

Determinants of Fintech Use in an Indonesian Healthcare Context: Evidence from an Extended Technology Acceptance Model

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Abstract:

Objective: Digital transformation in healthcare payments is accelerating globally, with financial technology (fintech) improving efficiency, transparency, and access. In Indonesia, adoption remains uneven, particularly in semi-urban areas with varying infrastructure, literacy, and trust. This study examined the determinants of patients' intention to adopt fintech for healthcare payments in semi-urban Indonesia using an extended Technology Acceptance Model (TAM).

Material and Methods: A cross-sectional survey was conducted between June and August 2025 among 858 patients from community health centers, pharmacies, hospitals, and clinics in Banyumas Regency, Indonesia. The extended TAM incorporated perceived trust, perceived risk, digital financial literacy, and facilitating conditions. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to test the proposed model and to assess the relationships among these constructs, as well as measurement reliability, validity, and structural paths.

Results: All constructs demonstrated strong reliability (Cronbach's $\alpha=0.785-0.873$) and validity. Behavioral intention was significantly predicted by digital financial literacy ($\beta=0.070$, $p\text{-value}=0.024$), facilitating conditions ($\beta=0.099$, $p\text{-value}<0.001$), perceived ease of use ($\beta=0.182$, $p\text{-value}<0.001$), perceived usefulness ($\beta=0.140$, $p\text{-value}<0.001$), perceived risk ($\beta=0.208$, $p\text{-value}<0.001$), and social influence ($\beta=0.253$, $p\text{-value}<0.001$). Perceived trust predicted perceived risk ($\beta=0.456$, $p\text{-value}<0.001$) and indirectly affected behavioral intention. Overall, the model explained 49.6% of the variance in behavioral intention, with social influence ($\beta=0.253$, $p\text{-value}<0.001$) and perceived risk ($\beta=0.208$, $p\text{-value}<0.001$) emerging as the strongest predictors.

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Conclusion: This study shows that fintech adoption for healthcare payments in semi-urban Indonesia is driven by both technological and socio-psychological factors, underscoring the importance of improving digital literacy, trust, and risk perception.

Keywords: behavior, digital health, finance, health services, Technology Acceptance Model

Introduction

Digital transformation in healthcare has become a strategic priority globally and nationally, with financial technology (fintech) emerging as a key enabler of efficient, inclusive, and adaptive payment systems^{1,2}. Worldwide, innovations such as mobile banking, QR-based payments, and electronic wallets are increasingly integrated into healthcare service delivery, reducing transaction costs, shortening payment times, improving transparency, and enhancing patient access to care. According to the World Bank and Organization for Economic Co-operation and Development (OECD), digital financial services are expanding rapidly, with health-related transactions expected to grow in parallel with broader e-health and telemedicine developments^{3,4}. This shift aligns with global efforts toward financial inclusion and universal health coverage, where streamlined payment systems are critical to both efficiency and equity.

Integrating fintech into healthcare payment systems presents opportunities to address persistent challenges in financial access, out-of-pocket expenditure, and patient satisfaction⁵. Evidence from various countries shows that adoption decisions are shaped by psychological and contextual factors, including perceived ease of use, perceived usefulness, trust, perceived risk, social influence, and digital financial literacy⁶. However, healthcare settings pose distinct adoption barriers compared to other sectors, such as heightened concerns over data privacy, varying levels of patient financial literacy, and uneven infrastructure readiness⁷. Studies in Bangladesh⁸, Saudi Arabia⁹, India¹⁰,

and China¹¹ demonstrate that social influence, trust, and perceived risk significantly shape intention to adopt healthcare fintech, although the magnitude and interplay of these factors vary across socio-economic and cultural contexts.

In Indonesia, the digital economy has expanded rapidly, supported by nationwide initiatives such as the Quick Response Code Indonesian Standard (QRIS), e-wallets, and mobile banking¹². The government actively promotes digital payment integration into public services, including healthcare facilities, to improve efficiency and broaden access. National statistics indicate substantial growth in internet penetration and mobile payment usage; however, despite the growth of digital financial services in Indonesia, adoption remains uneven, particularly in semi-urban areas with unique infrastructure and trust challenges¹³. This disparity reflects differences in infrastructure, income, digital literacy, and social trust¹. Semi-urban areas, such as Banyumas Regency in Central Java, with a population exceeding 1.86 million, represent transitional zones where technology penetration is increasing but remains inconsistent. In such settings, healthcare payment adoption is likely shaped by both modern digital drivers and traditional interpersonal trust networks.

Despite increasing interest in fintech adoption in Indonesia, research has predominantly focused on urban populations¹⁴, institutional perspectives¹⁵, or general commercial transactions. Few empirical studies have examined patient behavioral intentions to adopt fintech for healthcare payments in semi-urban settings¹⁶, where

the digital divide, financial literacy gaps, and infrastructure constraints may exert unique influences. Recent studies in Indonesia have explored determinants such as perceived ease of use¹⁶, perceived usefulness¹⁷, trust, perceived risk¹⁸, digital literacy¹⁹, and social influence²⁰, yet few have integrated these factors into a comprehensive, theory-driven model in the semi-urban Indonesian healthcare context. Furthermore, constructs such as digital financial literacy and the mediating role of perceived risk are often omitted, despite their demonstrated importance in other sectors.

This study developed and tested an Extended Technology Acceptance Model for fintech, incorporating perceived trust, perceived risk, digital financial literacy, and traditional TAM constructs to capture the behavioral drivers of fintech adoption for healthcare payments in semi-urban Indonesia.

Material and Methods

Study design and setting

This study used a quantitative, cross-sectional survey design to examine the relationships among psychological, social, and behavioral constructs influencing patients' intention to use financial technology (fintech) for healthcare payments. The conceptual framework was adapted from the Technology Acceptance Model (TAM) and extended with *Perceived Trust*, *Perceived Risk*, *Digital Financial Literacy*, *Social Influence*, and *Facilitating Conditions*. Model testing was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM). The research was conducted in Banyumas Regency, Central Java, Indonesia, a semi-urban area with approximately 1.86 million residents in 2024. The region hosts 18 general hospitals, 7 specialty hospitals, 40 community health centers, and various private healthcare facilities. Data collection took place between 30 June and 5 August 2025, with a total study duration of seven months.

Population and sampling

The study population comprised patients who had accessed healthcare services in Banyumas Regency and had potential exposure to fintech payment systems. Purposive sampling was employed to specifically target patients with prior exposure to digital financial services, including e-wallets, QRIS, and mobile banking, to ensure that respondents had relevant experience with fintech-based payment technologies. Eligibility criteria included individuals aged 17 years or older who had paid for healthcare services within the past year, had used or were familiar with at least one fintech payment application, and provided informed consent. Respondents unwilling to participate or with incomplete data were excluded. Using the Raosoft® Sample Size Calculator with a 5% margin of error, 95% confidence level, and 50% response distribution, the minimum required sample size was 385. To account for potential non-responses and incomplete questionnaires, the target sample size was set at 400–420 participants; however, a total of 858 eligible respondents were successfully recruited, exceeding the minimum requirement and thereby increasing the statistical power of the analysis.

Measures

Eight latent constructs were measured: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Perceived Trust (PT), Perceived Risk (PR), Digital Financial Literacy (DFL), Social Influence (SI), Facilitating Conditions (FC), and Behavioral Intention (BI). Items were adapted from validated instruments used in prior fintech and digital finance studies and rated on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). Perceived Risk (PR) was adapted from previous studies examining financial, privacy, and security risks associated with digital payment systems, capturing respondents' concerns regarding data protection, transaction security, and potential financial loss. Digital

Financial Literacy (DFL) was adapted from established financial literacy and digital finance frameworks, assessing individuals' ability to understand, evaluate, and effectively use digital financial services for healthcare payments. Perceived Risk (PR) items were reverse-coded prior to analysis; therefore, higher PR scores indicate lower actual perceived risk, reflecting greater perceived safety and security in using fintech-based healthcare payment systems. Content validity was assessed by two experts in digital financial accounting and two in public health using the Content Validity Index (CVI), with items scoring below 0.78 revised or removed²¹. A pilot test with 30 respondents ensured clarity and reliability^{22,23}.

Data collection

Data were collected through online (Google Forms) and printed questionnaires distributed across community health centers, pharmacies, hospitals, and clinics in Banyumas Regency, as well as through local community networks. Participation was voluntary, and confidentiality was maintained throughout the study.

Data analysis

Data were analyzed using SmartPLS version 4.0. The measurement model was evaluated through convergent validity (Average Variance Extracted >0.50; outer loadings >0.70), reliability (Cronbach's alpha and Composite Reliability >0.70)²⁴, and discriminant validity (Fornell-Larcker criterion and cross-loadings). The structural model was assessed using path coefficients, t-statistics, and p-values obtained through bootstrapping with 5,000 resamples. Predictive power was evaluated with R^2 (substantial ≥ 0.75 , moderate ≥ 0.50 , weak ≥ 0.25), effect sizes (f^2 : small=0.02, medium=0.15, large=0.35), and predictive relevance ($Q^2 > 0$)^{25,26}. Model fit was determined using the Standardized Root Mean Square Residual (SRMR ≤ 0.08).

Ethical considerations

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Harapan Bangsa, Indonesia (No. B. LPPM-UHB/642/06/2025). The study complied with the Declaration of Helsinki and CIOMS guidelines. All participants received information on the study's objectives, procedures, risks, and benefits, and provided informed consent, electronically for online surveys and in writing for paper-based surveys. No personally identifiable data were collected, and all responses were anonymized prior to analysis.

Results

Sample characteristics

A total of 858 respondents participated in the study (Table 1). The largest age group was 25–29 years (14.0%), followed by 30–34 years (13.4%) and 35–39 years (12.2%). Most participants were female (74.2%). Educational attainment was predominantly elementary school (29.4%), senior high school (25.4%), and bachelor's degree (19.2%). The majority reported a monthly income below IDR 2.5 million (74.2%). Nearly half of respondents accessed care at community health centers (47.6%), followed by pharmacies (38.9%), hospitals (6.9%), and clinics (6.6%).

Table 1 Sample characteristics (n=858)

Variable	Category	n (%)
Age (years)	20–24	104 (12.1)
	25–29	120 (14.0)
	30–34	115 (13.4)
	35–39	105 (12.2)
	40–44	104 (12.1)
	45–49	79 (9.2)
	50–54	88 (10.3)
	55–59	50 (5.8)
	60–64	55 (6.4)
	≥ 65	38 (4.4)

Table 1 (continued)

Variable	Category	n (%)
Gender	Female	637 (74.2)
	Male	221 (25.8)
Education	Elementary	252 (29.4)
	Junior High	138 (16.1)
	Senior High	218 (25.4)
	Diploma	46 (5.4)
	Bachelor	165 (19.2)
	Master/Doctoral	39 (4.5)
Monthly income	<IDR 2.5M	637 (74.2)
	IDR 2.5M–<5.0M	152 (17.7)
	>IDR 5.0M	69 (8.0)
Facility type	Community Health Center	408 (47.6)
	Pharmacy	334 (38.9)
	Hospital	59 (6.9)
	Clinic	57 (6.6)

Measurement model

Table 2 presents the detailed item-level loadings, variance inflation factors (VIF), and construct reliability statistics. All constructs demonstrated high internal consistency, with Cronbach's α ranging from 0.785 (Perceived Risk) to 0.873 (Digital Financial Literacy), composite reliability (CR) between 0.876 and 0.908, and average variance extracted (AVE) values from 0.619 (Social Influence) to 0.756 (Facilitating Conditions). All indicator loadings exceeded the recommended threshold of 0.70, except for FL3 (0.767), PE1 (0.749), PE2 (0.777), and SI3 (0.743), which were retained due to their acceptable contributions to construct reliability and convergent validity. Variance inflation factor values for all items were below 5, indicating no evidence of problematic multicollinearity.

Discriminant validity

Discriminant validity assessment using the Fornell–Larcker criterion indicated that the square root of the AVE for each construct (bolded diagonal in Table 3) was greater than its correlations with other constructs. The

highest observed correlation was between Social Influence and Behavioral Intention ($r=0.556$), which remained lower than the corresponding $\sqrt{\text{AVE}}$ values (0.787 and 0.849, respectively). This confirms that each construct was empirically distinct from the others.

Structural model and hypothesis testing

The structural model analysis (Figure 1) demonstrated significant relationships among all the hypothesised paths. Standardized path coefficients (β), standard errors (SE), t -values, and p -values based on 5,000 bootstrapped subsamples are reported in Table 4.

For direct effects, Behavioral Intention (BI) was significantly predicted by Digital Financial Literacy ($\beta=0.070$, p -value=0.024), Facilitating Conditions ($\beta=0.099$, p -value<0.001), Perceived Ease of Use ($\beta=0.182$, p -value<0.001), Perceived Risk ($\beta=0.208$, p -value<0.001), Perceived Usefulness ($\beta=0.140$, p -value<0.001), and Social Influence ($\beta=0.253$, p -value<0.001). Because the Perceived Risk construct was reverse-coded, this positive coefficient indicates that lower actual perceived risk (i.e., higher perceived safety and security) is associated with higher behavioral intention to use fintech-based healthcare payment systems. Perceived Trust significantly predicted Perceived Risk ($\beta=0.456$, p -value<0.001). For the indirect effects, Perceived Trust showed a significant mediated pathway to Behavioral Intention through Perceived Risk ($\beta=0.095$, p -value<0.001). For total effects, the strongest predictors of Behavioral Intention were Social Influence ($\beta=0.253$, p -value<0.001) and Perceived Risk ($\beta=0.208$, p -value<0.001), while Perceived Trust was the strongest predictor of Perceived Risk ($\beta=0.456$, p -value<0.001). The model explained 49.6% of the variance in Behavioral Intention ($R^2=0.496$) and 20.8% in Perceived Risk ($R^2=0.208$). Effect size (f^2) analysis further indicated that Social Influence ($f^2=0.084$) exerted the strongest contribution to Behavioral Intention, while Perceived Risk ($f^2=0.057$) also

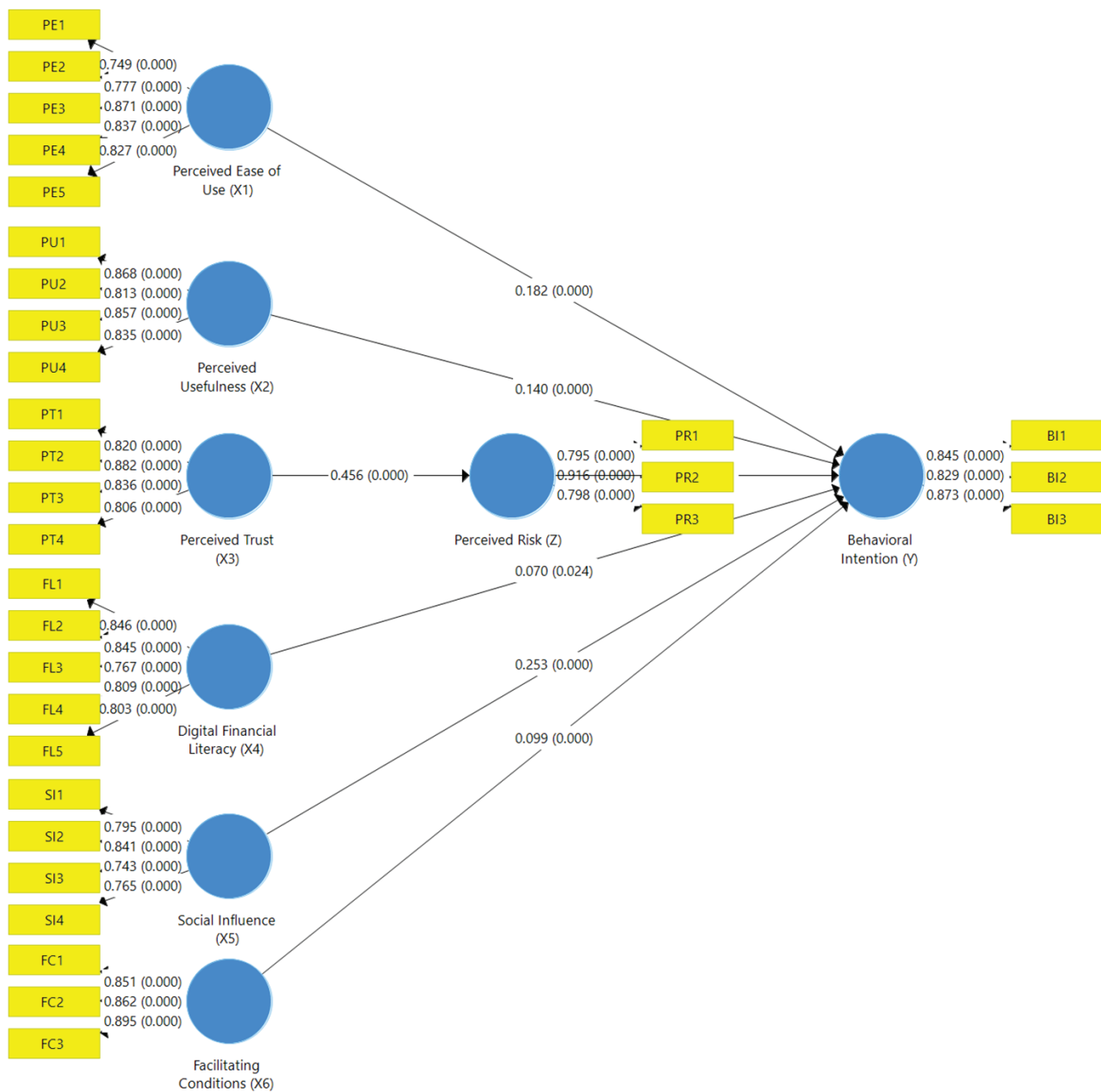
demonstrated a moderate effect. Other predictors showed ($f^2=0.013$), and Digital Financial Literacy ($f^2=0.006$). Model smaller effects, including Perceived Ease of Use ($f^2=0.039$), fit indices indicated acceptable fit (SRMR=0.076). Perceived Usefulness ($f^2=0.024$), Facilitating Conditions

Table 2 Item-level loadings, VIF, and construct reliability (n=858)

Construct/Indicator	Loading	VIF	Cronbach's α	CR	AVE
Behavioral Intention (BI)			0.806	0.885	0.720
BI1	0.845	1.727			
BI2	0.829	1.654			
BI3	0.873	1.938			
Facilitating Conditions (FC)			0.839	0.903	0.756
FC1	0.851	1.877			
FC2	0.862	1.921			
FC3	0.895	2.225			
Digital Financial Literacy (DFL)			0.873	0.908	0.663
FL1	0.846	2.246			
FL2	0.845	2.376			
FL3	0.767	1.786			
FL4	0.809	1.846			
FL5	0.803	1.925			
Perceived Ease of Use (PEOU)			0.871	0.907	0.661
PE1	0.749	1.597			
PE2	0.777	1.760			
PE3	0.871	2.512			
PE4	0.837	2.224			
PE5	0.827	2.202			
Perceived Risk (PR)			0.785	0.876	0.702
PR1	0.795	1.638			
PR2	0.916	2.420			
PR3	0.798	1.727			
Perceived Trust (PT)			0.857	0.903	0.700
PT1	0.820	1.953			
PT2	0.882	2.459			
PT3	0.836	1.948			
PT4	0.806	1.782			
Perceived Usefulness (PU)			0.864	0.908	0.711
PU1	0.868	2.273			
PU2	0.813	1.805			
PU3	0.857	2.222			
PU4	0.835	2.042			
Social Influence (SI)			0.794	0.866	0.619
SI1	0.795	1.753			
SI2	0.841	2.287			
SI3	0.743	1.524			
SI4	0.765	1.945			

All item loadings exceeded 0.70 except FL3 (0.767), PE1 (0.749), PE2 (0.777), and SI3 (0.743), which remain above the minimum acceptable threshold of 0.50. All VIF values were <5, indicating no multicollinearity.

VIF=variance inflation factor, CR=composite reliability, AVE=average variance extracted



n=858, bootstrapping=5,000 subsamples. Model fit: SRMR=0.076, $R^2(BI)=0.496$, $R^2(PR)=0.208$

Figure 1 Structural equation model (PLSSEM) with standardized path coefficients (β) and pvalues in parentheses; outer loadings are shown on indicator arrows

Model Summary, Predictive Relevance, and Effect Sizes

The model accounted for **49.6%** of the variance in Behavioral Intention (BI) ($R^2=0.496$; Adjusted $R^2=0.493$) and **20.8%** of the variance in Perceived Risk (PR) ($R^2=0.208$; Adjusted $R^2=0.207$). Predictive relevance (Q^2) values exceeded the 0.05 threshold for both BI ($Q^2=0.353$) and PR ($Q^2=0.145$), indicating satisfactory predictive capability. Model fit was acceptable, with a Standardized Root Mean Square Residual (SRMR) of 0.076. Effect size (f^2) analysis showed that, in predicting BI, the largest contributions came from Social Influence ($f^2=0.084$) and Perceived Risk

($f^2=0.057$), followed by Perceived Ease of Use ($f^2=0.039$), Perceived Usefulness ($f^2=0.024$), Facilitating Conditions ($f^2=0.013$), and Digital Financial Literacy ($f^2=0.006$). In predicting PR, Perceived Trust demonstrated a large effect size ($f^2=0.263$).

Discussion

To the best of our knowledge, this is the first study to empirically examine an Extended Technology Acceptance Model that integrates the constructs of perceived trust, perceived risk, and digital financial literacy in explaining patients' intentions to adopt financial technology for

Table 3 Fornell–Larcker criterion (square root of AVE on the diagonal) and inter-construct correlations (n=858)

Construct	BI	DFL	FC	PEOU	PR	PT	PU	SI
BI	0.849							
DFL	0.464	0.814						
FC	0.454	0.392	0.870					
PEOU	0.535	0.486	0.476	0.813				
PR	0.533	0.416	0.407	0.454	0.838			
PT	0.524	0.472	0.397	0.482	0.456	0.837		
PU	0.503	0.485	0.430	0.467	0.435	0.520	0.843	
SI	0.556	0.444	0.379	0.443	0.445	0.470	0.440	0.787

Diagonal values in bold represent the square root of AVE for each construct

BI=behavioral intention, DFL=digital financial literacy, FC=facilitating conditions, PEOU=perceived ease of use, PR=perceived risk, PT=perceived trust, PU=perceived usefulness, SI=social influence

Table 4 Structural model results (direct, indirect, and total effects)

Path	Direct β (O)	Indirect β (O)	Total β (O)	SE	t	p-value
DFL $\rightarrow$ BI	0.070	,	0.070	0.031	2.270	0.024*
FC $\rightarrow$ BI	0.099	,	0.099	0.027	3.684	<0.001***
PEOU $\rightarrow$ BI	0.182	,	0.182	0.034	5.371	<0.001***
PR $\rightarrow$ BI	0.208	,	0.208	0.026	8.116	<0.001***
PT $\rightarrow$ PR	0.456	,	0.456	0.026	17.324	<0.001***
PU $\rightarrow$ BI	0.140	,	0.140	0.034	4.171	<0.001***
SI $\rightarrow$ BI	0.253	,	0.253	0.030	8.437	<0.001***
PT $\rightarrow$ BI	,	0.095	0.095	0.013	7.528	<0.001***

Significance: *p-value<0.05, **p-value<0.01, ***p-value<0.001

Table 5 Model summary, predictive relevance, and effect sizes

Outcome / Predictor	R ²	Adj. R ²	Q ²	SRMR	f ² Effect Size
Behavioral Intention (BI)	0.496	0.493	0.353	0.076	–
Digital Financial Literacy (DFL)	–	–	–	–	0.006
Facilitating Conditions (FC)	–	–	–	–	0.013
Perceived Ease of Use (PEOU)	–	–	–	–	0.039
Perceived Risk (PR)	–	–	–	–	0.057
Perceived Usefulness (PU)	–	–	–	–	0.024
Social Influence (SI)	–	–	–	–	0.084
Perceived Risk (PR)	0.208	0.207	0.145	–	–
Perceived Trust (PT)	–	–	–	–	0.263

R²=coefficient of determination, Adj. R²=adjusted R², Q²=predictive relevance, SRMR=standardized root mean square residual, f² effect size interpretation: 0.02=small, 0.15=medium, 0.35=large

healthcare payments in a semi-urban setting in Indonesia. The inclusion of these healthcare- and context-specific constructs builds upon a well-established global foundation of fintech adoption research, where perceived usefulness and perceived ease of use have been consistently validated across sectors such as mobile banking, e-commerce, and digital payment systems in both developed and developing economies. The model demonstrated strong explanatory capacity, accounting for nearly half of the variance in behavioral intention and one-fifth of the variance in perceived risk. All hypothesised relationships were statistically significant. Among these, social influence and perceived risk emerged as the most substantial predictors of behavioral intention, while perceived trust was the most powerful predictor of perceived risk. This pattern aligns with global fintech literature showing that, while TAM constructs explain baseline adoption behavior, contextual factors such as trust, perceived risk, and social norms become dominant drivers in environments characterised by higher uncertainty and lower institutional familiarity with digital finance. The measurement model achieved strong reliability, convergent validity, and discriminant validity, supporting the robustness of the constructs.

The findings indicate that digital financial literacy, facilitating conditions, perceived ease of use, perceived risk, perceived usefulness, and social influence each made a significant contribution to predicting behavioral intention to use financial technology for healthcare payments²⁷. Consistent with prior fintech adoption studies in banking and mobile payments, perceived usefulness and perceived ease of use retained significant effects, confirming their cross-sectoral and cross-cultural applicability, while trust- and risk-related constructs explained context-specific variation in adoption behavior. The predominance of social influence as the strongest determinant is consistent with previous research in technology adoption within developing countries, particularly in semi-urban environments, where interpersonal networks, community leaders, and family members strongly influence individual decisions²⁸.

In the Indonesian semi-urban context, where communal values and reliance on trusted social networks are deeply embedded, social influence operates not only as a direct driver of adoption intention but also as a key mechanism through which community-based trust in fintech systems is established. Endorsements and normative cues from respected community figures, healthcare providers,

and peers can enhance perceptions of legitimacy, safety, and reliability, thereby reinforcing perceived trust in fintech-based healthcare payment systems. This socially embedded trust, in turn, reduces perceived risk and facilitates patients' willingness to adopt digital payment technologies, highlighting the interdependent relationship between social influence, community trust, and adoption intentions in semi-urban settings. Perceived risk was the second most influential predictor, underscoring that reducing uncertainty and concerns about digital transactions is essential for encouraging adoption in healthcare contexts.

Beyond their direct effects, and in line with the observed dominance of social influence and perceived risk, contextual factors such as perceived trust and digital financial literacy interact closely with technological determinants, including perceived ease of use and perceived usefulness, in shaping adoption intentions. In semi-urban Indonesia, perceived trust is deeply embedded in local community values, where recommendations from peers, family members, and respected community figures play a pivotal role in legitimizing new technologies. Such socially grounded trust can amplify perceptions of usefulness and reduce cognitive effort associated with learning new systems, thereby indirectly enhancing perceived ease of use. Similarly, digital financial literacy strengthens users' ability to comprehend system functionalities, assess benefits, and interpret potential risks, enabling technological attributes to exert their intended influence on behavioral intention. These interactions suggest that technological acceptance in semi-urban settings cannot be fully understood in isolation from the surrounding social and cultural context, as contextual enablers condition how technological features are perceived and acted upon by users.

Unlike general e-commerce, fintech-based healthcare payments involve the concurrent handling of financial data and sensitive Personal Health Information

(PHI), placing these transactions in a higher-risk category of digital services. Concerns related to data confidentiality, unauthorized access, and secondary use of health information are therefore likely to amplify perceived risk among patients.

In global digital health and health informatics literature, stringent regulatory frameworks such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States and the General Data Protection Regulation (GDPR) in the European Union are widely regarded as gold standards for PHI protection, emphasizing principles of data minimization, purpose limitation, security safeguards, and user consent^{29,30}. Prior studies have shown that adherence to such regulatory principles enhances user trust and significantly reduces perceived risk in electronic health records, digital payment systems, and other health information technologies³¹.

Although Indonesia operates under a different regulatory environment, these international standards provide an important benchmark for understanding patients' expectations regarding privacy and data security. In settings where awareness of data protection regulations is growing but institutional enforcement may be perceived as uneven, trust in fintech-based healthcare payments becomes closely intertwined with perceptions of how well personal and health-related data are protected.

The analysis revealed that perceived trust had an indirect influence on behavioral intention through its impact on perceived risk. This mediating mechanism has been widely documented in global digital finance and e-commerce studies, reinforcing the argument that trust serves as a foundational antecedent that reduces perceived uncertainty and enables adoption across sectors, including healthcare payments³². In healthcare contexts, however, trust is inherently multi-dimensional and may operate through distinct but interrelated pathways. Specifically, patients may

differentiate between trust in the clinician or healthcare institution (clinical or institutional trust) and trust in the fintech payment platform itself (administrative or technological trust). Trust in healthcare providers and hospitals can function as an institutional trust anchor, whereby confidence in the provider's competence and ethical standards transfers to affiliated payment systems. In contrast, trust in the fintech platform directly shapes perceptions of transaction security, data privacy, and system reliability, thereby reducing perceived financial and technological risk.

The strong predictive effect of trust on perceived risk observed in this study likely reflects the combined influence of these trust dimensions, particularly in semi-urban settings where provider endorsement, institutional reputation, and long-standing patient-provider relationships play a critical role in shaping acceptance of new digital services. By reducing concerns over potential errors, fraud, or misuse of personal data, increased trust can remove a major barrier to adoption⁸. These dynamics are relevant not only to healthcare payments but also to transactions within the broader pharmaceutical and health services sectors. Similar patterns have been reported in developing-country fintech ecosystems, where perceived security, transparency, and institutional credibility significantly condition behavioral intention³³, and where performance expectancy and social influence remain dominant drivers of acceptance in digitally transforming environments³⁴. Moreover, evidence from healthcare blockchain adoption shows that trust and knowledge-related mechanisms mediate technology acceptance among clinicians, underscoring the central role of confidence and shared understanding in health-related digital systems^{35,36}.

Although Digital Financial Literacy (DFL) exhibited an enabling rather than a dominant motivational role, in semi-urban and developing contexts, Social Influence ($\beta=0.253$) and Perceived Risk ($\beta=0.208$) are expected

to exert stronger effects than individual cognitive factors, such as DFL, as adoption decisions are often shaped by communal norms, trust in social networks, and heightened uncertainty surrounding digital transactions. Nevertheless, the statistical significance of DFL remains theoretically important, as it indicates that a minimum level of digital and financial knowledge is necessary for individuals to evaluate system usefulness, understand transaction processes, and interpret potential risks. In this sense, DFL functions as an upstream capability that conditions the effectiveness of stronger predictors, rather than directly driving adoption decisions. This interpretation aligns with recent fintech and healthcare technology studies in emerging economies, which highlight that literacy and knowledge-sharing capabilities indirectly enhance adoption by strengthening trust, reducing uncertainty, and improving perceived value^{33,35,36}. This finding supports the argument that basic education and literacy are essential prerequisites for fintech adoption, even when social trust and perceived risk ultimately dominate the final decision-making process in semi-urban settings.

This study extends the Technology Acceptance Model by explicitly incorporating digital financial literacy and perceived risk into the framework and testing it in a healthcare payment context. In the field of health economics, this integration offers a more comprehensive understanding of patient decision-making in adopting payment technologies, revealing the importance of combining traditional acceptance constructs with financial capability and risk perception³⁷. Within public health accounting, the results highlight the interplay of psychological, social, and infrastructural determinants in the digital transformation of healthcare payment systems³⁸. The findings are particularly relevant to low-to-middle income and semi-urban settings, where infrastructural constraints, socio-economic disparities, and community norms converge to shape adoption behavior.

The predominance of social influence and perceived risk as key determinants suggests that interventions to promote financial technology adoption in healthcare should focus on enhancing the credibility of these systems within communities and addressing users' security concerns³⁹. Leveraging respected community leaders, peer educators, and patient testimonials could harness social networks to build acceptance¹⁰. Simultaneously, transparent communication about the safety and reliability of digital payment systems, visible security measures, and clear regulatory oversight could reduce perceived risk⁴⁰. Beyond individual-level determinants, the successful implementation of fintech-based healthcare payments is also contingent upon effective system integration and interoperability with existing hospital and clinic infrastructures. Integrating external fintech platforms with Electronic Health Records (EHRs), billing systems, and hospital information systems presents substantial technical and organizational challenges, particularly in semi-urban and resource-constrained settings. Fragmented information systems, limited use of standardized data exchange protocols, and variability in digital maturity across healthcare facilities may hinder seamless transaction processing and real-time financial reconciliation. For example, the absence of real-time synchronization between a fintech payment application and a hospital's billing system may generate uncertainty about transaction completion or billing accuracy, increasing users' concerns about double-charging or delayed confirmation of payment status⁴¹. Such backend integration issues can indirectly influence patients' perceptions of trust, risk, and ease of use, thereby shaping adoption intentions.

The strengths of this study include a large and diverse sample of patients from various types of healthcare facilities, the application of robust partial least squares structural equation modeling with comprehensive validity assessment, and a focus on a semi-urban population that

has received limited attention in the literature on digital health payment adoption. Nevertheless, several limitations must be acknowledged. The cross-sectional design of this study precludes causal inference; therefore, the observed relationships should be interpreted with caution and regarded as indicative associations rather than causal effects. While the hypothesised paths are theoretically grounded in the Technology Acceptance Model and supported by prior empirical research, longitudinal or experimental designs are required to establish temporal ordering and causality. In addition, reliance on self-reported measures introduces the possibility of recall bias and social desirability bias. Moreover, trust was modeled as a single construct; future studies should explicitly differentiate clinical/institutional trust from administrative or platform-based trust to further disentangle their distinct effects on perceived risk and adoption intention. Furthermore, the study was conducted in a single district, which may limit the generalisability of the findings to other regions with different socio-economic or infrastructural contexts. Replication in rural and urban settings is warranted to confirm the applicability of the model.

Conclusion

This study demonstrates that an Extended Technology Acceptance Model incorporating perceived trust, perceived risk, and digital financial literacy provides a robust explanation for patients' intentions to adopt financial technology for healthcare payments in a semi-urban Indonesian context. Social influence and perceived risk emerged as the most influential determinants of adoption, while perceived trust strongly reduced perceived risk, underscoring the critical role of trust-building in digital health payment systems. Although digital financial literacy exerted a smaller direct effect, it remains a significant enabler, highlighting the need for targeted digital financial literacy programs integrated into community health initiatives

and supported by accessible digital infrastructure. From a policy and practice perspective, these findings suggest that governments and healthcare authorities should prioritize trust-building strategies, including clear data protection regulations, transparent communication regarding transaction security, and the involvement of trusted healthcare institutions and community leaders in promoting digital payment systems. Healthcare providers and fintech developers should design user-centered platforms that emphasize simplicity, security, and interoperability with existing health information systems to reduce perceived risk and enhance perceived usefulness. Collectively, these measures can support equitable and sustainable adoption of secure digital healthcare payment systems in semi-urban Indonesia and comparable settings.

Future research should adopt longitudinal study designs to validate the present findings and examine causal relationships over time, particularly to assess the long-term effects of digital financial literacy and trust on fintech adoption across diverse urban, semi-urban, and rural healthcare settings in Indonesia.

These findings also contribute to health economics and public health accounting by providing actionable guidance for policymakers, healthcare providers, and financial technology developers to strengthen trust, enhance digital financial literacy, and implement patient-centered payment systems that improve adoption, convenience, and equitable access to secure healthcare payments.

Author contributions

Conceptualization, AR, AS, NKP; methodology, AR, NKP; investigation, AS, SPM, PP; data curation, PP; writing—original draft preparation, AR; writing—review and editing, NKP; supervision, AS, AR; funding acquisition, SPM, PP. All authors have read and agreed to the published version of the manuscript.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Conflict of interest

The authors declare no conflict of interest.

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