's empowerment and inclusive socio-economic development. Although various parts of the world indeed have, over the decades, recorded gender equality, poor families residing in low and middle-income countries continue to experience severe structural constraints that restrict women from the formal labour market, freedom of movement, ownership, and influence of assets, besides dominating the domestic sphere ([Nwosu et al., 2026](#)). These barriers are especially acute in the society of patriarchy in which the majority of women are forced to deal with unpaid household chores or ineffective informal labor by the socio-cultural norms and gender roles, and are not provided with access to education and financial services ([Santos, 2026](#)).

Pakistan has acute problems with these issues. The participation rates of the female labour force are still one of the lowest in South Asia, and rural and low-income women are disproportionately represented. After conventions, physical inactivity, early marriages, and overworking, unpaid care also serves as an additional factor to diminish the potential of women who desire to work paid employment outside the home. Even the economically active females will not enjoy any income power and will not be consulted in crucial decisions within their families, which makes the disparity between economic participation and empowerment continuous. This will not only perpetuate the poverty of individuals and households, but also restrict the growth of the country as a whole because fifty percent of the productive power of the population is not utilized ([Sharma et al., 2025](#)).

The current digital revolution in Pakistan over the last ten years has opened new opportunities in solving some of these barriers of tradition. The low mobile phone penetration has made it cheaper to enter the market as a small-scale entrepreneur, and the growing internet connectivity, inexpensive smartphones, and the ongoing rise in digital mobile payment services (including Easypaisa and JazzCash) have enabled this ([Rajeev et al., 2025](#)). Through the internet, the generation of income in the home-based is done in online selling, social media marketing, freelancing, and online transactions of e-commerce that do not demand high mobility of the body and of capital. Digital entrepreneurship would provide a potentially transformative access to remain at home and receive income, and also expand the markets into broader areas for women who are restricted in their mobility and socio-cultural capacity ([Memon et al., 2025](#)). Among the major gaps in the available literature are. To begin with, the bulk of the literature available about digital inclusion of women in Pakistan and South Asia is either qualitative or descriptive and does not provide any detailed quantitative modelling as to which variables cause or condition what. Second,

the research has also tended to use urban or rather educated samples, so that the realities of poor, low literacy, rural women who are the target population of the community-based programs have not been given much attention ([Dabkiene et al., 2025](#)). Third, there are limited studies that have investigated the moderating processes by which digital entrepreneurship can (or cannot) result in empowerment. Lastly, more sophisticated methods of analysis like Structural Equation Modeling (PLS-SEM), multi-group analysis (MGA), and the importance-performance map analysis (IPMA) have been used on a very meagre basis in this field, constraining richness in theoreticalities as well as the implications of policies ([Chandel et al., 2025](#)).

These gaps will be filled by the paper by discussing the correlation between the involvement in digital entrepreneurships and the economic empowerment of 355 poor households involved in community-based digital programs in Punjab, Pakistan. It compares the PLS-SEM and bootstrapping to analyze the direct impact of digital entrepreneurship on a multidimensional impact of economic empowerment (financial autonomy, household decision-making power, and psychological confidence). It also cuts across the moderating effects of digital literacy, ICT access, and family support. Other strength and policy-based indicators, such as MGA (rural vs. peri-urban) and IPMA, bring in more accurate data on the heterogeneity and priorities of intervention ([Cameron et al., 2025](#)).

The specific aims are to explore the direct impact of digital entrepreneurship on women's economic empowerment, to estimate the moderation of the digital literacy, ICT access, and family support in this association, and to determine contextual heterogeneity of impacts and base action priorities of policy based on advanced analyses ([Begum, 2025](#)). The current study forms a conditional model of digital empowerment as formulated based on Empowerment Theory, Capability Approach by Amartya Sen, Technology Acceptance Model (TAM), and Digital Divide Theory, which is empirically validated. Through that, it can contribute to the furthering not only of academic learning but also of practice in the area of development, as it will be proven that digital entrepreneurship can be a highly efficient but situation-specific tool of empowering women economically in low-income and conservative societies ([Ahmed et al., 2025](#)).

2 Literature Review

The theoretical definition of women's empowerment employed has transformed a great deal over the past 60 years. The earlier models of the post-war development saw women as largely consumers of the economic growth rather than economic growth agents, but largely ignored the gendered system of power inside the home and society. The Women in Development (WID) model that had been built in the 1970s was in a bid to make women included in formal economies by obtaining easier access to credit, education, and work. Even though this paradigm was more publicly totalitarian in its overview of the productive role of women, it was condemned because it concentrated on the symptoms, but not the reasons of inequality and failure to challenge patriarchal institutions ([Shrestha et al., 2024](#)).

The Women and Development (WAD) approach in the 1980s not only stressed the role that women already played in the development processes, but also showed how women were exploited in the capitalistic world systems. However, the issue of gender relations within households was not very highly rated in WAD. Based on the radical approach to alter the state of unequal gender relations rather than just introduce women in the existing framework, the Gender and Development (GAD) framework became widely known in the 1990s. GAD was concerned with the idea of empowerment as an activity that meant the development of agency, the capacity to make strategic choices regarding life and access

the resources, as well as the achievement of the desired outcomes. It is on this development that the concept of empowerment is defined as multidimensional as opposed to the form of economic form of empowerment ([Hidrobo et al., 2024](#)).

This multidimensional approach has also been expounded in modern scholarship. Empowerment has also come to be interpreted in new ways to include economic aspects (financial independence and freedom over resources), social aspects (involvement in household and community decision-making), and psychological aspects (self-confidence, hopes, and agency). In the South Asian scenario, like that of Pakistan, studies have always found that economic engagement in secluded situations will not enable women when patriarchal standards limit their earnings and options. The present study adheres to the multidimensional GAD-inspired pathway, according to which economic empowerment is realised through financial independence, empowering household decision-making, and guaranteed confidence ([Sundarasan et al., 2023](#)).

2.1 Money vs. Actual Empowerment

One of the issues that has long been debated in the gender and development literature deals with the correlation between income-generation and real empowerment. Many early activities in the microfinance and entrepreneurship assumed that the earning capacity of people was to be automatically converted into the empowerment and independence of the family unit's women. Nonetheless, this is not the case, as has been proven through empirical evidence. Women are the earners but lack spending power since the cultural norms are inclined to concentrate the resources on the male breadwinners or on the joint families ([Small et al., 2023](#)).

This disconnection is specifically evident in Pakistan and South Asia in general. It has been shown that in those instances when women contribute a substantial amount to the household income through informal or household duties, the authority to make major decisions on important expenditures, education, and health is, quite frequently, entrusted to the male relatives. Digital entrepreneurship could have specific benefits over conventional informal activities. Being a visible skill-building and direct market activity, it is capable of improving the perceived role of women in the economy, and, potentially, of increasing their bargaining power ([Matthew et al., 2023](#)). Nonetheless, digital income to empowerment conversion remains open to the contextual conditions, such as family approval and the ability of women to keep some income under control. Therefore, this study is not just based on the outcome of income, but aspects of economic empowerment at large, as well as the determinants that facilitate or hinder their realisation ([AlMehrzy et al., 2023](#)).

2.2 Digital Divide Theory

Digital Divide Theory offers critical insight into why technological advances are not evenly distributed across society. The levels that are identified in the theory include the first-level divides (access to devices and connectivity), the second-level ones (skills and competencies to use them effectively), and the third-level ones (different outcomes and benefits) ([Adewunmi et al., 2023](#)). Pakistan has a feminine disadvantage that is acutely experienced by women living in the low-income and rural areas of the developing world.

The level of gender inequality in meaningful use of digital lives in Pakistan continues to be high even though mobile penetration has been rising at a pace that is extremely high rate of more than 80 percent over the past few years. This is since the independent use of the internet and mobile phones among women is mostly connected to a moral lack of safety or the unacceptability of social exposure due to

socio-cultural outlook. Families tend to restrict ownership of the devices, privacy of the surfing, and favor the male family members and children. Other obstacles include low digital literacy because of the absence of formal education, affordability, and the necessity to share a device, which disrupts the principles of privacy and autonomy, movement limitation that interferes with training attendance, and fear of being harassed or stigmatized on the Internet ([Palalar Alkan et al., 2022](#)).

2.3 Community-based Interventions, NGOs, and Microfinance Programs

The NGOs and microfinance institutions have used community-based intervention approaches that have been at the forefront in ensuring women's inclusion in the economy of developing nations. The traditional approaches to microfinance were largely centered on loan provision, which partially had empowering connotations. Even though loans might enable small-scale income-earning activities, the resources and their management and decision-making were, in many cases, controlled by the male members of the family ([Saifuddin et al., 2021](#)).

More holistic designs of programs were developed and incorporated financial services with vocational training, group formation, and social mobilisation. Self-help groups and peer networks have been observed to result in social capital development that has influenced the collective power of bargaining, confidence, and movement of women positively. In recent years, many community-based projects have been digitalized, such as smartphone training, online marketing, online selling platforms, and financial technology. It has been assessed that income, self-efficacy, and market access have improved, but the long-term sustainability is usually confined to maintaining technical infrastructure, secure connectivity, market relations, and family acceptance ([Ngong et al., 2021](#)).

The NGO-based programmes in Punjab, Pakistan, have brought in online training of poor women in entrepreneurship with the aim of marketing their handicraft goods, agricultural products, and services provided at home. Whereas the number of individuals participating has grown, little serious consideration is made of whether such initiatives generate a sustainable multidimensional empowerment. The research is useful as it offers a systematic analysis of the results of such community-based digital interventions regarding empowerment under the assistance of complex quantitative modelling ([Krupnik et al., 2021](#)).

2.4 Theoretical Frameworks

The paper combines four perspectives, which are complementary theories, to describe the connection between digital entrepreneurship and the economic empowerment of women. The Empowerment Theory is a theory that follows the GAD framework, and the theory is conceptualised as empowerment, meaning the process of agency, resources, and achievement. Digital entrepreneurship may be advantageous to all three dimensions because it may provide new sources of money and opportunities to act independently economically ([Dziubaniuk et al., 2021](#)). Amartya Sen's Capability Approach is directed at the increased real liberty of individuals to execute their preferred functioning. The digital platforms will expand the potential of women in the environments in which they cannot move around and access the market, as they will assist them in raising income at home and reducing dependence on moving around ([Fleming et al., 2021](#)).

The Technology Acceptance Model (TAM) is the model explaining the uptake of technology based on the perceived usefulness and perceived ease of use concepts. Digital literacy positively impacts perceived ease of use in this case, but family support and obvious income improvements enhance perceived usefulness of digital entrepreneurial activities. Digital Divide Theory focuses on the mediating role of

access, skills, and results of digital activity. The combination of the theories presupposes that digital entrepreneurship is an opportunity for capability expansion that is empowering but conditional with respect to individual capabilities (digital literacy), infrastructural conditions (ICT access), and relationships (family support) ([Withorn et al., 2020](#)).

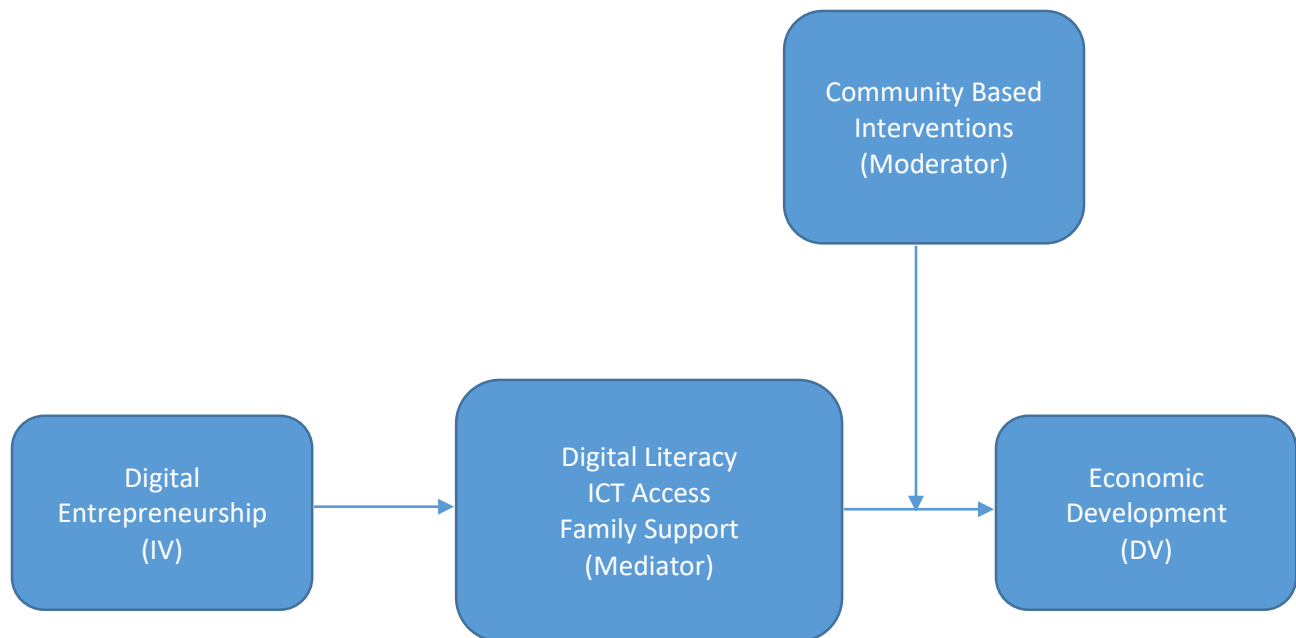


Figure 1: Research Model

The evidence shows that there exist positive relationships between digital and mobile-based entrepreneurship and female economic outcomes all over the world. The Sub-Saharan African and Southeast Asian studies also mention that digital platforms have contributed to the gains in income, independence, self-confidence, and market access ([Rosca et al., 2020](#)). In South Asia, the research reveals that digital solutions may help women to break the cycle of immobility and access more markets, yet the advantages tend to be scarce and highly contingent on the family structure ([Murray et al., 2020](#)). Higher incomes and the belief that women who take digital training courses are reported in the new research in Pakistan. However, other commentaries stress the fact that the outcomes of empowerment depend on the support of the family and access to technology in the future. The obstacles are more likely to be increased in rural women as they are more likely to have connection problems, as well as high normative restraint. Structural equation modelling or the utilization of moderating variables in a rigorous manner has been done in very little research, and the questions regarding the conditional pathways and heterogeneity are open. This paper deals with these shortcomings by analyzing a sample of poor household women in Punjab by use of PLS-SEM ([Maes et al., 2019](#)).

It is believed that three factors will mediate the relationship between digital entrepreneurship and economic empowerment. Digital literacy will enable the women to negotiate their way around them successfully and help them deal with customers, make online transactions, and reduce the anxiety they may have towards the technology ([Koyana et al., 2017](#)). The viability of a business interaction continuation is determined by ICT accessibility, which means a stable and reliable device, internet access, and electricity. The family support functions involve the provision of social legitimacy required, the reduction of domestic resistance, the ease of time reallocation between family duties, and strengthening the confidence of women to practice entrepreneurial activities. In some cases, family acceptance may be a final impediment to the further economic participation of women in South Asian conservative societies ([Mason et al., 2017](#)).

Though the number of digital inclusion and women entrepreneurship literature continues to grow, there are several gaps that are of a critical nature. Firstly, many of the studies in Pakistan and South Asia are descriptive-qualitative, and few of the developed quantitative approaches, such as PLS-SEM, are used. Second, a limited analysis is done of the moderating processes by which digital engagement is transformed into power ([Tiwari et al., 2014](#)). Third, rural women, who are the primary target of community-based programs, and especially, the poorest and least-educated ones, have often been overlooked in research. Fourth, not numerous studies employ policy-oriented analysis as a multi-group analysis or importance-performance mapping to guide a particular intervention. This paper directly fills these gaps through testing a conditional model by applying rigorous PLS-SEM, along with extra robustness and prioritisation tests ([Ahmadi, 2017](#)).

3 Research Methodology

3.1 Research Design

The research design employed was the cross-sectional research design, which constitutes a quantitative research design that was applied in the research to determine how digital entrepreneurship impacts the economic empowerment of poor household women who have been enrolled in community-based interventions in Punjab, Pakistan. The cross-sectional type of design is particularly useful in researching the relationship between program attendance and the outcome variables at a specific time and in situations where one is interested in understanding the associations but not creating causality over the course of time. It was developed in an explanatory analytical format, which also tested hypothesised direct effects and moderated relationships using integrated theoretical frameworks.

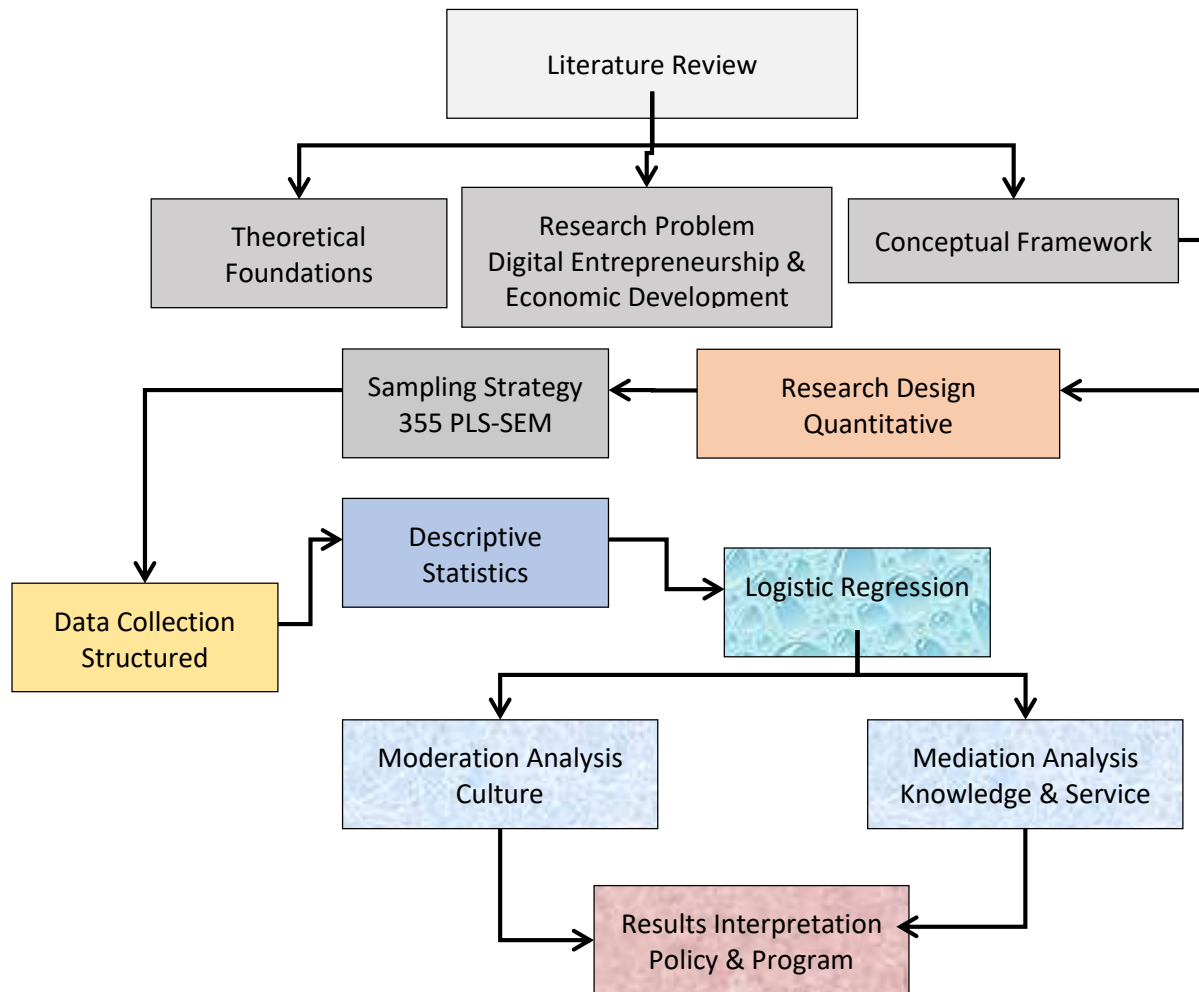


Figure 2: Research Flow Chart

PLS-SEM was chosen to be the primary statistical approach in the process of analyzing the data. Such a study is fitting to PLS-SEM because the model contains several latent constructs, which have reflective indicators, and moderating variables in a complex predictive model. In addition, analyses such as multi-group analysis (MGA) and importance-performance map analysis (IPMA) can also be performed using PLS-SEM, and these contribute to enhancing the topicality of the policies against the results provided by the policy-specific effects and priorities concerning the significance of the intervention. The fact that it was indeed determined that PLS-SEM was the best alternative to covariance-based SEM is because the nature of the research is not simply theory testing but rather prediction-oriented research, which could lead to practical recommendations to policy development programs.

In social science applications, it should be preferred when the researcher has to describe a high level of variance (R^2) and moderate predictive relevance (Q^2) when blindfolding is applied (Ahmed et al., 2025). Bootstrapping with 5,000 resamples led to the acquisition of stable standard errors and confidence intervals and ensured that the method is stable in the presence of non-normality of field data of vulnerable populations. It had been done in Punjab province, which is the most economically varied and populated province in Pakistan. Punjab was specifically chosen because of the combination of rural,

peri-urban, and urban areas, which have an ideal environment for studying differences in the results of digital empowerment in various infrastructural and socio-cultural settings. The province is dominated by high levels of community-based digital entrepreneurship that are initiated by NGOs, microfinance institutions, and government skill development centres, which target low-income-earning women.

The population under study was a married reproductive-age (18 to 49 years old) female who resides in an economically disadvantaged family and who is currently engaged in digital entrepreneurship training and income-generating community-based services. These programs were usually focused on practical skills such as the use of a smartphone, social media marketing, selling the products of the handicraft or farm products online, and basic digital financial management. The choice of this specific group was because they were the most marginalised group in which the digital intervention can be projected to have the greatest transformative effect. The study also limited itself to the active participants of the programs, which made the sample very relevant and limited the selection bias, based on the non-exposure to the digital tools. The recruitment of the eligible participants was based on a purposive sampling strategy with the help of snowball referrals. This non-probability method was required since there were no readily accessible lists of official beneficiaries of the programs, and such a non-probability method was used to guarantee that only women who fulfilled the inclusion criteria (active participation in digital entrepreneurship programs and belonging to poor households) were included. Training of women enumerators who would speak the local language was done to visit the potential respondents within the training centres, community meetings, and through referrals from other participants.

The final sample used was that made up of 355 filled samples. The sample size was determined based on the accepted rates of PLS-SEM rules of at least ten times the indicators that are proposed to be the most complex construct or at least 200-300 observations required in the model containing moderation effects. The achieved sample size was within these limits, at ease with adequate statistical power to identify medium-large effects, conduct a moderation analysis, and conduct subgroup comparisons through multi-group analysis. G*Power analysis of the power indicated the sample size to be adequate in terms of identifying medium-sized effects with 80% power and 0.05 α . Data collection of primary data was done through a structured questionnaire that had specifically been designed and piloted to collect the required data. Female enumerators who were trained administered the survey using the preferred local language (Punjabi or Urdu) to the respondents to ensure the survey was as much understood as possible, and that the respondents were not tired of the survey, especially when addressing low literacy individuals who are most of the women. The collected data was collected at convenient locations, either at the end of 2025 or the beginning of 2026, depending on the considerations of safety and comfort, which can be in community training centres, meeting points in a village, or the residences of the participants.

The purpose of the study, its voluntariness, and confidentiality were well specified at the beginning of each survey session. The questionnaire took around 25 to 35 minutes of time to complete. The questions were developed in a neutral manner amenable to minimizing the issue of the problem of social desirability, and sensitive items were placed at the bottom of the instrument. To get the honest answers, the enumerators were required to be trained that they needed to build rapport and generate privacy during the interview.

3.2 Instrument and Measurement of Variables Development

The research instrument was designed based on the modification of the already existing scales of international and regional literature and cultural appropriateness to the Pakistani environment. Multi-item reflective scales based on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) were used to measure all latent constructs. Digital Entrepreneurship (independent variable) was measured with questions that measured the frequency, intensity, and variety in the categories of online selling, online marketing, freelancing, and mobile-based business operations ([Chandel et al., 2025](#)). The dependent variable, Economic Empowerment, was also operationalised into a higher-order construct noted to have three items that concerned financial autonomy (control over personal income and savings), influence within the family (impact on major family expenditure and decisions), and self-efficacy and future aspirations (psychological confidence).

Digital Literacy (moderator) incorporated questions that assessed the use of smartphones, maneuvering of applications, managing online transactions, and simple online marketing. The availability and reliability of the devices, the availability of the internet, the provision of electricity, and the price of the data packages were measured by ICT Access (moderator). Family Support (moderator) was used to evaluate emotional support, practical support, and social support of women in digital business by family members. Socio-demographic (age, education level, monthly household income, place of residence (rural vs. peri-urban/urban), and smartphone ownership type (personal vs. shared) were used as control variables. All scales were put into Urdu and Punjabi and reverse translated to achieve linguistic accuracy. Before the actual data collection, a pilot study of 45 females was conducted, and their sampling was non-probabilistic in other community programs, and not included in the main sampling frame. Its pilot was employed at multiple levels to find out the level of clarity and cultural (appropriateness of questionnaire items), time required to fill out questionnaires, and preliminary reliability. Based on feedback, some minor changes in the wording of some of the items were made. The alpha coefficients of Cronbach of all constructs in the pilot test were above 0.70, which indicates high internal consistency, and it is certain that when a main survey is being drawn. Pilot results were also used to improve the enumerator training procedures on sensitive issues. The process of data screening and preparation will be of the following type:

Questionnaires that had been gathered were verified to be complete and consistent immediately after they had been administered. Preliminary data screening was done using SPSS 27. The non-responses were small (no more than 5 percent) and were not covered by the means substitution in the case of the item being continuous. Multivariate outliers were identified with the help of box plots, standardised scores, and Mahalanobis distance. Suspected cases were matched with the initial questionnaires, and only those cases that were determined to be true responses were taken. Although PLS-SEM does not presuppose high-level normality, the Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted to assess the characteristics of distributions. The descriptive statistics also ensured that the distribution was not absurd, with skewness and kurtosis values lying within feasible ranges of bootstrapping processes.

Cronbach alpha, composite reliability (CR), and rho A (Dijkstra-Henseler) were used to determine the reliability of the measurement model; all the values should be over 0.70. Average variance extracted (AVE > 0.50) and outer indicator loadings (preferably > 0.70) were used to test convergent validity. The discriminant validity measure was performed according to Fornell-Larcker (square root of AVE is bigger

than inter-construct correlations) and heterotrait-monotrait (HTMT) ratio (less than 0.85). Such steps were informed by current principles of PLS-SEM to offer quality measurements.

The analysis of data was carried out in two primary steps, with the help of SmartPLS 4 software. In the first phase, the outer (measurement) model was tested for reliability, convergent, and discriminant validity. The second one was the structural (inner) model, which has been tested with path coefficients, t-statistics, and p-values of bootstrapping with 5,000 resamples. The quality of the model was also determined with the help of the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2 through the blindfolding procedure with omission distance at 7. The moderate effects were also examined by the development of the interaction terms and the interpretation of the simple slopes at the standard deviation of -1. Other more specific analyses were multi-group analysis (MGA) to compare rural and peri-urban/urban subgroups, and importance-performance map analysis (IPMA) used to find out what should be implemented in practice.

3.3 Justification for PLS-SEM

The PLS-SEM was chosen among covariance approaches for several reasons. The research model is not confirmatory but multifaceted and predictive with a variety of latent variables and moderators. The information that is transferred to PLS-SEM is not sensitive, and it brings robust results with good sample sizes that are prevalent in field surveys involving vulnerable people. It is also the most effective in maximising explained variance and out-of-sample prediction, which is in line with the twofold goals of the study to test the theory and come out with practical policy proposals. Bootstrapping also provides stability to inference in case of potential non-normality of the data being collected when it comes to the respondents of low-income.

To ensure good quality and integrity of data, several additional data validation processes were implemented. This non-response bias was established by comparing early and late respondents in the major demographic variables and construct mean using independent samples t-tests; these results could not be found to be significant ($p > 0.05$). The response bias was also checked through examination of straight-lining patterns and variance of response. Mahalanobis was used to determine multivariate outliers, which were removed following the inspection of the original questionnaires. These tests ensured that the data were devoid of any systematic biases and were appropriate for more sophisticated modelling. The single-factor test by Harman represented a secondary test of common method bias, and the first factor had a substantially lower variance of 28.4 (which is significantly less than 50%). A method of showing a theoretically unrelated measure (general life satisfaction) was also outlined, which did not find significant inflation of path coefficients. These additional validation procedures can increase confidence in the validity of the measurements and structural results.

4 Results

The survey provided 355 valid replies of married women of reproductive age (18 to 49 years) and in poor households who actively participated in community-based digital entrepreneurship initiatives in different districts of Punjab, Pakistan. The sample is representative of the target population of economically vulnerable women trying to use digital means to generate income and pivot through large structural limitations. Table 1 gives the demographic profile.

Looking at the age distribution in Table 1, the largest group is 26–35 years (40.0%, $n=142$), followed by 18–25 years (27.6%, $n=98$). This age bracket is the most fertile and economically productive age group. This means that the sample targets women at a life stage where the family must be looked after, and

their income demands are high. This value has yielded the finding that most of the respondents are at the most productive working stages and thus are the most suitable individuals to undergo the digital entrepreneurship interventions, which demand time and energy investments. Overall, the age profile serves as an affirmation that the study addressed the most general demographic to be the focus of such programs, in which digital tools are more likely to foster a balanced approach of both domestic and economic roles.

Table 1: Condensed Socio-Demographic Profile of Respondents (n = 355)

Variable	Category	Frequency	Percentage (%)
Age	18–25 years	98	27.6
	26–35 years	142	40.0
	36–45 years	89	25.1
	Above 45 years	26	7.3
Education	No formal education	72	20.3
	Primary/Middle	118	33.2
	Matric/Intermediate	112	31.5
	Higher secondary & above	53	14.9
Monthly Household Income	< PKR 15,000	168	47.3
	PKR 15,001–30,000	129	36.3
	> PKR 30,000	58	16.3
Place of Residence	Rural	201	56.6
	Peri-urban/Urban	154	43.4
Smartphone Ownership	Own smartphone	248	69.9
	Shared device	107	30.1

The education variable indicates no formal education (20.3% n= 72) and primary or middle school (33.2% n= 118). This is an indication that more than 53 percent of the sample has very low formal education. The observation is that the lack of schooling is very common, and this will pose a problem in learning digital skills and navigation on platforms. The consequence is that the sample portrays the poorest women, that is, the most educationally disadvantaged, and digital interventions need to be effective against the strong literacy barriers. This has significant consequences for the design of the program because training should be designed to meet the needs of low-literacy audiences through simple, visual, and hands-on modes.

Monthly household income indicates that 47.3% (n=168) have less than PKR 15, 000 per month. It is a very low level of income, even in Pakistani terms. This statistic concludes that the respondents are under acute economic pressure and have low financial buffers. What it means is that financial need is a great power of involvement in digital entrepreneurship. As discussed in detail, this level of utter poverty can generate even minor supplementary income due to digital activities around deep value, but also indicates that any impediments (like communal gadgets or relatives) can play a disproportionate adverse influence on the achievement of the program and its sustainability.

Place of residence shows that 56.6% (n=201) reside in the rural areas. This rural-dominant makeup is substantial. The results reveal that the sample is characterized by women who are residing in regions with less developed infrastructure and high traditional norms. What it means is that the study is in a

good place to test the digital entrepreneurship under the most difficult circumstances. It is discussed in detail that living in the country increases mobility and market-access limitations, and thus, the ICT access and family support moderating roles in this research are especially important. Lastly, the Smartphone ownership rate is 69.9% (n=248) who own a personal device and 30.1% (n=107) share a device. The result of this split is that although digital infrastructure has already touched most respondents, the use of shared devices is still a significant obstacle. The net effect is that access is positive, though unfinished. Through in-depth explanation, it is evident that shared devices are likely to restrict privacy, time of use, and make decisions independently, which may undermine the empowerment pathway unless programs are put in place to deal with the issue of ownership of devices.

4.1 Latent Construct Descriptive Statistics

The respondents expressed positive impressions on all major constructs, and the mean scores were higher than 3.8 on a 5-point Likert scale. This means average to high degrees of interest and perceived gains of digital entrepreneurship courses. Nevertheless, the standard deviations (between 0.89 and 1.12) indicate that there is significant individual variation that should be interpreted as heterogeneous experience, and further analyses (moderation and subgroup) need to be conducted.

Table 2: Descriptive Statistics of Latent Constructs

Construct	Mean	SD	Skewness	Kurtosis
Digital Entrepreneurship	4.28	0.89	-0.62	0.41
Economic Empowerment	4.15	0.92	-0.48	0.29
Digital Literacy	3.98	1.05	-0.35	-0.12
ICT Access	3.87	1.12	-0.28	-0.31
Family Support	4.05	0.98	-0.51	0.18

Digital Entrepreneurship has the highest mean of 4.28 with SD = 0.89. High average involvement in internet business has been demonstrated by this value. It is determined that women in the sample are currently using digital tools to generate income. The net output is that exposure to the program has effectively been converted to real entrepreneurial behaviour. The discussion shows in detail that such a high mean has been achieved due to the effectiveness of community-based training in promoting the initial adoption; however, the moderate SD reflects the fact that some women are more active than others, and this is explained by the moderation analysis later. Economic Empowerment has a mean of 4.15 (SD = 0.92). This is a bit less than digital entrepreneurship participation. The observation of this value is that in the process of making income, not everyone is yet completely empowered (autonomy and confidence).

The impact is that digital revenue allows empowerment to be based, but it does not necessarily generate it. As it is detailed later, the fact that these two means are not identical indicates that the process is conditional in nature, and the introduction of moderators into the model is justified. Digital Literacy has a mean of 3.98 (SD = 1.05). This is the lowest of the scores. It is found that the levels of skills are sufficient on average, but are highly varied. The net effect is that literacy is a possible bottleneck for some women. In-depth explanation reveals that the SD is relatively high, meaning that low-literacy subgroups might not have access to digital opportunities beneficially, which is why the moderation solution to digital literacy is possible. ICT Access has the lowest mean at 3.87 (SD = 1.12).

This figure indicates continued problems with infrastructure. The observation is that there is no consistent connectivity or device reliability. The consequence is that access is a restricting aspect for many respondents. The factual points on why ICT access is a moderator are thoroughly discussed with an emphasis on the fact that, despite high smartphone ownership, a lack of reliable internet and power will disrupt long-term business performance. Family Support has a mean of 4.05 (SD = 0.98). This is moderately high. The result is that a good amount of family support is extended to many women. The general conclusion is that relational support exists, but not everywhere. As discussed in some detail, the moderate SD indicates that family dynamics are diverse; this is why family support turned out to be the most powerful moderator in the further analysis.

4.2 Evaluation of the Measurement Model

Individual item reliability was supported by the fact that all the indicator loadings were greater than an ideal value of 0.70, with the majority over 0.80. In the case of Digital Entrepreneurship, the loadings were between 0.78 and 0.91. In Economic Empowerment, the loading was between 0.76 and 0.93. Digital Literacy loadings were between 0.74 and 0.89. The ICT Access loadings varied between 0.72 and 0.87. The Family Support loadings were between 0.79 and 0.92. These high loadings have led to the conclusion that every item is a strong reflection of its construct. The general outcome is great convergent item-level validity. As discussed in greater detail, these high loadings give reason to believe that the measurement model effectively represents the theoretical concepts it was intended to represent, and that measurement error in further structural analysis is reduced.

The internal consistency of reliability was very high, whereas the Cronbach alpha and composite reliability (CR) of all constructs were over 0.80. Convergent validity was determined because the average variance extracted (AVE) values were between 0.62 and 0.71, which was above the 0.50 mark. Using both the Fornell-Larcker criterion and HTMT ratios (all less than 0.85), discriminant validity was confirmed. Standard biases (full collinearity VIF < 3.3) also indicated that the nature of responses did not provide unnatural relationships.

Table 3: Internal Consistency, Reliability, and Convergent Validity

Construct	Cronbach's α	Composite Reliability (CR)	AVE
Digital Entrepreneurship	0.89	0.92	0.71
Economic Empowerment	0.91	0.93	0.68
Digital Literacy	0.87	0.90	0.65
ICT Access	0.85	0.88	0.62
Family Support	0.88	0.91	0.67

Table 4: Discriminant Validity

Construct	DE	EE	DL	ICT	FS
Digital Entrepreneurship	0.84	0.68	0.59	0.52	0.61
Economic Empowerment	0.68	0.82	0.55	0.49	0.64
Digital Literacy	0.59	0.55	0.81	0.63	0.48
ICT Access	0.52	0.49	0.63	0.79	0.44
Family Support	0.61	0.64	0.48	0.44	0.82

(The full HTMT matrix is available upon request; all HTMT ratios < 0.85.) (Fornell-Larcker Criterion – Square root of AVE on diagonal; correlations below diagonal).

4.3 Structural Model – Direct Effects

The structural model showed a significant explanatory power and revealed that it explained 63% of Economic Empowerment ($R^2 = 0.63$). This is reckoned as high in investigating social science, which deals with behavioural outcomes. Digital entrepreneurship had a positive direct impact on economic empowerment, which was statistically significant and strong ($\beta = 0.54$, $SE = 0.043$, $t = 12.45$, $p < 0.001$, 95% bias-corrected bootstrapped CI = 0.47, 0.61). The effect size ($f^2 = 0.42$) can be considered large based on the guidelines of Cohen, which demonstrates that digital entrepreneurship is a practically significant source of empowerment. The predictive relevance was also high ($Q^2 = 0.41$ through blindfolding), indicating that the model is suitable for making out-of-sample forecasts of other similar populations.

Table 5: Direct Path Coefficients and Effect Sizes

Path	β	SE	t-value	p-value	f^2	95% BCa CI
Digital Entrepreneurship → Economic Empowerment	0.54	0.043	12.45	<0.001	0.42	0.47, 0.61

The path coefficient 0.54 is large, and it is positive. The result of this value is that economic empowerment would rise by 0.54 units on the latent scale with a one-unit rise in digital entrepreneurship participation. The outcome is a positive, high direct relationship. As it will be discussed further, such a significant impact proves that digital entrepreneurship is indeed a potent income-to-empowerment channel, which is many times larger than the average effect in gender and development research.

4.4 Moderation Analysis

The three moderators hypothesised had significant positive effects on the relationship between digital entrepreneurship and economic empowerment, which proved the conditional character of the empowerment process. The most significant moderator was family support ($\beta = 0.16$), then there was digital literacy ($\beta = 0.14$) and ICT access ($\beta = 0.11$). These results show that technological opportunity alone is not enough; facilitating contexts of skills, infrastructure, and social approval are key in transforming digital participation into empowerment benefits. Extra analysis using the simple slope showed stronger positive correlations at high levels of each moderator (+1 SD).

Table 6: Moderation Effects

Interaction Path	β	t-value	p-value	95% BCa CI
DE × Digital Literacy → EE	0.14	3.28	0.001	0.06, 0.22
DE × ICT Access → EE	0.11	2.81	0.005	0.04, 0.19
DE × Family Support → EE	0.16	3.76	<0.001	0.08, 0.24

The interaction DE × Digital Literacy has $\beta = 0.14$, $t = 3.28$, $p = 0.001$. The result is that an increased level of digital literacy increases the impact of digital entrepreneurship on empowerment. The outcome is a very strong positive moderation. As explained in detail, women who have better skills benefit more from digital participation, which proves literacy as a major conversion movement. The general model showed a very good global fit and predictive capacity. The Standardized Root Mean Square Residual (SRMR) value of 0.062 is considerably lower than the conservative level of 0.08, which shows that the assumed relationships are very close to the reproducibility of the observed data structure. The model is useful in predicting the outcomes of empowerment in similar environments, as the predictive relevance ($Q^2 = 0.41$) is greater than the 0.35 strong relevance criterion.

Table 7: Model Fit Indices and Predictive Relevance

Index	Value	Threshold	Interpretation
SRMR	0.062	< 0.08	Good global fit
Q ² (EE)	0.41	> 0.35	Strong predictive relevance

SRMR = 0.062 is excellent. The conclusion is that the model fits the data rather well. The outcome is great structural validity. The theoretical formulation of the conditional model is elaborated on, and this low SRMR is in its favor.

Multi-group comparison was also carried out to investigate the contextual heterogeneity between the rural (n=201) and peri-urban/urban (n=154) respondents. The significance of the effect of digital entrepreneurship on the empowerment of the economy was direct in a rural environment (= 0.61, p = 0.001) as compared to peri-urban/urban (= 0.46, p = 0.001), and the effect was statistically significant (= 0.032). Such a trend implies that online entrepreneurship would be more radical in those locations where the traditional barriers (mobility, market access, and social norms) are most predominant, which justifies the generalization of the rural woman as an object of what is to come.

Table 8: MGA Results (Rural vs. Peri-urban/Urban)

Path	Rural β	Peri-urban/Urban β	Difference p-value
DE \rightarrow EE	0.61	0.46	0.032

Rural β = 0.61 is markedly higher than urban β = 0.46. The conclusion was that the effect of empowerment is greater in rural areas. The outcome is great rural-urban heterogeneity. As elaborated later, it is the rural women who benefit because digital tools could be utilized to minimize the barriers hindering the access of rural women to their destinations in terms of both mobility and access to a market, and rural targeting is one of the most effective methods. The Economic Empowerment was the target construct in which IPMA was carried out. The central role was confirmed by the fact that digital entrepreneurship was in the high importance/high performance quadrant (total effect = 0.54, performance index \approx 78). The significance of the family support (total effect = 0.38) and comparatively worse performance (index this = 65) showed the existence of a certain gap in intervention.

It means that the family engagement activities must be prioritized in the programs to maximise the overall empowerment effects. Digital Entrepreneurship; high importance/moderate performance gap: Family Support, this is where the intervention is supposed to be focused on. The total impact of the Digital Entrepreneurship is 0.54 with a performance of 78. The result is that it is significant and successful. It has the consequence that digital entrepreneurship is already a potent force. Retaining this driver and growing it should be one of the main strategies, as it has been discussed in detail. To further test the conditional model, there was a comparison of the direct-only model (moderators missing) with the full moderated model. The R² and Q² in the full moderated model (0.63 vs. 0.41 and 0.41 vs. 0.28) are significantly higher, which confirms the increase in the explanatory and predictive capacity with the introduction of the moderators.

Table 9: Model Comparison (Direct vs. Full Moderated Model)

Model	R ² (EE)	Q ² (EE)	SRMR
Direct-only	0.41	0.28	0.071
Full Moderated	0.63	0.41	0.062

The growth of R^2 and Q^2 indicates the worthiness of the moderation terms. The result is that the conditional model is better. The outcome is the high level of support for the hypothesised moderating mechanisms. As it was discussed in detail, the use of moderators would be underestimated, and the program design should be context-sensitive.

5 Discussion

The analysis of the presented main findings will be based on the following methodology: The empirical findings are powerful and solid indications to show that digital entrepreneurship is an effective avenue of economic empowerment of poor household women in Punjab. The high direct impact on economic empowerment ($= 0.54$, $p < 0.001$) and the high explanatory power ($= 0.63$) of digital entrepreneurship indicate that the active involvement in online and mobile-based income actions significantly improves the level of financial independence, role in family decision making, and self-confidence. The predictive relevance ($Q^2 = 0.41$) is also high, ensuring that the model can be expected to forecast the outcome of the empowerment in other vulnerable population groups.

Significantly, the results show that empowerment does not come automatically due to digital income generation. The moderation coefficients are high, indicating that the process is conditional, whereby digital literacy ($= 0.14$), trustful ICT access ($= 0.11$), and, most central, family support ($= 0.16$) are conditional conversion factors. Without these enabling circumstances, the potential of digital platforms is not realised to the letter. The results highlight a point that technological opportunity should be delicately aligned with skill training, infrastructural base, and socio-cultural acceptance to create high agency benefits. Of importance is that the R^2 is large at 0.63. The output is that the model accounts for a good percentage of the variance of empowerment. The resultant effect is that the predictors and moderators adopted are highly relevant. The discussion on this amount of explained variance is done to show that this is an excellent level of explained variance in behavioural studies on gender and development, and it proves the applicability of the conditional framework.

There are some important theoretical contributions that are made in this study. It adds to the Empowerment Theory and the Capability Approach proposed by Amartya Sen as empirically valid evidence of the fact that digital entrepreneurship is a capacity-enabling process in highly constraining, patriarchal environments. Digital technologies enhance the actual liberties of women and their roles by eliminating the barriers of movement and enabling them to generate revenue at home. Another generalisation used in the study is the Technology Acceptance Model (TAM) and the Digital Divide Theory of how access and perceived usefulness are not sufficient but are bound through skill, infrastructure, and relationship variables and their effects on empowerment. The integration of these structures into a single conditional PLS-SEM model containing MGA and IPMA is an innovative methodological/theoretical advancement, within the under-researched region of rural South Asia, where the family process dictates whether women are or will be economically involved.

These outcomes are congruent with the data regarding Africa and Southeast Asia, which generally suggest positive correlations between digital/micro-entrepreneurship and revenue and independence among women groups. The effect sizes in the study are far more substantial, possibly because of the impacts of acute mobility and limitations to market access among rural Pakistani women. In contrast to most of the previous descriptive or qualitative research conducted in Pakistan, the study also resorts to rigorous moderated SEM with bootstrapping and advanced analyses (IPMA and MGA) to seal major gaps in terms of methodology. The modulating power of the family is overwhelming as well, which indicates

that currently, the literature urges more scholars to be more attentive to the relational and socio-cultural dimensions of empowerment in conservative settings. Altogether, the study confirms and expands the current knowledge by quantifying conditional pathways within a vulnerable population.

Compared to the existing models of digital entrepreneurship, this study contributes on its own part. Models on TAM tend to be interested in perceived usefulness and ease of use as direct predictors of adoption, but rarely in downstream consequences of empowerment and relational mediating factors. Based on the TAM, this paper develops a further contribution that usefulness (digital entrepreneurship) can be changed to empowerment only by moderating variables of literacy, access, and familial support. Capability Approach models concentrate on the expansion of opportunities, yet are generally not empirically researched on the conditional mechanics; this paper provides real evidence of the role of digital tools in enlarging capabilities. Digital Divide models highlight the variation in access, yet they fail to proceed to argue that the variation causes empowerment; the present conditional model bridges this gap by demonstrating the mediation of the divide between empowerment outcomes. It is a terrific theoretical move to make a combination of these models into a single PLS-SEM framework incorporating MGA and IPMA.

5.1 Practical and Policy Implications

The practical implications of the findings of the program design and the policy of the population are self-evident. Programs on digital entrepreneurship should extend beyond short training courses to more of an ecosystem-focused intervention, which, simultaneously, can strengthen digital literacy, improve ICT infrastructure (via subsidised devices and data packages), and engage the male family members actively in this area, through awareness campaigns. Family support is of high importance, but not the most well-performing area, according to the IPMA analysis, and the family engagement modules may lead to an outcome of disproportionately high empowerment.

The priority of policymakers and NGOs should be scaling of such programs among the rural and low-educated populations, where the multi-group analysis shows the greatest effects. This will be a strategic measure that will have direct correlation to Sustainable Development Goals 5 (Gender Equality), 8 (Decent Work and Economic Growth), and 9 (Industry, Innovation and Infrastructure). Governments can facilitate scalability by promoting market connections between the government and the private sector via public-private partnering, mentoring, and providing constant technical support. Monitoring frameworks should be able to keep track of not just the income but also multidimensional indicators of empowerment to ensure long-term effects. The utility of the strong rural effect of MGA has an immediate practical value. This concludes that rural targeting produces optimum returns on investment. The result is a great prioritisation recommendation. As mentioned below, the funds should be directed towards the rural districts at the very onset so that maximum impact of empowerment is achieved per rupee spent on the same.

There are some limitations that should be identified. The research design of cross-section restricts causal analysis; longitudinal research would be necessary to find out how the empowerment varies with time and whether the initial gains are sustained. There is a possibility of some degree of perception bias in the usage of self-reported data; hence, the procedural remedies have been employed to curb the chances of biases. The Punjab sample, though variable, limits an additional generalisation on other provinces, which might have different socio-cultural processes. Experimental or quasi-experimental designs (e.g., RCTs) should be used in future research to prove stronger causality.

6 Conclusions

The case study in this paper aims to observe how poor household women in Punjab, Pakistan, can be economically empowered by community-based interventions of digital entrepreneurship. According to the survey data of 355 participants and to the Partial Least Squares Structural Equation Modeling (PLS-SEM), the results are highly robust to demonstrate that digital entrepreneurship may be taken as a powerful positive predictor of economic empowerment ($\beta = 0.54$, $p < 0.001$) and the 63% of variance in the variable under scrutiny may be explained ($R^2 = 0.63$). The model was also discovered to be a good fit (SRMR = 0.062) and predictive relevance ($Q^2 = 0.41$). Interestingly, it is discovered that empowerment is not automatic but conditional. Digital literacy, ICT access, and above all, family support mediates the relationship to a considerable degree, with the family support being the most significant moderator ($\beta = 0.16$). Multi-group analysis showed more effects in the rural areas, and analysis of importance-performance maps (IPMA) showed family support as a high-importance but lower-performance area that requires intervention. These discoveries confirm that it has much potential in terms of the amount of revenue made and agency enhanced on digital platforms, but the transformative impact of the same would be facilitated by supporting enabling circumstances in terms of skills, infrastructure, and social acceptance.

This research counters with several interesting theoretical contributions. First, it is based on the Empowerment Theory and the Capability Approach by Amartya Sen because it empirically demonstrates that digital entrepreneurship is a capability-building process existing in a highly resource-deprived and patriarchal environment. Digital tools help to overcome the limitations of mobility and expand the actual freedoms of women to achieve intended economic and social outcomes by allowing them to earn money at home. Second, the researchers expand the Technology Acceptance Model (TAM) and Digital Divide Theory by establishing that access and perceived usefulness are sufficient but not requirements of empowerment. The mediating power of digital literacy, ICT access, and family support determines that the positive impact of digital interaction is conditional upon individual abilities and relational scenarios. These models, enhanced into a single equilibrium PLS-SEM model with the assistance of MGA and IPMA, are a novel contribution to the literature about gender, technology, and development, particularly to the South Asian rural context, which is under-researched.

Practically, the findings are that community-based digital entrepreneurship initiatives may be effective in empowering women economically if they are formulated in a holistic way. Online activities enrollment does not merely lead to income, but also to financial independence, control in the household decision-making, and psychological assertiveness. However, the conditionality of these findings suggests that there will be only a certain long-term effect of isolated training programs. Alternatively, sustainable empowerment requires a harmonious ecosystem that combines the skills gaps, infrastructural gaps, and social and cultural barriers. The results present some viable recommendations to the policy makers and development organizations. First, the digital entrepreneurship courses to be pursued in the future must be skills-based, along with long-term investment in digital literacy, subsidised software and data services, and high-quality internet services. Individual workshops cannot be a tool of sufficient power. Second, male-family and elder awareness and sensitisation sessions should be embraced in the programs since family support is a potent moderator. Digital activities of women can be facilitated in their homes by engaging families and offering enabling environments to them. Third, multi-group analysis indicates that there are stronger effects of empowerment on rural areas.

The policymakers should concentrate on the expansion of interventions of such nature in rural and low-educated communities with the highest mobility and market constraints. Fourth, the basic income or participation measures should be left aside by the program evaluation models, focusing on the financial autonomy and power in decision-making and psychological confidence measures. It is preferable to have regular use of verified empowerment scales. Finally, the government departments of skill development, the NGO, and the digital platforms occupied by the private sector can be scaled and sustainably kept in contact with each other. These guidelines are in line with Sustainable Development Goals 5, 8, and 9, which Pakistan is obligated to. There are various limitations of the study. First, it is cross-sectional, and this makes it difficult to establish causality and time-related empowerment changes. Longitudinal would give more information on the sustainability of the effects that are observed. Second, the problem of bringing a certain degree of perception or social desirability bias to self-reported data can be observed despite the procedures of safeguarding it. Third, it is restricted to Punjab province; the results might not be a complete generalisation of the other parts of Pakistan. Finally, though high-level analyses (MGA and IPMA) were conducted, the study had not yet considered any unpleasant events that might occur in the form of increased tension in the country or a cyber threat.

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