

Developing the Technology Acceptance Model (TAM) to Examine Fintech Adoption in the Microfinance Institution (MFI): An Empirical Study in Laos

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(Abstract)

This study examines the factors that affect fintech adoption in microfinance institutions (MFIs) in Laos. We developed a theoretical model by extending the Technology Acceptance Model (TAM) with perceived risk, government support, and regulation. To collect data, we formulated a questionnaire and surveyed a randomly selected sample of managing directors from MFIs, resulting in 74 responses. Subsequently, we conducted an empirical analysis to assess the reliability and validity of the model in predicting MFIs' intentions to adopt fintech. We utilized Structured Equation Modeling (SEM) to test the proposed hypotheses. The results provide useful insights for practitioners in implementing strategies to promote influential factors while addressing and overcoming inhibiting factors in fintech adoption. This study contributes to the existing literature by developing and verifying the effectiveness of the extended TAM for investigating fintech adoption.

Keywords: Fintech adoption, Microfinance institution, Operational efficiency, Financial inclusion.

1. Introduction

Financial technology (fintech) has emerged as a transformative force, merging finance and technology to offer innovative and convenient financial solutions empowered by technological advancements (Arner, Barberis, and Buckley 2015). Fintech includes a wide range of technology-driven businesses¹ that automate financial services, this trend has the potential to lower costs, improve services, and create a stable and diverse financial ecosystem (Philippon 2019; Dubey 2019; Moro-Visconti 2021).

The financial sector has witnessed the positive impact of fintech, as highlighted in extensive research that fintech enhances operational efficiency (Brammertz and Mendelowitz 2018; Dubey 2019; Chen 2020; Chen et al. 2021; Hannoan et al. 2021), bank lending (Sedunov 2017; Sanchez 2018; Sheng 2021), financial stability (Fung et al. 2020; Daud et al. 2022), and financial inclusion (Mention 2019; Tok and Heng 2022; Yeyouomo et al. 2023). While fintech innovations have transformed the industry globally, their potential impact on microfinance institutions (MFIs) in developing countries is particularly significant.

MFIs play a crucial role in promoting financial inclusion² by providing financial services.

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such as small loans, savings accounts, and insurance, to individuals and enterprises who typically have limited access to traditional banking services, serving as a powerful tool in the fight against poverty (Mushtaq and Bruneau 2019). The positive impact of financial inclusion through MFIs has been highlighted in various empirical studies, demonstrating its role in reducing poverty (Morduch 1999; Quinones and Seibel 2000; Morduch and Haley 2002; Khandker 2005; Imai et al. 2012), income inequality (Hashemi et al. 1996; Mahjabeen 2008; Hermes 2014), and generating social impact (Cheston and Kuhn 2002; DeLoach and Lamanna 2011; Hamdani and Naeem 2012; Louis et al. 2013).

Considering the important role of MFIs and the vast development of fintech, the adoption of fintech in MFIs presents an opportunity to improve their operational efficiency, and stability, and make a more substantial impact on financial inclusion (Moro-Visconti 2021; Banna et al. 2022). In the context of this study, we specifically focus on the adoption of fintech within MFIs in Laos. Laos presents a unique setting for studying fintech adoption due to its evolving financial landscape and digitalization efforts. Additionally, the country's microfinance is a key sector in promoting financial inclusion. Laos, officially known as the Lao People's Democratic Republic (the Lao PDR), is a landlocked country located in Southeast Asia, it shares borders with China, Vietnam, Cambodia, Thailand, and Myanmar (Kittikhoun 2009). Over the past 30 years (1989-2018), Laos has achieved economic growth of 7.1% on average, even amidst challenges such as the Asian Financial Crisis (1997-99), while GDP-per-capita growth averaged 5.1%. In 1975, the country's economy had to be rebuilt from scratch following years of destruction during the Second Indochina War. In the last five years, the country's GDP growth has leveled down by 4.8% on average, falling from 5.7% in 2015 to 3.1% in 2019. Despite its ongoing status as a Less Developed Country (LDC), from which it hopes to escape in 2026, Laos has achieved lower middle-income status with a GNI of USD 2,560 per capita in 2019 (UNCDF 2021).

In Laos, financial exclusion continues to be a significant challenge, as a large portion of the population lacks access to basic financial services. With only 47% of adults having access to formal finance, the level of financial inclusion is notably low (FinMark Trust 2014). Consequently, expanding financial inclusion efforts is a critical priority in the country. To address this issue, a financial inclusion roadmap has been developed, aiming to improve financial access for the neglected poor who have limited support from banks. However, banks have shown limited commitment to expanding their distribution networks and lack innovative product designs that cater to customers with low or irregular incomes. As a result, one of the main priorities outlined in the financial inclusion roadmap for Laos is the expansion of MFIs to enhance financial outreach. MFIs specialize in serving underserved populations, providing them with access to financial services that traditional banks may not offer (FinMark Trust 2016).

MFIs³ in Laos have experienced remarkable growth in recent years (2014-2021), with they having outpaced commercial banks with a surge of 720% in deposits and a 637% increase in credit. The number of MFIs has also increased by 173%, highlighting their crucial role in

promoting financial inclusion for low-income and marginalized populations (see Appendix A). Nonetheless, this growth poses a risk to MFIs concerning the default risk of their clients, particularly vulnerable individuals and groups that are often excluded from the formal financial system. This risk could potentially threaten financial stability (Danisman and Tarazi 2020). To address this challenge, MFIs can adopt fintech to manage the risk, enhance financial stability, and support long-term financial inclusion (Banna et al. 2022). Currently, none of the MFIs in Laos have adopted fintech. Laos has consistently ranked at the bottom among ASEAN nations in terms of fintech adoption over the past three years (2017-2019). While there have been some improvements in this area over time, there is still a long way to go (Huong et al. 2021). Laos has also made progress in enhancing its digital connectivity, with increased internet usage, household access to the internet, and fixed-telephone subscriptions. However, despite these advancements, the country still lags behind its neighboring countries like Thailand, Vietnam, and Cambodia when it comes to the overall ranking on the ICT Development Index (International Telecommunication Union 2017). Digital financial services in Laos are currently in the early stages of development. To drive progress in this area, recent partnerships have been formed between banking incumbents, financial institutions, and the Bank of the Lao PDR (BOL), the country's central bank. These collaborations aim to introduce innovative fintech solutions and pave the way for the adoption of digital financial services. The BOL, in cooperation with financial regulators from the Asia-Pacific region, is actively upgrading payment infrastructure, exploring the potential of a central bank digital currency (CBDC), and spearheading initiatives such as the Lao Payment and Settlement System (LaPASS) and the Lao QR Code. Moreover, Laos is collaborating with Malaysia to establish the Lao Digital Park and Fintech Valley, with a specific focus on creating a fintech regulatory sandbox, developing digital government applications, and fostering new fintech solutions (Fintech News Singapore 2023).

Given the significant growth of MFIs in Laos and the country's ongoing digitization efforts, there is a clear necessity to investigate the adoption of fintech within MFIs in this country. This study aims to uncover the factors influencing their intention to adopt fintech and identify the barriers that impede such adoption. To examine fintech adoption in MFIs, we developed a theoretical model based on the Technology Acceptance Model (TAM), incorporating perceived risk, government support, and regulation. To validate the model, we conducted an empirical test to assess its reliability and validity in predicting MFIs' intention to adopt fintech. We designed a questionnaire for data collection and administered it to a randomly selected group of managing directors from all 120 MFIs in Laos. Out of the initial sample, we obtained a suitable sample size of 84 respondents. However, we had to exclude 10 participants due to incomplete answers, resulting in a final sample size of 74 for our analysis. We employed Structured Equation Modeling (SEM) to analyze the collected data and evaluate the proposed hypotheses. The results of our analysis provide substantial evidence in support of the extended TAM model, demonstrating its effectiveness in predicting the factors that affect the intention of MFIs to

adopt fintech.

This study contributes to the existing literature in several ways. First, it fills the gap that virtually little study has examined fintech adoption in MFIs by extending TAM. This study enhances the theoretical understanding of fintech adoption in MFIs by developing TAM, incorporating perceived risk, government support, and regulation. Second, this study focuses on the adoption experiences of future or non-users, providing insights into the factors influencing their intention to adopt fintech and the barriers they face. This approach expands the understanding of fintech adoption beyond the experiences of existing users. Lastly, we employ SEM to analyze the proposed model, revealing the significant roles of perceived usefulness and perceived ease of use in influencing the intention of MFIs to adopt fintech. Additionally, perceived risk and regulatory factors emerge as significant barriers. These empirical findings contribute to a deeper understanding of the factors shaping the adoption intentions of MFIs and offer valuable insights for practitioners in overcoming barriers and fostering fintech adoption.

The following section reviews the literature and proposes hypotheses. Section 3 introduces the research model and describes the research methods and data collection. Section 4 shows a comprehensive analysis of the research model and results. Finally, Section 5 discusses the findings and concludes with the study's implications and limitations.

2. Literature reviews and hypotheses

2.1. Perceived usefulness

In this study, we define perceived usefulness (PU) as the belief of MFIs that using fintech will result in beneficial outcomes. MFIs are more likely to adopt fintech if they think using fintech will improve their operations and efficiency. Hence, the more MFIs believe in fintech's usefulness; the more likely it is that they will adopt and use fintech. Previously, PU has been employed in several studies that have used TAM to define the extent to which users think that adopting a particular system or technology will improve their performance and aid in more effective job implementation (Davis 1989; Davis et al. 1989). Numerous studies have discovered that PU significantly influences users' intentions to adopt fintech (INT). For example, the study by Chuang et al. (2016) confirmed that users are more willing to use fintech if they positively perceive its benefits. In addition, the study by Jiwasiddi et al. (2019) argued that besides the innovation of fintech, users choose to utilize fintech because they see personal benefit in using such technology. Moreover, the findings of the study by Al-Okaily et al. (2021) concluded that it should not be surprising that people will increase their adoption of fintech if they see the usefulness of such systems. Based on the previous empirical evidence, we propose the following hypothesis:

H1. Perceived usefulness (PU) positively influences the intention of MFIs to adopt fintech (INT).

2.2. Perceived ease of use

Perceived ease of use (PEU) is defined in this study as the degree to which MFIs are ready to begin adopting fintech and the degree to which MFIs currently have the necessary technological facilities to support their fintech adoption. The term “PEU” was initially defined in the literature on technology adoption as the extent to which people expect to be able to embrace new technologies with little to no difficulty (Davis et al. 1989). PEU substantially impacts how people adopt fintech because users are more likely to accept new technologies when they perceive that using them will be simple (Ramli and Rahmawati 2020). Additionally, PEU has been shown to affect INT in several empirical studies. For example, the study conducted by Tun-Pin, et al. (2019) suggested that a user’s opinion of how easy a system is to use significantly affects whether or not the user intends to use fintech for banking transactions. Moreover, Singh et al. (2020) came to a similar conclusion that users were more likely to adopt fintech when they thought it was easier to use. In addition, PEU also influences the intellectual process of PU (Venkatesh and Bala 2008). The study by Venkatesh (2000) found that PEU will influence PU toward adopting new technology because the easier it is to use, the more helpful technology can be. Numerous empirical studies found that PEU affects PU. For example, the study by Luarn and Lin (2005) confirmed that people are more likely to see the benefits of technology if they perceive it to be easy to use. Furthermore, the study by Gu et al. (2009) showed that PEU is the most significant variable in PU. It suggested that mobile banks should focus on making their services easy to use to promote the adoption of mobile banking. Alalwan et al. (2017) also suggested that if people perceived using technology as simple and easy to use, they would be more likely to see its benefits and find it useful. In the present study, because of the unique characteristics of fintech, a certain level of MFIs readiness and the necessary technological facilities to support fintech adoption may increase the likelihood that MFIs will see the usefulness of fintech. Accordingly, PEU may significantly influence the PU of such technologies among MFIs. We, therefore, propose the following hypothesis:

H2. Perceived ease of use (PEU) positively affects the intention of MFIs to adopt fintech (INT).

H3. Perceived ease of use (PEU) positively affects the perceived usefulness (PU) of adopting fintech.

2.3. Government support

This study defines government support as a necessary element for MFIs to adopt fintech. Government support plays a crucial role in stimulating user innovation and driving fintech adoption (von Hippel and Jin 2008). Previous research has found that the level of government support is a determining factor in individuals’ willingness to use online banking, as clear cyber laws instill confidence in users (Chong et al. 2010). Furthermore, government support plays a significant role in shaping the regulatory environment (Rapih et al. 2023). When governments

provide favorable regulations and policies, it can enhance the perception of a supportive regulatory framework. The implementation of sandbox pilot protocols with government support can also boost investments in fintech by reducing uncertainty (Goo and Heo 2020). Moreover, government support influences fintech adoption through investments in infrastructure development, including improved internet connectivity, digital payment systems, and cybersecurity measures (Hu et al. 2019). These initiatives contribute to enhancing the overall ease of use of fintech services. When potential users have access to reliable and efficient infrastructure, it reduces barriers and enhances the user experience, making fintech adoption more convenient and beneficial. Considering these factors, the following hypotheses are proposed:

- H4.** Government support (GS) positively affects the intention of MFIs to adopt fintech (INT).
- H5.** Government support (GS) positively affects the perception of MFIs on regulation (REG).
- H6.** Government support (GS) positively affects the perceived ease of use (PEU) of adopting fintech.
- H7.** Government support (GS) positively affects the perceived usefulness (PU) of adopting fintech.

2.4. Perceived risk

This study defines perceived risk as three main types: financial risk, security risk, and performance risk. In the context of people's decisions to adopt new technology, financial risk has been extensively studied as a crucial aspect of perceived risk (Grewal et al. 1994). Security risk refers to the potential loss of privacy and control over personal data when criminals exploit customers' identities for unauthorized fraud, while financial risk pertains to the potential monetary loss due to fraudulent activities (Featherman and Pavlou 2003). On the other hand, performance risk relates to the possibility that the product or service may not function as expected (Grewal et al. 1994). However, there is a lack of consensus among scholars regarding the precise definition of "perceived risk." In essence, perceived risk represents how individuals perceive the potential uncertainties and negative consequences associated with adopting a new product or service. These perceptions of risk can significantly impact individuals' willingness and intention to adopt new technology (Dowling and Staelin 1994). Notably, perceived risk has a negative effect on users' intention to adopt internet banking at the initial stage, specifically in terms of financial, security, and performance risk (Lee 2009). Moreover, when consumers perceive potential risks in online transactions, they become worried about the unknown and undesirable outcomes (Kim et al. 2008). This worry can influence how users perceive the convenience of adopting fintech. In the context of new technology, if users perceive risks, it can have a negative impact on their behavior (Ali et al. 2021). The reason for this negative impact is that users may be less inclined to adopt fintech platforms due to the complexity of the adoption process and the feeling of being isolated in terms of time and space (Xie et al. 2021). The perception of

uncertainty and complexity surrounding fintech can influence how easy it is perceived to use. When individuals anticipate negative outcomes like financial loss or privacy breaches related to fintech adoption. Such perceived risks can impede the perceived ease of use, as users may find the technology more challenging or risky to navigate. Given these factors, we suggest the following hypotheses:

H8. Perceived risk (PR) negatively affects the intention of MFIs to adopt fintech (INT).

H9. Perceived risk (PR) negatively affects the perceived ease of use (PEU) of adopting fintech.

2.5. Regulation

In this study, “regulation” refers to how MFIs perceive regulations that could potentially hinder their adoption of fintech. The multiplicity of business models within the financial sector has presented practitioners and policymakers with significant challenges. Among these challenges are ensuring that consumers and investors are well protected and that threats to financial stability and the economy as a whole are accurately assessed (Claessens et al. 2018). Moreover, regulators also confront the difficulty of ensuring a fair playing field for incumbent financial institutions and new entrants to encourage expansion in fintech while protecting the financial system. It is important that new entrants in fintech do not play the same role that shadow banking did before the 2007-2009 financial crisis by concealing systemic risk (Vives 2017). Since the recent financial crisis, international standard-setters and national authorities have tightened and restructured financial regulations. As a result, financial institutions must adhere to more tightening regulations (Hannig and Jansen 2010).

The Bank of the Lao PDR (BOL), which is the country’s central bank, is accountable for maintaining a secure microfinance and banking system in Laos. BOL oversees the operations of MFIs primarily under regulations such as the decree on microfinance No.460/BOL, dated 03 October 2012, and the guideline of implementation on microfinance decree No.01/BOL, dated 19 April 2016. MFIs must always obtain BOL approval before making significant changes and innovations such as increasing authorized capital, accepting an external loan, partnering with foreign investors and firms, changing shareholders, expanding branches and units, adopting accounting and operation software programs, and providing new types of financial products and services. Moreover, BOL does off-site analysis and on-site inspection. It requires the MFIs to adhere to the stability measures standard outlined in the regulation on non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008, the regulation on deposit microfinance supervision No. 04/BOL, dated 20 June 2008, and the rules on classification of debt and deduction of classified debt of microfinance institutions No. 02/BOL, dated 04 February 2015. Additionally, to further ensure that MFIs strictly adhere to regulations, on 20 September 2018, BOL enacted a regulation on actions against violators No.845/BOL.

Tightening regulations, on the other hand, raises the risk that financial institutions may

shift risky financial activities outside of the regulated financial system. Therefore, stricter regulations might have unforeseen effects (Philippon 2016). For example, strict regulations on traditional banks increased the market share of riskier shadow banks⁴ in US mortgages from roughly 30% in 2007 to 50% in 2015, with the majority of the growth taking place in 2011 (Buchak et al. 2018). Moreover, tightening regulations also negatively affect the fintech lending market when regulations are made more restrictive for financial institutions.⁵ This could suggest that areas where banking regulation is laxer also have low controls on fintech activities. On the other hand, countries with stringent prudential and bank licensing systems may make it harder to initiate new lending operations. Less stringent regulation of fintech activities might facilitate their growth but encourage regulatory arbitrage if similar risks are regulated more strictly in traditional financial institutions. Accordingly, it may be difficult for financial institutions in countries with stringent regulations and financial license regimes to adopt fintech (Claessens et al. 2018). After considering these factors, we put forward the following hypothesis:

H10. Regulations (REG) negatively affects the intention of MFIs to adopt fintech (INT).

3. Methodology

3.1. Research model

The research model of this study is based on the original TAM (see Figure 1). TAM introduced by Davis (1986), is the research framework that aimed to understand how external factors influence internal beliefs, attitudes, and intentions. According to TAM, the perception of ease of use and usefulness of technology predicts attitudes and subsequent usage of technology (Davis et al. 1989). Initially adapted from the theory of reasoned action (TRA), TAM has been extensively tested and established as a dominant model in technology acceptance literature (Hale et al. 2002; Luarn and Lin 2005; Venkatesh and Bala 2008; Chuang et al. 2016; Lee 2017; Marakarkandy, Yajnik, and Dasgupta 2017; Meyliana and Fernando 2019). To enhance its predictive power, additional variables such as perceived security, risk, and social influence have been introduced by previous studies (Cheng et al. 2006; Dumpit and Fernandez 2017; Huei et al. 2018; Singh, Sahni, and Kovid 2021; Al-Okaily et al. 2021).

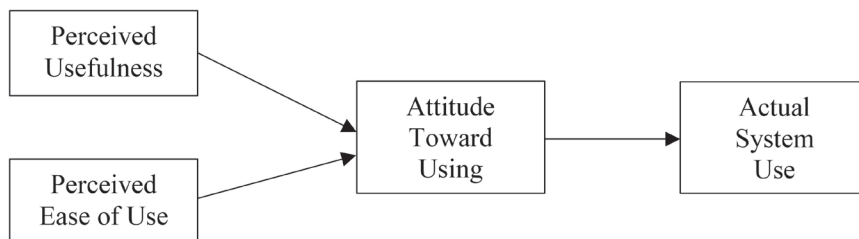


Fig.1. Technology Acceptance Model (TAM)

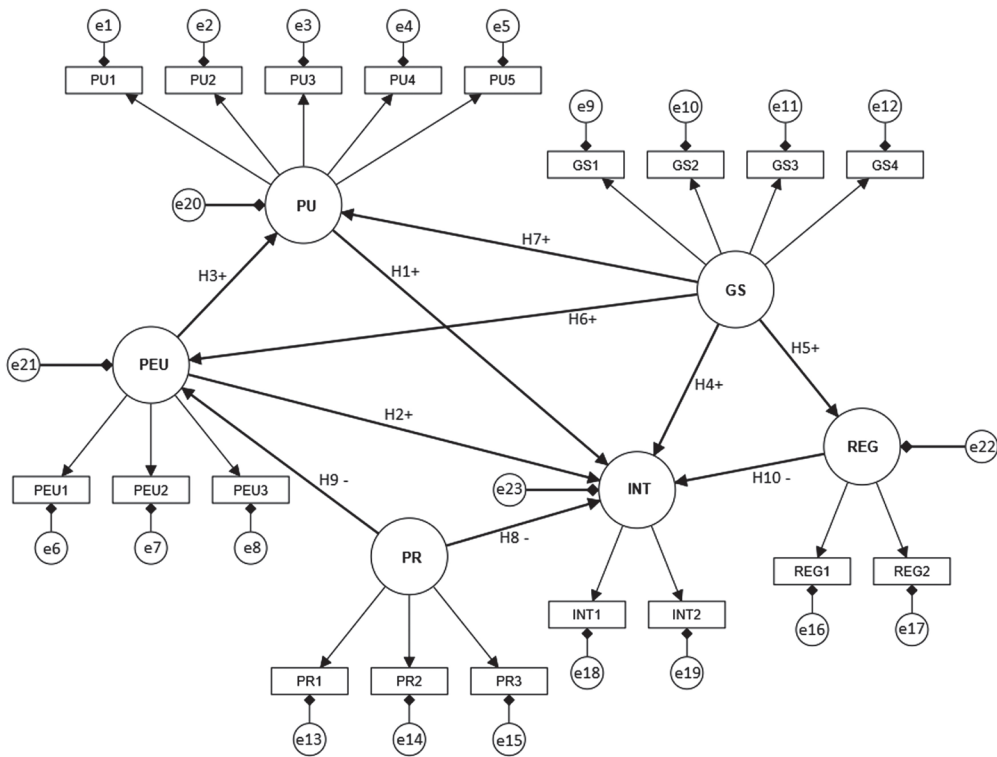


Fig.2. Research model

However, virtually little study has examined fintech adoption in MFIs by expanding TAM. To address this gap, we developed a research model based on the original TAM, incorporating additional constructs such as government support, perceived risk, and regulation⁶ (see Figure 2). We aimed to understand the factors that affect the attitude of Lao MFIs towards adopting fintech⁷, specifically referring to their intentions⁸ to adopt fintech into their operations.

In the research model of Figure 2, H1 to H10 represent the hypotheses. Perceived usefulness, perceived ease of use, government support, perceived risk, regulations, and intention are latent variables. Each latent variable has its measured variable indicators or observed variables (see Table 1). There are five measured variable indicators of perceived usefulness (PU1, PU2, PU3, PU4, and PU5) and three of perceived risk (PR1, PR2, and PR3). There are four indicators of government support (GS1, GS2, GS3, and GS4), two of the regulation (REG1 and REG2), two of intention (INT1 and INT2), and three of perceived ease of use (PEU1, PEU2 and PEU3). In the path diagram of this model, circles represent latent variables, and rectangles represent measured variables (also known as observed variables or indicators). Arrows between latent variables and their indicators indicate that the latent variables predict or cause the measured variables. Additionally, arrows among the latent variables show the relationships between factors that affect fintech adoption in MFIs.

3.2. Sample

To test the research model and examine the study hypothesis, we partnered with the Bank of the Lao PDR and the Lao Microfinance Association (LMFA) to collect relevant empirical data by conducting an online survey. The study participants were the managing directors who represented MFIs to join this study. The survey’s sample size was determined using simple random sampling. Initially, we identified all 120 MFIs in Laos to establish the sample size. We used a confidence level of 95 percent, a margin of error of 5 percent, and a standard deviation of 0.5 percent for this determination. Following the application of simple random sampling to the 120 MFIs, we arrived at an appropriate sample size of 84. Subsequently, we distributed an online questionnaire via email and other messaging applications to the managing directors of these 84 MFIs. However, we had to eliminate 10 respondents from the study due to incomplete and inappropriate answers (such as declining to fill out the consent form), resulting in a final sample size of 74 for this study.

To ensure the scale’s content validity, we mostly adapted items from previous literature for each construct as shown in Table 1. The survey used the measure variables, and each variable has an indicator using a five-point Likert scale to measure it. There are seven sections in the questionnaire: (1) General information of the respondents (2) MFIs’ opinion on the perceived usefulness of using fintech (3) MFIs’ opinion on the perceived ease of use of using fintech (4) MFIs’ opinion on the perceived risk of using fintech (5) MFIs’ opinion on the government support of using fintech (6) MFIs’ opinion on the existing regulation related to the microfinance sector, and (7) MFIs’ opinion on their intention to use fintech (see Appendix B).

Table 1. Statistics on measurement items of latent variables

Latent Variables	Measurement Items	Mean	Std. Deviation	Sources
Government Support (GS)	GS1: Government support will help my MFI in fintech usage	4.270	0.643	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Tan and Teo 2000)
	GS2: The government has introduced new legislation and revised some existing regulations to reduce barriers to fintech initiatives and support fintech services	4.230	0.669	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017)
	GS3: The government should have a sandbox pilot protocol that allows operators to experiment and use fintech	4.176	0.644	Adapted from (Goo and Heo 2020)
	GS4: The government set up all kinds of infrastructure, namely telecom networks and information communication technology (ICT), that promote and support the use of fintech	4.338	0.552	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Tan and Teo 2000)

Intention (INT)	INT1: My MFI intends to use fintech	3.068	1.245	Adapted from (Cheng et al. 2006; Marakarkandy, Yajnik, and Dasgupta 2017)
	INT2: My MFI is likely to use fintech as soon as possible	2.824	1.277	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Pavlou 2003)
Perceived Ease of Use (PEU)	PEU1: Using fintech is easy without hard effort	3.432	0.823	Adapted from (Hu et al. 2019)
	PEU2: It is easy for my MFI to have the equipment that supports the use of fintech (Servers, Computers, Electronic devices, Internet, Software, etc.)	3.595	0.752	Adapted from (Hu et al. 2019)
	PEU3: My MFI is ready to start using and providing fintech services to customers	3.581	0.735	Adapted from (Cheng et al. 2006; Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017)
Perceived Risk (PR)	PR1: Using fintech will cause financial risk to my MFI	3.068	0.859	Adapted from (Kim et al. 2008; Ryu 2018)
	PR2: Using fintech will cause a security risk that my MFI will damage by cyber attacks	3.324	0.737	Adapted from (Lockett and Littler 1997; Ryu 2018)
	PR3: Using fintech will cause performance risk to my MFI	3.068	0.684	Adapted from (Lockett and Littler 1997; Ryu 2018)
Perceived Usefulness (PU)	PU1: Using fintech will benefit my MFI	3.878	0.734	Adapted from (Cheng et al. 2006)
	PU2: Using fintech will save the operational cost of my MFI	3.743	0.718	Adapted from (Hall, B. H., and Khan 2003; Lockett and Littler 1997)
	PU3: Using fintech will improve the quality of my MFI's products and services	3.892	0.708	Adapted from (Lockett and Littler 1997; Singh et al. 2020)
	PU4: Using fintech will make my MFI sustainable	3.743	0.754	New indicator
	PU5: Using fintech can support financial inclusion	3.932	0.622	New indicator
Regulation (REG)	REG1: The microfinance-related regulations have created difficulties, prevented, and slowed my MFI intention to use fintech	4.014	0.688	New indicator
	REG2: The law on consumer protection is being used ineffectively and inefficiently	3.649	0.761	New indicator

Table 2 displays the sample demographics, showing that 73% of respondents were from non-deposit microfinance institutions⁹ (NDTMFIs). The largest group consisted of MFIs that had been in operation for one to five years. Moreover, 89% of those who responded do not have a branch, and 73% do not have a unit. Most participants reported authorized capital in the

range of one to five billion LAK (1 USD is about 19,101 LAK).

Table 2. Description of respondents

Demographics	Items	Frequency	Percentage
Type of MFIs	DTMFI	20	27%
	NDTMFI	54	73%
Year of Establish	≤ 1 year	1	1.4%
	1-5 years	31	41.9%
	6-10 years	29	39.2%
	11-20 years	12	16.2%
	≥20 year	1	1.4%
Branche	Have	8	11%
	Do not have	66	89%
Unit	Have	20	27%
	Do not have	54	73%
Authorized Capital	≥ 1 billion LAK	11	15%
	1-2.9 billion LAK	20	27%
	3-5.9 billion LAK	29	39%
	6-10 billion LAK	4	5%
	≤ 10 billion LAK	10	14%

4. Data analysis and results

4.1. Original research model testing

4.1.1. Reliability testing

In this study, we utilized SmartPLS software¹⁰ as a tool to assess the fit of the research model. Initially, we employed confirmatory factor analysis (CFA)¹¹ to examine the reliability, which aimed to determine the consistency of the measurement outcomes across repeated procedures (Carmines and Zeller 1979; Heale and Twycross 2015). The assessment of the measurement model involved estimating internal consistency for reliability. To calculate internal consistency, we utilized both Cronbach’s alpha (Hammersley 1987; Hasan et al. 2021; Heale and Twycross 2015) and composite reliability (CR) (Ruvio et al. 2008; Setiawan et al. 2021). Internal consistency reliability is deemed acceptable when both Cronbach’s alpha (representing the lower limit) and CR (representing the upper limit of the unknown true) exceed 0.7 (Hair et al. 2013). As shown in Table 3, each latent variable has Cronbach’s Alpha and CR excess of 0.7, which means the model that includes reliability was estimated with a high acceptant level.

Table 3. Reliability and validity measures (original research model)

Constructs	Items	Factor loadings	Cronbach's alpha	CR	AVE
GS	GS1	0.573	0.724	0.739	0.412
	GS2	0.710			
	GS3	0.700			
	GS4	0.556			
INT	INT1	0.955	0.928	0.933	0.875
	INT2	0.918			
PEU	PEU1	0.400	0.714	0.721	0.503
	PEU2	0.811			
	PEU3	0.835			
PR	PR1	0.762	0.805	0.803	0.577
	PR2	0.828			
	PR3	0.687			
PU	PU1	0.928	0.879	0.884	0.622
	PU2	0.596			
	PU3	0.835			
	PU4	0.629			
	PU5	0.899			
REG	REG1	0.792	0.732	0.730	0.578
	REG2	0.729			

4.1.2. Validity testing

We conducted CFA to evaluate the construct validity of the survey data, which measures the degree of fit of the model (Hu et al. 2019). Construct validity was assessed by examining convergent and discriminant validity (Chin, Gopal, and Salisbury 1997). Convergent validity is considered acceptable when the average variance extracted (AVE)¹² for the constructs exceeds the minimum threshold of 0.5 (Fornell and Larcker 1981). Additionally, for convergent validity to be deemed satisfactory, items should demonstrate high loadings on their respective factors, surpassing 0.50 (Wixom and Watson 2001; Kim et al. 2008). In terms of discriminant validity, it is deemed acceptable when the square root of AVE for each latent variable exceeds the correlation values among other latent variables (Fornell and Larcker 1981; Chin 1998).

Table 4. Correlations between latent variables (original research model)

	GS	INT	PEU	PR	PU	REG
GS	0.642					
INT	0.405	0.935				
PEU	0.424	0.648	0.709			
PR	0.194	-0.234	-0.027	0.760		
PU	0.586	0.636	0.653	0.06	0.789	
REG	0.327	-0.129	0.138	0.063	0.192	0.760

Note: The diagonal elements represent the square root of the extracted average variance. For adequate discriminant validity, these values need to be higher than the inter-construct correlations.

Upon examining the results for convergent validity in Table 3, most items exhibited factor loadings that met the suggested level. However, items such as GS1, GS2, PU2, and PU4 had factor loadings at a moderate level, while PEU1 had a low-level loading.¹³ Additionally, the AVE of all latent variables exceeded the significant acceptance levels, except for GS, which had an AVE below the acceptable threshold. Regarding the testing of discriminant validity, as shown in Table 4, the square root of AVE for most latent variables exceeded the significant acceptance levels, except for GS, which had a square root of AVE below the correlation values among other latent variables. These statistics indicate a moderate fit rather than a strong fit in terms of the construct validity of the original research model, as suggested by some authors (Fornell and Larcker 1981; Chin 1998; Miles and Shevlin 1998). Consequently, modifications were required to the original research model to investigate how certain items with low factor loadings affected its construct validity (Ganley et al. 2019).

4.2. Modified research model

In line with Bagozzi, Yi, and Phillips (1991) which studied construct validity in organizational research, it is suggested to carefully analyze the factor loadings of items to identify areas for enhancing construct validity. Adopting this approach, we made adjustments to the research model by excluding items with low factor loadings. Specifically, we began by removing the item with the lowest loading respectively (PEU1, GS4, GS1, PU2, PU4), as indicated in Table 3.

To assess the construct validity further, we conducted additional CFA to examine the factor loadings and identify any problematic items that may indicate issues with construct validity. The results provide evidence for the soundness of the construct validity and support the robustness of the final research model. As presented in Table 5, the convergent validity of the final research model is considered acceptable since the AVE for all constructs is greater than 0.5 (Fornell and Larcker 1981), and the factor loadings for all items exceeded 0.70 (Miles and Shevlin 1998). Moreover, Table 6 illustrates that the final model's discriminant validity is deemed acceptable because the square root of AVE for each latent variable is higher than the inter-construct correlations (Fornell and Larcker 1981; Chin 1998).

In regards to reliability, although the original research model showed reliability at a highly acceptable level, the modifications made to the model further enhanced the internal consistency reliability of the final research model. These enhancements are evident in Table 5, where each latent variable displays Cronbach's Alpha and CR values exceeding 0.7 (Hair et al. 2013).

Table 5. Reliability and validity measures (Final research model)

Constructs	Items	Factor loadings	Cronbach's alpha	CR	AVE
GS	GS2	0.782	0.771	0.767	0.623
	GS3	0.796			
INT	INT1	0.957	0.928	0.933	0.875
	INT2	0.914			
PEU	PEU2	0.767	0.803	0.805	0.676
	PEU3	0.873			
PR	PR1	0.765	0.805	0.805	0.579
	PR2	0.834			
	PR3	0.675			
PU	PU1	0.927	0.915	0.916	0.785
	PU3	0.831			
	PU5	0.896			
REG	REG1	0.718	0.732	0.738	0.581
	REG2	0.804			

Table 6. Correlations between latent variables (Final research model)

	GS	INT	PEU	PR	PU	REG
GS	0.789					
INT	0.358	0.935				
PEU	0.373	0.654	0.822			
PR	0.230	-0.215	-0.02	0.761		
PU	0.454	0.656	0.651	0.045	0.886	
REG	0.224	-0.157	0.084	0.052	0.102	0.762

Table 7. Fit statistic of the final research model

Fit statistic	Achieved
Chi-square	93.290
Number of observations	74
<i>Degrees of freedom (df)</i>	66
Chi-square significance	0.015
Chi-square/ <i>df</i>	1.413
Comparative fit index (CFI)	0.950
Normed fit index (NFI)	0.854
Tucker-Lewis index (TLI) or (NNFI)	0.931
Goodness-of-fit index (GFI)	0.852
Root mean square error of approximation (RMSEA)	0.074

Furthermore, Table 7 displays the fit statistic indices, indicating that the final research model meets the suggested criteria for model fit. These criteria include CFI > 0.90 (Bentler 1990), TLI > 0.90 (Hu and Bentler 1999), RMSEA < 0.08 (Browne and Cudeck 1993), Chi-square/*df* < 5.0 (Wheaton et al. 1977), and a significant Chi-square test with a p-value of ≤ 0.05 (Cheng et al. 2006). While most fit indices meet the recommended thresholds, the NFI and GFI exhibit a slightly lower level of fit. This discrepancy can be attributed to the small sample size of this study (*N* = 74). Smaller sample sizes tend to yield NFI values below 1.0, as observed in the study by Bearden, Sharma, and Teel (1982), which found a positive relationship between NFI

mean and sample size. Several studies have noted that NFI and GFI increase with sample size, while TLI's association with sample size is not significant (Anderson and Gerbing 1984; Marsh, Balla, and McDonald 1988; Bollen 1990). In this sense, the difference between the NFI and GFI of the final research model and the recommended thresholds of NFI > 0.90 (Bentler and Bonett 1980) and GFI > 0.90 (Jöreskog and Sörbom 1984) is relatively small. In certain cases, such deviations may still be considered useful, particularly if other fit indices collectively support a good fit (Hu and Bentler 1999; Marakarkandy, Yajnik, and Dasgupta 2017). This further strengthens the reliability and validity of the study's results by demonstrating that the hypothesized model reasonably fit with the observed data.

4.3. Hypothesis testing and results

In this study, we test the proposed hypotheses by using Structural Equation Modeling (SEM) to examine the statistical significance of standardized path coefficients through *t* values in the SmartPLS software. SEM is a powerful statistical method when multiple indicators for each latent variable are first tested through CFA to prove the conceptual soundness of the research model (Schreiber et al. 2006), as indication in Tables 5, 6, and 7. Generally, the coefficient test is considered significant at the *p* < 0.05 confidence level if the *t* > 1.96, at the *p* < 0.01 level if the *t* > 2.58, and at the *p* < 0.001 level if the *t* > 3.1 (Hu et al. 2019).

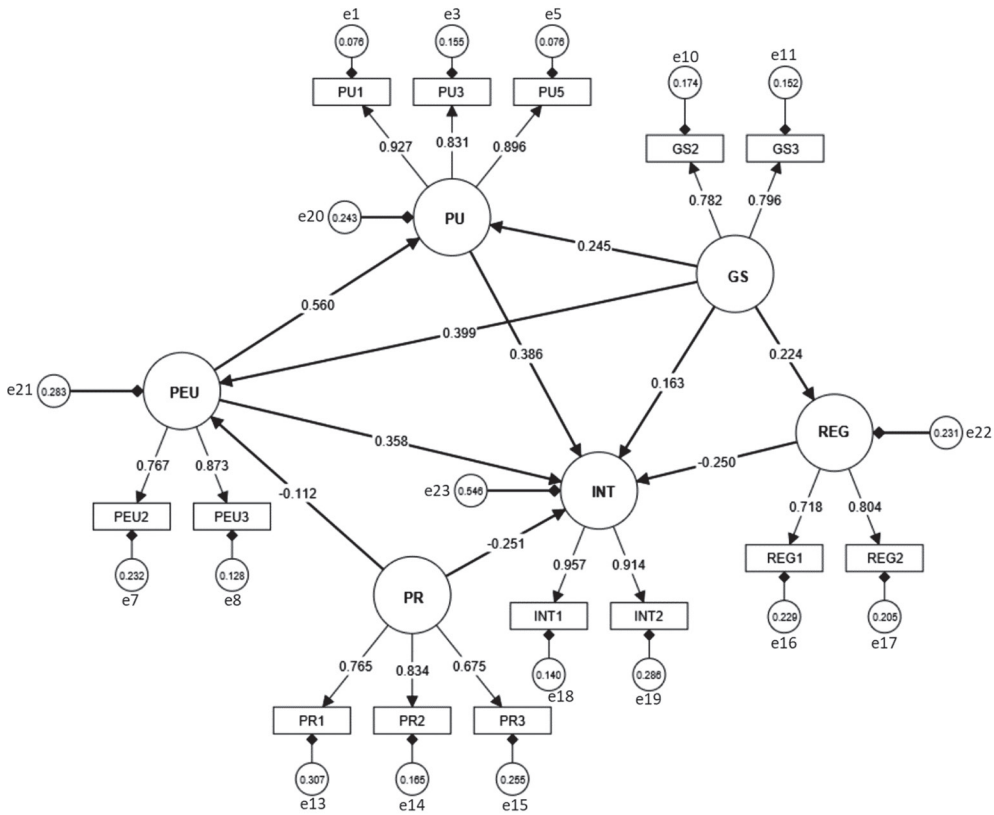
Table 8. SEM results of the final model

<i>Hypothesis</i>	Standardized path coefficients β	S.E.	<i>t</i>
H1 (PU -> INT)	0.386	0.253	2.755**
H2 (PEU -> INT)	0.358	0.306	2.492*
H3 (PEU -> PU)	0.560	0.158	4.194***
H4 (GS -> INT)	0.163	0.281	1.363
H5 (GS -> REG)	0.224	0.150	1.407
H6 (GS -> PEU)	0.399	0.184	2.396*
H7 (GS -> PU)	0.245	0.165	1.927
H8 (PR -> INT)	-0.251	0.212	2.209*
H9 (PR -> PEU)	-0.112	0.127	0.774
H10 (REG -> INT)	-0.250	0.279	2.234*

Note: * = *P* < 0.05; ** = *P* < 0.01; *** = *P* < 0.001

After conducting bootstrapping on a two-tailed test in SmartPLS, we obtained the results presented in Table 8 and Figure 3. These results indicate that PU ($\beta = 0.386, t = 2.755$) and PEU ($\beta = 0.358, t = 2.492$) positively influence INT, while PR ($\beta = -0.251, t = 2.209$) and REG ($\beta = -0.250, t = 2.234$) have a negative impact on INT. As a result, hypotheses H1, H2, H8, and H10 were supported, as their *t*-values exceeded 1.96. Regarding the relationships between other latent variables, we found that PEU ($\beta = 0.560, t = 4.194$) significantly affects PU, while GS ($\beta = 0.399, t = 2.396$) has a positive influence on PEU. Thus, hypotheses H3 and H6 were supported. However, we observed that GS ($\beta = 0.163, t = 1.363$) did not have a significant effect on INT,

Fig. 3. SmartPLS graphic of the final research model



Note: The relationship between observed variables and latent variables is represented as follows: The factor loadings (standardized loadings) are displayed in the middle of the arrows, and the error items associated with the observed variables are represented inside small circles. Meanwhile, for the relationship between latent variables, the path coefficients β are shown in the middle of the arrows, and the error items associated with the latent variables are depicted inside small circles.

leading to the rejection of hypothesis H4. Furthermore, the results revealed that GS ($\beta = 0.224$, $t = 1.407$) did not have a significant impact on REG, and GS ($\beta = 0.245$, $t = 1.927$) also did not significantly affect PU. Additionally, PR ($\beta = -0.112$, $t = 0.774$) had no significant influence on PEU, given that their t-values were below 1.96. As a result, hypotheses H5, H7, and H9 were not supported.

5. Discussion and conclusions

5.1. Empirical findings

Empirical evidence suggests that MFIs are more likely to adopt fintech if they think it will be useful. This is in line with the claims of previous studies (Lee 2017; Jiwasiddi et al. 2019; Tun-Pin et al. 2019; Lien et al. 2020; Hasan et al. 2021) that perceived usefulness has a significant effect on the intention to adopt fintech. Moreover, this finding suggests that as MFIs gain more confidence in the usefulness of fintech, their likelihood of adopting it increases. In 2021,

MFI in Laos served a significant number of clients, reaching 333,069 individuals, including approximately 93,594 borrowers, and disbursed a total loan amount of 1,525 billion LAK. These figures reflect an impressive 637% increase compared to 2014. Deposits also experienced substantial growth, totaling approximately 1,558 billion LAK, marking a significant surge of 720%. Therefore, to effectively serve their current clients and expand financial services to more underserved and unbanked, MFIs need to improve operational efficiency, reduce costs, enhance service quality, and mitigate risks while expanding their outreach. Consequently, MFIs are more likely to adopt fintech solutions when they perceive them as capable of delivering positive impacts.

Furthermore, this study provides evidence that the perceived ease of use positively affects the intention of MFIs to adopt fintech. This result supports the findings of previous researchers who confirmed that perceived ease of use significantly affects the intention to adopt fintech (Chuang et al. 2016; Meyliana and Fernando 2019; Ramli and Rahmawati 2020; Singh, Sahni, and Kovid 2021). In the specific context of Laos, MFIs may have allocated a dedicated budget to improve the efficiency of their business operations. Consequently, they perceive acquiring specialized hardware and software to support their fintech adoption as a straightforward process. This ease of use fosters their willingness to adopt fintech when they feel prepared and believe that the adoption process will be effortless. Additionally, this study identifies a positive relationship between the perceived ease of use and the perceived usefulness of fintech. This finding aligns with other studies conducted by Riquelme and Rios (2010), Belanche et al. (2019), Singh et al. (2020), and Setiawan et al. (2021). The positive effect can be attributed to the fact that Lao MFIs believe they are adequately equipped to adopt fintech and can easily access the necessary technological facilities to support its adoption. This, in turn, increases their likelihood of recognizing the benefits of fintech in enhancing the efficiency of their business operations.

The interesting finding of this study is that government support does not have an impact on the intention of MFIs to adopt fintech. This result adds to the ongoing debate about the influence of government support on fintech adoption. It aligns with previous studies that also suggest a lack of significant impact of government support on fintech adoption (Hernandez and Mazzon 2007; Setiawan et al. 2021). However, it is important to note that conflicting findings exist in the academic community, with some studies indicating a substantial influence of government support on fintech adoption (Tan and Teo 2000; Chong et al. 2010; Hu et al. 2019). In contrast to the direct relationship between government support and fintech adoption, this present study reveals an indirect effect through the perception of ease of use, as new evidence. Specifically, while government support did not directly influence the intention of MFIs to adopt fintech, it did have a significant impact on the perceived ease of use. This means that government support indirectly affects fintech adoption by shaping the perception of how easy it is to use fintech solutions. Since the perceived ease of use was found to be a significant factor affecting fintech adoption among MFIs in this study. This highlights the importance of considering

the role of perceived ease of use as a mediating factor in the relationship between government support and fintech adoption. These findings suggest that government support can play a crucial role in enhancing fintech adoption through perceived ease of use. By providing adequate support, such as regulatory frameworks and improving the accessibility and quality of telecom, internet, and ICT infrastructure, the government can help address the challenges and barriers that MFIs may face in adopting fintech solutions. This, in turn, can enhance the perceived ease of use of fintech and encourage greater adoption among MFIs.

More importantly, this study finds evidence that regulation has a negative impact on the intention of MFIs to adopt fintech. The research highlights the significant barriers created by current regulations that have made it difficult for MFIs to use fintech. The stability measures standard is one such regulation¹⁴ that makes it challenging for MFIs in Laos to adopt fintech. To comply with these standards, MFIs must meet certain financial ratios such as the capital adequacy ratio, the asset quality ratio, the earnings ratio, the efficiency of implementation, and the liquidity ratio. This can be particularly challenging for MFIs who may struggle to meet these stringent requirements.

Additionally, lengthy licensing procedures and regulatory uncertainty may also discourage MFIs from adopting fintech. Fintech is a relative innovation with complex features, and MFIs may require a high degree of stability and meet additional ambiguous requirements throughout the approval process. Lack of clarity around the fintech approval procedure may make MFIs hesitant to adopt it until the approval process is clearer. The approval process for MFIs to expand new branches and units, for instance, requires them to have consistent net profits over three years and meet the stability measures standard. However, there is an ambiguous approval process for other significant changes or innovations that the regulations broadly define. This lack of clarity may make MFIs less motivated to adopt fintech if they have to go through an unclear approval process that requires them to seek authorization from the BOL.

This study also finds concerns about consumer protection laws in Laos and how they may negatively impact the adoption of fintech by MFIs. MFIs may be hesitant to use fintech if they feel that neither they nor their customers are adequately protected under current consumer protection laws. For example, the recent failure of Lao Post Deposit-Taking MFI due to capital sufficiency and liquidity problems highlights the need for proper protection of depositors by regulators. The MFI struggled with inefficient internal operations and faced consumer panic, which ultimately led to many depositors losing their money. In June of 2022, consumers could not withdraw deposits totaling over 17 billion LAK, including over 1.5 billion LAK of interest-rate earnings in the savings account.

Based on these findings, this study suggests that the successful integration of fintech within the MFI sector requires a proper regulatory framework and efficient implementation. To promote fintech adoption, policymakers and regulators should address any existing regulatory barriers that impede the integration of fintech within MFIs. This may involve re-evaluating

the stability measures standard and considering the challenges it poses for MFIs. Additionally, policymakers and regulators should work towards providing clearer guidelines for the approval process of fintech innovations, especially for significant changes or innovations that are broadly defined by regulations. Strengthening consumer protection laws is also vital to instilling confidence in MFIs and their customers. When people feel safe using financial services, they are more likely to start using new financial technologies. This benefits everyone involved, including the customers, MFIs, and the economy as a whole.

Finally, this study finds that perceived risk negatively affects the intention of MFIs to use fintech, which is consistent with results from studies in mobile banking and fintech. For example, perceived risk was found to be a significant barrier to the adoption of mobile banking. One of the main reasons why more people do not adopt mobile banking is that they are afraid of using it. A common concern among users is that their identification numbers might fall into the wrong hands, allowing unauthorized parties access to their financial data (Al-Jabri and Sohail 2012). In addition, the study by Slade et al. (2015) found that perceived risk negatively affects the intention to adopt mobile payment because it increases the anxiety of non-users about the possible consequences of using such technology. Similarly, multiple studies in the field of fintech have reported that perceived risk is the core inhibitor for fintech platform adoption because users worry about the unpredictability and complexity of fintech (Ryu 2018; Ryu and Ko 2020; Xie et al. 2021). There will be uncertainty and risks with fintech, as with most new financial products and services. This evidence demonstrates that Lao MFIs are less likely to use fintech when they believe there will be a significant level of risk involved. Therefore, to deal with the risks and support the use of fintech by MFIs, this finding suggests that the government of Laos should set up a “regulatory sandbox” where MFIs may begin testing out fintech innovations in a risk-free environment. By doing so, MFIs will be granted permission to adopt and use fintech in a restricted area and within an appropriate timeframe where the regulator (BOL) will provide adequate regulatory assistance by easing specific legal and regulatory restrictions. There will be enough safety measures to limit the damage if something goes wrong. It will also help BOL bring in the right regulatory technology (RegTech) to deal with the risks of fintech.

5.2. Contributions

This study contributes both theoretically and practically. The theoretical contribution lies in its integration of the TAM with additional constructs such as government support, regulation, and perceived risk in the context of MFIs. By incorporating these constructs into the research model, this study provides a more comprehensive understanding of the drivers and barriers to fintech adoption by MFIs. The integration of the TAM in this study provides a solid foundation for examining the influence of perceived usefulness and perceived ease of use on the intention to adopt fintech. This study confirms the positive effects of perceived usefulness and perceived ease of use on the adoption intention of MFIs, aligning with prior studies conducted in different

contexts. Thus, this study contributes to the validation and generalizability of the TAM in the specific context of fintech adoption in MFIs. Moreover, this study focuses on the adoption experiences of future or non-users of fintech, identifying the factors that contribute to the intention to adopt fintech among this group, shedding light on their specific concerns, needs, and perceptions. This approach expands the understanding of fintech adoption beyond the experiences of existing users, offering a broader perspective on the adoption process. This contributes to the existing body of knowledge by providing insights into the unique challenges faced by non-users and informing strategies to address these barriers and promote fintech adoption among this important segment of the population. Furthermore, by expanding the theoretical framework, this study uncovers new evidence of an indirect effect of government support on fintech adoption through the perception of ease of use. While previous studies have yielded mixed results regarding the direct impact of government support on fintech adoption, this study highlights the significance of users' perceptions and the mediating role of perceived ease of use in the relationship between government support and fintech adoption. Moreover, these findings challenge previous claims in the literature and contribute to the ongoing academic debate surrounding the impact of government support on fintech adoption. This study also sheds light on the significant barriers imposed by current regulations, especially the stability measures standard, which hinders MFIs from embracing fintech. By identifying these regulatory challenges, this study contributes to a better understanding of the regulatory landscape and its implications for fintech adoption in the MFI sector. This study also emphasizes the negative impact of perceived risk on the intention to adopt fintech by MFIs. This finding aligns with studies in the mobile banking and fintech fields, indicating that perceived risk is a crucial inhibitor for the adoption of new financial technologies. The recognition of this risk factor highlights the need for appropriate risk management strategies and mechanisms to address the concerns of MFIs and foster their confidence in adopting fintech.

Accordingly, there is clear evidence that this study contributes to the advancement of knowledge in the field of fintech adoption. The findings offer theoretical insights, and new evidence, challenge existing claims, and provide practical implications for policymakers, regulators, and practitioners seeking to promote the successful adoption of fintech in the MFI sector. By understanding the critical drivers of adoption and addressing the identified barriers, stakeholders can harness the potential of fintech to enhance operational efficiency, foster financial inclusion, and contribute to the overall development of the microfinance sector.

5.3. Limitations and future research

This study's findings are limited to developing countries comparable to Laos. Future research should compare models across developing countries to identify similarities and differences in fintech adoption in MFIs. Increasing the sample size would further enhance the robustness of the research model. Additionally, while this study offers a preliminary examination of the

impact of regulations on adoption intention, it provides only a general explanation of these effects. Future research should concentrate on specific regulations to gain a clearer understanding of how specific laws, acts, and rules can influence adoption intention. Expanding the scope of the study to include a broader range of financial institutions would contribute to a more comprehensive understanding of fintech adoption in the financial sector.

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¹ Such as blockchain, robo-advisors and trading systems, peer-to-peer lending, equity crowdfunding, mobile payment systems, artificial intelligent (AI), and machine learning (ML).

² Financial inclusion, as defined by many academics, is the process of connecting the unbanked population (vulnerable groups like low-income people and weaker sections that lack access to even the most fundamental financial services) to the formal financial system so that they could gain affordable and timely access to a variety of financial services such as savings, payments, transfers, credit, and insurance (Dev 2006; Hannig and Jansen 2010; Sarma and Pais 2011; Demirgüç-Kunt and Klapper 2012; Dangi and Kumar 2013; Soederberg 2013; Garg and Agarwal 2014).

³ The majority of MFIs in Laos, accounting for 59%, are situated in the capital city of Vientiane. The remaining 41% of MFIs are spread across various provinces in the country (Bank of the Lao PDR 2021).

⁴ Shadow banks contributed to the recent financial crisis by making loans to sell to third parties virtually entirely. The third party's identification is context-specific and, hence, product-specific: To put it simply, Fannie Mae and Freddie Mac purchase conforming mortgages, whereas Ginnie Mae purchases government-backed mortgages from the Federal Housing Administration and the Veterans Administration. Private securitization firms purchased nonconforming jumbo and subprime mortgages. These nonagency markets, in which shadow banks had been most active and engaged before the crisis, disappeared during it. Shadow bank lenders like Countrywide and New Century could not get new funding when the secondary market

for nonconforming subprime and jumbo loans collapsed in 2007. Thus, many shadow bank lenders went bankrupt or were acquired by more conventional financial institutions (Buchak et al. 2018).

- ⁵ The study's findings show that stricter regulations appear to inhibit consumer credit activity, similar to what happens with aggregate and company fintech credit (Claessens et al. 2018).
- ⁶ Including regulatory variables can shed light on the influence of regulations on fintech adoption in MFIs. Adding perceived risk variables to TAM helps us understand the impact of risk perceptions on fintech adoption (Grewal et al. 1994; Dowling and Staelin 1994; Kim et al. 2008; Xie et al. 2021, Ali et al. 2021). Furthermore, by examining government support variables, we can better understand the extent of government support and its effect on fintech adoption (von Hippel and Jin 2008; Chong et al. 2010; Hu et al. 2019; Goo and Heo 2020).
- ⁷ Attitude refers to how an individual feels about using a specific system in their job. It reflects their evaluative affect towards the system. In this context, the definition and measurement of attitude align closely with the definition of behavioral intention (Davis 1986).
- ⁸ Venkatesh and Bala (2008) refer to attitude as the behavioral intention that is predicted by perceived ease of use and perceived usefulness.
- ⁹ According to Article 2 of the non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008, NDTMFI is a financial institution that has been granted a license to do business by the Bank of the Lao PDR (BOL), but it is not allowed to accept deposits from the general public. In addition, NDTMFI is defined under the decree on microfinance No. 460/BOL, dated 03 October 2012, as a financial institution that provides microloans and other financial services. Meanwhile, a deposit-taking microfinance institution (DTMFI) is a financial institution that can take a deposit, provides microloans, and other financial services.
- ¹⁰ SmartPLS is a software tool that represents a significant advancement in latent variable modeling by integrating cutting-edge techniques such as PLS-POS (Partial Least Squares-Path Modeling with Optimal Scaling), IPMA (Interaction- and Polynomial-Based Model Analysis), and sophisticated bootstrapping procedures (Ringle, C. M et al. 2022). This study used SmartPLS version 4.0.9.4 to evaluate model fit using various fit indices, assess the significance of relationships between latent variables, and generate graphical representations of the results.
- ¹¹ This study used CFA as part of the Structural Equation Modeling (SEM) framework to rigorously evaluate the underlying factor structure of the survey instrument. CFA is chosen because it provides a more rigorous assessment of the underlying factor structure of the survey instrument compared to Exploratory Factor Analysis (EFA) (Bollen 1989; Jöreskog and Sörbom 1989). By testing and confirming a pre-specified measurement model based on prior theory and research, CFA allows for hypothesis testing and model evaluation (Anderson and Gerbing 1988; Bagozzi, Yi, and Phillips 1991; Avolio, Bass, and Jung 1999). Unlike EFA, which explores new factor structures, CFA focuses on confirming an existing structure (O'Leary-Kelly and Vokurka 1998). Previous studies have successfully employed CFA to assess the fit between observed data and theoretical models by estimating relationships between observed variables and latent variables (Schreiber et al. 2006). Therefore, this study aims to test the proposed measurement model and evaluate how well the observed data aligns with the theoretical model by utilizing CFA.
- ¹² AVE is a useful measure that indicates convergent validity by showing how well the observed variables represent the latent variables (Farrell 2010). In simple terms, when AVE is high, it shows that a larger proportion of the construct's variance is captured by its indicators and less measurement error is present. Additionally, AVE helps assess discriminant validity by showing the distinctiveness of different constructs in the model (Fornell and Larcker 1981).
- ¹³ Miles and Shevlin (1998) noticed three different factor loading levels to be present: low (0.3), medium (0.5), and high (0.7).
- ¹⁴ This measures criterion is under the regulation on 1) non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008. 2) the regulation on deposit microfinance supervision No. 04/BOL, dated 20 June 2008. 3) the rules on classification of debt and deduction of classified debt of microfinance institutions No. 02/BOL, dated 04 February 2015. 4) the decree on microfinance No. 460/BOL, dated 03 October 2012. 5) the guidance of implementation on microfinance decree No.01/BOL, dated 19 April 2016. 6) the regulation on measures against violators No.845/BOL, dated 20 September 2018.

Appendixes

Appendix A: The growth of MFIs compares to commercial banks in Laos

			In billion LAK
Formal financial institutions	2014	2021	% Growth
Commercial banks			
Number	37	44	19%
Deposits	45,995	128,149	179%
Credits	40,295	87,298	117%
Credit-to-deposit ratio	88%	68%	
MFIs			
Number	44	120	173%
Deposits	190	1,558	720%
Credits	207	1,525	637%
Credit-to-deposit ratio (MFIs)	109%	98%	

Source: Bank of the Lao PDR and Financial Institution Supervision Department

Appendix B. A questionnaire

Characteristics	Answer	
What is the type of your MFI?	<input type="checkbox"/> Deposit Taking MFI	<input type="checkbox"/> Non-Deposit Taking MFI
How long has your MFI been established?	<input type="checkbox"/> Under 1 year <input type="checkbox"/> 2 years <input type="checkbox"/> Other (Specify)	<input type="checkbox"/> 1 year <input type="checkbox"/> 4 years
Does your MFI have a branch?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does your MFI have a unit?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
How much is the authorized capital of the MFI?	<input type="checkbox"/> Less than 1 billion LAK <input type="checkbox"/> 3-5.9 billion LAK <input type="checkbox"/> Over 10 billion LAK	<input type="checkbox"/> 1-2.9 billion LAK <input type="checkbox"/> 6-10 billion LAK
Latent Variables	Questions	Please answer to questions by ticking your choice in the box (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree)
Perceived Usefulness (PU)	1) To what extent do you think using fintech will benefit your MFI?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think using fintech will save the operating cost of your MFI?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	3) To what extent do you think using fintech will improve the quality of products and services of your MFI?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	4) To what extent do you think using fintech will make your MFI sustainable?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5

	5) To what extent do you think using fintech can support financial inclusion?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Perceived Ease of Use (PEU)	1) To what extent do you think using fintech is easy without hard effort?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think your MFI is easy to have the equipment that supports the use of fintech such as servers, computers, electronic devices, Internet, Software, etc.?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	3) To what extent do you think your MFI is ready to start using and providing fintech services to customers?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Perceived Risk (PR)	1) To what extent do you think using fintech will cause financial risk to your MFI?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think using fintech will cause the security risk that your MFI will damage by cyber-attacks?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	3) To what extent do you think using fintech will cause operational risk to your MFI?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Government Support (GS)	1) To what extent do you think government support will help your MFI in fintech usage?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think the government has introduced new legislation and revised existing regulations to reduce barriers to fintech usage and support fintech services?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	3) To what extent do you agree that government, especially the Bank of the Lao PDR, should have a sandbox pilot protocol that allows operators to experiment and use fintech?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	4) To what extent do you think the government set up all kinds of infrastructure, namely telecom networks and information communication technology (ICT), that promote and support the use of fintech?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Regulation (REG)	1) To what extent do you think the microfinance-related regulations created difficulties, prevented, and slowed your MFI intention to use fintech?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think the law on consumer protection is being used ineffectively and inefficiently?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Intention (INT)	1) To what extent do you think your MFI intends to use fintech?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
	2) To what extent do you think your MFI is likely to use fintech as soon as possible?	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5