Management and Organization Review (2026), **22**, 833–859
doi:10.1017/mor.2025.10112

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ARTICLE

Does Digital Financial Knowledge Participate in Poverty Alleviation? A Moderating Study with Microfinance in Pakistan

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(Received 29 October 2024; accepted 20 October 2025)

Abstract
This study examines the relationship between microfinance and poverty alleviation, considering the moderating effect of both digital and traditional financial knowledge, as well as of social capital. The data sample comprises survey responses from 500 clients of conventional and Islamic microfinance institutions in Bhakkar, one of Pakistan's most dynamic microfinance districts. The empirical results, obtained via structural equation modeling, show that digital financial knowledge positively moderates the relationship between microfinance effectiveness and poverty alleviation. A similar result is found for the moderating role of social capital when traditional financial knowledge is included in the model. However, this is not the case when digital financial knowledge is included in the model. These findings emphasize the importance of promoting both financial literacy and digital skills to maximize the positive impact of microfinance on poverty reduction.

摘要
本研究探讨微型金融与扶贫之间的关联性，同時考量数字金融知识、传统金融知识及社会资本的调节作用。数据样本涵盖巴基斯坦最具活力微型金融地区之一——巴卡尔地区的500 名客戶, 其来自传统及伊斯兰微型金融机构的问卷調查。研究发现,数字金融知识对微型金融成效与扶贫效果之间的关系具有正向调节作用。当传统金融知识纳入结构方程模型时，社会资本的调节作用亦呈現类似結果; 然而若模型中包含数字金融知识, 此调节效应便不复存在。这些结果表明, 若要最大化微型金融对减贫的积极影响, 必须同步提升民众的金融素养和数字化能力。

Keywords: digital financial knowledge; microfinance; poverty alleviation; social capital; traditional financial knowledge
关键词: 传统金融知识; 数字金融知识; 微型金融; 扶贫; 社会资本

Introduction

'Digital poverty reduction refers to efforts, approaches, strategies, and solutions aimed at reducing poverty (e.g., a region or country) through the application of digital technologies and digital inclusion initiatives and artificial intelligence (AI) technologies' (Si, Hall, & Wei, 2024). Alongside this definition, digital poverty alleviation has received significant attention from academic research (e.g., Ng, Lim, Lye, Chan, & Lim, 2025; Pei, Zhang, & Zhou, 2024). In this regard, the role of digital finance has been highlighted as it facilitates access to digital financial services on mobile phones and digital

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https://doi.org/10.1017/mor.2025.10112 Published online by Cambridge University Press

financial platforms (Adu & Hartarska, 2025; Islam, Ornob, & Hossain, 2025). Consequently, digital finance is regarded as an efficient and transformative force in poverty alleviation (Dorfleitner, Forcella, & Nguyen, 2022). Meanwhile, various studies, such as Abdallah Ali, Mughal, and Chhorn (2022), Cooke and Amuakwa-Mensah (2022), Gupta and Sharma (2023), and Hasan, Singh, Agarwal, and Kushwaha (2025), demonstrated microfinance's effectiveness in reducing poverty. In this regard, the adoption of digital technologies has increased the efficiency of microfinance by optimizing transaction costs and improving financial transparency (Offiong, Szopik-Depczyńska, Cheba, & Ioppolo, 2024), thereby helping to alleviate poverty. In the same vein, digital financial knowledge can enhance microfinance effectiveness through the provision of access to digital financial applications (Liu, Wang, Sindakis, & Showkat, 2024). Therefore, digital financial knowledge is essential for effective financial management of microfinance clients (Abdallah, Tfaily, & Harraf, 2025; Bhat, Lone, SivaKumar, & Krishna, 2025; Kandie & Islam, 2022).

Motivated by the importance of both digital technologies and microfinance in alleviating poverty, this study examines whether enhancing the level of digital financial knowledge of microfinance clients could positively influence the link between microfinance effectiveness and poverty alleviation. For that, we consider both digital and traditional financial knowledge, as well as social capital, to be potential moderating factors of this relationship. From our knowledge, this threefold moderation effect has not been considered in previous studies investigating the role of microfinance in alleviating poverty. Furthermore, this research leans on a sample of 500 microfinance clients from Bhakkar, the most dynamic microfinance district in Pakistan's Punjab province. In addition, its findings can provide critical insights into the role of microfinance in emerging Asian countries such as China. In this study, Pakistan was chosen because it still has a very high proportion of people living in poverty (37.2%, World Bank, 2023).

Empirical results obtained using the structural equation modeling (SEM) approach demonstrate a positive connection between microfinance effectiveness and poverty alleviation. Notably, digital and traditional financial knowledge have a positive moderating effect on this relationship. The same result is found with social capital when traditional financial knowledge is included in the model. However, this is not the case when it comes to digital financial knowledge. This finding raises questions about the potential detrimental effect of digital development on the social capital of microfinance clients. Therefore, to optimize microfinance's positive effect on poverty reduction, it is crucial to foster both traditional and digital financial knowledge, while also recognizing the importance of fostering social connections of microfinance clients. Based on these results, we recommend that microfinance institutions and governments educate microfinance clients further in both financial and digital basics. We also recommend that microfinance clients embark on a continuous learning journey to better use the funds provided by microfinance institutions. Furthermore, traditional financial knowledge can enable microfinance clients' social connections to positively contribute to poverty alleviation. However, it is not the case with digital financial knowledge. This finding leads us to call for future research to delve deeper into the interaction between digital development and social capital to better understand its influence on the link between microfinance effectiveness and poverty alleviation.

These findings can inspire future studies into the impact of microfinance in other emerging nations, such as China, where significant differences need to be considered. First, China's level of digital financial knowledge far exceeds that of Pakistan. For example, 38% of the population in China use credit cards, while the one in Pakistan is 0.22% (The Global Economy). Furthermore, the average income level is another difference between the two countries: $3041 per month in China, compared to $293 per month in Pakistan (World Bank, 2025). In addition, according to Fouillet and Pairault (2010), microfinance in China is closely linked to the government. Conversely, microfinance in Pakistan is more closely associated with local and regional management. Given these differences, the questionnaire used in this study would need to be adapted for the Chinese context to effectively evaluate constructs such as digital and traditional financial knowledge, social capital, and microfinance effectiveness.

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Theoretical Background and Hypothesis Development

Although most studies investigating the ability of digital technology in reducing poverty have found positive effects, academic literature on this topic is mixed. On the positive side, Lechman and Popowska (2022) demonstrated that information technology (IT) can improve educational attainment and living standards in developing nations. Similarly, Lee, Lou, and Wang (2023) showed that digital financial inclusion is an important factor in alleviating poverty in China. Furthermore, Tao, Wang, Li, and Wei (2023) showed that inclusive digital finance in China can reduce households' credit constraints, increase investment in risky assets and entrepreneurship, and decrease relative poverty. Meanwhile, Xu (2024) demonstrated that digital finance reduces the rural-urban income gap, which is consistent with the research of Wang, Wang, Zhou, Chen, and Mao (2025) on industrial digitalization and the study of Wang, Qu, and Yin (2025) on digital literacy. Similarly, Zhou, Zha, Qiu, and Zhang (2024) demonstrated that digital literacy decreases the likelihood of re-experiencing poverty. Additionally, Hariyani, Hariyani, and Mishra (2025) showed that digital technology facilitates the achievement of the 17 Sustainable Development Goals (SDGs). Furthermore, Javed, Ashraf, and Shahbaz (2025) showed that digital technologies can help Pakistani women develop their skills and achieve financial inclusion. In addition, Li and Huang (2025) found that digital literacy moderates the ability of social security coverage to alleviate relative poverty in a positive way.

In contrast, Dzator, Acheampong, Appiah-Otoo, and Dzator (2023) found that IT development increases the poverty rate, regardless of the population age. According to Wu (2024), one reason for the negative influence of IT is the digital divide, or digital inequality. Crucially, they showed that social security coverage can mitigate the negative effect of the digital divide. This result supports the moderating effect of social capital considered in this research. Similarly, Zeng, Yang, Wang, and Zou (2025) showed that digital exclusion increases the level of relative poverty. However, the magnitude of this negative effect depends on household characteristics, while education has a positive moderating effect. In a European context, Antonietti, Burlina, and Rodriguez-Pose (2025) demonstrated that greater access to digital technology exacerbates income inequality. Nevertheless, stronger institutions can mitigate this negative impact.

In summary, recent research has largely demonstrated the positive influence of digital technologies in alleviating poverty. However, it is important to consider the potential negative impact of digital divide, as well as the various channels through which digital technologies operate, such as the internet and mobile phones. These findings support our study, confirming the significance of including digital financial knowledge as a moderating variable in the link between microfinance and poverty reduction.

Regarding microfinance, its relationship with poverty alleviation leans on three theories: vulnerable group theory (Ozili, 2024), social capital theory (Bourdieu & Richardson, 1986), and financial literacy theory (Ozili, 2025). Vulnerable group theory stipulates that financial inclusion leads to the economic empowerment of microfinance clients. Furthermore, this theory emphasizes the importance of financial education (Choudhary & Jain, 2023), justifying the consideration of both financial knowledge and digital financial knowledge in our empirical analyses. Additionally, microfinance institutions can contribute significantly to leveraging social capital by promoting community-based lending schemes (Bongomin, Munene, Ntayi, & Malinga, 2018). Thus, social capital theory provides a theoretical justification for the consideration of social networks and trust in improving the effectiveness of microfinance. Indeed, individuals with strong social capital have better access to financial resources, leading to poverty reduction (Ogbari et al., 2024; Zhang & Zhao, 2024). In addition, financial literacy theory stipulates that financial knowledge empowers microfinance clients to make better financial decisions, thereby amplifying microfinance's positive impact on poverty alleviation

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(Lontchi, Yang, & Su, 2022; Prayitno, Sahid, & Hussin, 2022). This research therefore extends this theory by also considering digital financial knowledge.

Much of the research on microfinance is based on this theoretical foundation and has demonstrated its positive relationship with poverty alleviation. This is because microfinance fosters entrepreneurship and creates income-generating opportunities, thereby reducing poverty levels (Farooq, Din, Soomro, & Riviezzo, 2024). In this regard, providing financial services to the poor helps improve their investment skills while encouraging new business initiatives (Qamar, Masood, & Nasir, 2017; Tasos, Amjad, Awan, & Waqas, 2020; Van Rooyen, Stewart, & De Wet, 2012). Furthermore, Garcia, Lensink, and Voors (2020) identified a positive connection between microcredit, hope, and economic wellbeing. Furthermore, Begum, Alam, Mia, Bhuiyan, and Ghani (2018) found that Islamic microfinance is a more ethical approach for poverty reduction as it provides clients experiencing difficulties with a longer period to repay their loans.

In contrast, previous research also showed that microfinance is not always an efficient tool in reducing poverty. For instance, Banerjee, Duflo, Glennerster, and Kinnan (2015) demonstrated that microfinance has an insignificant impact on clients' spending habits, educational attainment or the decision-making abilities of women. Furthermore, microfinance services can also lead to increased daily expenditure, causing clients to become indebted and trapped in a cycle of poverty (Banerjee & Jackson, 2017; Nawaz, 2010). Similarly, Donou-Adonsu and Sylwester (2016) demonstrated that, unlike traditional banks, microfinance institutions do not help reduce poverty. In the Philippines, Agbola, Acupan, and Mahmood (2017) found that microfinance only had a limited impact on poverty reduction. In addition, Zainal, Nassir, Kamarudin, and Law (2020) showed that microfinance institutions encounter mission drift and are therefore inefficient at reducing poverty in ASEAN-5 countries.

Overall, previous research shows that digital technologies and microfinance can effectively alleviate poverty. However, if their potential side effects are not considered, such as the digital divide and high levels of microcredit-related debt, they can also exacerbate poverty. Against this backdrop, our central research question is whether digital financial knowledge can influence the link between microfinance effectiveness and poverty reduction by acting as a moderator. There are three reasons for investigating this research hypothesis. Firstly, understanding the moderating role of digital financial knowledge can help explain the dual role, positive and negative, of digital technologies on poverty reduction. Secondly, microfinance and digital technologies are known as efficient tools for reducing poverty. However, to our knowledge, the moderating role of digital financial knowledge has not yet been adequately explored in previous research (e.g., Mushtaq & Bruneau, 2019). Thirdly, given the importance of microfinance and digital technology development in Pakistan, this research question is particularly relevant. Therefore, the main research hypothesis is as follows.

Hypothesis 1 (H1): Digital financial knowledge has a positive moderating effect on the effectiveness of microfinance in alleviating poverty.

The arguments for the positive moderating influence of digital financial knowledge are as follows. Firstly, previous empirical evidence suggests that financial knowledge is important for microfinance clients to optimize the use of microcredit. In this regard, financial literacy theory (Ozili, 2025) posits that financial knowledge is a key driver of financial inclusion. Therefore, it is important to extend this theory to further consider the importance of digital financial knowledge. Secondly, individuals with greater digital financial knowledge are more likely to engage with microfinance institutions because they can use microcredits more efficiently (Hasan, Le, & Hoque, 2021). Thirdly, digital financial knowledge improves the effectiveness of microfinance by facilitating the use of digital financial products, leading to poverty alleviation (Abdallah et al., 2025; Bhat et al., 2025; Kandie & Islam, 2022; Liu, Wang, Sindakis, & Showkat, 2024). Therefore, combining microfinance with digital financial knowledge enhances financial inclusion and reduces poverty (Bongomin, Malinga, Amani, &

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Balinda, 2025; Koskelainen, Kalmi, Scornavacca, & Vartiainen, 2023; Teslenko & Maslakova, 2024), leading to the main research hypothesis of this study.

To specifically measure digital financial knowledge in Pakistan, we consider two dimensions[1] which are the knowledge about credit card and the understanding of timely bills payment. Indeed, using credit cards encourages the use of e-commerce and other digital services. In this regard, previous studies indicated that knowledge of credit cards is an important component of digital financial knowledge (Abdallah et al., 2025; Antonietti et al., 2025; Chhillar, Arora, & Chawla, 2024; Shehadeh, Dawood, & Hussainey, 2024; Vieira, Matheis, Lehnhart, & Tavares, 2024). Interestingly, Osuma, Nzimande, and Simon-Ilogho (2025) found that using ATMs (Automated Teller Machines) can reduce poverty and improve a country's GDP. In the context of our data sample of microfinance clients in Pakistan, knowledge of credit cards is an important indicator of digital financial knowledge given that only 0.22% of the population has a credit card (The Global Economy, 2021). Regarding the importance of timely bills payment, Vieira et al. (2024) concluded that bill payments through digital tools is one of the measurement items of digital financial capability, aligning with the finding of Widyastuti, Respati, Dewi, and Soma (2024). Therefore, understanding the importance of timely bills payment can participate in the development of digital financial knowledge of microfinance clients in the data sample of this study (more details about the measurement of these two items are presented in third section).

Methods

This research leans on primary data collected from 500 microfinance clients in a district of the Punjab province in Pakistan between December 2021 and June 2022. The participants' responses to the survey were used to measure the five main constructs to be considered in the analysis. Further, empirical analysis has been carried using structural equation modeling (SEM) on cross-sectional data.

Sample

This study employed the snowball sampling technique to identify elusive populations while minimizing data collection costs (Biernacki & Waldorf, 1981). It is based on chain referrals, whereby active participants help identify other participants (Sudman, 1976). Specifically, our data collection process began with a small number of microfinance clients, who then referred us to other microfinance clients. Employees of related microfinance institutions also referred us to other microfinance clients, enabling us to reach a broader audience and achieve greater diversity in the sample. With this method, the final sample comprised 500 completed questionnaires of microfinance clients, 250 of which were from Islamic microfinance institutions and 250 from conventional microfinance institutions.[2]

The questionnaire used in this study can be found in Appendix I. When developing the questionnaire, we considered previous research related to each construct considered. Specifically, Kumari's (2021) work informed the measurement of microfinance effectiveness and inspired the poverty alleviation questions. The work of Perry and Morris (2005) informed the measurement of digital and traditional financial knowledge (DFK and FK). Additionally, Chen, Stanton, Gong, Fang, and Li's (2009) work helped us identify how to measure social capital. Furthermore, all the items included in the questionnaire are directly related to our research objective. For instance, we only included items from Kumari's (2021) study that were related to microfinance effectiveness.

Five constructs were then calculated using items collected from the survey (see Table 1). The Microfinance Effectiveness (ME) construct comprises four items, which are measured using a five-point Likert scale spreading from 'Strongly Disagree' to 'Strongly Agree' (see Appendix I for full details). Similarly, the Poverty Alleviation (PA) construct consists of six items. The Digital Financial Knowledge (DFK) construct comprises two items, while the Traditional Financial Knowledge (TFK) construct comprises five items. Finally, the social capital construct consists of five items. Table 1 shows the items used to develop the five constructs.

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Table 1. Constructs with measuring items

Constructs	Items	Measurement items
Microfinance Effectiveness	ME1	Providing sufficient loan to operate the business
	ME2	Provide operational assistance to operate the business
	ME3	Loan is sufficient to enhance household appliances
	ME4	Loan repayment schedule is convenient
Poverty Alleviation	PA1	Income increase
	PA2	Higher access to education
	PA3	Higher access to healthcare
	PA4	Better financial situation of the family
	PA5	Increase of employment opportunities
	PA6	Improvement in family living standard
Digital Financial Knowledge	DFK1	I know the importance of timely bills payments
	DFK2	I know about credit cards
Financial Knowledge	FK1	I know how to control my spending
	FK2	I know how to plan for my financial future
	FK3	I know how to provide for myself and my family
	FK4	I know about the Insurance
	FK5	I know about interest rates
Social Capital	SC1	How much importance do you give to the following people?
		Relatives
		Neighborhood
		Friends/fellows
	SC2	With how many people do you keep routine contact?
		Relatives
		Neighborhood
		Friends/fellows
	SC3	Among the people in each category, how many can you trust?
		Relatives
		Neighborhood
		Friends/fellows
	SC4	Who will help you upon your request?
		Relatives
		Neighborhood
		Friends/fellows
	SC5	Considering people in these categories, how many possess the following assets?
		Political power
		Broad connections with others
		With a professional job

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To measure Digital Financial Knowledge (DFK), we examined participants' responses to two specific questions: one concerning credit cards and the other concerning the importance of timely bill payment. As discussed above, credit cards play a key role in digital financial knowledge because they are widely used on digital platforms. Therefore, knowing how to use them is essential in digital financial literacy. For microfinance clients without access to credit systems, understanding credit cards and their associated costs is important for personal financial management (Atkinson & Messy, 2012). In the same vein, understanding the importance of timely bill payment is essential for personal financial management in the context of rapid digital technology development. As bill payments are now commonly made through digital tools, being aware of when they are due can prevent microfinance clients from digital penalties (Chhillar et al., 2024; Koskelainen et al., 2023; Vieira et al., 2024). Therefore, paying bills on time can demonstrate an efficient use of digital tools, which is directly related to personal financial stability (Ozili, 2018). Regarding microfinance clients in our research sample, most of them are novices when it comes to using mobile phones and digital banking. Therefore, this item allows us to measure their ability to interact with digital finance and to avoid financial losses (Seldal & Nyhus, 2022; Koskelainen et al., 2023; Lusardi, 2019).

Table 2 presents the main descriptive statistics of the final sample of 500 participants and shows that 60.6% are male and 39.4% are female. Similarly, there are more young clients than older ones. Furthermore, most participants have an annual income lower than 25,000 Pakistani rupees (PKR), equivalent to around 90 USD per year. Moreover, most of the participants come from rural backgrounds and have an educational attainment level below matriculation. Finally, most participants are married (refer to Table 2 in Appendix I for more details on descriptive statistics of each survey item). In addition, Table 3 shows the correlation matrix for the variables under consideration. Panel 3A-1 relates to traditional financial knowledge, while Panel 3A-2 relates to digital financial knowledge. Overall, correlation coefficients are lower than 0.5, which prevents multicollinearity issues in the estimated model.

Variables

Table 4 defines the variables and their original references. Figure 1 shows how the five constructs under study are measured. To avoid issues of multicollinearity between Financial Knowledge and Digital Financial Knowledge, which have a correlation of 0.962, we construct two separate models. In the first one, only Digital Financial Knowledge (Figure 1) is included while in the second one, only Traditional Financial Knowledge is included (Figure 1A). To save space, the model with Traditional Financial Knowledge (Figure 1A) is presented in Appendix II. Regarding Figure 1, all the constructs are measured through items represented as ME1-ME4, PA1-PA6, DFK1-DFK2, and SC1-SC15, referring to microfinance effectiveness, poverty alleviation, digital financial knowledge, and social capital, respectively. The arrows from each construct to its respective items indicate the strength of their relationship, as measured by factor loadings. These factor loadings are obtained by conducting a structural equation modeling (SEM) analysis using a confirmatory factor analysis (CFA) approach. Higher factor loadings indicate stronger associations between the considered constructs and their measurement items. The error terms, 'e1' to 'e32', show the measurement errors of the considered items. Figure 1 also shows the relationship among the constructs (the arrows on the left of the figure). This measurement model has been statistically validated, ensuring the reliability and validity of the constructs.

Table 5 presents the main descriptive statistics of the constructed variables. The average value of microfinance effectiveness (ME) is 3.8440, out of a maximum of 5. This indicates that participants generally recognize the benefits of microfinance. Similarly, the average of poverty alleviation (PA) of 3.7077 indicates that microfinance has effectively alleviated poverty among survey respondents. Furthermore, the average value of digital financial knowledge is 2.89, which shows that microfinance clients in the sample possess low digital financial knowledge. In addition, an average of social capital

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Table 2. Descriptive statistics of participants

Number	Variables	Categories	Frequency	Percentage
1.	Gender	Male	303	60.6%
		Female	197	39.4%
		Total	500	100%
2.	Age	18–23	10	2.0%
		24–29	79	15.8%
		30–35	165	33.0%
		36–41	142	28.4%
		42 & more	104	20.8%
		Total	500	100%
3.	Monthly Income	Under 10,000	10	2.0%
		10,000–15,000	87	17.4%
		15,000–20,000	149	29.8%
		20,000–25,000	124	24.8%
		Over 25,000	130	26.0%
		Total	500	100%
4.	Residential Area	Rural	348	69.6%
		Urban	152	30.4%
		Total	500	100%
5.	Education	Illiterate	147	29.4%
		Under Matric	205	41.0%
		Matric	67	13.4%
		Intermediate	10	2.0%
		Bachelor	11	2.2%
		Master & Above	60	12.0%
		Total	500	100%
6.	Marital Position	Married	421	84.2%
		Unmarried	52	10.4%
		Divorced	27	5.4%
		Total	500	100%
7.	Microfinance Type	Islamic Microfinance	250	50.0%
		Conventional Microfinance	250	50.0%
		Total	500	100%

Note: The distribution of the main variables collected from the survey is shown in this table.
Source: The authors.

of 3.1559 indicates that participants have moderate social connections. Furthermore, the skewness and kurtosis values of the variables are less than 3 and 10, respectively, suggesting that they are

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Table 3. A: Correlation matrix. Panel 3A-1: With traditional financial knowledge. Panel 3A-2: With digital financial knowledge

Constructs	Microfinance effectiveness	Poverty alleviation	Financial knowledge	Social capital
Panel 3A-1				
Microfinance Effectiveness	1	–	–	–
Poverty Alleviation	0.463**	1	–	–
Financial Knowledge	0.380**	0.338**	1	–
Social Capital	0.242**	0.229**	0.293**	1
Panel 3A-2				
Microfinance Effectiveness	1	–	–	–
Poverty Alleviation	0.463**	1	–	–
Digital Financial Knowledge	0.360**	0.322**	1	–
Social Capital	0.242**	0.229**	0.268**	1

Note: ** means that the correlation is significant at the 0.01 level.

Table 4. Variables

Number	Variables	Definitions	References for the definition	Number of items considered in the calculation	References for the calculation of the variables
1.	Microfinance Effectiveness	Microfinance provides financial services to the poor, including self-employed people.	Ledgerwood (1999)	4 (ME1 to ME4)	Kumari (2021)
2.	Poverty Alleviation	Poverty means the deprivation of material requirements for the minimum acceptable fulfillment of basic needs.	Shaffer (2008)	6 (PA1 to PA6)	Kumari (2021)
3.	Digital Financial Knowledge	Digital financial knowledge means understanding the use of technology in financial services.	Perry and Morris (2005)	2 (DFK1 to DFK2)	Perry and Morris (2005)
4.	Financial Knowledge	Traditional financial knowledge means understanding critical financial terms needed to function daily in society.	Perry and Morris (2005)	5 (FK1 to FK5)	Perry and Morris (2005)
5.	Social Capital	Features of social life networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives.	Putnam (1993)	5 (SC1 to SC5)	Chen, Stanton, Gong, Fang, and Li (2009)

Notes: This table shows the definition of the main variables used in the empirical analysis. ME1 to ME4 refer to the 4 survey items to measure microfinance effectiveness. The same is applied for PA, DFK, FK, and SC. See Table 1 and Appendix I for full details.

not affected by heavy tails or asymmetry (Kline, 2011). Additionally, the multicollinearity assessment (Table 6) revealed that the tolerance values for the considered constructs are greater than 0.1, while the values of VIF are lower than 10, indicating the absence of multicollinearity.

Before conducting the SEM estimation, the measurement models need to be validated using Confirmatory Factor Analysis (CFA) (Awang, 2015). CFA is used to measure the reliability, validity, and one-dimensionality of the constructs (Awang, 2015; Kline, 2011).[3] As shown in Table 7, all the AVE values are between 0.55 and 0.77, which corresponds to the criterion of 0.5. Furthermore, all

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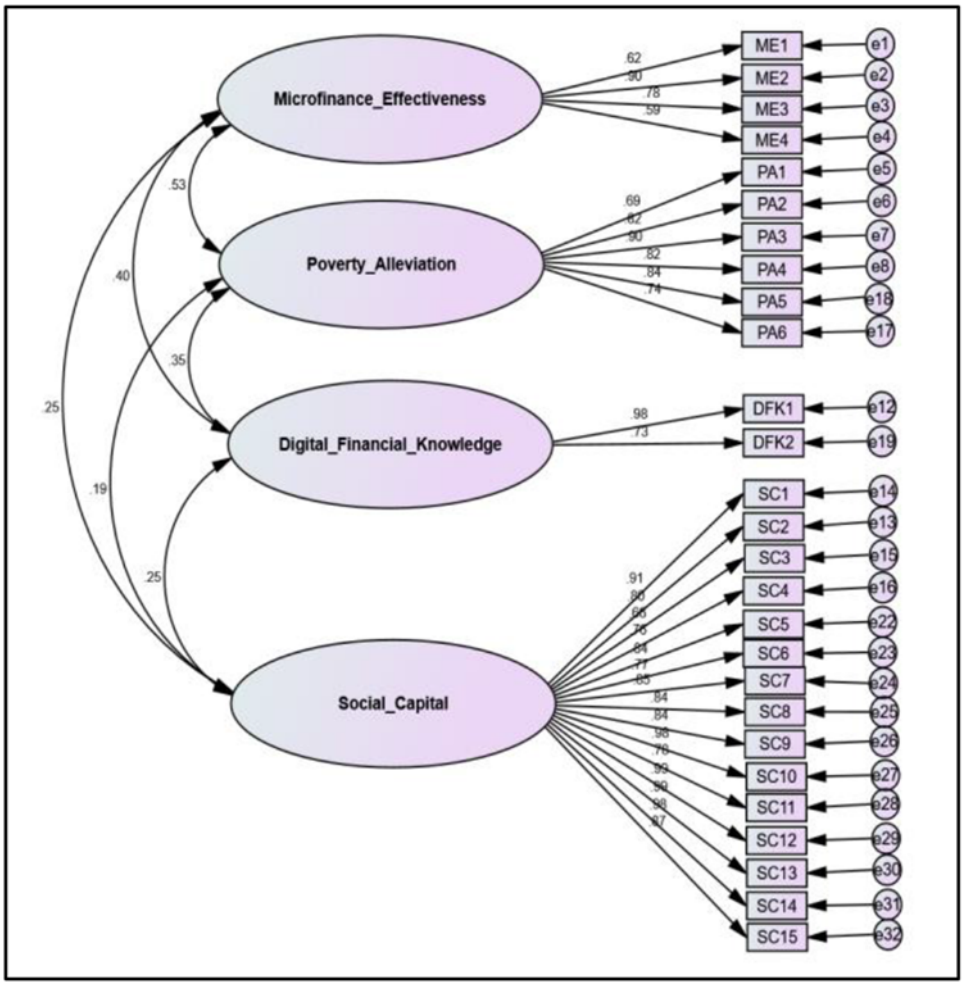


Figure 1. The constructs' measurement model with digital financial knowledge

Notes: This figure shows the model to measure the four constructs in the model with Financial Knowledge. ME1 to ME4, PA1 to PA6, DFK1 to DFK2, and SC1 to SC15 correspond to the questions in the survey (see Appendix I for more details). 'e1' to 'e32' represent measurement errors. The numbers on the arrows on the left side represent factor loadings. The numbers on the arrows on the right side represent the correlations of each pair of variables. Source: From the authors.

Table 5. Descriptive statistics of the constructs

Variables	N	Min	Max	Mean	Standard deviation	Skewness	Kurtosis
ME	500	2	5	3.84	0.76	−0.27	−0.59
PA	500	2	5	3.71	0.79	−0.01	−0.68
DFK	500	1	5	2.89	0.91	0.540	0.14
FK	500	1	5	2.85	0.99	0.49	−0.41
SC	500	2	5	3.16	0.67	−0.12	−0.71

Notes: This table shows the main descriptive statistics of the five variables. ME refers to Microfinance Effectiveness. PA refers to Poverty Alleviation. DFK refers to Digital Financial Knowledge. FK refers to Traditional Financial Knowledge. SC refers to Social Capital.

the Cronbach's alpha values are above 0.5, confirming the satisfactory internal consistency of the measurement items (Fornell & Larcker, 1981; Malhotra, Mukhopadhyay, Liu, & Dash, 2012). Similarly,

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Table 6. Tolerance and variance inflation factor values

	Variables	Tolerance	VIF
	Panel A: Results with Digital Financial Knowledge		
1.	Microfinance Effectiveness	0.84	1.19
2.	Digital Financial Knowledge	0.76	1.32
3.	Social Capital	0.89	1.12
	Panel B: Results with Traditional Financial Knowledge		
1.	Microfinance Effectiveness	0.83	1.21
2.	Traditional Financial Knowledge	0.73	1.38
3.	Social Capital	0.87	1.15

Note: Dependent variable = Poverty Alleviation.

Table 7. The reliability of the constructs

Sr.	Variable name	Items	Cronbach's alpha	AVE	CR
1.	Microfinance Effectiveness	4	0.79	0.54	0.82
2.	Poverty Alleviation	6	0.91	0.65	0.91
3.	Digital Financial Knowledge	2	0.82	0.74	0.85
4.	Traditional Financial Knowledge	5	0.95	0.80	0.95
5.	Social Capital	5	0.98	0.74	0.97

Notes: This table shows the reliability measures of the main constructs considered in empirical analysis. The reliability of one variable is the extent to which an instrument is reliable in measuring the variable (Awang, 2015) and is measured through three criteria which are Cronbach's alpha, Average Variance Extracted (AVE), and Construct Reliability (CR), following previous works such as Fornell and Larcker (1981). Cronbach's alpha measures the internal coherence of the scale of the variables. A value of Cronbach's alpha of at least 0.5 shows the reliability of the items in the questionnaire used to calculate the variables. AVE measures the amount of variance that is captured by a construct in relation to the amount of variance due to the measurement error. A value of AVE of at least 0.5 shows that the latent variables from the questionnaire explain at least 50% of the variance of the constructed variables (Awang, 2015). CR measures the construct reliability. A value of CR higher than 0.7 is required to achieve construct reliability.

Table 8. Discriminant validity with digital financial knowledge (with the Fornell and Larcker (1981) method)

	ME	PA	DFK	SC
ME	0.74			
PA	0.53***	0.80		
DFK	0.39***	0.35***	0.86	
SC	0.26***	0.19***	0.25***	0.86

Notes: According to Fornell and Larcker (1981). ** Correlation is significant at the 0.01 level (2-tailed), ME = Microfinance Effectiveness, PA = Poverty Alleviation, DFK = Digital Financial Knowledge, SC = Social Capital. Source: Authors' calculations.

the diagonal values (the square root of the Average Variance Extracted) are above the off-diagonal values (Table 8). This result indicates that the measurement items of this construct differ from those of the other constructs in the study. Furthermore, the correlations are less than 0.85 (see Table 8). Therefore, the discriminant validity of the constructs is validated.

In addition, Table 9 shows the HTMT (Heterotrait-Monotrait Ratio of Correlations) results for assessing discriminant validity. An acceptable level of discriminant validity is with a value lower than 0.9, a criterion that all our variables meet. Tables 7A and 8A (in Appendix III) also demonstrate construct validity when the model incorporates traditional financial knowledge.

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Table 9. Discriminant validity with digital financial knowledge (with the $HTMT_{0.85}$ criterion)

	ME	PA	DFK	SC
ME	0.74			
PA	0.53***	0.81		
DFK	0.39***	0.35***	0.86	
SC	0.26***	0.19***	0.25***	0.86

Notes: According to the HTMT0.85 criterion. ** Correlation is significant at the 0.01 level (2-tailed), ME = Microfinance Effectiveness, PA = Poverty Alleviation, DFK = Digital Financial Knowledge, SC = Social Capital. Source: Authors' calculations.

Structural Equation Model (SEM)

Following the validity of the model presented above, Equation (1) illustrates the SEM used to analyze the relationship between microfinance effectiveness (exogenous variable) and poverty alleviation (endogenous variable):

$$PA_i = \beta_0 + \beta_1 ME_i + \varepsilon_i \tag{1}$$

where PA_i represents the measure of poverty alleviation of participant *i*. ME_i represents the measure of microfinance effectiveness of participant *i*. ε_i represents the error terms.

To examine the moderating effect of digital and traditional financial knowledge, as well as social capital, we further estimate the equations below:

$$PA_i = \beta_0 + \beta_1 ME_i + \beta_2 FK_i + \beta_3 ME_i DFK_i + \varepsilon_i \tag{2a}$$

$$PA_i = \beta_0 + \beta_1 ME_i + \beta_2 DFK_i + \beta_3 ME_i FK_i + \varepsilon_i \tag{2b}$$

$$PA_i = \beta_0 + \beta_1 ME_i + \beta_2 SC_i + \beta_3 ME_i SC_i + \varepsilon_i \tag{3}$$

where PA_i represents the measure of poverty alleviation of participant *i*. ME_i represents the measure of microfinance effectiveness of participant *i*. DFK_i represents the measure of digital financial knowledge of participant *i*. FK_i represents the measure of traditional financial knowledge of participant *i*. SC_i represents the measure of social capital of participant *i*. ε_i represents the error terms.

Equations (2a), (2b), and (3) include three variables which are digital financial knowledge (DFK), traditional financial knowledge (FK), and social capital (SC), respectively. Importantly, an interactive variable between each of these three variables with microfinance effectiveness (ME) is also included. While coefficient β_2 measures their direct relationship with poverty alleviation, coefficient β_3 allows to capture their moderating role on the link between microfinance effectiveness and poverty reduction. If β_3 is significant and positive, it means that DFK, FK, or SC, has a significantly positive moderating effect. In this case, when microfinance effectiveness increases, an increase in FK, DFK, or SC, will positively influence poverty alleviation. The same is applied for a negative moderating effect. For our research hypothesis to be validated, coefficient β_3 in Equation (2a), related to digital financial knowledge, should be significant and positive.

Results

Model Validity

Figure 2 shows the structural model obtained from the SEM analysis. This illustrates the relationships between the latent constructs of microfinance effectiveness (ME), digital financial knowledge (DFK), social capital (SC), and poverty alleviation (PA). Figure 2A in Appendix IV presents a similar model that incorporates traditional financial knowledge.

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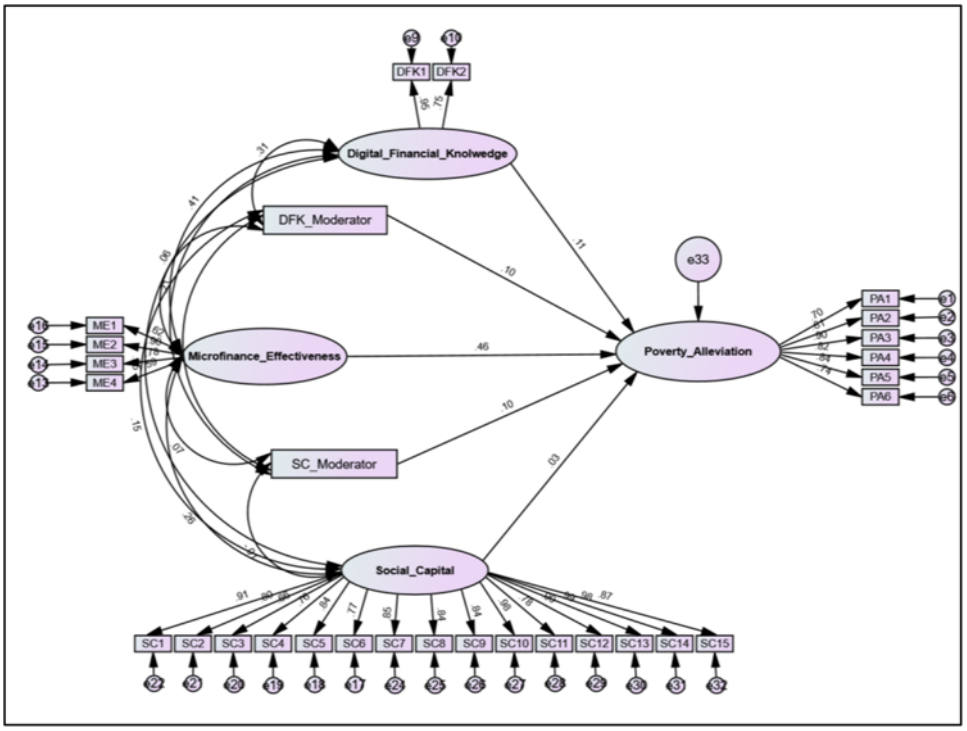


Figure 2. The structural equation model (SEM) with digital financial knowledge
Notes: DFK1 and DFK2 are the items in the survey related to Digital Financial Knowledge. ME1 to ME4 are the items in the survey related to microfinance effectiveness. SC1 to SC15 are the items in the survey related to social capital. PA1 to PA6 are the items in the survey related to poverty alleviation. Source: From the authors.

The arrows in Figures 2 and 2A show the direction and the strength of the connection among latent constructs, with higher values meaning stronger effects. The error term 'e33' illustrates the residual variance of the dependent variable (i.e., poverty alleviation). The direct and indirect relationships among the latent variables were statistically tested to confirm their significance. Furthermore, it is necessary to ensure that the estimated model fits well. In this regard, the SEM approach uses various goodness of fit indices to determine how the model fits the data sample. According to Kline (2011), there are three broad categories of model fit indices: absolute fit, parsimonious fit, and incremental fit. As shown in Table 10, including digital financial knowledge, all the considered fitness indices achieve the required thresholds,[4] indicating that the data and the model are reasonably well-matched. Table 9A (in Appendix V), including traditional financial knowledge, also shows the fitness of the model with the data sample.

SEM Results

The results for digital financial knowledge (DFK) are presented in Table 11. Similarly, Table 10A in Appendix V shows the results for traditional financial knowledge (FK). Table 11 shows that there is a significant and positive relationship between Microfinance Effectiveness (ME) and Poverty Alleviation (PA) ($\beta = 0.46$, p-value $= 0.000$). Furthermore, DFK has a significant and positive relationship with PA ($\beta = 0.11$, p-value $= 0.031$). Similarly, social capital is also significantly and positively related to poverty alleviation ($\beta = 0.09$, p-value $= 0.021$).

Table 11 shows the results of the moderating effect of DFK and social capital (SC) on ME, as determined by their interaction. The estimated interaction coefficient between ME and DFK is $\beta = 0.11$

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Table 10. SEM model fit statistics including digital financial knowledge

Goodness of fit indices	Structural model (conceptual framework)	Norms
X2	34.71	NA
X2/df	2.26	>1 and <5
GFI	0.88	≥0.90
AGFI	0.91	≥0.90
TLI	0.86	≥0.90
CFI	0.90	≥0.90
RMSEA	0.06	≥0.05
IFI	0.92	≥0.90

Notes: X2 = Chi-squared statistic, X2/df = Chi-Square to Degrees of Freedom Ratio, GFI = Goodness-of-Fit Index, AGFI = Adjusted Goodness-of-Fit Index, TLI = Tucker-Lewis Index, CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, IFI = Incremental Fit Index.
Source: Authors' calculations.

Table 11. The validity of the research hypotheses including digital financial knowledge

H	IV	Path	DV	Estimate	SE	C.R.	*P*-value
H1	ME	→	PA	0.46	0.06	7.61	0.000
H2	DFK	→	PA	0.11	0.03	2.17	0.031
	ME-DFK	→	PA	0.11	0.03	2.37	0.018
H3	SC	→	PA	0.09	0.03	2.31	0.021
	ME-SC	→	PA	0.03	0.052	0.75	0.453

Notes: H denotes hypothesis. H1, H2, and H3 denote the three hypotheses developed in second section. IV denotes independent variables. Path denotes the direction of the relationship. DV denotes the dependent variable. Column "Estimate" shows the results of the beta coefficients in Equations (1), (2), (3), and (4). Estimate (Std) denotes the standard deviation of the estimates. S.E. denotes standard errors. C.R. denotes Critical Ratio. P-value denotes the probability of the statistics of the significance test.

(p-value = 0.018). This shows that DFK significantly and positively moderates the relationship. In other words, greater DFK strengthens the positive relationship between ME and PA. This may be because more educated microfinance clients can make a better use of microfinance loans, thereby reducing their level of poverty. This finding is in line with that in previous studies, such as Hasan et al. (2021).

Although social capital is significantly related to poverty alleviation when considered as an independent variable (β = 0.09, p-value = 0.021), the estimated coefficient for its interaction with microfinance effectiveness (ME_SC) is not significantly different from zero (β = 0.03, ρ = 0.453). This important finding shows that SC does not significantly moderate the link between ME and PA. This result implies that SC can alleviate poverty independently of microfinance effectiveness. It suggests that the digital dimension of financial knowledge may be associated with an increased use of digital tools for connecting with others, leading to an increasing relationship between social capital and poverty alleviation.

As shown in Table 10A in Appendix V, incorporating traditional financial knowledge (FK) into the model leads to a positive relationship between ME and PA (β = 0.45, p-value = 0.000). Importantly, FK has a positive moderating effect on this relationship (β = 0.09, p-value = 0.022). However, the result regarding the moderating effect of SC is different. While SC is not significantly related to PA (β = 0.03, p-value = 0.554), it has a significant and positive moderating effect on the link between ME and PA (β = 0.06, p-value = 0.035). This result suggests that microfinance clients with a strong understanding of FK may not use digital tools to connect with other people. This may explain why social capital does not significantly alleviate poverty. Nevertheless, combining social capital with ME

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can further reduce poverty. In line with the findings in Table 11, Table 10A further shows that digital financial literacy can strengthen social connections and alleviate poverty, regardless of microfinance effectiveness.

Discussion

The results demonstrate that microfinance effectively alleviates poverty, considering a study sample of 500 microfinance clients in Pakistan, consistent with that of previous research by Hermes and Lensink (2011) and Tasos et al. (2020). Notably, the SEM results revealed that digital and traditional financial knowledge positively moderate the link between microfinance effectiveness and poverty alleviation. These results suggest that financial and digital financial knowledge enable microfinance clients to make a better use of microfinance loans, thereby increasing their income and decreasing their level of poverty (Samer, Majid, Rizal, Muhamad, & Rashid, 2015). This corroborates previous studies on the role of knowledge in improving financial conditions (Ginanjar & Kassim, 2019). Therefore, this study recommends equipping microfinance clients with both financial and digital knowledge to improve the efficiency with which microfinance alleviates poverty.

The moderating role of social capital is significant and positive when financial knowledge is incorporated into the model. However, this is not the case when digital financial knowledge is included. The same applies to the relationship between social capital and poverty alleviation, insignificant in the model with financial knowledge while being positive in the model with digital financial knowledge. This result is in line with that of previous studies by Wu (2024), Xu (2024), Antonietti et al. (2025), and Li and Huang (2025), which identified a positive moderating effect of social security and social capital. This important result leads us to make various observations. Firstly, there is a direct relationship between social capital and poverty alleviation in the context of digital finance. Digital tools facilitate social connections through digital social media, leading social capital to significantly influence poverty alleviation. However, the insignificant relationship between social capital and poverty alleviation when financial knowledge is included suggests that social capital alone is insufficient to influence poverty alleviation without a digital element. Therefore, optimizing the positive relationship between microfinance effectiveness and poverty alleviation would require optimizing both digital and physical social connections.

Another possible explanation for the difference in the moderating effect of social capital when digital financial knowledge is included in the model is how this knowledge is measured. The latter is constructed using two items: knowledge of credit cards and understanding the importance of timely bill payment. These items are therefore less related to the social dimension than the five items in the financial knowledge construct, which relate to controlling spending, financial planning, financial allocation for the family, insurance, and interest rates. This may explain why social capital does not moderate the relationship between microfinance effectiveness and poverty alleviation when digital financial knowledge is included in the model. It may also be because real social connections play a less important role for microfinance clients with digital financial knowledge as they rely on digital social connections instead. Consequently, one might infer that microfinance clients with digital financial knowledge would not seek advice from others when making financial decisions (Kumar, Pillai, Kumar, & Tabash, 2023).

These findings also raise questions about the effect of digital technologies on the effectiveness of microfinance. Previous studies showed that digital technologies can have a dual effect on microfinance effectiveness. On the one hand, they improve operational efficiency (Wijayanti et al., 2024). On the other hand, they also increase the likelihood of microfinance institutions drifting from their mission to reduce poverty (Bisht, Noronha, & Tripathy, 2025). Furthermore, Sebai and Bouzadi (2025) also identified FinTech's dual impact on microfinance institutions. On the one hand, FinTech improves operational efficiency, reduces costs, and increases access to financial services for microfinance clients. On the other hand, it raises issues such as cybersecurity and compliance risks.

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Therefore, alongside previous research, our results suggest that digital technologies are an effective tool to reduce poverty. However, to achieve this, it is important to consider the associated risks related to reduced social connection quality, microfinance institutions' mission drift, cybersecurity issues, and compliance issues.

Conclusion

This study examines the relationship between microfinance effectiveness and poverty alleviation, exploring the moderating effect of digital and traditional financial knowledge, as well as of social capital. With a sample of 500 microfinance clients in Pakistan, the empirical results demonstrate a significant positive relationship between the effectiveness of microfinance and poverty alleviation. Notably, both digital and traditional financial knowledge have a significant and positive moderating effect on the relationship between microfinance effectiveness and poverty alleviation. It therefore emphasizes the importance of providing microfinance clients with both financial and digital skills. Social capital, or connections with other people, also has an important role in microfinance effectiveness towards poverty alleviation. In addition, it also positively moderates the relationship between microfinance effectiveness and poverty alleviation when traditional financial knowledge is included in the model. However, when it comes to digital financial knowledge, this effect no longer exists. This important result suggests that digital financial knowledge may lead to stronger connections with other people through digital social media. Therefore, digital financial knowledge can lead to a stronger moderating influence, compensating the influence of social capital. This finding may help better understand the dual effect of digital technologies on poverty alleviation, positive on the one hand (e.g., Lechman & Popowska, 2022), and negative of the other hand (e.g., Dzator et al., 2023), through the channel effect of digital technologies on social capital.

The results of this study make contributions to knowledge on the role of digital technologies in alleviating poverty. Given the positive moderating effect of digital financial knowledge, we recommend that governments, non-governmental organizations (NGOs), and microfinance institutions continue to improve education programmes focusing on digital and financial literacy. This recommendation aligns with the findings of Si et al. (2024) that digital technology disrupts entrepreneurship and business models, creating new opportunities to alleviate poverty. Therefore, to capture the positive effects of digital technologies, it is important to understand the factors that determine individuals' level of digital financial knowledge. In this regard, Lyons and Kass-Hanna (2021) recommended considering the five dimensions which are 'basic knowledge and skills, awareness, practical know-how, decision-making, and self-protection.'

Furthermore, this study encourages microfinance institutions to use digital technologies to reduce poverty in emerging markets, such as Pakistan and China. Previous research showed that digital technologies have a dual effect on microfinance institutions. On the positive side, they can improve operational performance (Khanchel, Lassoued, & Khiari, 2025; Wijayanti et al., 2024). On the negative side, Bisht et al. (2025) found that digital technologies lead microfinance institutions to drift from their original purpose to reduce poverty, leading to a decreasing quality of services provided to the clients. Our results help understand this negative side because when digital financial knowledge is included in the model, social capital no longer has a positive moderating effect on microfinance effectiveness in poverty alleviation. Therefore, it is essential to understand and measure the effect of digital technologies on social connections of microfinance clients.

Finally, the study can be extended by including other emerging countries, such as China. However, the significant differences in digital technologies and microfinance between China and Pakistan need to be considered. Given China's advanced digital technologies, measures of digital financial knowledge need to be adapted for its population. Similarly, Pakistan's extensive microfinance landscape, which combines conventional and Islamic microfinance, is also an important difference with

https://doi.org/10.1017/mor.2025.10112 Published online by Cambridge University Press

China. Therefore, we recommend that future research considers specific characteristics related to each country.

Acknowledgements. The authors would like to thank Professor Xiao-Ping Chen, Editor-in-Chief, University of Washington, US, and Professor Steven Si, Guest Editor of the special issue on 'Digital Poverty Reduction through Entrepreneurship and Innovation', Commonwealth University of Pennsylvania, US, and Zhejiang University, China. We are very grateful to two anonymous reviewers whose comments helped us to significantly improve our manuscript through the two rounds of revision. We would also like to thank the respondents to our survey for their time and effort in completing the questionnaire. Any errors or omissions are the responsibility of the authors.

Data availability statement. The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/nsv53/files?view_only=fa26c6151c054ae28ab401ac4cc0066c

Notes

1. It is worth noting that these two dimensions were originally extracted from an initial survey primarily designed to measure the overall financial knowledge. When revising the article, we selected these two items to evaluate the digital financial knowledge of the 500 participants in the original data sample.
2. The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/nsv53/files?view_only=fa26c6151c054ae28ab401ac4cc0066c
3. Further information on each measure can be found in Table 6 and its associated footnote at the end of the article.
4. A model is considered fit if the chi-squared value is not significant and the p-value is greater than 0.05. Adequate model fit is indicated by an RMSEA (Root Mean Square Error of Approximation) value of 0.05 or greater. The GFI (goodness of fit index) indicates a good fit when its value is 0.9 or greater.

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https://doi.org/10.1017/mor.2025.10112 Published online by Cambridge University Press

APPENDICES

Appendix I: Questionnaire Used in the Survey

Part A: Socio-Demographics

Part A: Socio-Demographics

Gender ☐ Male ☐ Female

Age ☐ 18-23 ☐ 24-29 ☐ 30-35 ☐ 36-41 ☐ 42 & Above

Monthly Income ☐ < Rs/- 10000 ☐ 10000-15000 ☐ 15000-20000 ☐ 20000-25000 ☐ > 25000

Residential Area ☐ Rural Area ☐ Urban Area

Educational Level ☐ Illiterate ☐ Below Matric ☐ Matric ☐ Intermediate ☐ Bachelor ☐ Masters & Above

Marital Status ☐ Married ☐ Unmarried ☐ Divorced ☐ Widowed

Microfinance Type ☐ Islamic Microfinance ☐ Conventional Microfinance

In the bow below, tell me the loan amount you borrowed from your microfinance institution.

☐

Part B: Microfinance Effectiveness, Poverty Alleviation, Financial Knowledge, Digital Financial Knowledge, and Social Capital

Part B: Microfinance Effectiveness, Poverty Alleviation, Financial Knowledge, Digital Financial Knowledge, and Social Capital

Name of Microfinance Bank/NGO ☐

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Read each statement carefully and select the most suitable choice for you.
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Microfinance Effectiveness (ME)						
Please rate the following statements		SD	D	N	A	SA
ME1	Provides sufficient loan amount to run the business.	1	2	3	4	5
ME2	Provide operational assistance, which is helpful to run the business.	1	2	3	4	5
ME3	Loan is sufficient for the improvement of household appliances.	1	2	3	4	5
ME4	Loan repayment schedule is convenient.	1	2	3	4	5
Poverty Alleviation (PA)						
After receiving a microfinance loan, please rate the following statements.		SD	D	N	A	SA
PA1	Income has increased.	1	2	3	4	5
PA2	Better access to education.	1	2	3	4	5
PA3	Better access to healthcare.	1	2	3	4	5
PA4	Better financial situation of the family.	1	2	3	4	5
PA5	Employment opportunities have increased.	1	2	3	4	5
PA6	Improvement in the living standard of the family.	1	2	3	4	5
Digital Financial Knowledge (DFK)						
DFK1	I know the importance of timely bills payments.	1	2	3	4	5
DFK2	I know about credit cards.	1	2	3	4	5
Traditional Financial Knowledge (FK)						
Please rate the following statements		SD	D	N	A	SA
FK1	I know how to control my spending.	1	2	3	4	5
FK2	I know how to plan for my financial future.	1	2	3	4	5
FK3	I know how to provide for myself and my family.	1	2	3	4	5
FK4	I know about insurance.	1	2	3	4	5
FK5	I know about interest rates.	1	2	3	4	5
Social Capital						
SC1	How much importance do you give to the following people?	None	Few	Some	Most	All
	Your relatives	1	2	3	4	5
	People in your neighborhood	1	2	3	4	5
	Your friends/fellows	1	2	3	4	5
SC2	How many people do you keep in routine contacts?	None	Few	Some	Most	All
	Your relatives	1	2	3	4	5
	People in your neighborhood	1	2	3	4	5
	Your friends/fellows	1	2	3	4	5

(*Continued*)

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(*Continued.*)

Microfinance Effectiveness (ME)						
SC3	Among the people in each category, how many can you trust?	None	Few	Some	Most	All
	Your relatives	1	2	3	4	5
	People in your neighborhood	1	2	3	4	5
	Your friends/fellows	1	2	3	4	5
SC4	Who will help you upon your request?	None	Few	Some	Most	All
	Your relatives	1	2	3	4	5
	People in your neighborhood	1	2	3	4	5
	Your friends/fellows	1	2	3	4	5
SC5	When people in these categories are considered, how many possess the following assets/resources?	None	Few	Some	Most	All
	Certain political power	1	2	3	4	5
	Broad connections with others	1	2	3	4	5
	With a professional job	1	2	3	4	5

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https://doi.org/10.1017/mor.2025.10112 Published online by Cambridge University Press

Table 2A. Detailed descriptive statistics of the constructs' items

Items	Description	Min	Max	Mean	Standard Deviation	Skewness	Kurtosis
ME1	Provides sufficient loan amount to run the business	2	5	3.96	1.02	−0.47	−1.05
ME2	Provide operational assistance which is helpful to run the business	2	5	3.81	0.79	−0.32	−0.25
ME3	Loan is sufficient for the improvement of household appliances	2	5	3.98	0.89	−0.49	−0.58
ME4	Loan repayment schedule is convenient	1	5	3.63	1.16	−0.56	−0.54
PA1	Income has increased	2	5	3.51	0.95	−0.02	−0.91
PA2	Better access to education	2	5	3.75	0.92	−0.08	−0.96
PA3	Better access to healthcare	2	5	3.73	0.86	0.16	−1.01
PA4	Better financial situation of the family	2	5	3.80	0.96	−0.38	−0.81
PA5	Employment opportunities have increased	2	5	3.58	0.97	−0.11	−0.95
PA6	Improvement in the living standard of the family	1	5	3.87	1.04	−0.64	−0.05
DFK1	I know the importance of timely bills payments	1	5	2.84	1.08	0.63	−0.49
DFK2	I know about credit cards	1	5	2.94	0.91	0.42	0.62
FK1	I know how to control my spending	1	5	3.10	0.96	0.17	0.02
FK2	I know how to plan for my financial future	1	5	3.08	1.01	0.37	−0.04
FK3	I know how to provide for myself and my family	1	5	3.01	1.06	0.47	−0.34
FK4	I know about Insurance	1	5	2.74	0.95	0.68	0.05
FK5	I know about interest rates	1	5	2.32	1.41	0.56	−0.99
SC1	How much importance do you give to the following people?	2	5	3.17	0.67	−0.08	−0.67
SC2	How many people do you keep in routine contact?	2	5	3.09	0.67	0.44	0.41
SC3	Among the people in each category, how many can you trust?	2	5	3.18	0.67	−0.12	−0.67
SC4	Who will help you upon your request?	2	5	3.15	0.72	−0.19	−0.83
SC5	When people in these categories are considered, how many possess the following assets/resources?	2	5	3.19	0.74	−0.08	−1.09

Notes: ME = Microfinance Effectiveness, PA = Poverty Alleviation, DFK = Digital Financial Knowledge, FK = Traditional Financial Knowledge, SC = Social Capital, N = 500

Appendix II: The Model with Traditional Financial Knowledge

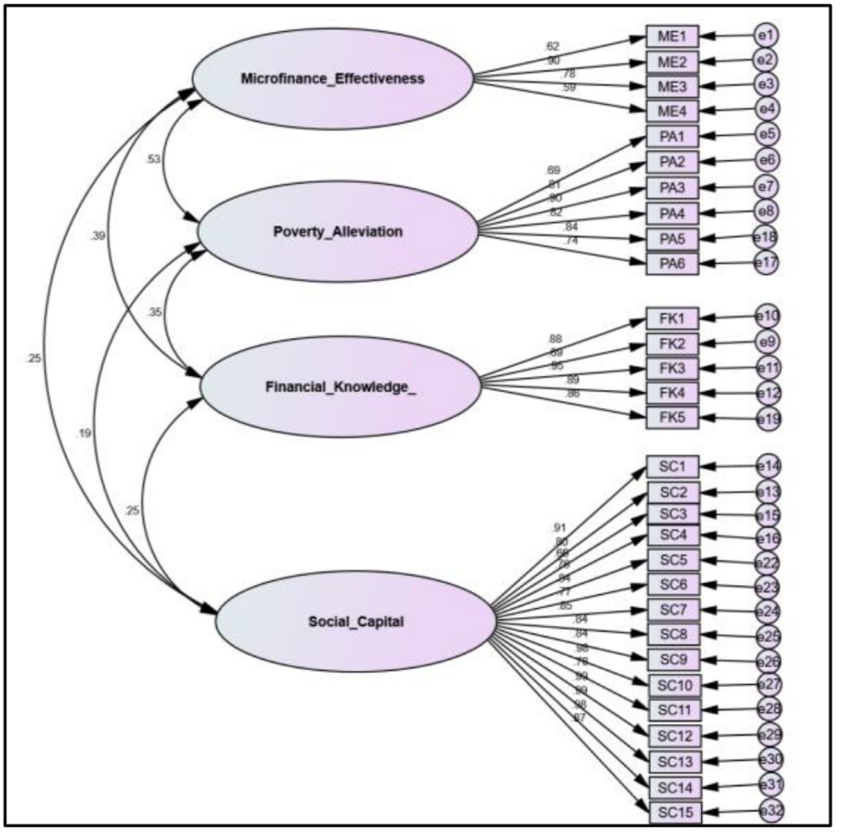


Figure 1A. The constructs' measurement model with traditional financial knowledge
Notes: This figure shows the model to measure the four variables in the model with Traditional Financial Knowledge. ME1 to ME4, PA1 to PA6, FK1 to FK5, and SC1 to SC15 correspond to the questions in the survey (see Appendix 1 for more details. 'e1' to 'e32' represent measurement errors The numbers on the arrows represent factor loadings
Source: From the authors.

Appendix III: The Validity of the Variables including Traditional Financial Knowledge

Table 7A. Discriminant validity with traditional financial knowledge (with the Fornelle and Larcker (1981) method)

	ME	PA	FK	SC
ME	**0.74**			
PA	0.53***	**0.81**		
FK	0.39***	0.35***	**0.89**	
SC	0.26***	0.19***	0.25***	**0.86**

Notes: According to Fornell and Larcker (1981).
**Correlation is significant at the 0.01 level (2-tailed), ME = Microfinance Effectiveness, PA = Poverty Alleviation, FK = Traditional Financial Knowledge, SC = Social Capital. Source: Authors' calculations.

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Table 8A. Discriminant validity with traditional financial knowledge (with the $HTMT_{0.85}$ criterion)

	ME	PA	FK	SC
ME	**0.85**			
PA	0.547	**0.85**		
FK	0.430	0.364	**0.85**	
SC	0.277	0.243	0.312	**0.85**

Notes: According to the $HTMT_{0.85}$ criterion. ** Correlation is significant at the 0.01 level (2-tailed), ME = Microfinance Effectiveness, PA = Poverty Alleviation, FK = Traditional Financial Knowledge, SC = Social Capital. *Source*: Authors' calculations.

Appendix IV: The SEM with Traditional Financial Knowledge

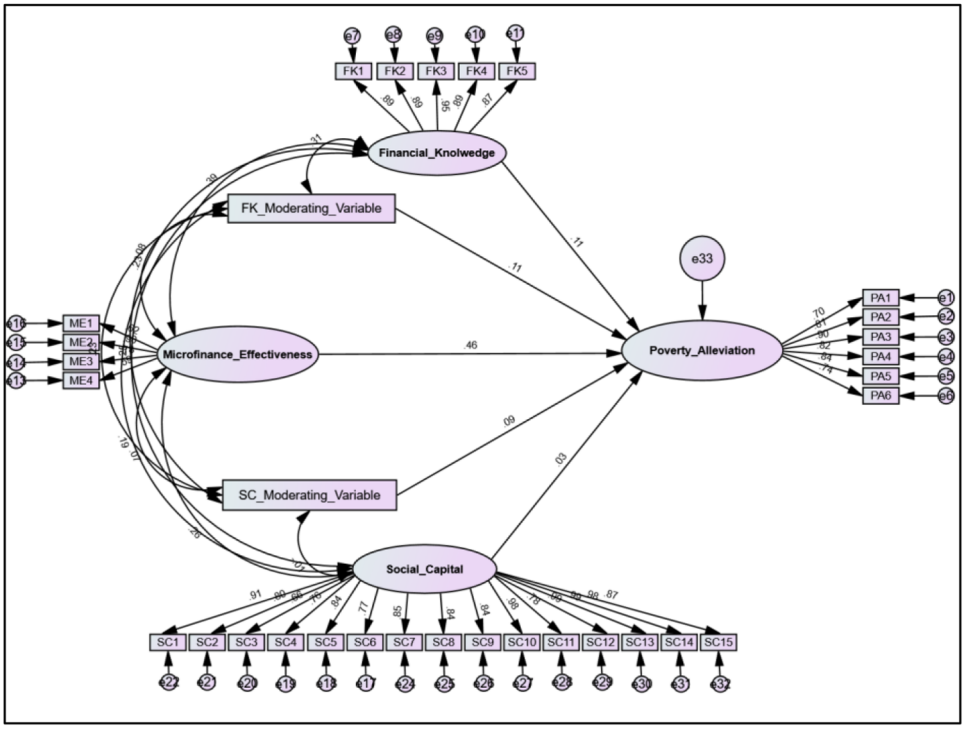


Figure 2A. The structural equation model (SEM) with traditional financial knowledge
Notes: FK1 to FK5 are the items in the survey related to traditional financial knowledge. ME1 to ME4 are the items in the survey related to microfinance effectiveness. PA1 to PA6 are the items in the survey related to poverty alleviation. FK1 to FK5 are the items in the survey related to social capital. SC1 to SC15 are the items in the survey related to social capital.
Source: From the authors

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Appendix V: The SEM Results including Traditional Financial Knowledge

Table 9A. SEM model fit statistics with traditional financial knowledge

Goodness of Fit Indices	Structural Model (Conceptual Framework)	Norms
X2	36.911	NA
X2/df	2.32	>1 and <5
GFI	0.912	≥ 0.90
AGFI	0.821	≥ 0.90
TLI	0.889	≥ 0.90
CFI	0.921	≥ 0.90
RMSEA	0.056	≥ 0.05
IFI	0.910	≥ 0.90

Notes: X2 = Chi-squared statistic, X2/df = Chi-Square to Degrees of Freedom Ratio, GFI = Goodness-of-Fit Index, AGFI = Adjusted Goodness-of-Fit Index, TLI = Tucker-Lewis Index, CFI = Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, IFI = Incremental Fit Index.
Source: Authors' calculations.

Table 10A. The validity of the research hypotheses with traditional financial knowledge

H	IV	Path	DV	Estimate	Estimate (Std)	S.E.	C.R	P-Value
H_1	ME	→	PA	0.45	0.46	0.06	7.74	0.000
H_2	FK	→	PA	0.09	0.11	0.04	2.29	0.022
	ME-FK	→	PA	0.08	0.11	0.03	2.61	0.009
H_3	SC	→	PA	0.03	0.03	0.05	0.59	0.554
	ME-SC	→	PA	0.06	0.09	0.03	2.11	0.035

Notes:: H denotes hypothesis. H1, H2, and H3 denote the three hypotheses developed in section 2. IV denotes independent variables. Path denotes the direction of the relationship. DV denotes the dependent variable. Column Estimate shows the results of the beta coefficients in Equations (1), (2), (3), and (4). Estimate (Std) denotes the standard deviation of the estimates. S.E. denotes standard errors. C.R. denotes Critical Ratio. P-value denotes the probability of the statistics of the significance test.

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Cite this article: Nadeem, M. A., Akhter, W., & Hoang, T. H. V. 2026. Does Digital Financial Knowledge Participate in Poverty Alleviation? A Moderating Study with Microfinance in Pakistan. *Management and Organization Review*, **22**(4): 833–859. https://doi.org/10.1017/mor.2025.10112

https://doi.org/10.1017/mor.2025.10112 Published online by Cambridge University Press