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From Financial Literacy to Financial Inclusion: Mediating Role of Digital Financial Innovation among University Students

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Abstract

Purpose: Grounded in the Theory of Planned Behavior and financial literacy theory, this study examined the influence of financial literacy on financial inclusion through the mediating role of digital financial innovation.

Design/methodology/approach: Using a survey design, cross-sectional data were collected from 389 university students conveniently in Kathmandu Valley. The data were analysed using PLS-SEM.

Findings: The findings revealed that financial literacy significantly influences both financial inclusion and digital financial innovation. Likewise, digital financial innovation exerts a significant positive effect on financial inclusion and significantly mediates the relationship between financial literacy and financial inclusion.

Conclusion: The findings underline the important role of financial literacy in shaping university students' attitudes and engagement with digital financial innovation while contributing to financial inclusion.

Implications: Practically, the findings can inform universities, banks, fintech providers, and regulators seeking to build financially capable and digitally included young adults.

Originality/value: This study contributes by providing evidence from a developing-country university context on the role of financial literacy in advancing financial inclusion in the digital era

JEL Classification: D14, G2, G51, G53, O33

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Introduction

Financial inclusion (FI) has moved from being a narrow banking objective to a central development priority because it shapes how individuals save, borrow, invest, absorb shocks, and participate in the formal economy (Kuada, 2019). The policy relevance of inclusion has grown further in the digital era, where access to financial services increasingly depends not only on physical banking infrastructure but also on the capacity to navigate digital platforms, payment systems, and app-based financial products. Globally, account ownership rose from 51% in 2011 to 76% in 2021 (Nugroho & Sugiyanto, 2020), while in developing economies it increased from 63% to 71% over the same period; moreover, 64% of adults worldwide made or received a digital payment in 2021 (Demirauc-kunt et al., 2021), showing that digital channels are now central to the inclusion agenda. Yet access alone does not guarantee meaningful inclusion. Individuals must also possess the knowledge, judgment, and confidence required to evaluate financial products, manage risk, and use digital tools safely and effectively (Nepal et al., 2023). This makes financial literacy (FL) a foundational capability for inclusive finance.

The importance of FL is particularly visible among university students, who are entering adulthood at a time when financial decisions are becoming more complex and increasingly digital. Students today must manage tuition payments, digital wallets, mobile banking, online purchases, savings, and sometimes credit for the first time, often without structured financial education (Barus et al., 2024). This matters because university years are a formative period in which financial habits, attitudes toward debt, saving discipline, and technology-enabled payment behavior begin to solidify. Although young adults are often assumed to be digitally competent, digital familiarity does not automatically translate into financial capability. Recent international evidence continues to show that many adults, and especially younger users of digital finance, lack the knowledge and skills needed to use financial products safely and responsibly; the OECD/INFE survey reports persistent gaps in financial knowledge, behavior, and attitudes across countries, while OECD commentary on youth in the digital age highlights growing use of online payments and digital financial services without a commensurate rise in financial capability (Atkinson & Messy, 2013; OECD, 2026). For university students, therefore, FL is not simply a desirable life skill; it is a prerequisite for effective participation in a rapidly digitizing financial system.

This issue has become more salient because digital financial innovation (DFI) is transforming the architecture of FI. Mobile banking, QR payments, e-wallets, platform-based payments, app-based savings tools, and embedded finance have reduced the cost and distance barriers that traditionally excluded young people and low-income users from formal finance (Shakya & Karki, 2025). In developed economies, policy initiatives such as open banking, digital consumer protection, and financial education frameworks have tried to align digital innovation with responsible inclusion (Agbeve et al., 2025). In developing economies, digital platforms have often served as the first entry point into formal finance, particularly where branch networks are thin and transaction costs are high (Putrevu & Mertzanis, 2024). The World Bank's Findex evidence shows that digital payments are now one of the fastest-growing channels through which FI is expanding in developing countries (World Bank Group, 2021). However, the benefits of DFI are unevenly distributed: users who do not understand fees, privacy risks, fraud exposure, digital credit terms, or the functional value of financial apps may remain formally connected yet functionally excluded. This suggests that the inclusion effects of digital finance depend partly on whether users possess sufficient FL to adopt and use such innovations meaningfully.

The Nepalese context makes this relationship especially important. Nepal has made visible progress in financial-sector modernization through branchless banking, mobile banking, digital wallets, QR-based payments, and payment-system reforms led by Nepal Rastra Bank (NRB; Adhikari & Chapagain, 2024). At the same time, FI remains incomplete and uneven. World Bank's Global Findex Database 2021 indicates that 67.3% of adults in Nepal had an account at a formal financial institution, meaning a substantial segment of the population remained outside formal finance or underused available services (Demirauc-Kunt et al., 2022).

Nepal's broader digital transition has accelerated since the COVID-19 period, with digital payments, online commerce, and mobile-based financial transactions becoming increasingly normalized (Dawadi et al., 2026). For university students, this shift is especially consequential: they are among the most active users of smartphones, internet-based services, online shopping, and digital payment applications, and they are likely to become long-term users of formal financial services. Yet this same group may face a paradox. They are technologically connected but not necessarily financially informed; they may be able to operate a wallet app or banking interface without fully understanding budgeting, digital credit, fraud risk, investment choices, or long-term financial planning. Such a mismatch can weaken the developmental promise of digital finance.

Despite the relevance of this issue, the empirical literature remains fragmented in three important ways. First, a substantial body of work links FL to savings, budgeting, investment behavior, and financial well-being, and another stream connects digital finance to broader financial inclusion (FI). However, far fewer studies explicitly examine how FL translates into FI through the mechanism of DFI, particularly among young adults. Second, most FI studies in developing countries focus on households, microentrepreneurs, women, rural users, or low-income communities (Saluja et al., 2023; Sherwani et al., 2024). These are important groups, but such emphasis has left university students relatively underexamined despite their strategic importance as future workers, consumers, borrowers, and investors. Third, evidence from Nepal remains limited and often concentrates on general banking behavior or broad inclusion challenges rather than on the student population's interaction with digital finance. As a result, we still know too little about whether financially literate students are more financially included because they are better able to adopt and use DFIs.

This study addresses that gap by examining the influence of FL on FI among university students, with DFI as a mediating mechanism. The model is theoretically and practically justified. FL can improve students' ability to understand financial products, evaluate digital payment options, compare costs, manage risks, and build trust in formal finance. Those capabilities should make students more willing and more able to use DFIs such as mobile banking, e-wallets, online transfers, and QR payments. In turn, greater use of such innovations should expand students' access to, usage of, and engagement with formal financial services, thereby strengthening FI. Accordingly, this study pursues three objectives: (1) to examine the effect of FL on FI among university students, (2) to assess the influence of FL on DFI and the effect of DFI on FI, and (3) to assess the mediating role of DFI in the FL–FI relationship.

Thus, the findings can inform universities, banks, fintech providers, and regulators seeking to build financially capable and digitally included young adults. For Nepal, where digital finance is expanding faster than formal financial capability, such evidence can support more targeted student-focused financial education, safer digital finance design, and inclusion policies that convert technological access into meaningful financial participation.

Literature Review

FL has been widely established as a significant determinant of FI across both developed and developing economies, improving individuals' access to formal financial services, savings behaviour, credit utilization, and overall financial decision-making (Bongomin et al., 2018; Grohmann et al., 2018; Koomson et al., 2020). Nevertheless, the magnitude of these relationships varies considerably across demographic and institutional contexts, suggesting that FL alone is insufficient to guarantee meaningful FI.

Second, recent scholarship increasingly recognizes DFI as a transformative force that expands financial access through mobile banking, digital wallets, internet banking, and fintech platforms (Morgan et al., 2019). However, the majority of studies investigate DFI either from an organizational or technological adoption perspective (Hussain & Papastathopoulos, 2022) rather than examining how it facilitates the translation of FL into financial inclusion at the individual level. Consequently, the behavioural mechanism connecting financial capability with DFI remains underexplored.

Third, despite growing interest in digital finance, empirical evidence integrating FL, DFI and FI within a single theoretical framework remains limited, particularly among university students in developing economies. Existing studies predominantly focus on households, banking customers, or cross-country populations, offering limited insights into young adults who represent the most active users of digital financial technologies (Bongomin et al., 2018; Grohmann et al., 2018; Karakurum-Ozdemir et al., 2019; Karakurum-Ozdemir et al., 2019). Moreover, the mediating role of digital financial innovation has received little empirical attention, despite its potential to explain how financially literate individuals transform knowledge into actual financial participation. Accordingly, this study addresses an important gap by examining DFI as a mediating mechanism between FL and FI among university students in Nepal.

Table 1: Empirical Review

Authors and Country	Research Focus	Theory/ Framework	Methodology	Key Findings
Guiso and Viviano (2015), Italy	Examined whether FL influences financial decision quality.	Market Efficiency Theory; CAPM	Survey of 1,576 banking clients; Regression analysis	FL significantly improved investment timing and rational financial decisions.
Fungáčová and Weill (2015), China	Investigated determinants of FI.	Financial Development/ Growth Theory	World Bank Global Findex; 150,000+ respondents across 148 countries; Probit regression	Education, income and age significantly influenced formal account ownership and savings behaviour.
Grohmann et al. (2018), Cross-country (143 countries)	Assessed the relationship between FL and FI.	Financial Literacy Theory; Theory of Planned Behavior	Instrumental Variable Regression using Global Findex data	FL consistently enhanced FI across countries despite institutional differences.
Bongomin et al. (2018), Uganda	Examined the relationship between FL and FI with cognition as a moderator.	Cognitive Theory; Financial Literacy Theory	Cross-sectional survey; 400 households; SEM	FL significantly improved FI, while cognition strengthened the relationship.
Karakurum-Ozdemir et al. (2019), 11 Middle-income Countries	Investigated financial capability and FI.	Financial Capability Perspective	Cross-country survey; Regression analysis	Education significantly improved financial capability, although FI effects varied across countries.
Koomson et al. (2020), Ghana	Evaluated FL training on FI.	Human Capital Theory	Randomized field experiment; 1,415 participants	FL training increased account ownership and savings, particularly among women.
Morgan et al. (2019), Asian Countries	Examined FL and DFI.	Financial Capability Theory	Cross-country survey; Econometric analysis	FL significantly increased digital financial service adoption and FI.

Lyons and Hanna (2021), Global Review	Reviewed digital financial capability literature.	Digital Financial Capability Framework	Systematic literature review	Digital financial capability complements FL in promoting financial well-being.
Hussain and Papastathopoulos (2022), UAE	Investigated determinants of digital financial innovation adoption.	Strategic Alignment Theory; Organizational Readiness Theory	Survey; 680 firms; PLS-SEM	Organizational readiness positively influenced digital financial innovation adoption.

Financial Innovation, Technology, and Inclusion among University Students

The rapid digital transformation of financial services has fundamentally reshaped how individuals' access, manage, and utilize formal financial products, making DFI an increasingly important enabler of FI. DFI refers to the application of digital technologies, including mobile banking, digital wallets, internet banking, electronic payment systems, and fintech applications, to deliver financial services more efficiently and accessibly (Mpofu, 2024; Shahen & Sharaf, 2025). Unlike traditional financial systems, digital financial services reduce geographical constraints, lower transaction costs, improve service accessibility, and facilitate real-time financial transactions, thereby extending formal financial services to previously underserved populations (Minarni, 2025). Consequently, DFIs have shifted the focus of FIs from merely expanding banking infrastructure to enhancing individuals' ability to participate actively in an increasingly digital financial ecosystem (Mittal et al., 2024; Tay et al., 2022).

The growing importance of DFI is evident from recent global trends. According to the World Bank Global Findex Database 2021, approximately 76% of adults worldwide owned a formal financial account, compared with 68% in 2017 and 51% in 2011, demonstrating remarkable progress in FI over the last decade (Demirgüç-Kunt et al., 2022). A significant proportion of this expansion has been driven by digital financial services. Globally, nearly two-thirds of adults reported making or receiving digital payments, while digital payment adoption in developing economies increased substantially following the expansion of mobile financial services and internet connectivity (Demirgüç-Kunt et al., 2022). Similarly, the Global System for Mobiles Communications Association reported that mobile money services are now available in more than 100 countries, processing transactions exceeding USD 1.6 trillion annually, illustrating the growing role of digital finance in improving financial accessibility, particularly in low- and middle-income economies.

Within this evolving financial landscape, university students represent one of the most important demographic groups for understanding the role of DFI in promoting FI. As digital natives, university students are among the earliest adopters of mobile banking, digital wallets, online payment platforms, and fintech applications (Akter et al., 2023). These technologies have transformed the way students manage tuition payments, receive allowances, conduct peer-to-peer transfers, save money, and increasingly participate in investment activities (Bermeo-Giraldo et al, 2023). However, technological familiarity should not be interpreted as financial capability. Despite high levels of digital technology adoption, empirical evidence consistently indicates that many university students possess inadequate FL, resulting in poor budgeting practices, excessive borrowing, insufficient savings, and limited long-term financial planning (Khalisharani et al., 2022; Kumar, 2025). Consequently, the availability of digital financial services alone does not guarantee meaningful FI unless students possess the knowledge and confidence necessary to use these services responsibly and effectively.

Existing empirical studies increasingly support the complementary relationship between FL and DFI. Minarni (2025) found that mobile financial services significantly improved FI by encouraging greater participation in savings and financial transactions. Similarly, Koskelainen et al. (2023) demonstrated that

financially literate individuals are substantially more likely to adopt digital financial services because they better understand financial products, perceive lower transaction risks, and exhibit greater confidence in digital financial platforms. Bhat et al. (2025) and Sharma and Priya (2025) further argued that digital financial capability, combining FL with digital competence, has become essential for achieving financial well-being in increasingly technology-driven financial markets. Collectively, these findings suggest that DFI should not be viewed merely as a technological infrastructure but rather as an enabling mechanism through which FL is translated into effective financial participation.

Recognizing the transformative potential of digital finance, governments and regulatory institutions worldwide have adopted policies promoting digital FI. The G20 High-Level Principles for Digital FI emphasize digital technologies as critical instruments for expanding equitable access to financial services while promoting consumer protection, financial capability, and responsible innovation (G20 Global Partnership for Financial Inclusion, 2016). Likewise, the OECD (2020) advocates integrating financial education with digital financial capability to ensure individuals can effectively navigate increasingly sophisticated financial products. In Nepal, NRB's Financial Inclusion Strategy (2023–2028) identifies digital financial services as a strategic priority for expanding formal financial access through mobile banking, branchless banking, digital wallets, QR-based payment systems, and interoperable digital payment infrastructure. According to NRB (2025), the number of mobile banking users, digital wallet transactions, and electronic payment volumes has increased substantially over recent years, reflecting the country's accelerating digital financial transformation. Nevertheless, disparities in financial literacy and digital capability continue to constrain effective utilization of these services, particularly among young adults.

Research Model

Financial innovation, FL, and DFI are multidisciplinary fields and are mostly influenced by theories from several disciplines such as economics, psychology, finance, sociology, and technology. Likewise, for a better understanding and analysis of behaviors linked to our research topic, concepts from several theories such as the Theory of Planned Behavior (TPB), financial literacy theory, and UTAUT were explicitly reviewed.

This study is grounded in Financial Literacy Theory and the TPB to explain financial inclusion among university students in the digital era. Financial Literacy Theory provides the primary foundation for the model by explaining FL (Potrich et al., 2016) as the predictor variable, as students with stronger financial knowledge, skills, and awareness are more capable of understanding financial products, making sound financial decisions, and participating in formal financial services. In turn, TPB best explains the behavioral mechanism underlying the adoption of DFI, as students' attitudes, perceived control, and readiness to use digital financial services shape their engagement with mobile banking, e-wallets, and other digital financial platforms (Tandilino et al., 2025). Accordingly, DFI is positioned as a mediating variable, linking students' financial knowledge with their actual inclusion in formal financial systems. The integration of these two theories strengthens the research model by combining a capability perspective with a behavioral perspective, thereby offering a more comprehensive explanation of how FL is translated into FI. While Financial Literacy Theory explains the direct influence of FL on FI, TPB clarifies how financially literate students are more likely to adopt DFIs, which in turn enhance access to and usage of financial services.

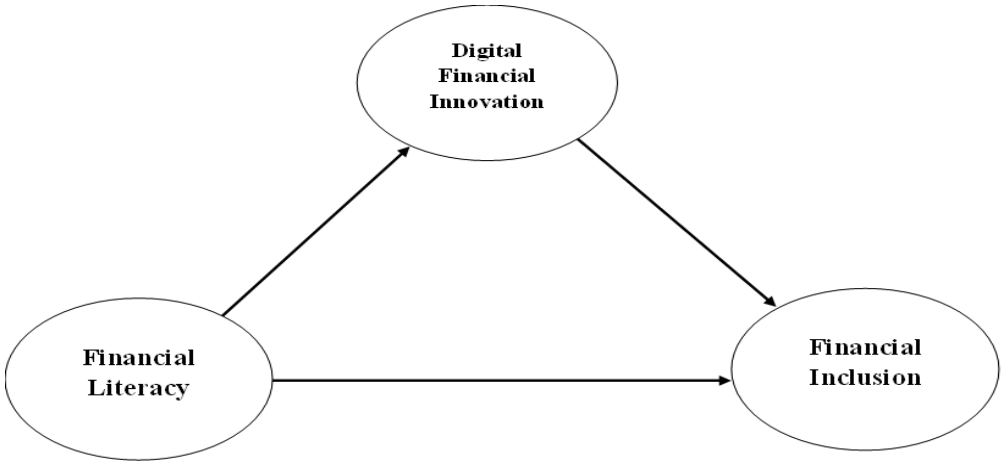


Figure 1: Research Model

Financial Literacy and Financial Inclusion

FL is widely regarded as a foundational driver of FI because it enhances individuals' ability to understand financial products, assess alternatives, and make informed decisions regarding saving, borrowing, and financial planning (Das, 2024; Ghimire et al., 2023; Thapa & Paudel, 2025). Beyond mere awareness, it develops the competence required to navigate formal financial systems and to use available services in a meaningful and sustained manner. This relationship is particularly relevant in the context of university students, who are increasingly required to manage bank accounts, digital payments, budgeting, and other financial responsibilities while transitioning toward financial independence (Al-Smadi, 2023). Students with stronger FL are better positioned to recognize the benefits, costs, and procedures associated with formal financial services, which increases both their confidence in and engagement with the financial system (Lusardi & Mitchell, 2014; Rodriguez-Correa et al., 2025). In contrast, limited financial knowledge may restrict their ability to evaluate financial options effectively, thereby constraining participation even when services are available (Hussain et al., 2018). Accordingly, FL can be expected to strengthen FI by converting financial awareness into informed financial participation and sustained service usage.

H1: FL has a significant positive influence on FI among university students.

Financial Literacy and Digital Financial Innovation

FL plays a crucial role in fostering DFI by equipping individuals with the knowledge and confidence required to understand, evaluate, and use emerging digital financial services (Pandey et al., 2026). In the contemporary financial landscape, innovation is not limited to the supply of new technologies such as mobile banking, e-wallets, QR payments, and online financial platforms; its value also depends on users' ability to adopt and utilize these tools effectively (Ungratwar et al., 2025). This linkage is particularly important in the case of university students, who are highly exposed to digital technologies and increasingly rely on app-based financial services for payments, transfers, savings, and day-to-day money management. Students with stronger FL are more likely to appreciate the usefulness, convenience, and potential benefits of digital financial tools, which enhances their readiness to adopt such innovations (Felimban & Alzahrani, 2025). By contrast, inadequate financial knowledge may create uncertainty about digital transactions, fees, risks, and service functionality, thereby limiting the uptake of digital financial solutions (Al-Okaily et al., 2023). Accordingly, FL can be expected to stimulate DFI by enabling university students to engage more confidently and effectively with emerging digital financial services.

H2: FL has a significant positive influence on DFI among university students.

Digital Financial Innovation and Financial Inclusion

DFI is increasingly recognized as a key enabler of FI because it reduces the physical, cost, and procedural barriers that often limit access to formal financial services (Mpofu, 2024). By offering services through mobile banking, e-wallets, QR payments, and online financial platforms, digital innovation expands the reach of the financial system beyond conventional branch-based channels and enables faster, more convenient, and more affordable transactions (Alnafrah & Mouselli, 2025). This relationship is especially relevant for university students, whose financial activities are becoming progressively integrated with smartphones, digital payments, and app-based financial services. For students, DFI can simplify everyday financial practices such as receiving funds, making payments, saving, and managing transactions, thereby strengthening their participation in formal finance (Agrawal et al., 2026). Moreover, the accessibility and convenience associated with digital financial services can encourage more frequent usage of formal financial products, even among those who may face time, distance, or procedural constraints in traditional banking environments (Shaikh et al., 2023). Accordingly, DFI is expected to enhance FI by translating technological accessibility into greater financial access, usage, and engagement within the formal financial system.

H3: DFI has a significant positive influence on FI among university students.

Mediating Role of Digital Financial Innovation

DFI provides the operational pathway through which FL can be translated into FI by converting financial knowledge into actual usage of formal financial services (George, 2024; Zaimovic et al., 2025). Financially literate individuals are better able to understand the value, functionality, and risks of digital financial tools such as mobile banking, e-wallets, and online payment platforms, which increases their likelihood of adopting and using these innovations (El Amri et al., 2026). This mechanism is particularly relevant for university students, who are highly exposed to digital technologies and increasingly rely on app-based financial services for everyday financial activities. Through DFI, financially literate students can access, manage, and utilize financial services more conveniently, efficiently, and confidently, thereby strengthening their inclusion in the formal financial system. Accordingly, DFI innovation acts as a key mechanism by linking students' financial knowledge with their actual financial participation, as FL encourages the adoption of digital financial services, which in turn enhances FI (Muat et al, 2026; Zaimovic et al., 2025).

H4: DFI mediates the relationship between FL and FI among university students.

Research Methods

The study employed a survey design, following a post-positivist approach to examine the causal relationship between the study variables. Kathmandu Valley was chosen for its unique attributes that significantly contribute to the robustness and applicability of the study. Kathmandu Valley was selected as the study area because it is Nepal's leading hub for digital financial services, with a high concentration of financial institutions, fintech companies, and advanced digital infrastructure. Additionally, the presence of numerous universities and colleges provides access to a diverse population of university students, making it an appropriate setting for the study.

Despite the focus on a specific stratum of individuals, sample frame consisting of a comprehensive list of the population was not available; a non-probability sampling method was used. Likewise, the sample size was determined using Cochran's (1977) formula at a 95% confidence level and a 5% margin of error, resulting in a minimum required sample size of 384 respondents.

Structured survey questionnaires were administered through Google Forms. Data were collected from September to November, 2025. Assuming the average response rate of 60%, the number of questionnaires to be distributed = Desired number of responses/Expected response rate (i.e., 384/.60) = 640. Therefore, the researcher distributed 640 questionnaires to achieve 384 responses with an expected response rate of 60%.

A pilot study involving 30 respondents was conducted before the main survey to evaluate the reliability and clarity of the questionnaire, following the recommendation of Nunnally (1978). The results showed that all constructs achieved Cronbach's alpha values above the recommended threshold of .70, and participants reported no notable difficulties in understanding the questionnaire items.

Similarly, of the 640 questionnaires distributed through different channels, 410 were received; 21 printed responses were incomplete, filled in randomly, and had to be excluded. The remaining 389 responses were deemed usable, representing a good response rate of 60.78%.

Descriptive analysis was conducted with the help of SPSS version 23, while inferential analysis was carried out with the help of SmartPLS 4.0. Since the study is grounded on well-established reflective measures, the model was classified as reflective. Following the two-stage analytical procedure (i.e., test of measurement and structural model) as suggested by Anderson and Gerbing (1988), PLS-SEM was utilized in PLS-SEM to evaluate the psychometric properties of the scales.

Measures and Instruments

The study adapted a widely used pre-existing scale. Since the scales were developed in different countries, the constructs underwent a revalidation, with subtle minor adjustments to ensure contextual consistency in the context of the Nepalese analysis. Similarly, the assessment of all the observed statements was constructed using a 5-point Likert scale, indicating their level of agreement, 1 being "Strongly Disagree" and 5 being "Strongly Agree".

Table 2 : Measures and Instruments

Constructs/ Dimension	Number of Observed items and Adopted From	Scale	Sample
Financial Literacy (FL)			
Knowledge	8 observed items adopted from (Bongomin et al., 2018)	5 Point Likert Scale	"I am aware of the financial risks."
Skill	7 observed items adopted from (Bongomin et al., 2018)		"I can prepare a personal budget."
Attitude	7 observed items adopted from (Bongomin et al., 2018)		"I am always interested in financial matters."
Behavior	7 observed items adopted from (Bongomin et al., 2018)		"I always read the terms and conditions on use of financial products/services."
Financial Inclusion (FI)	10 observed items adopted from ((Bongomin et al., 2018)		"There are many financial services delivery channels available."
Digital Financial Innovation (DFI)	7 items were adopted from (Hussain & Papastathopoulos, 2022)		"The quality of our digital financial solutions is superior."

Result and Analysis

Socio-Demographic Profile

Table 3 demonstrates the demographic profile of the 389 respondents. Male respondents constituted 56.81% (n = 221) of the sample. In terms of age group, the respondents were primarily young adults within 18 to 29 years (31.36% + 31.88% = 63.24%). Regarding educational qualifications, 47.56% of the respondents held a graduate degree, while a slightly larger proportion (52.44%) had completed postgraduate education. Respondents were asked, "Do you use digital financial services (like: Mobile Banking, Internet Banking,

E-Sewa, Khalti, POS, Fonepay, etc.) offered by Nepalese Banks?" All the respondents agreed that they use such digital financial services offered by Nepalese banking institutions.

Table 3 : Socio-Demographic Profile of the Respondents

Variables	Category	Frequency	Percentage (%)
Gender	Male	221	56.81
	Female	168	43.19
Age	18–23 years	122	31.36
	24–29 years	124	31.88
	30–34 years	98	25.19
	35 years or above	45	11.57
Education	Graduate	185	47.56
	Postgraduate	204	52.44
Use of Digital Financial Services	Yes	389	100
	No	0	0

Descriptive Analysis

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of Sphericity were employed to assess the adequacy and suitability of the dataset. The KMO value was found to be .818, indicating a high level of suitability for factor analysis and suggesting a dataset containing substantial common variance among the variables. Likewise, Bartlett's test of sphericity yielded a statistically significant result ($p < 0.05$), indicating data set are not unrelated and has a factorable correlation matrix. Therefore, the dataset satisfied the assumptions for factor analysis.

The mean score for each construct falls between 3.088 (FI) and 3.522 (DFI), indicating slight positive responses or sentiments towards all the constructs. Also, the standard deviation for all constructs ranges from .596 (FL) to .849 (FI), suggesting a moderate level of variability in responses. Here, a lower standard deviation of FL, DFI, and FI indicates that the responses are more clustered around the mean value, while the higher standard deviation of TR indicates that the responses are more spread out. Likewise, the skewness values for all the constructs range from -.881 to -.495, falling within the accepted range of -1 to +1, as cited by Hair et al. (2019), indicating a generally symmetrical distribution across the dataset. However, the kurtosis value ranges from .286 to 1.725, indicating slight deviation from the normal distribution, although still within the acceptable range of -3 to + 3 as recommended by Kline (2016). Therefore, both the skewness and kurtosis values are within the predetermined limits; the normal distribution has been satisfied, indicating the data are suitable for further statistical analysis.

Statistically, Harman's single-factor test revealed that no single factor explained most of the covariance (i.e., 31.873% of variance below the cut-off value of 50%), suggesting that common method bias is not a notable concern within this model. Further evidence that the model is not impacted by common method bias is provided by the full collinearity test, where the variance inflation factor (VIF) is less than 3.3 (Kock, 2015).

Table 4 : Descriptive Statistics and Normality Test

Constructs	Mean	Standard Deviation	Skewness	Kurtosis
Financial Literacy (FL)	3.249	.596	-.547	1.181
Attitude (ATT)	3.266	.815	-.495	.652
Knowledge (KNW)	3.280	.811	-.664	.534
Skills (SKL)	3.320	.778	-.669	.920
Behavior (BEH)	3.129	.818	-.737	.848
Digital Financial Inclusion (DFI)	3.522	.754	-.881	1.725
Financial Inclusion (FI)	3.088	.849	-.562	.286

Measurement Model

To assess the reflective measurement model, the study employed the method suggested by Hair et al. (2019) to assess the measurement model using multiple tests, including standardized factor loading (SFL), internal consistency, content validity, convergent, and discriminant validity, with a focus on the unidirectional predictive relationships between each latent underlying construct and its observed indicators. The study included three reflective constructs with 50 items. According to Sarstedt et al. (2021) and Hulland (1999), the general rule of thumb is to retain the observed items whose loading falls between .40 and .70. The reliability of individual items was evaluated by looking at the outer loading of the measures (items) of each construct (Hair et al., 2014), where the standardized factor loading for each observed item present in the study fulfilled the cut-off criterion of .70.

As seen in Table 5, 42 observed items showed significant loadings onto their respective latent constructs, while six items across all variables were removed from the sample due to low factor loadings. Similarly, the Cronbach's alpha (CA) and composite reliability (CR) values were used to evaluate the internal consistency; these values were more than the standard of .70, indicating the internal consistency of the measures (Cohen, 2013; Hair et al., 2019). Similarly, AVE is also higher than .50, ensuring convergent validity, as Fornell and Lacker (1981) assert that for the presence of convergent validity, the value should be greater than .50

Table 5 : Measurement Model Analysis

Constructs	Observed Items	SFL	Cronbach's Alpha	Composite Reliability	AVE
Attitude	ATT_2	.751	.854	.812	.536
	ATT_3	.844			
	ATT_4	.821			
	ATT_5	.769			
	ATT_6	.811			
	ATT_7	.839			
Behavior	BEH_1	.719	.869	.826	.737
	BEH_3	.781			
	BEH_4	.798			
	BEH_5	.792			
	BEH_6	.849			

Knowledge	KNW_1	.826	.835	.847	.719
	KNW_2	.866			
	KNW_3	.846			
	KNW_4	.821			
	KNW_5	.854			
	KNW_6	.832			
	KNW_7	.864			
Skills	SKL_1	.785	.908	.928	.684
	SKL_2	.838			
	SKL_3	.875			
	SKL_4	.841			
	SKL_5	.886			
	SKL_6	.858			
Digital Financial Innovation	DFI_1	.833	.891	.917	.649
	DFI_2	.887			
	DFI_3	.876			
	DFI_4	.889			
	DFI_6	.769			
	DFI_7	.741			
Financial Inclusion	FI_1	.733	.889	.913	.612
	FI_2	.784			
	FI_3	.825			
	FI_4	.766			
	FI_5	.851			
	FI_9	.841			
	FI_10	.748			

Note(s). In the first-order construct, one item of Skill (SKL_7), one item of Attitude (ATT_1), one item of Digital Financial Innovation (DFI_5), and three items of Financial Literacy (FI_6, FI_7, and FI_8) were dropped due to low factor loading issues.

Discriminant validity entails concept distinctiveness, which is evaluated by using the Fornell-Larcker criterion, Heterotrait–Monotrait Ratio (HTMT), and cross-loading as suggested by Hari et al. (2019). The Fornell-Larcker criterion evaluates discriminant validity by assessing each latent variable's square root of the Average Variance Extracted (AVE). Based on this criterion, the square root of AVE of each latent variable should exceed its correlation with any other latent variable. The findings validated that the square root of AVE for each latent variable exceeds its correlation with other variables (see Table 6). In contrast, Henseler et al. (2015) contend that although the classic Fornell-Larcker criterion method has gained widespread acceptance, its unacceptable poor sensitivity leads them to recommend employing a different, more contemporary approach such as HTMT.

Table 6 : Fornell-Larcker Test

	ATT	FI	BEH	DFI	KNW	SKL
ATT	**.778**					
FI	.565	**.765**				
BEH	.438	.519	**.827**			
DFI	.376	.376	.371	**.836**		
KNW	.453	.418	.363	.328	**.828**	
SKL	.473	.560	.276	.242	.441	**.817**

The analysis of correlation using the HTMT approach was established by Henseler et al. (2015) in order to find a reliable criterion for the validation of discriminant validity. High HTMT values indicate potential issues with discriminant validity, with a threshold set at .85 for constructs that are conceptually distinct in the path model, and .90 for constructs that are closely related in concept. For this study, a more stringent HTMT criterion of .85 was employed. As shown in Table 7, each HTMT ratio satisfied the suggested threshold of .85, signifying the determination of discriminant validity.

Moreover, in order to validate discriminant validity, an item's outer loading within the parent construct needs to be higher than its cross loadings in any other construct. Since all the criteria of the measurement model have been fulfilled, it indicates that the measurement models adequate and does not have issues with cross-loadings.

Table 7 : HTMT Test

	ATT	FI	BEH	DFI	KNW	SKL
ATT						
FI	.660					
BEH	.473	.485				
DFI	.384	.416	.313			
KNW	.494	.464	.385	.369		
SKL	.524	.598	.299	.268	.439	

Structural Model

After establishing the adequacy of the measurement model, the structural model was assessed using a bootstrapping procedure with 10,000 resamples. The evaluation comprised coefficient of determination (R^2), effect size (f^2), predictive relevance (PLS-Predict/Q^2), and model fit, followed by hypothesis testing.

Predictive Relevance: The R^2 value reflects the proportion of variance in the endogenous constructs explained by the model and serves as an indicator of its explanatory power (Purwanto & Sudargini, 2021). Following Hair et al. (2021), R^2 values of .75, .50, and .25 indicate substantial, moderate, and weak explanatory power, respectively. In this study, the R^2 values for FI (.107) and DFI (.057) indicate weak explanatory power.

The effect size (f^2) was assessed to determine the contribution of each exogenous construct to the explained variance of the endogenous constructs. Based on the guidelines of Cohen (2013), the results indicate a small effect of financial literacy on digital financial innovation (f^2 = .060) and financial inclusion (f^2 = .088), while digital financial innovation exhibited a negligible effect on financial inclusion (f^2 = .011). Thus, the findings suggest that the exogenous constructs exert relatively weak effects on the endogenous constructs.

The Q^2 predictive values were used to assess the model's predictive relevance. As shown in Table X, the Q^2 values for DFI (.037) and FI (.062) are greater than zero, indicating that the model possesses adequate predictive relevance and satisfactory out-of-sample predictive capability (Henseler et al., 2015).

Given that all constructs were specified as reflective, model fit was assessed using the Standardized Root Mean Square Residual (SRMR), a widely recommended fit index for PLS-SEM (Dijkstra & Henseler, 2015; Hair et al., 2021). The SRMR value of .059 is below the recommended threshold of .08, indicating a good model fit.

Table 8 : Predictive Relevance of the Structural Model

Assessment	Construct / Relationship	Value	Benchmark	Interpretation
Coefficient of Determination (R^2)	DFI	.057	.25 = Weak; .50 = Moderate; .75 = Substantial	Weak explanatory power
	FI	.107		Weak explanatory power
Effect Size (f^2)	FL → DFI	.06	.02 = Small; .15 = Medium; .35 = Large	Small effect
	FL → FI	.088		Small effect
	DFI → FI	.011		Negligible effect
Predictive Relevance (Q^2 Predict)	DFI	.037	> 0	Predictive relevance established
	FI	.062		Predictive relevance established
Model Fit (SRMR)	Saturated Model	.059	< .08	Good model fit
	Estimated Model	.079		Acceptable model fit

Hypothesis Testing : Furthermore, the study examined the causal relationship by analyzing the effects of independent variables on the dependent variable, and also by conducting the mediating analysis.

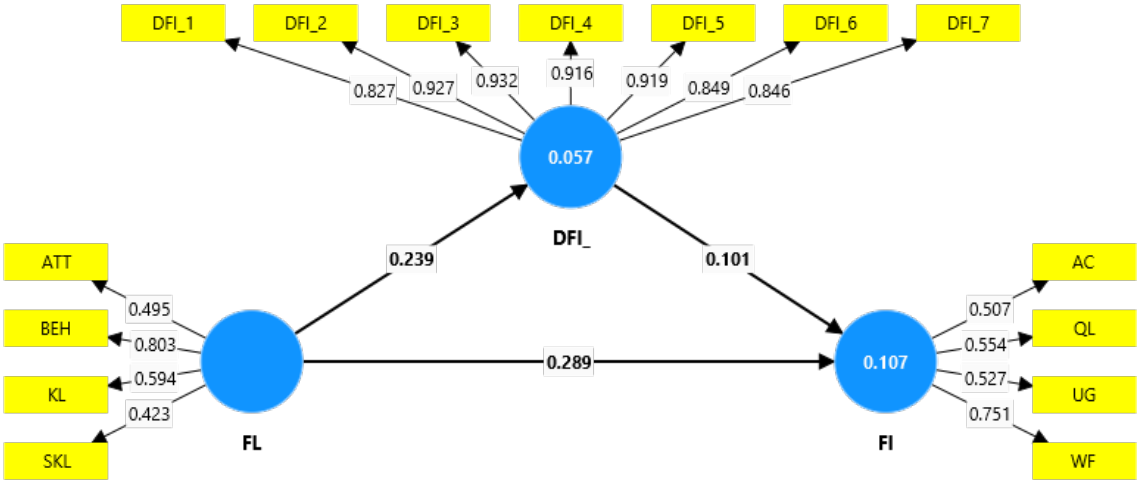


Figure 2 : Path Diagram

Following standard bootstrap procedures, all the path coefficients are statistically significant (see Table 8). This suggests that FL has a positive significant effect on FI (β= *.289, p < .01*), followed by the positive significant effect of FL on DFI (β = *.239, p < .001*). In contrast, DFI (β = *.101, p < .05*) showed an insignificant relation with FI. Thus, all three direct structural paths (H1, H2, and H3) were supported.

The finding revealed that DFI mediates the relationship between FL and FI (β = *.043, p < .05*). Hence, H4 is accepted. Thus, financially literate students are empowered to leverage DFI tools, leading to greater FI.

Table 8 : Hypothesis Testing

Structural Path	Beta Coefficient (β)	Sample mean (M)	Standard Deviation (STDEV)	*t-value*	*p-values*	Empirical Decision
FL -> FI	.289	.305	.093	3.10	.002	Supported
FL -> DFI	.239	.255	.058	4.082	.000	Supported
DFI -> FI	.101	.095	.122	.824	.035	Supported
FL -> DFI -> FI	.043	.046	.021	2.207	.038	Supported

Discussion

By integrating the TPB with Financial Literacy Theory, this study provides a broader understanding of how FL influences DFI and financial inclusion among university students in Kathmandu Valley.

The finding that FL significantly influences FI among university students indicates that students with stronger financial knowledge, understanding, and skills are more likely to access and effectively use formal financial services (Das, 2024). This suggests that FL equips students with the ability to evaluate financial products, understand the benefits of saving and digital transactions, and make informed decisions regarding banking and other financial services. In the context of university students, greater FL may reduce uncertainty and hesitation associated with formal financial systems, thereby encouraging broader participation in financial activities (Kunwar & GC, 2025). This result reinforces the view that FL is a foundational driver of FI, as it enhances individuals' confidence, awareness, and capability to engage with available financial opportunities in a meaningful and responsible manner (Lusardi & Mitchell, 2014; Rodriguez-Correa et al., 2025).

The results indicate that FL has a positive and statistically significant effect on DFI. This finding is consistent with previous research suggesting that individuals with stronger financial knowledge are more likely to adopt and use emerging financial technologies effectively. For example, Das (2024) argued that financially literate individuals demonstrate greater confidence in engaging with innovative financial products and services, thereby increasing the use of digital financial platforms. Similarly, Bongomin et al. (2018) emphasized that FL enhances individuals' ability to access and manage financial services responsibly, contributing to more inclusive financial systems. University students who possess adequate financial knowledge are therefore better equipped to navigate digital payment systems, mobile banking applications, and other technology-enabled financial services (Abdulle et al., 2025; Bempah et al., 2026). From the perspective of the TPB, greater financial knowledge is likely to strengthen favorable attitudes toward adopting digital financial technologies, thereby encouraging their use. These findings highlight the importance of strengthening financial education as a foundation for promoting digital financial participation and informed financial decision-making.

Similarly, DFI was found to have a significant positive effect on FI among university students. This finding suggests that the availability and use of innovative digital financial services, such as mobile banking, digital wallets, and online payment platforms, enhance students' access to and engagement with formal financial systems. By offering greater convenience, speed, and accessibility, DFI can reduce

traditional barriers associated with financial service usage, particularly among younger and technologically familiar populations (Lumsden, 2017). This result is consistent with prior studies that emphasize the role of digital financial technologies in expanding financial access and promoting inclusive financial participation (Bongomin et al., 2018). In the context of university students in Nepal, the finding indicates that DFI has become an important mechanism through which financial services are made more reachable, practical, and relevant to the daily financial needs of students.

Furthermore, the mediating effect of DFI was found to have a significant relationship between FL and FI, which aligns with a growing body of scholarly work, indicating the crucial role of DFI in empowering individuals with financial knowledge to translate it into concrete financial well-being (Jadoon et al., 2025; Shen et al., 2018). According to earlier studies (Mpofu, 2024; Muat et al, 2026; Yasrizal et al., 2025; Zaimovic et al., 2025), financially literate people have found it easier to make transactions when they have access to fintech such as digital banking services and DFI platforms, which has led to a greater number of individuals becoming part of the formal financial system.

Conclusion and Implications

The findings of this study highlight the important role of FL in shaping university students' attitudes and engagement with DFI while contributing to FI. However, the results also reveal that FL alone is insufficient to guarantee broader FI. FL and DFI are critical enablers of FI among university students. Consequently, strengthening FL should be accompanied by initiatives that enhance digital financial competencies and reduce structural barriers to ensure that DFI translates into meaningful FI. The study concludes that improving students' FL while simultaneously expanding and promoting DFI can substantially enhance FI. These findings highlight the need for universities, financial institutions, and policymakers in Nepal to prioritize financial education and digital financial infrastructure as complementary strategies for fostering a more financially inclusive youth population.

From a theoretical perspective, this study integrates the TPB with Financial Literacy Theory to provide a comprehensive explanation of how FL influences DFI and, ultimately, FI among university students in Kathmandu Valley. By positioning DFI as a mediating mechanism, the study extends existing knowledge and offers new empirical evidence from the context of Nepalese graduate and postgraduate students, a population that has received limited scholarly attention.

The findings further suggest that universities should strengthen financial education by incorporating practical digital financial skills into academic curricula, enabling students to confidently access and effectively utilize digital financial services. Such initiatives can foster informed financial decision-making, enhance financial empowerment, and encourage responsible participation in the digital economy. At the policy level, efforts to promote FI should extend beyond improving financial knowledge and include behavioral interventions, digital infrastructure development, consumer protection measures, and supportive regulatory frameworks that build trust and encourage the widespread adoption of digital financial services. Collectively, these measures can contribute to the development of a more inclusive, accessible, and sustainable financial ecosystem.

Limitations and Future Research

There are a few limitations to this study, leaving opportunities for further investigation. This empirical study exclusively considered only the colleges operating in Kathmandu Valley and only Nepalese universities. Future research could explore various colleges and universities (National and international) within or outside the Kathmandu Valley to analyze the interplay between the study constructs. While cross-sectional data provided a snapshot, limiting causal inference, longitudinal studies could deepen understanding of digital transformations. Additionally, documenting participant experiences using a qualitative approach, such as interviews with a few study experts and students, would further validate the research findings. Furthermore,

broadening the model by including variables such as regulatory environment, students' attitude and trust towards digital financial tools would provide a more thorough comprehension of the drivers of agility.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Ethical Statement

Formal ethical approval was not required for this study, as it was based on a perception/behavioural survey and did not involve any intervention, medical procedure, or sensitive personal data. The authors affirm that the study was conducted in accordance with established research ethics and academic integrity standards.

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