Doctoral Dissertation

Digital Banking Transformation in Developing Economies: A Multi-Level Analysis of Organizational, Human and Technological Factors in Lao PDR

開発途上国の銀行セクターにおけるデジタルトランスフォーメーション：ラオス人民民主共和国に着目した組織的・人的・技術的要因の多層的分析

by:

Tiengmany Soulita

Academic Supervisor:

Assoc. Professor Nguyen Huu Phuc

September 2026

Graduate School of Sciences and Technology for Innovation,
Yamaguchi University

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Acknowledgements

First and foremost, I would like to express my deepest gratitude to my supervisor, Associate Professor Nguyen Huu Phuc, for his continuous guidance, encouragement, and invaluable support throughout this research. His insightful comments, patience, and dedication have greatly contributed to the completion of this thesis, and I am truly thankful for his mentorship.

I would also like to extend my sincere appreciation to the staff of Yamaguchi University for their kind assistance during my study period. In particular, I am grateful to the staff of the Management of Technology (MOT) Office, the International Student Support Office, and the Student Affairs Section for their continuous support and cooperation.

My heartfelt thanks go to JICA for granting me this precious opportunity to pursue my doctoral studies in Japan. Without this support, this academic journey would not have been possible.

I am deeply indebted to all participants who contributed to this research. I would like to thank the bank customers and bank employees who generously took the time to respond to the questionnaire, as well as the key informants from various banks who participated in the interview sessions. Their valuable insights and cooperation have been essential to the success of this study.

On a personal note, I would like to express my profound gratitude to my beloved parents, Tiengmany Keo and Somvimane Khammone, for their unconditional love, sacrifices, and constant encouragement. I am also sincerely thankful to my younger brother, Tiengmany Anousack, and my husband, Phumeenit Youtitham, for their unwavering support and belief in me throughout this journey.

My special thanks go to my dear daughter, Phumeenit Alisa, and my son, Phumeenit Phanoudeth, who have been my greatest source of motivation and strength. Their love and understanding have inspired me to persevere and complete this thesis.

Finally, I would like to thank all my friends for their understanding, encouragement, and companionship during this challenging yet rewarding journey.

Abstract

The global financial services industry is undergoing a profound digital transformation (DX). While mature economies have transitioned relatively smoothly, developing nations like the Lao People's Democratic Republic (Lao PDR) face unique structural and psychological impediments. This dissertation addresses a critical gap in the literature by providing a comprehensive, multi-level analysis of the factors enabling or constraining Digital Transformation Adoption (DA) in a resource-constrained environment. Using a multi-study sequential design, the research integrates macro-level global trends, organizational-level employee dynamics, and individual-level customer experiences.

The macro-level landscape, established through a bibliometric analysis of 2,084 publications (2000–2023), reveals a field dominated by technology acceptance models but lacking in developing economy perspectives and employee-centric research in mandatory contexts. Addressing these gaps, the second study proposes a modified Unified Theory of Acceptance and Use of Technology (UTAUT) for bank employees (n=354). The findings demonstrate that Digital Engagement, introduced to replace Behavioral Intention in mandatory environments, is primarily driven by Performance Expectancy and Organizational Culture. Notably, qualitative data indicates that while security concerns are pervasive, "Perceived Risk" does not statistically deter engagement, suggesting a transfer of responsibility in which employees rely on institutions to mitigate system risks.

The third study shifts to the demand side, utilizing an iterative model refinement of UTAUT2 among Lao bank customers (n=128). This study introduces "Seamless Experience", a novel second-order construct that captures a unified perception of application quality and infrastructure reliability. Results indicate that in infrastructure-constrained environments settings, users do not cognitively distinguish between app-related bugs and connectivity failures; rather, this holistic "Seamless Experience" serves as the primary predictor of adoption. Furthermore, security can be conceptualized as a "hygiene factor", meaning that it functions as a foundational requirement that prevents adoption when absent but does not necessarily increase users' intention once a basic level of trust has been established.

The dissertation culminates in an integrated framework that aligns global trends with local institutional realities. The findings offer actionable guidance for banking institutions to prioritize employee digital commitment and customer habit formation, while providing policymakers with

evidence-based strategies for digital infrastructure investment and regulatory streamlining to meet Lao PDR's ambitious 2040 digital economy goals.

Chapter 1: Introduction

1.1 Background and Context

The global financial services industry is undergoing a transformation of a depth and speed with few historical precedents. Digital transformation in banking is not, as it is sometimes superficially understood, a matter of replacing paper processes with digital equivalents or adding mobile application interfaces to existing service architectures. It represents, more fundamentally, a reconfiguration of how banks create and deliver value, how they organize their internal capabilities, and how they engage with the customers and communities they serve (Porfírio et al., 2024; Vial, 2019). This reconfiguration is driven by the convergence of technologies including big data analytics, artificial intelligence, machine learning, blockchain, the Internet of Things, and fifth-generation mobile networks, each of which individually reshapes specific dimensions of banking operations, and which together produce a compounding transformation pressure that no banking institution can afford to ignore.

The urgency of this transformation has been amplified by changes in the competitive landscape. Digital-first financial service providers, operating without the legacy infrastructure and regulatory burdens of traditional banks, have redefined customer expectations around speed, personalization, and 24-hour accessibility. Younger, digitally native customer segments, who represent the growth horizon of the financial services industry, enter adulthood with expectations shaped by the best digital interfaces in any sector and have limited patience for banking experiences that fall short of those benchmarks. As Vial (2019) argues, digital capability has consequently shifted from being a source of competitive advantage to being a minimum condition for institutional survival in modern financial services.

The COVID-19 pandemic accelerated this transition by compressing what would otherwise have been a decade of gradual behavioral change into a period of months. Public health restrictions rendered physical banking transactions difficult or impossible for extended periods, forcing institutions to accelerate digital deployment strategies and compelling customers who might otherwise have remained attached to branch-based banking to discover and adopt digital alternatives (Dissanayake et al., 2023). The pandemic also reshaped institutional priorities, elevating digital transformation from a medium-term strategic consideration to an immediate operational imperative. In economies with mature digital infrastructure, this transition proved disruptive but ultimately manageable. In developing economies, where infrastructure limitations, regulatory uncertainties,

and significant digital literacy gaps created conditions that digital transformation was both intended to address and constrained by, the challenge has been of a fundamentally different character.

It is important to recognize that digital banking transformation is not merely a technological phenomenon but a behavioral and organizational one. Research has increasingly documented that digital payment systems subtly reshape consumption patterns by lowering psychological barriers to transactions and increasing their frequency, transforming not only the mechanics of financial exchange but the cognitive and habitual relationship between individuals and their finances (Wen, 2024). This behavioral dimension means that understanding digital transformation requires examining not only what technologies are deployed but how people, both inside and outside banking institutions, relate to those technologies, build confidence in them, integrate them into daily routines, and, in some cases, resist or circumvent them.

Lao PDR represents a particularly instructive case for examining these dynamics. As one of Southeast Asia's least developed economies by standard digital and financial inclusion metrics, Lao PDR sits at a point in its digital transformation journey where ambition and structural constraint are in acute tension. The Government of Lao PDR has articulated an ambitious national vision for the digital economy to grow from approximately 3 percent to 10 percent of GDP by 2040, signaling recognition at the highest policy levels that digital transformation is an economic development imperative rather than a sectoral convenience (Beschorner et al., 2022). Yet the gap between this vision and the current material reality is substantial. The country continues to exhibit some of the most expensive and slowest internet connectivity in the ASEAN region, persistently low levels of digital literacy across broad population segments, bank account ownership of approximately 26.8 percent of adults, and regulatory frameworks for data protection, cybersecurity, and consumer protection that remain in active development (Beschorner et al., 2022).

To appreciate why internet infrastructure functions as a binding constraint on digital banking transformation in Lao PDR, it is useful to state the scale of the gap in concrete, comparative terms, particularly for readers from developed economies where high-speed connectivity has long been a solved background condition. At the start of 2025, internet penetration in Lao PDR stood at 63.6 percent of the population, meaning that approximately 2.85 million people, or 36.4 percent of the population, remained entirely offline; the typical fixed broadband connection delivered a median download speed of approximately 34.6 Mbps, an improvement of 17.8 percent over the previous year but still among the slowest in the ASEAN region (Kemp, 2025). By comparison, across member

countries of the Organization for Economic Co-operation and Development (OECD), a widely used proxy for developed economies, the share of households with basic internet access reached 92 percent in 2024, and the median fixed broadband download speed roughly tripled over five years, from 53 Mbps in late 2019 to 178 Mbps in late 2024 (OECD, 2025), several times faster than the equivalent connection in Lao PDR. For a reader in a developed economy, where near-universal, high-speed, low-latency connectivity has been the norm for two decades, it may not be intuitively obvious why "internet infrastructure" would be treated as a serious barrier to digital banking rather than as a solved technical detail. In Lao PDR, by contrast, slow and unreliable connectivity is an everyday lived experience for a substantial share of digital banking users, particularly outside the capital, Vientiane. This is a central reason why this dissertation, and Chapter 4 in particular, treats infrastructure quality not as background noise but as a determinant of user experience on par with application design itself.

Financial inclusion data further illustrate the developmental starting point from which Lao digital banking transformation proceeds. The World Bank's Global Findex Database recorded formal account ownership among Lao adults at 29 percent in 2017 (Wilson, 2019) and at approximately 26.8 percent in the assessment underlying the figures cited above (Beschorner et al., 2022); the most recent Global Findex Database 2025 places account ownership in Lao PDR at 38 percent, still well below the East Asia and Pacific regional average of 83 percent and neighboring Thailand's 92 percent (FinDev Gateway, 2026). As recently as 2023, an estimated 70 percent of Lao adults remained unbanked, a gap that motivated the Bank of Lao PDR's 2023 pilot of a retail central bank digital currency, the "Digital Kip," and a cross-border QR-code payment system launched jointly with Vietnam in January 2025 (Laotian Times, 2025). These figures indicate that the population of digital banking non-users in Lao PDR remains substantially larger than the population of users documented in Chapter 4, underscoring that the barriers this dissertation investigates, ranging from infrastructural constraints to entrenched cash-based saving habits, are not marginal frictions but conditions shared by the majority of the adult population.

Compared to regional neighbors such as Thailand, Vietnam, and even Cambodia, Lao PDR demonstrates markedly lower levels of internet penetration and digital financial service adoption. This gap is not merely a matter of technological investment; it reflects a complex interaction of infrastructural, institutional, cultural, and human capital factors that resist simple policy solutions and that require systematic, multi-level investigation before evidence-based guidance can be

provided to the practitioners and policymakers working to close it. Digital transformation in Lao banking is, in this sense, a problem that cannot be solved at any single level of analysis alone. It requires understanding simultaneously how global research trends and theoretical frameworks apply to this specific context, how banking organizations can effectively engage and develop the human capital that transformation depends upon, and how customers with variable digital capabilities and significant security anxieties develop the habitual engagement with digital banking services that sustainable adoption requires.

This dissertation is motivated by the recognition that these three levels of the digital transformation challenge in Lao PDR have been examined separately in the literature, if they have been examined at all, but have not been analyzed in an integrated, multi-level framework that reveals their interconnections and their collective implications for strategy and policy. At the organizational level, the employees who must operationalize digital transformation mandates, who serve simultaneously as primary users of digital systems and as the frontline intermediaries guiding customers through their own digital journeys, have received remarkably little scholarly attention in the digital banking literature, which has focused disproportionately on customer-facing adoption dynamics (Porfírio et al., 2024; Verhoef et al., 2021). At the customer level, the factors governing sustained digital banking engagement under conditions of infrastructure constraint, rather than initial adoption under laboratory-equivalent conditions, remain inadequately theorized and empirically tested. The interaction between these two levels, through which organizational capability and service quality on the supply side meets customer experience and habitual adoption on the demand side, has received almost no systematic scholarly attention.

This dissertation addresses these gaps through a deliberately constructed multi-level analysis that moves from the global to the organizational to the individual, using Lao PDR as the empirical site, and concludes by integrating the findings across levels into a framework that speaks to the full complexity of digital banking transformation in developing economy contexts.

1.2 Research Problem and Significance

The research problem that animates this dissertation can be articulated across three interconnected dimensions, each of which corresponds to a level of analysis and a study within the dissertation's multi-study design.

At the knowledge level, there is insufficient understanding of how the global research landscape on digital payment systems and mobile banking relates to the specific institutional and infrastructural conditions of developing economies like Lao PDR. The dominant theoretical frameworks, methodological approaches, and identified challenges in the international literature were largely developed in and calibrated for contexts with mature digital infrastructure, high digital literacy, and voluntary adoption environments. The extent to which these frameworks travel meaningfully to resource-constrained, institutionally developing settings is rarely interrogated. This gap limits researchers' and practitioners' ability to leverage international scholarly knowledge while making the contextual adaptations that different settings require.

At the organizational level, the internal dynamics of digital transformation adoption within banking institutions in developing economies remain poorly understood. Despite extensive research on customer technology adoption, the employee perspective has been systematically neglected. This neglect is consequential because employees are the human agents through whom digital transformation achieves or fails to achieve its organizational goals. They must not only adapt their own professional practices to digital systems but also support, guide, and reassure the customers who encounter digital banking services through their interaction with bank staff. Understanding which organizational, cultural, regulatory, and psychological factors support genuine digital engagement rather than reluctant compliance among banking employees in a mandatory adoption context is therefore a prerequisite for effective digital transformation strategy. The Lao banking context, with its combination of coercive regulatory mandates, limited human capital, infrastructure constraints, and collectivist organizational culture, presents a particularly demanding version of this challenge.

At the individual customer level, understanding what drives sustained habitual engagement with digital banking services under conditions of infrastructure constraint remains a theoretical and empirical frontier. Technology acceptance models provide robust frameworks for understanding initial adoption intentions, but their direct application to contexts characterized by unreliable internet connectivity, high connectivity costs, evolving regulatory frameworks, and significant security anxieties requires careful adaptation and empirical validation. Moving beyond initial adoption to understand the factors that create deep, habitual engagement in such constrained environments is essential for the sustainable digital transformation that development goals require.

The significance of addressing these three connected problems is substantial. Theoretically, this research extends and refines established technology acceptance frameworks, UTAUT for the mandatory organizational context and UTAUT2 for the infrastructure-constrained customer context, in ways that reflect the specific realities of developing economy digital banking and that introduce theoretically grounded new constructs, specifically Digital Engagement and Seamless Experience, which have potential applicability beyond this study's specific empirical context. Empirically, by providing rigorous quantitative and qualitative evidence from a developing economy setting across both organizational and customer levels, the dissertation contributes to a literature that has been dominated by developed market studies and addresses the multi-level integration gap identified above. Practically, the findings provide actionable, evidence-based guidance for banking institutions in Lao PDR and comparable developing economies, for policymakers and regulators seeking to build enabling environments for digital transformation, and for researchers developing the next generation of context-sensitive adoption frameworks. Socially, the dissertation speaks to the fundamental development ambition of financial inclusion: bringing previously unbanked populations into the formal financial system through digital channels whose potential depends entirely on the quality of the organizational and experiential conditions that banking institutions and policymakers create.

1.3 Research Questions

This dissertation is organized around three overarching research questions, each corresponding to one of the three core studies, and an integrative question that governs the synthesis chapter.

Research Question 1 (Macro Level): What are the major trends, dominant themes, influential contributors, methodological patterns, primary challenges, and future research directions in the global literature on digital payment systems and mobile banking over the period from 2000 to 2023, and what gaps in that literature motivate context-specific investigation in developing economies?

Research Question 2 (Organizational Level): What organizational, cultural, regulatory, and psychological factors influence bank employees' digital engagement with digital transformation initiatives in the Lao banking sector, how do these factors interact, and what is the mediating role of Digital Engagement in translating antecedent conditions into actual digital transformation adoption outcomes?

Research Question 3 (Individual Customer Level): What are the most critical drivers of digital banking acceptance and sustained usage among customers in Lao PDR under conditions of infrastructural constraint, and how do the constructs of the UTAUT2 framework perform, require adaptation, or require reconceptualization in this specific context?

Integrative Research Question: How do findings across the macro, organizational, and individual customer levels converge to provide a holistic, multi-level understanding of digital banking transformation in developing economies, and what integrated framework emerges from this synthesis that speaks to the needs of practitioners, policymakers, and researchers working in comparable contexts?

Each research question is accompanied by a set of sub-questions that guide the specific analytical decisions made in the corresponding study. These are detailed within their respective chapters.

1.4 Research Objectives

The overarching objective of this dissertation is to develop a comprehensive, empirically grounded, and practically actionable framework for understanding and fostering sustainable digital banking transformation in developing economies, using Lao PDR as a case study.

The first specific objective is to systematically map and analyze the evolution of global research on digital payment systems and mobile banking from 2000 to 2023, identifying publication trends, leading contributors, dominant theoretical frameworks, methodological approaches, recurring challenges, and gaps in the literature that motivate the subsequent empirical studies. This bibliometric analysis establishes the intellectual context within which the dissertation's empirical contributions are positioned.

The second specific objective is to develop and empirically test a theoretically grounded, context-appropriate model of employee digital engagement in mandatory adoption contexts within the Lao banking sector. This involves extending the UTAUT framework with constructs capturing organizational culture, regulatory influence, and perceived risk, replacing behavioral intention with Digital Engagement as the primary mediating construct, and examining how antecedent factors combine to drive Digital Transformation Adoption as the ultimate organizational outcome. The study integrates quantitative survey data from 354 employees across 26 banks with qualitative

evidence from semi-structured interviews and open-ended survey responses to produce both structural model evidence and contextually grounded interpretation.

The third specific objective is to identify the most parsimonious and robust predictors of digital transformation adoption and sustained use among customers in Lao PDR under conditions of infrastructural constraint. This involves systematically testing and refining the UTAUT2 framework through empirically guided model development, developing and validating the novel construct of Seamless Experience as a unified perception of service quality integrating application usability and infrastructure reliability, and examining the roles of Behavioral Intention and Habit in driving actual digital banking use among experienced users.

The integrative objective is to synthesize findings across all three studies into a coherent multi-level framework that connects global research trends to local empirical realities, illuminates the interplay between organizational readiness on the supply side and customer experience on the demand side, identifies convergent themes across analytical levels, and provides comprehensive guidance for sustainable and inclusive digital banking transformation in developing economies.

1.5 Dissertation Framework

The overall research framework of this dissertation, illustrated in Figure 1, adopts a multi-level analytical architecture that moves progressively from the global to the organizational to the individual customer, while maintaining explicit connections across levels that enable genuine multi-level synthesis in the concluding chapter.

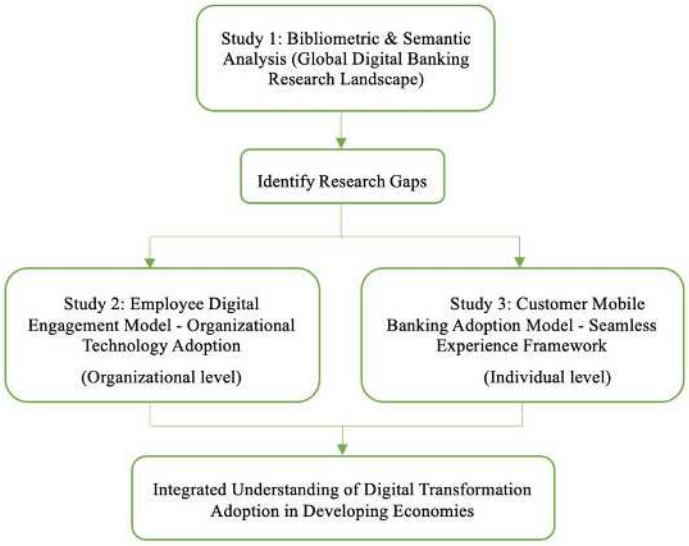


Figure 1. Overall Research Framework of the Dissertation

The first study, presented in Chapter 2, conducts a bibliometric and semantic analysis of 2,084 publications on digital payment systems and mobile banking from 2000 to 2023, providing the macro-level intellectual map within which the subsequent empirical investigations are positioned. The second study, presented in Chapter 3, develops and tests an employee-centric model of digital banking adoption using mixed-methods research with 354 bank employees across 26 banks in Lao PDR. The third study, presented in Chapter 4, develops and tests a customer-centric model using survey and qualitative data from 128 digital banking customers in Lao PDR. The synthesis in Chapter 5 integrates findings across all three studies into a multi-level framework for digital banking transformation in developing economies.

The progression from global to organizational to individual is not merely a structural convenience. It reflects a substantive theoretical logic: understanding what the global literature has established about digital banking adoption is necessary for positioning the Lao PDR studies within the field and for justifying the theoretical adaptations they introduce; understanding the organizational conditions that determine the quality of the supply-side digital banking experience is necessary for contextualizing the demand-side customer adoption findings; and integrating both perspectives is necessary for the holistic framework that neither level of analysis can independently generate.

1.6 Dissertation Structure

This dissertation is organized into five chapters that correspond to the multi-study sequential design described above.

Chapter 1 establishes the research context, articulates the problem and its significance, presents the research questions and objectives, and outlines the overall dissertation structure and its underlying methodological logic.

Chapter 2 provides the macro-level foundation through a comprehensive bibliometric analysis of global research on digital payment systems and mobile banking from 2000 to 2023. Using data from Scopus and employing multiple complementary analytical tools including Publish or Perish, VOSviewer, KH Coder, and Large Language Models, the study maps the field's intellectual evolution, identifies dominant themes and methodological patterns, documents influential contributors, and synthesizes key challenges and gaps. Three critical gaps emerge from this synthesis that directly motivate the subsequent empirical studies: the underrepresentation of

developing economy perspectives in dominant adoption models, the neglect of employee-centric perspectives in mandatory adoption contexts, and the inadequate treatment of infrastructure and regulatory environment as systemic forces shaping adoption dynamics.

Chapter 3 addresses the first and second of these gaps through an organizational-level investigation of employee digital engagement in the Lao banking sector. It develops and tests an extended UTAUT model adapted for mandatory adoption contexts, introducing Digital Engagement to replace Behavioral Intention as the primary mediating construct and incorporating Organizational Culture, Regulatory Influence, and Perceived Risk as context-specific extensions. Analysis of survey data from 354 employees across 26 banks, combined with qualitative insights from semi-structured interviews and open-ended survey responses, reveals that Performance Expectancy and Organizational Culture are the two dominant drivers of Digital Engagement, followed by Social Influence, Regulatory Influence, and Effort Expectancy. Digital Engagement in turn strongly predicts Digital Transformation Adoption, confirming its validity as the appropriate mediating construct in mandatory adoption contexts. Facilitating Conditions emerge as a threshold enabler whose effects are partially invisible to linear structural models but experientially central to employees' working lives, a pattern that parallels and anticipates the Seamless Experience findings in Chapter 4.

Chapter 4 addresses the third gap through a customer-level investigation of digital banking adoption in Lao PDR. Beginning with the comprehensive UTAUT2 framework, the study undertakes a systematic, diagnostically guided model refinement process that reveals severe multicollinearity between Effort Expectancy and Facilitating Conditions in this infrastructure-constrained context. This finding motivates the development of Seamless Experience as a novel higher-order construct capturing users' holistic perception of service quality as the integrated outcome of application usability and infrastructure reliability. The final parsimonious model demonstrates that Behavioral Intention is primarily driven by Seamless Experience and Habit, with Digital Transformation Adoption following from Behavioral Intention in a fully mediated structural chain. Importance-Performance Map Analysis identifies infrastructure reliability, captured within the Facilitating Conditions dimension of Seamless Experience, as the highest-priority area for improvement, while qualitative evidence reveals that security concerns function as a foundational threshold condition rather than a differentiating predictor among established users.

Chapter 5 synthesizes findings across all three studies, drawing out the convergent themes, the cross-level interactions, and the integrated framework for digital banking transformation in developing economies that the multi-level analysis produces. It articulates the theoretical contributions of the dissertation, provides comprehensive practical implications for banking institutions and policymakers, acknowledges limitations across all three studies, and proposes a research agenda for the field.

1.7 Methodology Overview

This dissertation employs methodological pluralism, recognizing that the three distinct research questions require different methodological approaches and that triangulation across methods produces findings that are more robust and more credible than any single method could generate independently.

The first study employs bibliometric analysis, which is suited for systematically mapping large bodies of scholarly literature to identify patterns, trends, and intellectual structures that are not visible through traditional narrative review. Data were extracted from Scopus covering 2000 to 2023 using search terms encompassing electronic payment, digital payment, mobile banking, e-banking, internet banking, and online banking. Multiple complementary analytical tools were deployed, each addressing a distinct dimension of the bibliometric task: Publish or Perish for quantitative bibliometric indicators, VOSviewer for network visualization and co-authorship analysis, KH Coder for text mining and quantitative content analysis, and Large Language Models for enhanced semantic extraction. This multi-tool approach addresses the limitations inherent in any single method.

The second study employs a mixed-methods design, combining a structured quantitative survey administered to 354 employees across 26 banks with semi-structured interviews of five key informants and analysis of open-ended survey responses. Quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4, a technique appropriate for exploratory research with complex models involving both formative and reflective constructs. Qualitative data were analyzed through thematic analysis following Braun and Clarke's (2006) six-phase procedure. The integration of these methods follows the sequential explanatory design described by Creswell and Clark (2017), in which quantitative findings are interpreted and deepened through qualitative evidence.

The third study employs a quantitative survey design with a methodologically distinctive iterative model refinement feature. Beginning with the comprehensive UTAUT2 specification, the study uses composite-based structural equation modeling in the cSEM package in R for initial diagnostic analysis, followed by refined model estimation in SmartPLS using a two-stage approach for the higher-order Seamless Experience construct. Importance-Performance Map Analysis (IPMA) extends the interpretive value of the structural findings. Qualitative data from open-ended survey responses provide essential interpretive context, particularly for the security-related patterns that emerge as theoretically significant despite not appearing in the final structural model.

The multi-study sequential design is purposefully structured so that each study builds upon and motivates the subsequent ones. The bibliometric analysis establishes the gaps that the empirical studies address. The employee study provides the organizational supply-side context within which the customer study's demand-side findings are interpreted. The synthesis integrates both empirical perspectives in a way that neither alone could support. This progressive, cross-referencing structure is what makes the dissertation genuinely multi-level rather than merely multi-study.

1.8 Delimitations and Scope

Several deliberate delimitations define the scope of this dissertation and should be understood as theoretically motivated rather than merely pragmatic.

Geographically, the empirical studies focus specifically on Lao PDR. This focus enables the depth and contextual richness that a single-country study provides and reflects Lao's status as a theoretically valuable research site: a developing economy with ambitious digital transformation goals confronting infrastructure and institutional constraints that are unusually concentrated and therefore unusually revealing of the mechanisms through which such constraints shape adoption dynamics. The theoretical frameworks developed and tested here are intended to have relevance for comparable developing economies, but direct generalization requires replication with appropriate adaptations.

Temporally, the bibliometric analysis covers 2000 to 2023, capturing two decades of field evolution. Empirical data collection for the employee and customer studies was conducted between March and April 2025. Digital banking is a rapidly evolving field, and the findings represent conditions at a specific moment in Lao PDR's transformation journey.

Sectorally, the research focuses on licensed commercial banking institutions in Lao PDR, which represent the regulated core of the financial system most directly subject to the digital transformation mandates that are central to the study's theoretical concerns. While digital financial ecosystems in Lao PDR also involve mobile money providers, fintech startups, and informal financial institutions, the formal banking sector is the appropriate focus for a study whose primary theoretical concern is the interaction of organizational dynamics, regulatory pressure, and technology adoption.

In terms of stakeholders, the dissertation focuses primarily on employees in Chapter 3 and customers in Chapter 4. These two groups represent the supply-side and demand-side human actors whose behaviors collectively determine whether digital banking transformation achieves its organizational and social goals. Other stakeholder perspectives, including those of regulators, technology vendors, and senior executives, are incorporated through qualitative evidence but are not the primary focus of the structural models.

1.9 Definition of Key Terms

The following definitions establish the conceptual vocabulary used consistently throughout this dissertation.

Digital Banking Transformation, as used throughout this dissertation, refers to a bidirectional and continuous process of transformation in banking that encompasses both the supply side and the demand side of the banking relationship, rather than to a single technology or delivery channel. On the supply side, it involves banks' strategic integration of digital technologies across all dimensions of their operations, including customer service delivery, internal processes, product innovation, organizational culture, employee capabilities, and business model design (Porfírio et al., 2024; Vial, 2019). On the demand side, it equally involves customers' own transformation: the acquisition of digital literacy and skills, the psychological and behavioral adjustment required to trust and rely on digital channels, and the incorporation of digital banking into habitual financial behavior (Wen, 2024). Digital Banking Transformation is therefore explicitly distinguished, in this dissertation, from digital banking as a channel (defined immediately below): full digital banking transformation is conceptualized as a requiring meaningful change on both the organizational and customer sides of the banking relationship. This dual-sided conceptualization is reflected directly in this dissertation's three-study design, which examines the macro-level research landscape in Chapter 2,

the employee and organizational side of transformation in Chapter 3, and the customer side of transformation in Chapter 4.

Digital Banking, distinguished here from Digital Banking Transformation above, refers narrowly to the delivery channel and set of services through which customers access banking, such as mobile banking applications and internet banking portals (see Digital Payment Systems and Mobile Banking below). This narrower, channel-level meaning is not synonymous with the broader transformation process defined above; internet-based access to bank services is one visible output of Digital Banking Transformation, not the transformation itself. Where this dissertation uses "digital banking" as a channel or usage variable, for example in the customer-level model developed in Chapter 4, it refers to this narrower meaning; where it uses "digital banking transformation," it refers to the broader, dual-sided organizational and behavioral process defined above.

Digital Payment Systems are electronic platforms and technologies that enable financial transactions without physical cash, including mobile banking applications, internet banking portals, digital wallets, and payment gateways.

Mobile Banking refers to banking services accessed through mobile devices via dedicated applications or mobile-optimized websites, enabling customers to conduct financial transactions remotely and asynchronously.

Technology Adoption describes the process by which individuals or organizations come to accept, integrate, and routinely use a new technology, encompassing both initial acceptance decisions and sustained usage behavior over time.

Behavioral Intention (BI) is an individual's subjective probability of performing a specific behavior, representing the motivational state that standard technology acceptance models posit as the immediate antecedent of actual behavior (Venkatesh et al., 2003).

Digital Engagement (DE), introduced in this dissertation as a construct for mandatory adoption contexts, refers to the psychological and behavioral state reflecting an employee's comprehensive motivational commitment, comfort level, and proactive alignment with digital tools, serving as a theoretically appropriate alternative to Behavioral Intention when adoption is organizationally mandated rather than individually chosen (Schaufeli et al., 2006).

Seamless Experience (SE), developed in this dissertation as a novel higher-order construct, captures users' unified holistic perception of digital banking service quality as the integrated outcome of application interface usability and underlying infrastructure reliability. This construct reflects the empirically documented finding that users in infrastructure-constrained environments do not cognitively distinguish between application failures and connectivity failures but experience service quality as a single integrated phenomenon.

Facilitating Conditions (FC) refer to the degree to which individuals perceive that organizational and technical resources and support exist to facilitate their technology use, including infrastructure quality, training availability, and technical assistance (Venkatesh et al., 2012; Venkatesh et al., 2003).

Performance Expectancy (PE) is the degree to which an individual believes that using a technology will help them attain gains in job performance or life efficiency (Venkatesh et al., 2003).

Effort Expectancy (EE) is the degree of ease associated with using a technology, capturing perceptions of user-friendliness, interface clarity, and the learning curve required for competent use (Venkatesh et al., 2003).

Habit (HT) is the extent to which individuals tend to perform behaviors automatically because of learning and repeated performance. In the post-adoption digital banking context examined in Chapter 4, Habit represents one of the two primary drivers of continued behavioral intention among experienced users (Laradi et al., 2025; Venkatesh et al., 2012).

Organizational Culture (OC) refers to the shared values, beliefs, and behavioral norms within an organization that collectively shape how employees respond to change, technology, and leadership direction, as conceptualized by Schein (2010) and applied to the digital transformation context by Hung (2024) and Sibassaha et al. (2025).

Regulatory Influence (RI) captures the degree to which employees perceive that external mandates from government, central bank policies, or internal compliance requirements shape their engagement with digital systems, representing the coercive isomorphic pressure of the institutional environment as described by DiMaggio and Powell (1983).

Perceived Risk (PR) refers to an individual's subjective perception of potential negative outcomes associated with digital technology use, including concerns about data breaches, fraud, privacy violations, and system failures (Apau et al., 2025).

Financial Inclusion is the process of ensuring access to appropriate, affordable financial services for all members of society, particularly marginalized and low-income populations historically excluded from the formal financial system.

PLS-SEM (Partial Least Squares Structural Equation Modeling) is a variance-based statistical technique for analyzing complex relationships between latent constructs, particularly well-suited for research with exploratory dimensions, models incorporating both formative and reflective constructs, and samples that are modest in size (Hair et al., 2022).

Bibliometric Analysis is a quantitative method that uses statistical and mathematical techniques to analyze patterns in large bodies of scholarly literature, including publication trends, citation networks, co-authorship structures, and thematic concentrations (Donthu et al., 2021)

Chapter 2: Macro-level landscape – Bibliometric and Semantic analysis of digital payment systems and mobile banking: trends, challenges, and future direction

2.1 Introduction

The rapid advancement of digital technologies over the past two decades has profoundly transformed the global financial services industry. Among the innovations that have reshaped this landscape, digital payment systems and mobile banking stand out as technologies that have moved from specialist novelty to mainstream infrastructure in a remarkably short period. The proliferation of smartphones, the expansion of internet connectivity, and the emergence of dedicated financial technology firms have together created the conditions for digital financial services to become central components of modern banking ecosystems across a growing range of economies and demographic groups.

These developments have attracted considerable scholarly attention from researchers working across disciplines that include information systems, finance, marketing, organizational behavior, and development economics. The resulting literature is large, diverse, and rapidly expanding, encompassing studies of technology acceptance, consumer behavior, service quality, financial inclusion, security and trust, regulatory dynamics, and the role of technological infrastructure in enabling or constraining digital financial service delivery. Given the volume and pace of publication in this area, obtaining a clear and systematic understanding of how the field has evolved, where its intellectual strengths lie, and where important gaps remain requires more than traditional narrative review. It requires methods that can handle the scale of the literature while preserving its intellectual nuance of its content.

This chapter addresses that requirement through a comprehensive bibliometric analysis of global research on digital payment systems and mobile banking from 2000 to 2023. Bibliometric analysis applies statistical and mathematical techniques to bibliographic data in order to map publication trends, citation patterns, collaboration networks, and thematic structures within a research domain (Donthu et al., 2021; Zupic & Čater, 2015). By making visible the intellectual architecture of a field rather than simply its content, bibliometric methods enable researchers to identify which contributions have been most influential, which themes have attracted sustained attention and which have been neglected, and where the boundaries of current knowledge create productive opportunities for new investigation.

The timing of this analysis is intentional. The period from 2000 to 2023 captures the full arc of digital payment research from the early days of internet banking through the proliferation of smartphone-based mobile applications, the emergence of fintech disruption, and the pandemic-driven acceleration of digital adoption. It also captures the emergence of new technological frontiers in blockchain, artificial intelligence, and fifth-generation connectivity that are reshaping the research agenda in real time. Understanding the intellectual terrain that has been built over this period is essential for positioning new research contributions credibly and for identifying the directions in which the field most urgently needs to develop.

For this dissertation, the bibliometric analysis serves a specific additional function: it establishes the global scholarly context within which the empirical investigations of Chapters 3 and 4 are positioned, and it provides the evidence-based justification for the theoretical adaptations and construct innovations that those chapters introduce. The gaps identified in the bibliometric synthesis are not merely interesting observations about the state of the literature; they are the specific intellectual problems that the subsequent empirical studies are designed to address.

2.1.1 Purpose and Objectives of the Bibliometric Study

The bibliometric analysis aims to provide a systematic overview of the intellectual structure and development of research on digital payment systems and mobile banking. Specifically, this study seeks to achieve the following objectives:

1. Examine publication patterns over the 24-year period (2000–2023) in order to understand the evolution of research activity and identify periods of significant growth or stagnation in the field.
2. Determine the most influential contributors, including leading authors, institutions, and academic journals, based on publication productivity and citation impact.
3. Trace the thematic development of the field by identifying dominant research topics, emerging areas of interest, and themes that have gradually declined over time.
4. Assess the methodological landscape of existing studies by examining the research designs, analytical techniques, and data collection approaches most commonly employed.
5. Identify the theoretical foundations that have guided research in this domain, with particular attention to the models and conceptual frameworks used to explain digital payment and mobile banking adoption.

6. Synthesize the key challenges and limitations repeatedly highlighted in the literature, including technological, behavioral, institutional, and contextual barriers.
7. Highlight potential directions for future research by drawing on the gaps and underexplored areas revealed through the bibliometric findings.

2.2 Literature Review: Contextualizing Digital Payment Research

Before presenting the bibliometric methodology and the results of the analysis, it is important to establish the theoretical and contextual foundations of research on digital payment systems and mobile banking. The rapid development of digital financial technologies has significantly transformed the global financial landscape, leading to the emergence of new digital payment infrastructures and innovative banking services. As a result, a substantial and interdisciplinary body of literature has emerged that examines technological innovation, financial inclusion, consumer behavior, and institutional transformation within digital financial ecosystems.

Understanding the evolution of this research field requires examining both the technological developments that have enabled digital financial services and the theoretical perspectives that scholars have used to explain their adoption and use. This section therefore reviews the key developments, technological drivers, challenges, and emerging research directions related to digital payment systems and mobile banking. By synthesizing prior studies, the review provides a conceptual foundation for interpreting the bibliometric analysis presented later in this chapter.

2.2.1 Evolution and Impact of Digital Payment Systems and Mobile Banking

The evolution of digital payment systems and mobile banking has been a progressive process spanning more than two decades. Early developments in electronic banking can be traced to the expansion of internet technologies in the late 1990s and early 2000s, when financial institutions began introducing online banking services that allowed customers to conduct financial transactions through web-based platforms (Gomber et al., 2018).

The foundational period between 2000 and 2010 was characterized by the emergence of internet banking and early mobile banking applications. This phase was driven by the rapid expansion of internet connectivity and the broader digitalization of financial services. During this period, research focused primarily on understanding initial adoption barriers, security concerns, and the factors that distinguished early adopters from the broader population (Venkatesh et al., 2012).

The transition from traditional branch-based banking to digital-first service models fundamentally altered the competitive dynamics of the financial sector. Financial institutions increasingly faced competition not only from established banks but also from emerging financial technology firms that offered specialized digital financial services with more flexible and user-friendly platforms (Gomber et al., 2018). This competitive pressure accelerated innovation within the banking industry and encouraged traditional financial institutions to invest heavily in digital transformation initiatives.

During the maturation period between 2011 and 2019, scholarly attention increasingly shifted toward understanding sustained usage of digital financial services rather than initial adoption alone. Researchers began examining factors such as trust, service quality, perceived value, and the integration of mobile banking within broader digital ecosystems. Studies during this period also explored the role of digital financial services in promoting financial inclusion and improving the efficiency of financial systems (Mahalakshmi et al., 2022; Ozili et al., 2024).

The COVID-19 pandemic between 2020 and 2023 represented a major turning point in the global adoption of digital financial technologies. Public health restrictions and concerns about physical contact accelerated the shift toward contactless and remote financial transactions. International organizations such as the OECD (2021) documented how the pandemic significantly increased reliance on digital payment platforms and mobile banking services worldwide. Consequently, recent research has focused on pandemic-driven behavioral changes, the resilience of digital financial infrastructure, and the implications of rapid digitalization for populations with limited digital access or digital literacy (Dissanayake et al., 2023).

2.2.2 Technological Innovations Driving Digital Financial Transformation

Technological innovation has played a central role in shaping the development of digital payment systems and mobile banking. In recent years, the rapid advancement of artificial intelligence, big data analytics, and digital infrastructures has significantly transformed the way financial services are delivered and consumed. Financial institutions are increasingly adopting these technologies to enhance operational efficiency, improve decision-making processes, and provide more personalized and responsive services (Ahmadi, 2024). As highlighted in recent studies, the integration of advanced digital technologies has not only improved service quality but also altered competitive dynamics and user expectations within the financial sector (Vuković et al., 2025).

One of the most influential technological drivers is the development of big data analytics. The ability to collect and analyze large volumes of transactional and behavioral data allows financial institutions to better understand customer preferences, enhance risk management practices, detect fraudulent activities, and deliver personalized financial services (Chen et al., 2012). More recent studies further emphasize the growing integration of big data with artificial intelligence, enabling advanced predictive analytics, automation, and real-time decision-making in digital financial services (Ahmadi, 2024). These capabilities have significantly improved the efficiency and responsiveness of digital banking platforms.

At the same time, the increasing reliance on data-intensive technologies has raised important concerns regarding privacy, data governance, and market structure. As firms accumulate and control large datasets, data becomes a strategic asset that can strengthen competitive advantage and reinforce the position of dominant players. Recent literature suggests that such data concentration may create barriers to entry for smaller firms and reshape competition within digital financial markets (Vuković et al., 2025). In addition, the widespread use of data-driven systems has brought renewed attention to the relationship between competition policy and consumer protection, particularly in relation to how personal data is collected, used, and regulated. These issues highlight the need for a careful balance between innovation and regulatory oversight in the development of digital financial ecosystems.

Closely related to this is the increasing use of artificial intelligence and machine learning in financial services. These technologies are now widely applied in areas such as credit assessment, fraud detection, customer service automation, and financial advisory services. Empirical evidence indicates that the adoption of AI can improve operational efficiency and support more accurate and data-driven decision-making within financial institutions (Gyau et al., 2024). At the same time, the use of algorithmic systems raises concerns about transparency, accountability, and fairness. For instance, machine learning models trained on historical data may unintentionally reproduce existing biases, leading to unequal outcomes for certain groups of users. Recent studies therefore emphasize the importance of developing responsible and explainable AI systems that ensure ethical and inclusive financial services (Mustafa & Reuben, 2025).

Another important technological development is the expansion of high-speed communication infrastructure, particularly with the introduction of 5G networks. Improved connectivity allows for faster data transmission, lower latency, and more reliable digital interactions,

which in turn support real-time financial transactions and more advanced mobile banking applications. These improvements enhance user experience and contribute to the increasing adoption of digital financial services. However, differences in infrastructure development across regions may also deepen existing digital divides, particularly in developing economies where access to advanced technologies remains uneven.

The Internet of Things has also begun to influence the evolution of digital payment systems. The growing use of interconnected devices enables financial services to be embedded into everyday technologies such as smartphones, wearable devices, and smart home systems. This creates new possibilities for seamless and automated financial transactions, allowing users to interact with financial services in more convenient and integrated ways. At the same time, the increased interconnectivity of devices raises concerns about data security, system vulnerability, and user control over financial information.

Blockchain and distributed ledger technologies represent another significant area of innovation within digital finance. These technologies enable decentralized transaction processing, which can increase transparency and reduce reliance on traditional intermediaries. As a result, blockchain has supported the development of new financial models, including cryptocurrency-based payment systems and decentralized financial platforms. Despite these potential benefits, recent research highlights ongoing challenges related to scalability, regulatory uncertainty, energy consumption, and user trust. These limitations suggest that while blockchain holds considerable promise, its role in mainstream financial systems is still evolving.

Overall, technological innovations have substantially enhanced the efficiency, accessibility, and functionality of digital financial services. At the same time, they have introduced new challenges that extend beyond technical performance, including issues related to data governance, cybersecurity, regulatory adaptation, and social inclusion. Understanding these technological developments is therefore essential for interpreting the evolution of digital payment systems and mobile banking, as well as for contextualizing the findings of the bibliometric analysis presented in this study.

2.2.3 Challenges and Barriers

Despite the substantial progress in digital payment systems, a number of critical challenges continue to limit their widespread adoption and effective use. While technological advancements

have enhanced convenience and efficiency, they have also introduced new forms of risk and uncertainty that shape user perceptions and behaviors.

Security and privacy concerns remain among the most significant barriers. As digital financial services depend heavily on the processing and storage of sensitive personal and financial data, users are increasingly exposed to risks such as data breaches, identity theft, and fraudulent transactions. These threats continue to evolve alongside technological advancements, making cybersecurity an ongoing concern rather than a fully solvable issue. Wójcik and Ioannou (2020) highlight the structural vulnerabilities associated with digital financial systems and emphasize the need for continuously updated and robust security measures to safeguard user data and maintain system integrity. More recent studies further suggest that perceived security is not only a technical issue but also a psychological one, as users' confidence in a system plays a decisive role in shaping their willingness to adopt and continue using digital financial services (Apau et al., 2025). Empirical evidence indicates that perceived security, trust, and risk perceptions jointly influence behavioral intention, with users relying more on subjective evaluations of system safety than on purely technical features (Trivedi & Sanchiher, 2023). In this context, trust functions as a key mechanism through which security perceptions are translated into adoption decisions, while perceived risk continues to act as a significant barrier to sustained usage.

Closely related to security is the issue of trust, which remains a fundamental determinant of user acceptance. Trust becomes particularly important for individuals with limited digital experience or for those who have previously encountered security-related problems (Trivedi & Sanchiher, 2023). Building trust requires more than technological reliability; it also depends on transparent communication, effective customer support, and the presence of strong regulatory protections. In this context, trust can be understood as a multidimensional construct that reflects both institutional assurance and individual perception. Recent research increasingly highlights that trust directly influences behavioral intention and long-term usage of digital financial platforms, especially in environments where uncertainty and perceived risk are high (Masrek et al., 2025).

Another important barrier is the digital divide, which continues to hinder inclusive access to digital financial services. Inequalities in access to digital technologies arise from differences in income, education, age, and geographic location. In many developing regions, limited infrastructure, high costs of internet connectivity, and low levels of digital literacy restrict the ability of individuals to engage with digital payment systems (OECD, 2021; Trivedi & Sanchiher, 2023). These disparities

not only affect initial adoption but also influence the quality and consistency of usage. As a result, recent literature emphasizes that technological innovation alone is insufficient to achieve financial inclusion. Instead, a broader approach is required, combining infrastructure development, education initiatives, and supportive policy frameworks (Pallavi & Dsa, 2025).

Regulatory challenges further complicate the development of digital financial ecosystems. In many cases, regulatory frameworks struggle to keep pace with rapid technological change, creating uncertainty for both service providers and users. Policymakers must balance multiple objectives, including fostering innovation, ensuring consumer protection, maintaining financial stability, and promoting fair competition. At the same time, inconsistencies across jurisdictions can create additional complexity, particularly for cross-border digital financial services. Recent discussions in the literature suggest that adaptive and technology-neutral regulatory approaches are essential to support sustainable growth in digital finance while protecting user interests (Putrevu & Mertzanis, 2023).

Importantly, recent research suggests that challenges in digital payment systems are not limited to technical and institutional factors but also involve important psychological and cognitive dimensions. Because digital payments rely on abstract numerical representations rather than physical cash, they reduce the visibility and salience of financial transactions. This reduced salience can weaken users' awareness of their spending behavior and create a degree of cognitive detachment from financial outflows. As a result, users may perceive a higher level of convenience and control, even when their actual ability to monitor and manage expenditures becomes less precise. These findings suggest that trust and security should not be viewed solely as technological constructs but also as perceptual and behavioral phenomena shaped by users' sense of transparency, awareness, and control. Consequently, digital banking research must increasingly consider how these psychological mechanisms influence not only initial adoption decisions but also continued usage and long-term engagement, particularly in contexts where digital literacy and financial awareness remain uneven (Faraz & Anjum, 2025).

Overall, the adoption and sustained use of digital payment systems are shaped by a complex interplay of technological, behavioral, and institutional factors. Persistent challenges related to security, trust, perceived risk, digital inequality, and regulatory uncertainty continue to influence user behavior and constrain the full potential of digital financial services. These barriers are particularly pronounced in developing economies, where infrastructural limitations and uneven

levels of digital literacy further complicate adoption and usage patterns. Addressing these challenges is therefore critical for fostering inclusive, resilient, and sustainable digital financial ecosystems.

2.2.4 Emerging Trends and Future Directions

Recent developments suggest that digital payment systems and mobile banking are entering a new phase characterized by deeper technological integration and expanding functional ecosystems. Innovations such as blockchain, artificial intelligence, and advanced data analytics are reshaping financial services by enhancing efficiency, transparency, and personalization. At the same time, the convergence of digital banking with broader fintech ecosystems, including lending platforms, insurance technologies, and digital wealth management services, is creating more interconnected and complex financial environments.

Despite these advancements, important challenges remain, particularly in relation to user adoption, trust, and inclusivity. Financial inclusion continues to represent both a major opportunity and a persistent concern, especially in developing economies where structural constraints limit access to digital infrastructure and financial literacy. These evolving dynamics highlight the need for context-sensitive research that goes beyond technology-centric perspectives to examine behavioral, organizational, and infrastructural factors influencing adoption and sustained usage. In this regard, the present study contributes by addressing these gaps through both macro-level bibliometric analysis and micro-level empirical investigation in the context of Lao PDR.

2.3 Methodology

This bibliometric analysis employs a systematic, multi-tool approach to comprehensively map the research landscape of digital payment systems and mobile banking.

2.3.1 Data Source and Search Strategy

Database Selection: Scopus was selected as the primary database for this analysis. This choice is justified by several factors: Scopus provides extensive coverage of peer-reviewed literature across sciences, technology, medicine, and social sciences; it offers robust search capabilities and standardized metadata; and it is widely recognized as one of the most comprehensive academic databases, making it ideal for bibliometric analysis.

Temporal Coverage: The analysis covers publications from January 1, 2000, to December 31, 2023 - a 24-year period that captures the full arc of digital payment evolution from early internet banking through the COVID-19 acceleration. The start date of 2000 corresponds with the dot-com

era when digital financial services began gaining traction, while the end date of 2023 ensures the analysis captures the most recent developments.

Search Terms: A comprehensive search string was developed to capture the breadth of digital payment and mobile banking research. The search terms included: “electronic payment” OR “digital payment” OR “mobile banking” OR “e-banking” OR “ebanking” OR “internet banking” OR “online banking”. These terms were applied to article titles, abstracts, and keywords to ensure comprehensive coverage while maintaining relevance.

Search Fields: The search was conducted across three fields, including the article title, abstract, and author-supplied keywords, to ensure an appropriate balance between comprehensiveness and relevance. Limiting searches to these fields (rather than full text) reduces noise from articles that merely mention digital payments tangentially.

Following the application of inclusion and exclusion criteria, which limited the dataset to English-language peer-reviewed articles and review articles with substantive focus on digital payment or mobile banking adoption, technology, behavior, or regulation, the initial retrieval of 8,098 documents was reduced to 2,084 documents that formed the analytical sample. This screening was conducted on July 10, 2024.

2.3.2 Bibliometric Tools and Analytical Techniques

To ensure a comprehensive and methodologically rigorous mapping of the digital banking and digital payment literature, this study adopts a multi-tool bibliometric and semantic analysis approach. Prior bibliometric research emphasizes that no single analytical tool can fully capture research productivity, intellectual structure, and thematic evolution simultaneously (Donthu et al., 2021; Zupic & Čater, 2015). Accordingly, this study integrates citation-based metrics, network visualization, quantitative text mining, and AI-driven semantic analysis, with each tool addressing a distinct analytical dimension of the literature.

Publish or Perish was employed to conduct citation-based performance analysis using quantitative bibliometric indicators such as total publications, citation counts, h-index, and g-index (Ahmi, 2021). These indicators are widely recognized for evaluating research productivity and scholarly impact at the levels of authors, institutions, and journals (Egghe, 2006; Hirsch, 2005). In this study, Publish or Perish played a foundational role by identifying influential contributors and

high-impact publication outlets, thereby establishing the empirical baseline of the research field and its academic reach.

To examine the relational and structural characteristics of the literature, VOSviewer was utilized for bibliometric mapping and visualization. VOSviewer enabled the analysis of text-based bibliometric data through Co-Authorship, Co-Citation, and Keyword Co-Occurrence networks (Ahmi, 2021; Eck & Waltman, 2010). Co-Authorship analysis reveals collaboration patterns and knowledge-sharing structures among scholars and institutions, while Co-Citation analysis identifies clusters of frequently cited works that reflect shared theoretical foundations. Keyword Co-Occurrence analysis further illustrates thematic concentrations and conceptual linkages within the field. Through clustering algorithms and visual mapping, VOSviewer facilitates the identification of dominant research streams and their temporal evolution.

While network-based bibliometric tools are effective in revealing structural patterns, they rely primarily on explicit metadata and keywords. To capture deeper thematic and contextual meanings embedded in textual data, KH Coder was employed for text mining and quantitative content analysis. KH Coder supports the detection of important themes, trends, and patterns by statistically analyzing word Co-Occurrences and conducting correspondence analysis between keywords and variables such as publication year (Higuchi, 2017). This tool is particularly useful for customizing keyword networks and uncovering latent thematic relationships that may not be visible through citation or network analyses alone. Its inclusion enhances interpretive depth and supports methodological triangulation.

To further address the limitations of traditional bibliometric approaches, Large Language Models (LLMs) were incorporated as an advanced semantic analysis layer. LLMs enable the semantic extraction of research issues and key concepts by identifying conceptual similarities even when different terminologies are used (Hadi et al., 2023). In this study, LLMs were applied to retrieve and categorize research themes, detect emerging subjects, and identify underexplored research gaps within the literature. By moving beyond surface-level keyword matching, LLMs provide a more nuanced understanding of complex and evolving research domains, thereby strengthening the conceptual coherence of the analysis.

Overall, the integration of Publish or Perish, VOSviewer, KH Coder, and LLM-based semantic analysis reflects a multi-level and context-sensitive methodological design aligned with

best practices in contemporary bibliometric research (Donthu et al., 2021). This triangulated approach enhances analytical robustness, mitigates the limitations associated with single-tool analyses, and enables the study to link global research trends with context-specific empirical investigations. As such, it provides a holistic and theoretically grounded foundation for examining digital banking and digital payment research in developing economies.

2.3.3 Analytical Procedures

The analytical framework of this bibliometric study was implemented through a structured five-stage sequential process, progressing from broad descriptive mapping to in-depth thematic synthesis. This staged design follows established bibliometric research practices and ensures analytical rigor by systematically building interpretive depth at each phase (Donthu et al., 2021; Zupic & Čater, 2015).

The first stage, Descriptive Analysis, established an overarching profile of the research field. Publication trends were examined chronologically to identify periods of growth, stability, or emerging scholarly interest over time (Aria & Cuccurullo, 2017). Publications were further classified according to document type, with particular attention to journal articles and conference papers, in order to assess the academic maturity of the research field. In addition, subject area distributions were analyzed to reveal the disciplinary foundations and interdisciplinary scope of digital banking and digital payment research.

The second stage, Performance Analysis, evaluated scholarly productivity and research influence. Key authors and leading academic institutions were identified based on publication volume, total citation counts, and h-index values, allowing for a balanced assessment of output and impact (Ahmi, 2021; Hirsch, 2005). The influence of source journals was examined using established journal quality indicators, including CiteScore, Source Normalized Impact per Paper (SNIP), and SCImago Journal Rank (SJR). Together, these metrics provided insight into where influential knowledge is generated and disseminated within the academic ecosystem (Moed, 2010).

The third stage, Network Analysis, focused on uncovering the intellectual and collaborative structure of the field. Using VOSviewer and KH Coder, bibliometric maps were constructed to analyze co-authorship networks, revealing patterns of collaboration among researchers and institutions (Eck & Waltman, 2010). Keyword Co-Occurrence analysis was conducted to visualize the conceptual structure of the literature, while temporal overlay analysis traced the emergence and

evolution of key research themes over the 24-year study period (Zupic & Čater, 2015). This stage enabled the identification of dominant clusters, thematic shifts, and emerging research priorities.

The fourth stage, Content and Semantic Analysis, extended the bibliometric mapping by examining the substantive intellectual content of the literature. Highly cited publications and articles from leading journals were systematically reviewed to identify dominant theoretical frameworks, commonly adopted research methodologies, and recurring empirical challenges. Recent methodological guidelines emphasize the value of advanced semantic approaches for improving transparency and conceptual depth in bibliometric reviews (Montazeri et al., 2023). In response to this recommendation, the present study incorporated Large Language Models (LLMs) to support semantic extraction and thematic interpretation. Unlike traditional keyword-based techniques, LLM-assisted analysis enabled the identification of latent themes, conceptual similarities, and emerging research directions across studies that employ heterogeneous terminologies, thereby strengthening the interpretive validity of the content analysis (Scherbakov et al., 2025).

The final stage, Synthesis, integrated findings across all preceding analytical approaches. Insights from descriptive, performance, network, and content analyses were consolidated to identify convergent patterns and critical gaps in the literature. This integrative synthesis provided the analytical foundation for the subsequent empirical studies presented in this dissertation and justified their theoretical positioning within the broader digital banking research landscape.

2.3.4 Quality Assurance and Limitations

To ensure the reliability, validity, and transparency of the analytical procedures, several quality assurance measures were implemented throughout the research process. First, systematic documentation of all search strategies, inclusion and exclusion criteria, and analytical decisions was maintained in line with contemporary best practices for rigorous bibliometric reporting (Montazeri et al., 2023). This documentation enhances reproducibility and enables readers and reviewers to critically assess the methodological rigor of the study.

Second, methodological robustness was strengthened through tool triangulation. Multiple bibliometric and semantic analysis tools, namely Publish and Perish, VOSviewer, and KH Coder, were employed to cross-validate quantitative indicators and thematic patterns through complementary analytical approaches (Ahmi, 2021; Higuchi, 2017). The use of multiple tools is widely recommended in bibliometric research to mitigate biases inherent in individual software

packages and to enhance the credibility of findings. In addition, an iterative refinement process was applied, whereby search terms, filters, and classification schemes were progressively adjusted based on preliminary diagnostic results to improve dataset relevance and analytical coherence.

More broadly, the overall design of the bibliometric methodology aligns with recent advances in bibliometric research frameworks that emphasize clearly defined research questions, transparent analytical sequencing, and explicit articulation of each analytical stage - from data retrieval to interpretation (Öztürk et al., 2024). This structured design ensures that the bibliometric review functions not merely as a descriptive mapping exercise but as a theoretically informed foundation for the subsequent empirical investigations presented in this dissertation.

Despite these quality controls, certain limitations inherent to bibliometric research must be acknowledged. First, major bibliographic databases such as Web of Science, Scopus, and emerging open sources like OpenAlex exhibit differential coverage and metadata quality, meaning that not all scholarly outputs (especially from non-indexed journals or disciplines) are equally captured, which can bias bibliometric results (Culbert et al., 2025). Second, bibliometric analysis remains inherently dependent on metadata completeness (including author keywords and indexing fields), and recent critiques note that linguistic and metadata inconsistencies can lead to thematic omissions or misrepresentations in keyword-based trend and Co-Occurrence analyses (Dagli et al., 2025). Third, research on citation dynamics indicates that citation accumulation occurs gradually over time, as scholarly publications often require a substantial period to gain visibility within the academic community. Consequently, bibliometric indicators may underestimate the impact of more recent publications (Giordano et al., 2025).

These limitations were partially addressed by integrating qualitative and semantic analytical techniques, including Large Language Models, in subsequent chapters to interpret latent conceptual structures and emerging thematic trends that citation-based indicators alone may not fully capture. Nonetheless, the interpretive boundaries imposed by database coverage and citation behavior should be carefully considered when generalizing findings derived from bibliometric analyses.

2.4 Results

2.4.1 Document Profile and Publication Trends

Table 1. Document Type

Article	1576	75.62%
Conference Paper	334	16.03%
Book Chapter	100	4.80%
Review	68	3.26%
Book	6	0.29%
Total	**2084**	**100%**

Document Types: The analysis of 2,084 documents reveals that journal articles comprise the dominant publication type, representing 75.62% (1,576 documents) of the total. Conference papers account for 16.03% (334 documents), book chapters 4.80% (100 documents), review articles 3.26% (68 documents), and books 0.29% (6 documents). This distribution indicates that the majority of research findings and innovations are disseminated through peer-reviewed academic journals, reflecting the scholarly nature of the field and the importance of rigorous peer review in establishing credible knowledge.

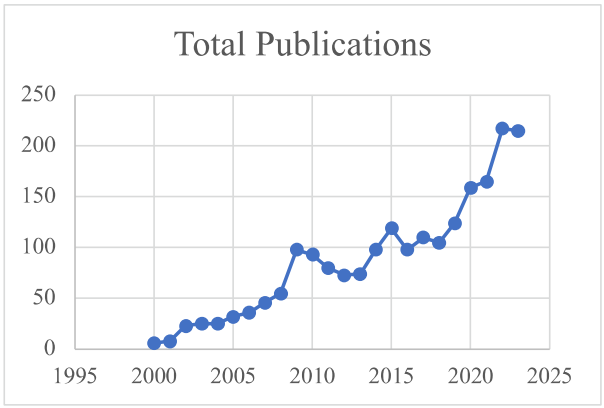


Figure 2. Publication trends by year

Temporal Trends: Figure 2 illustrates publication trends from 2000 to 2023, revealing a distinctive pattern of evolution. The early period (2000-2008) shows relatively modest publication volumes, averaging approximately 30-40 publications per year. This reflects the nascent stage of digital payment research when internet banking was still a novel concept and mobile banking was in its infancy.

A notable dip in publications occurred during 2009-2013, coinciding with the global financial crisis. This temporary decline likely reflects both the economic disruption that reduced research funding and the shift in institutional priorities toward financial stability and crisis management rather than innovation.

The most notable trend is the rapid acceleration that began in 2013, with annual publication volumes increasing from approximately 50 articles in 2013 to more than 220 by 2023, representing a more than fourfold increase within a single decade. This acceleration coincides with several catalytic developments in the global financial and technological landscape. First, the widespread adoption of smartphones significantly expanded access to mobile banking services, making digital financial platforms available to a broader population. Second, the emergence of fintech companies challenged traditional banking models by introducing innovative digital solutions and increasing competitive pressure within the financial sector. Third, rapid advances in enabling technologies, particularly cloud computing, of scalable and secure digital financial services. In addition, growing recognition of digital financial inclusion as a key development priority encourage policymakers and financial institutions to promote digital payment systems. Finally, the COVID-19 pandemic between 2020 and 2023 dramatically accelerated the adoption of digital payments and online financial services, while simultaneously stimulating scholarly interest in digital banking and financial technology.

The sustained growth through 2023 suggests that digital payment systems and mobile banking remain vibrant research areas with continued relevance and expanding scholarly interest.

2.4.2 Influential Institutions

Table 2. Most influential institutions

Affiliation	TP	TC	Year	Cites/Year	*h*	*g*
Multimedia University	29	605	2007-2023	35.59	10	24
Bina Nusantara University	19	114	2018-2023	19	4	10
Universiti Teknologi MARA	18	257	2007-2023	15.12	8	16
Amity University	16	101	2017-2023	14.43	6	9
Universiti Utara Malaysia	15	123	2010-2023	8.79	6	11
Symbiosis International Deemed University	15	133	2014-2023	13.3	5	11
International Islamic University Malaysia	14	114	2010-2023	8.14	6	10
Ulster University	14	472	2002-2017	21.45	12	14
Universiti Malaysia	14	601	2007-2021	35.35	8	14
Universiti Sains Malaysia	13	374	2010-2022	26.71	7	13

Table 2 presents the ten most influential institutions in digital payment and mobile banking research, ranked by total publications.

Leading Institution: Multimedia University (Malaysia) emerges as the most productive institution with 29 publications and 605 total citations, averaging 35.59 citations per year. The university's research spans from 2007 to 2023, indicating sustained engagement with the field over 16 years. Its h-index of 10 and g-index of 24 demonstrate both breadth and depth of impact, with multiple highly-cited contributions.

Geographic Concentration: A notable finding is the strong representation of Asian institutions in the research landscape, particularly universities in Malaysia and India. Prominent Malaysian institutions include Multimedia University, Universiti Teknologi MARA, Universiti Utara Malaysia, International Islamic University Malaysia, and Universiti Sains Malaysia, while leading contributions from India originate from institutions such as Amity University and Symbiosis International Deemed University. This geographic concentration reflects several structural factors. First, digital banking plays a strategic role in promoting financial inclusion across emerging Asian economies, which has stimulated considerable academic and policy interest in the topic. Second, many governments in the region actively support research related to the digital economy and financial technology, thereby encouraging scholarly output in this area. Third, universities in rapidly developing economies have significantly expanded their research capacity in recent years, enabling them to contribute more actively to the global body of literature on digital financial services.

Research Impact Variations: While publication count is one measure of influence, citation impact provides another lens. Ulster University, despite having fewer publications (14) than several other institutions, demonstrates the highest h-index (12), indicating that its research has been particularly influential. Similarly, Universiti Malaysia shows high citation impact (601 total citations, 35.35 per year) with relatively modest publication volume.

The variation in citations per publication across institutions suggests differences in research focus, quality, methodological rigor, or dissemination strategies. Institutions with higher average citations may be focusing on foundational theoretical contributions, addressing high-priority research questions, or publishing in more prestigious outlets.

2.4.3 Productive Authors

Table 3. Most Productive Authors (Published more than 6 papers)

Author	TP	TC	Year	C/P	h	g
Rahi, Samar	12	934	2015-2023	103.78	11	12
Laukkanen, Tommi	10	1716	2006-2016	171.6	9	10
Durkin, Mark G.	9	244	2004-2015	27.11	9	9
Shankar, Amit	9	597	2016-2022	66.33	8	9
Zolait, Ali	8	110	2008-2014	13.75	6	8
Oliveira, Tiago André Gonçalves Félix De	7	1992	2014-2023	284.57	6	7
Karjaluoto, Heikki Ensio	7	1709	2002-2019	244.14	7	7
Chaouali, Walid	7	506	2016-2021	72.29	6	7

Table 3 identifies the most productive authors in the field (those with six or more publications).

Most Impactful Author: Samar Rahi emerges as a particularly influential scholar with 12 publications accumulating 934 total citations, averaging an impressive 103.78 citations per publication. Rahi's research, spanning 2015-2023, focuses on integrating technology into financial services, enhancing customer service in e-commerce, technology adoption models, and business intelligence. The high h-index of 11 (meaning 11 publications have each been cited at least 11 times) demonstrates consistent impact across multiple contributions.

Citation Impact Leaders: While Rahi leads in overall productivity among highly productive authors, Tiago Oliveira and Heikki Karjaluoto demonstrate the highest citations per publication (284.57 and 244.14 respectively), despite fewer total publications. This pattern indicates that impactful research in digital payments is not solely a function of publication volume; strategic focus on high-relevance questions and rigorous methodology can generate substantial impact with fewer publications.

Oliveira's research (2014-2023) focuses particularly on technology adoption in developing economy contexts, while Karjaluoto's work (2002-2019) spans the full evolution of digital banking, including foundational early studies that have continued to be cited.

Research Continuity: The temporal span of author contributions reveals different patterns of engagement. Some authors (e.g., Karjaluoto: 2002-2019; Laukkanen: 2006-2016) conducted influential research over extended periods during the formative years of the field. Others (e.g., Rahi: 2015-2023; Shankar: 2016-2022) represent more recent but intensive engagement, potentially reflecting the growth of research capacity in emerging economy institutions.

Geographic and Institutional Diversity: The most productive authors are affiliated with institutions across multiple countries and continents, indicating that digital payment research has become a truly global scholarly endeavor. However, the concentration of highly-cited authors in European and Asian institutions reflects both the research infrastructure in these regions and the practical importance of digital payments in these contexts.

2.4.4 Source Journals

Table 4. Most Active Journal

Journal	TP	TC	Year	CitedScore	SNIP	SJR	Q*	*h*	*g*
International Journal Of Bank Marketing	133	14,096	2001-2023	10.7	2.014	1.328	Q1	68	118
Journal of Internet Banking and Commerce	108	1628	2009-2016	0.7	0.834	0.185	NA	22	33
International Journal of Electronic Finance	51	705	2006-2023	1.2	0.637	0.186	Q4	16	23
Banks and Banks Systems	37	267	2008-2023	2.6	0.619	0.249	Q2	10	14
Journal of Financial Services Marketing	29	928	2009-2023	5.6	1.219	0.501	Q2	18	29
International Journal of Business Information Systems	25	351	2013-2022	1.8	0.555	0.302	Q3	10	18
Electronic Commerce Research And Applications	21	2620	2002-2022	10.1	1.486	1.338	Q1	16	21
Journal of Retailing and Consumer Services	21	1,889	2008-2023	20.4	2.571	2.99	Q1	20	21
Journal of Payments Strategy and Systems	18	43	2018-2023	1.1	0.392	0.325	Q3	5	5
Internet Research	16	3377	2000-2023	11.2	2.035	1.819	Q1	14	16

Note: IF=Impact Factor; TP=Total publications; Year=Publication Years; CitedScore=Impact factor; SNIP=; SJR=SCImago Journal Rank, Q*=Journal Ranking; h=H-index; g=G-index.

Q* journals group into 4 qualities based on their SJR:

Q1: the top 25% of a SJR distribution in a given subject category

Q2: middle high position (top 25% to top 50% journals)

Q3: middle low position (top 50% to top 75% journals)

Q4: the bottom 25% of a SJR distribution in a given subject category

Table 4 presents the most active journals publishing digital payment and mobile banking research.

Preeminent Journal: The International Journal of Bank Marketing stands out as the leading outlet with 133 publications and an extraordinary 14,096 total citations. An h-index of 68 indicates that 68 articles published in the journal have each received a least 68 citations, reflecting the journal's sustained scholarly influence and high research impact. The journal's Q1 ranking (top 25% of journals in its category based on SCImago Journal Rank) and high CitedScore (10.7) confirm its prestige and influence. The temporal span (2001-2023) shows that this journal has been central to the field throughout its evolution.

Emerging Outlets: The Journal of Internet Banking and Commerce, while publishing a large volume of articles (108), shows lower citation impact and lacks a journal quality ranking. This

pattern may indicate that it serves more as a venue for emerging research and practice-oriented contributions rather than foundational theoretical work.

Quality Tiers: The journals exhibit clear stratification in quality indicators. Q1 journals (International Journal of Bank Marketing, Electronic Commerce Research and Applications, Journal of Retailing and Consumer Services, Internet Research) combine high publication volumes with strong citation impact and rigorous peer review standards. These outlets have been instrumental in establishing the intellectual foundations of the field.

Q2 and Q3 journals (e.g., Banks and Bank Systems, International Journal of Business Information Systems) play important roles in disseminating research but face challenges in achieving the citation rates of established Q1 journals. This reflects the competitive nature of academic publishing and the difficulty newer or more specialized journals face in building reputation and visibility.

Multidisciplinary Nature: The diversity of leading journals, which span disciplines such as banking, marketing, consumer services, electronic commerce, and information systems, highlights the inherently multidisciplinary nature of digital payment research. Effective research in this area requires integration of insights from technology, psychology, marketing, economics, and information systems.

2.4.5 Citation by country

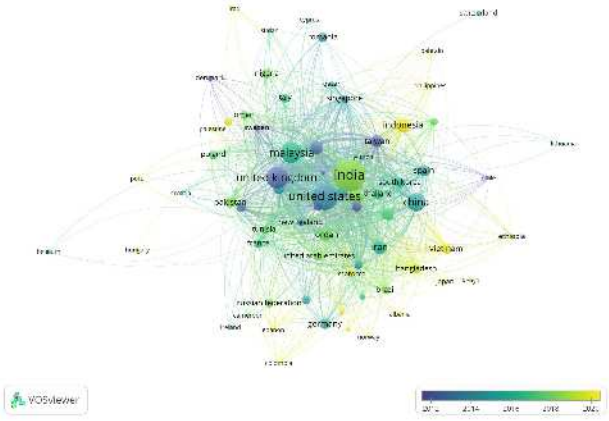


Figure 3. Network visualization map of the citation by countries

Note: Minimum number of documents of an author = 5; Minimum number of citations of an author = 1 of the 122 countries, 72 meet the thresholds.

2.4.6 Bibliographic Coupling of Country

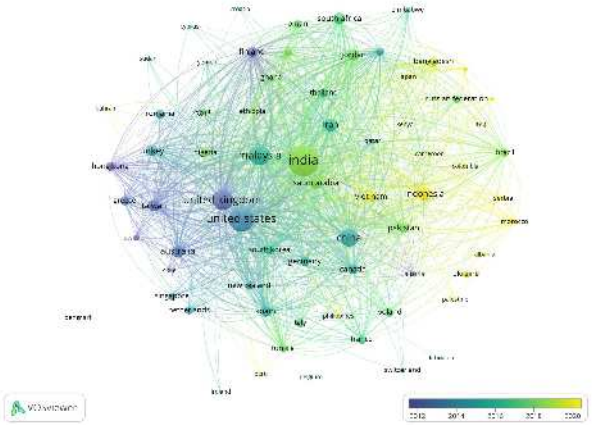


Figure 4. Overlay Visualization map of the Bibliographic Coupling of Countries

2.4.7 Co-Citation Analysis

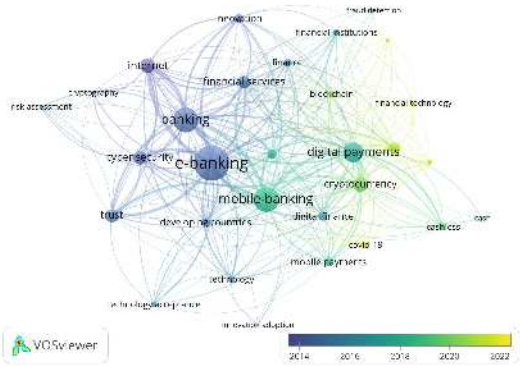


Figure 5. Co-Occurrence of Keywords

Note: Minimum number of occurrences of a keyword: 5 of the 6143 keywords, 421 meet the threshold.

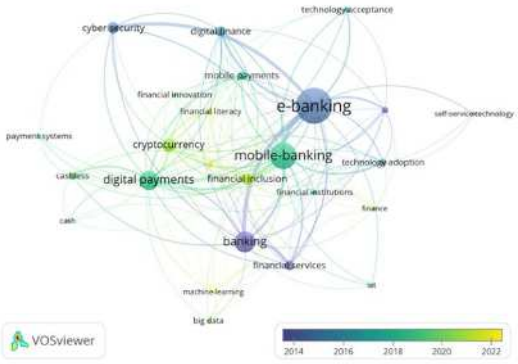


Figure 6. Co-Occurrence of Author Keywords

Note: Not: Minimum number of occurrences of a keyword: 5 of the 4188 keywords, 238 meet the threshold.

To examine the conceptual structure of the digital banking and digital payment literature, Keyword Co-Occurrence analysis was conducted using both author-supplied keywords and all indexed keywords. This dual approach enables the identification of both researcher-intended themes and database-curated conceptual patterns.

Across both analyses, core terms such as *e-banking*, *mobile banking*, *digital payments*, and *financial technology* emerge as dominant nodes, confirming their central role in the field. The author keyword network exhibits tighter thematic clustering, reflecting deliberate conceptual framing by scholars, while the all-keywords network reveals broader semantic dispersion, incorporating system-generated and methodological descriptors.

Clusters related to *trust*, *security*, *blockchain*, and *cryptocurrency* indicate a sustained research emphasis on technological reliability and risk mitigation. Additionally, the emergence of *COVID-19* as a distinct keyword cluster highlights its role as a contextual accelerator of digital finance adoption rather than a long-term theoretical pivot. Together, these results demonstrate both conceptual continuity and gradual thematic expansion within the literature.

2.4.8 Co-Occurrence Network of words

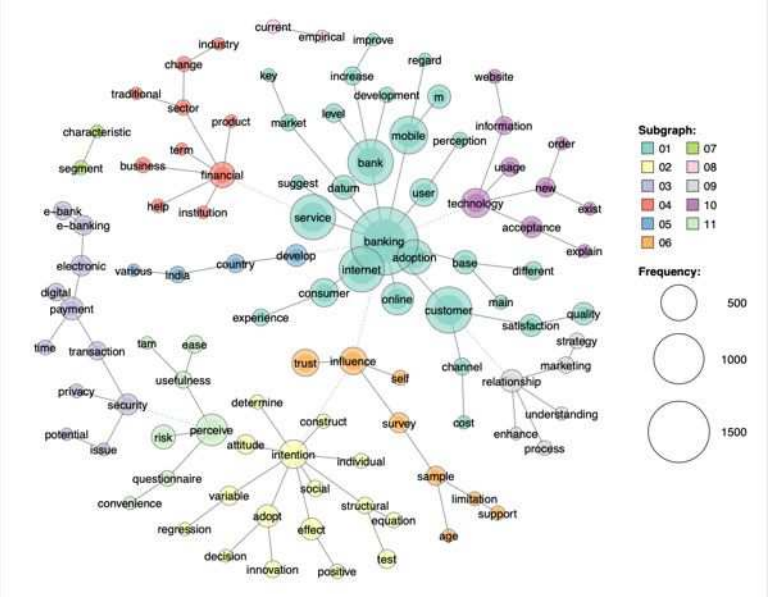


Figure 7. Co-Occurrence Network of words - words

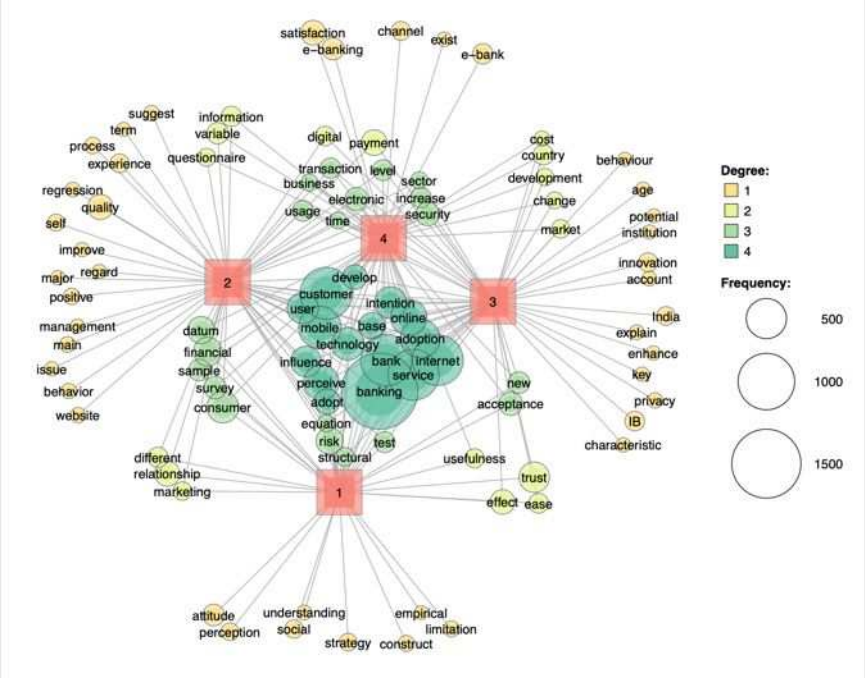


Figure 8. Co-Occurrence Network of words - Variables

Beyond keyword-level analysis, text-based Co-Occurrence networks were constructed to capture deeper semantic relationships embedded within titles and abstracts. Two complementary analyses were performed: Word-to-Word Co-Occurrence and Word-to-Variable Co-Occurrence.

The Word-to-Word network reveals dense associations among terms such as *adoption*, *customer*, *intention*, *trust*, and *technology*, indicating that the literature is predominantly anchored in behavioral and perception-based perspectives. These semantic linkages extend beyond formal keywords, capturing implicit conceptual relationships that may not be explicitly declared by authors.

The Word-to-Variable Co-Occurrence analysis further integrates methodological and contextual dimensions, linking conceptual terms with variables such as *survey*, *SEM*, *TAM*, and *UTAUT*. This mapping demonstrates a strong coupling between behavioral constructs and standardized quantitative methodologies, reinforcing the field's reliance on established adoption models. Collectively, these networks provide a richer, more nuanced representation of the field's intellectual structure than keyword analysis alone.

2.4.9 Enhanced analysis with Large Language Models (LLMs)

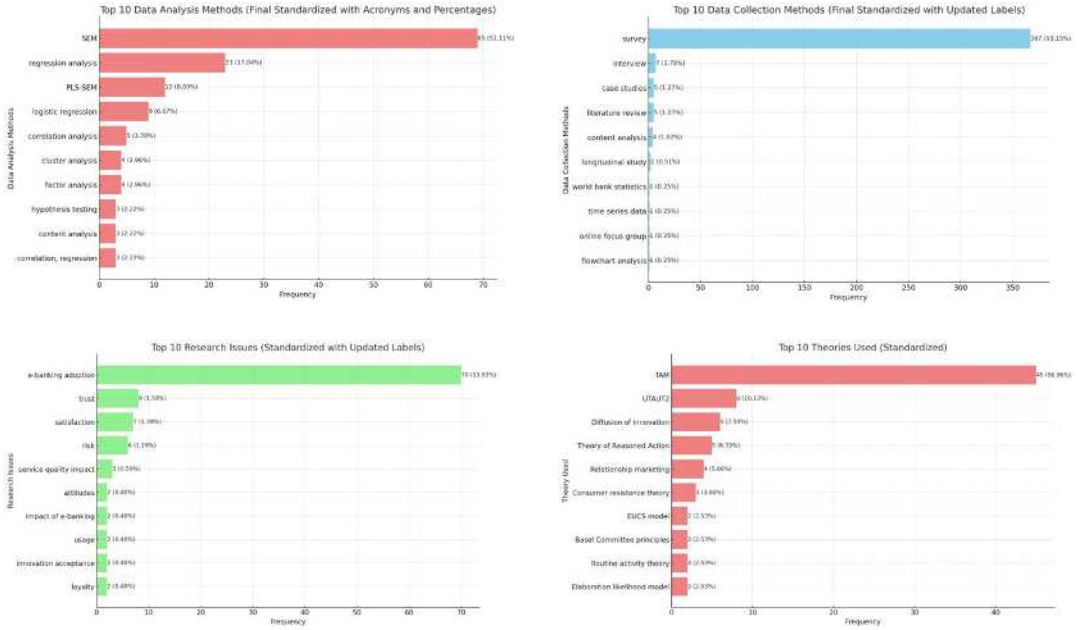


Figure 9. Large Language Models (LLMs)

To overcome the limitations of keyword-dependent bibliometric techniques, Large Language Models were employed to perform higher-order semantic extraction and standardization. The LLM analysis confirms that Structural Equation Modeling is the dominant analytical technique, appearing in 51.11% of studies, followed by regression-based methods and PLS-SEM.

Primary data collection overwhelmingly relies on survey instruments (93.15%), underscoring the behavioral orientation of the field. From a theoretical perspective, the Technology Acceptance Model remains the most frequently applied framework (56.96%), despite repeated calls for contextual adaptation. The most frequently addressed research issue is *e-banking adoption* (13.83%), with a notable surge in publications around 2010, coinciding with rapid internet diffusion in emerging markets.

By synthesizing latent themes across studies, the LLM-enhanced analysis reveals a literature that is methodologically mature but conceptually conservative, thereby reinforcing the need for context-sensitive theoretical extensions such as those developed in the subsequent chapters of this dissertation.

2.4.10 Synthesis of Research Gaps and Theoretical Motivation

Despite the rapid expansion of digital banking and payment research, the bibliometric synthesis reveals a persistent contextual imbalance in the literature. Empirical studies remain heavily concentrated in developed economies characterized by stable infrastructure, mature regulatory frameworks, and voluntary technology use. In contrast, research on digital transformation in developing economies, where infrastructure limitations, regulatory uncertainty, and institutional capacity strongly influence adoption dynamics, remains comparatively limited. This imbalance limits the explanatory power of dominant adoption models when applied to contexts such as Lao PDR, where national infrastructure quality and institutional readiness act as foundational conditions rather than background assumptions. Addressing this gap motivates the customer-centric model in Chapter 4, particularly the introduction of Seamless Experience, which reconceptualizes service quality as an integrated perception of system usability and infrastructure reliability under constrained conditions.

A second critical gap concerns the overwhelming focus on customer adoption in voluntary usage contexts, with minimal attention paid to employee adoption under mandatory conditions. The bibliometric evidence indicates that the dominant theoretical perspectives, particularly TAM and UTAUT, conceptualize technology adoption as a function of behavioral intention and implicitly assume that users have discretion over whether to adopt a system. This assumption is theoretically problematic in organizational settings where employees are required to use digital systems as part of their core job responsibilities. The absence of employee-centric perspectives obscures the internal dynamics that underpin successful digital transformation, particularly the role of motivation, commitment, and organizational alignment. This gap directly motivates Chapter 3, where Digital Engagement replaces Behavioral Intention as the central mediating construct, alongside Organizational Culture and Regulatory Influence, to capture the psychological and institutional drivers of effective adoption in mandatory banking environments.

Finally, the synthesis highlights a structural limitation in existing adoption models: their insensitivity to infrastructural and institutional constraints. Most empirical studies treat facilitating conditions, security, and regulation as peripheral antecedents rather than as systemic forces shaping adoption boundaries. Moreover, the dominance of cross-sectional survey designs limits insight into how trust, security, and usage patterns stabilize over time. These limitations motivate a multi-level research design that integrates organizational and customer perspectives while reinterpreting key

constructs. In Chapter 3, Facilitating Conditions are modeled as a direct enabler of transformation outcomes rather than a secondary moderator, while Regulatory Influence captures institutional pressure in a highly regulated banking system. In Chapter 4**,** Security is theorized as a foundational "hygiene factor," and Habit is incorporated to explain sustained use beyond initial adoption. Collectively, these extensions respond directly to the gaps identified in the bibliometric analysis and provide a theoretically grounded foundation for the empirical models developed in the subsequent chapters.

2.5 Discussion

2.5.1 Evolution of the Field: From Adoption to Ecosystem

The bibliometric findings indicate a clear evolution in digital payment and mobile banking research, moving from a relatively narrow focus on initial adoption toward a broader and more integrated ecosystem perspective. In the early stage, research was primarily concerned with whether users would accept digital financial technologies and which factors influenced initial adoption decisions. During this period, foundational theoretical frameworks such as the Technology Acceptance Model (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) were widely applied to explain user behavior, particularly in terms of perceived usefulness, perceived ease of use, and behavioral intention.

As the field matured, research attention expanded beyond adoption to include continued usage, service quality, customer satisfaction, and loyalty. This shift reflects a growing recognition that adoption alone is insufficient to explain the long-term success of digital financial services. Studies increasingly incorporated constructs such as trust and perceived risk, which have been identified as critical determinants of continued usage in digital environments (Susanto et al., 2022).

More recent research demonstrates a transition toward ecosystem-level thinking, where digital payment systems are examined as part of broader socio-technical and fintech ecosystems. This shift aligns with recent discussions on digital transformation and financial inclusion, which emphasize the interconnected roles of technology, institutions, and user behavior (Dissanayake et al., 2023; OECD, 2021). It also highlights the need to move beyond static adoption models toward more dynamic and context-sensitive approaches.

2.5.2 Theoretical Consolidation and the Need for Innovation

One of the most prominent findings of the bibliometric analysis is the strong dominance of established theoretical frameworks, particularly TAM and UTAUT. These models have played a significant role in enabling cumulative knowledge development by providing validated constructs and consistent measurement approaches across studies (Oliveira et al., 2014; Venkatesh et al., 2003)

However, this theoretical consolidation also raises concerns regarding limited innovation. As noted in the literature, these models were originally developed to explain voluntary technology adoption, primarily in developed and resource-rich environments. Their direct application to contexts characterized by mandatory usage, infrastructural limitations, and varying levels of digital literacy may not fully capture the complexity of user behavior (Rahim et al., 2021; Venkatesh et al., 2012).

The findings therefore suggest the need for theoretical extension rather than continued replication. Constructs such as trust, perceived risk, and facilitating conditions require contextual adaptation to reflect real-world constraints identified in earlier sections. In response, this dissertation introduces Digital Engagement as an alternative to behavioral intention in mandatory contexts and develops Seamless Experience as an integrative construct capturing user interaction under infrastructural constraints. These contributions address the theoretical gaps identified in the global literature and extend existing models in meaningful ways.

2.5.3 Methodological Homogeneity and Opportunities for Mixed Methods

The analysis also reveals a strong reliance on quantitative methods, particularly survey-based research and structural equation modeling. While these approaches are effective for testing theoretically grounded relationships, they may not fully capture the complexity of user behavior.

Survey-based studies rely heavily on self-reported data, which may introduce systematic biases such as social desirability and common method variance, potentially distorting observed relationships between constructs. This issue has been widely documented in the methodological literature (Jarvis et al., 2003) and continues to be emphasized in recent research, which highlights how common method bias can inflate or deflate empirical relationships and undermine the validity of findings (Polas, 2025).

The limited use of qualitative and mixed-methods approaches represents a notable gap. Mixed-methods research, as emphasized by (Dawadi et al., 2021), allows researchers to combine

statistical analysis with deeper contextual understanding, offering a more comprehensive perspective on complex phenomena.

To address this limitation, the present dissertation adopts a mixed-methods approach, integrating quantitative analysis with qualitative insights. This approach enables a more nuanced understanding of digital payment adoption and usage, particularly in environments characterized by institutional and infrastructural complexity.

2.6 Conclusion

This bibliometric analysis of 2,084 publications from 2000–2023 reveals a dynamic and rapidly expanding field characterized by strong theoretical consolidation around technology acceptance frameworks, methodological homogeneity centered on survey-based research and structural equation modeling (SEM), and persistent concerns related to security, trust, and digital inequality. Over time, the research agenda has evolved from basic questions of technology adoption toward more complex considerations involving digital ecosystems, emerging financial technologies, and financial inclusion. The analysis also highlights the growing contribution of research institutions in developing regions, particularly in Asia, while the COVID-19 pandemic represents a significant inflection point that accelerated both digital transformation adoption and scholarly attention to the topic.

Despite these advances, the bibliometric synthesis identifies several important limitations in the existing body of literature. In particular, research remains heavily concentrated in technologically advanced economies with mature digital infrastructures, well-established regulatory systems, and relatively high levels of digital literacy. Consequently, many dominant technology adoption models implicitly assume voluntary usage environments and pay limited attention to institutional pressures, infrastructural constraints, and organizational dynamics that frequently shape digital transformation processes in developing economies.

The analysis further highlights several critical gaps that motivate the empirical investigations presented in this dissertation. These include the limited consideration of employee perspectives in digital banking transformation, the predominant focus on voluntary customer adoption, and the insufficient treatment of infrastructure and regulatory environments as systemic forces influencing digital financial service delivery. Addressing these gaps is particularly important for understanding

digital banking transformation in contexts such as Lao PDR, where technological infrastructure, regulatory capacity, and digital capabilities are still evolving.

Responding to these limitations, the subsequent chapters move beyond macro-level bibliometric mapping toward empirical investigation within the specific institutional and infrastructural context of the Lao banking sector. Chapter 3 develops an employee-centric framework that reconceptualizes technology adoption through the construct of *Digital Engagement* within a mandatory and regulated organizational environment. Chapter 4 subsequently introduces a customer-centric model that captures infrastructure-sensitive perceptions through the concept of *Seamless Experience* and explains sustained digital banking usage through *Habit formation*.

Together, these complementary perspectives provide a coherent multi-level analytical framework for understanding digital banking transformation in developing economies, linking global research trends to organizational dynamics and individual user behavior. In this way, the bibliometric and semantic analysis presented in this chapter not only maps the intellectual evolution of digital banking research but also establishes the conceptual foundation that informs the empirical investigations presented in the following chapters.

Chapter 3: Internal Dynamics – An Employee-centric Model of Digital Transformation Adoption

3.1 Introduction

The bibliometric and semantic analysis presented in Chapter 2 identified a persistent and consequential imbalance in the digital banking adoption literature. The overwhelming majority of empirical work in this field has concentrated on the customer perspective, examining the psychological, social, and contextual factors that determine whether individual customers choose to adopt and sustain the use of digital banking services. Comparatively little scholarly attention has been devoted to the perspective of the employees who occupy the institutional interior of banking organizations, who are required to operationalize digital transformation mandates, and who serve simultaneously as internal users of digital systems and as frontline intermediaries guiding customers through their own adoption journeys (Porfírio et al., 2024). This omission matters because the success of any digital transformation initiative depends not only on the technologies deployed and the customers attracted but, on the willingness, capability, and psychological engagement of the people inside the organization who must make it work on a day-to-day basis.

This chapter addresses that gap. Its central concern is the following question: what organizational, cultural, regulatory, and psychological factors shape the depth and quality of bank employees' engagement with digital transformation initiatives in the Lao banking sector? This question is deliberately framed around engagement rather than adoption, because in organizational settings where technology use is mandated rather than voluntary, the more consequential question is not whether employees use digital systems, which is largely determined by institutional directive, but how effectively, confidently, and proactively they do so. The distinction between mere compliance and genuine engagement is the difference between digital transformation that produces organizational capability and digital transformation that produces only the appearance of it.

The Lao banking sector provides a theoretically instructive and practically significant context for examining these dynamics. As introduced in Chapter 1, Lao PDR remains at an early stage of its digital transformation journey, with government targets set for the digital economy to grow from approximately 3 percent to 10 percent of GDP by 2040 (Beschorner et al., 2022). The banking sector occupies a central position in this ambition, but the path from strategic vision to operational reality runs through a set of structural constraints that are specific to the Lao context and that interact in ways that standard technology adoption frameworks are not well equipped to capture.

Legacy IT infrastructure, limited pools of digitally specialized human capital, resource constraints on technology investment, regulatory frameworks that are simultaneously mandating change and evolving in their own right, and a customer base characterized by variable digital literacy and cautious trust in digital financial services all create an environment in which employees must navigate competing pressures and adapt continuously to shifting demands (Beschorner et al., 2022; Yao et al., 2024).

Understanding how employees respond to these pressures, and which organizational and institutional conditions support genuine engagement rather than reluctant compliance, is therefore not merely an academic exercise. It is a practical prerequisite for banking institutions and policymakers who wish to move beyond the deployment of digital infrastructure toward the realization of the operational transformation that digital infrastructure is intended to enable. This chapter seeks to provide that understanding through a theoretically grounded, empirically rigorous, and contextually sensitive analysis of employee digital engagement in the Lao banking sector.

3.1.1 The Distinctive Nature of Mandatory Technology Adoption

A foundational premise of this chapter is that the dynamics of technology adoption differ in substantively important ways between voluntary and mandatory organizational contexts, and that much of the dominant theoretical infrastructure of technology acceptance research was built on assumptions of voluntariness that do not transfer cleanly to the workplace banking environment.

The Technology Acceptance Model (TAM), developed by Davis (1989), and the Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh et al. (2003), were each calibrated against settings in which individuals exercise meaningful discretion over whether and how to use a given technology. In such contexts, behavioral intention serves as a theoretically coherent and empirically powerful mediating construct, reflecting an individual's conscious willingness to engage with the technology in question. The theoretical logic is that motivated intention produces adoption behavior, and that the determinants of intention, primarily perceived usefulness and perceived ease of use in the TAM tradition, or performance expectancy, effort expectancy, social influence, and facilitating conditions in the UTAUT tradition, are therefore the primary levers for promoting adoption.

This logic becomes considerably more complex when applied to organizational settings where technology use is not a matter of individual choice but of job requirement. In the Lao banking

sector, as in banking sectors more broadly, employees are required to use digital systems as part of their formal role responsibilities. Compliance with this requirement is not optional; it is a condition of employment. Under these conditions, the behavioral intention construct loses much of its explanatory power as a predictor of actual system use, because system use is determined less by individual intention than by organizational mandate and structural availability (Bilal et al., 2025). What remains theoretically important, and what becomes the more productive focus of inquiry, is the quality and depth of employees' engagement with the mandated technology rather than the binary question of whether they use it at all.

This distinction between mandated use and meaningful engagement is the conceptual heart of the shift from behavioral intention to digital engagement that this chapter introduces. The organizational psychology literature on work engagement, pioneered by Schaufeli et al. (2006) and subsequently elaborated by Bakker and Demerouti across an extensive body of research, conceptualizes engagement as a positive, fulfilling, work-related psychological state characterized by vigor, dedication, and absorption. Vigorous employees invest high levels of effort and persistence in their work; dedicated employees experience a sense of significance, enthusiasm, and pride in what they do; absorbed employees are fully concentrated and immersed in their activities, often to the point where time passes unnoticed. Together, these three dimensions describe a qualitatively different relationship with work than mere compliance, and they have been consistently associated with higher performance, greater creativity, reduced turnover, and better organizational outcomes (Bakker & Demerouti, 2008; Schaufeli et al., 2006).

Translating this construct to the domain of digital technology use within organizations, Digital Engagement in this study captures not merely whether employees operate digital systems but whether they do so with psychological investment, genuine competence confidence, proactive problem-solving orientation, and a sense of alignment with the digital transformation goals of their organization. Recent empirical evidence in the banking sector confirms the relevance of this framing: digital transformation has been shown to significantly shape employee engagement by influencing their motivation, confidence, and overall experience of their work, with employees who feel genuinely supported in their digital capability development demonstrating substantially higher levels of digital engagement than those who comply with digital mandates under conditions of insufficient training or unclear organizational commitment (Fransiska et al., 2025). The conceptual move from behavioral intention to digital engagement therefore reflects not merely a terminological

preference but a substantive theoretical reorientation toward understanding what effective digital transformation actually requires of organizational members.

This understanding is further supported by the Job Demands-Resources (JD-R) model developed by Bakker and Demerouti (2008), which provides a complementary theoretical lens for understanding employee engagement in the context of digital transformation. The JD-R model posits that job resources, including organizational support, clear performance feedback, leadership quality, and opportunities for skill development, activate motivational processes that produce work engagement, while job demands, including technological complexity, information overload, and the cognitive stress of continuous adaptation, can deplete employees' psychological resources and undermine engagement if not adequately supported. In the context of digital transformation in banking, this framework predicts that employees who experience their digital work environment as adequately resourced, in terms of training, technical support, clear leadership direction, and manageable demand levels, will demonstrate higher levels of digital engagement than those who experience it as demanding without adequate organizational scaffolding (Bakker & Demerouti, 2008; Schaufeli et al., 2006). This prediction shapes the theoretical structure of the modified UTAUT model developed in section 3.2.5.

3.1.2 The Role of Institutional Context in Developing Economies

Beyond the mandatory character of technology use, this chapter places strong theoretical emphasis on the institutional context in which digital transformation in the Lao banking sector occurs. The institutional environment shapes not only the formal conditions under which employees work but also the norms, expectations, and pressures that constitute the social reality within which they make sense of their relationship with digital technology. Failing to account for this institutional context risks producing an analysis that is behaviorally plausible in the abstract but disconnected from the specific forces that actually govern employee behavior in the Lao PDR banking environment.

Institutional theory, as elaborated in the foundational work of DiMaggio and Powell (1983), provides the most directly applicable theoretical framework for understanding how these environmental forces operate. DiMaggio and Powell argued that organizations operating within the same institutional field tend to become more similar over time, not primarily because they are converging toward technical efficiency but because they are responding to three types of institutional pressure that create normative expectations about how legitimate organizations in the

field should be structured and behave. Coercive isomorphism arises from external political and regulatory pressures, including formal mandates from state authorities and regulatory agencies, which compel organizations to adopt particular practices or structures to maintain legitimacy and avoid sanctions. Mimetic isomorphism arises from uncertainty, leading organizations to model themselves on peers that appear more successful or legitimate. Normative isomorphism arises from professionalization, as shared educational and training standards create common norms about appropriate organizational practices across a field.

All three mechanisms operate visibly in the Lao banking sector. Coercive pressures are particularly prominent: the Bank of the Lao PDR issues directives on digital payment infrastructure, data governance, and cybersecurity compliance that banking institutions are required to follow regardless of their individual readiness levels, and Laos's broader digital economy strategy (Beschorner et al., 2022) creates a policy environment in which digital adoption is not merely encouraged but effectively mandated at the national level. Mimetic pressures operate through regional and international banking benchmarks, as Lao banks look to more digitally advanced ASEAN neighbors for models of what digital banking transformation should look like. Normative pressures operate through professional training networks, banking associations, and the increasing standardization of digital banking competency expectations in the sector's human resource frameworks. Together, these pressures create an environment in which digital transformation is not experienced by employees as an organizational choice that they might accept or resist but as an institutional reality to which their organization and they themselves must adapt (DiMaggio & Powell, 1983; Minh et al., 2025).

This institutional framing has direct implications for how employee digital engagement should be theorized. In institutional environments characterized by strong coercive pressures, the psychological dynamics of engagement are qualitatively different from those in more voluntaristic contexts. Employees who operate under strong regulatory mandates for digital adoption cannot make the clean distinction between their own preferences and their institutional obligations that standard technology acceptance models assume. Their engagement is shaped by a complex interplay of personal motivation, organizational support, professional identity, and institutional legitimacy. Understanding employee digital engagement in the Lao banking sector therefore requires a framework that incorporates these institutional dimensions alongside the individual psychological factors that standard models address.

Organizational culture provides a related but distinct dimension of the institutional context. Culture, as conceptualized by Schein (2010), comprises the deep assumptions, shared values, and behavioral norms that constitute the taken-for-granted reality of organizational life. In the context of digital transformation, organizational culture functions as both an enabler and a constraint: a culture that values innovation, tolerates calculated risk, and distributes information and authority openly creates conditions in which digital engagement can develop and flourish, while a culture characterized by rigid hierarchy, risk aversion, and information hoarding creates conditions in which even technically capable employees may remain psychologically disengaged from digital transformation initiatives. Research examining the intersection of digital transformation and organizational culture in banking has consistently found that culture quality, particularly the dimensions of leadership vision clarity, collaborative orientation, and psychological safety, are among the strongest determinants of the depth of employee digital engagement (Fransiska et al., 2025; Hung, 2024; Sibassaha et al., 2025).

In the Lao banking context, organizational culture intersects with national cultural characteristics in ways that deserve specific attention. Lao society is characterized by strong collectivist orientations, high power distance, and a cultural emphasis on maintaining social harmony and deference to authority. These characteristics shape how employees relate to digital transformation directives: the high-power distance dimension means that mandates from senior management and regulatory authorities carry substantial normative weight, while the collectivist orientation means that peer adoption and social validation within work groups may be particularly powerful drivers of individual engagement (Cieslak & Valor, 2025). At the same time, cultural hierarchies can create barriers to the upward communication of problems and suggestions that digital transformation depends on for continuous improvement, as employees who observe system failures or usability problems may feel uncomfortable challenging the organizational commitment to a digital system by reporting difficulties openly.

Regulatory influence, treated in this chapter as a distinct theoretical construct rather than a background condition, captures the complex ways in which the formal and informal mandates of the regulatory environment shape employee attitudes and behaviors toward digital systems. As Porfírio et al. (2024) argue, the presence of clear, consistent, and well-supported regulatory frameworks can actively facilitate digital engagement by providing institutional legitimacy for the transformation effort and by creating accountability structures that motivate meaningful rather than superficial

compliance. Conversely, regulatory ambiguity, rapidly shifting compliance requirements, or the perception that regulatory mandates are imposed without adequate consideration of implementation realities can generate anxiety, resistance, and performative rather than genuine engagement. In developing economy contexts, where regulatory frameworks for digital financial services are frequently evolving and where the gap between formal regulatory intent and implementation capacity can be substantial, these dynamics are particularly significant (Beschorner et al., 2022; Jaradat, 2025).

3.1.3 Chapter Objectives and Structure

This chapter pursues four specific and interconnected objectives. The first is to develop a theoretically grounded and contextually appropriate model of employee digital engagement and digital transformation adoption for mandatory organizational contexts in developing economies, extending the UTAUT framework with constructs capturing institutional pressures, organizational culture, and risk perceptions in a manner consistent with the specific characteristics of the Lao banking sector.

The second objective is to empirically test this model using quantitative survey data from 354 bank employees across 26 banks in Lao PDR, employing Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the relationships between antecedent factors, digital engagement, and digital transformation adoption.

The third objective is to enrich the quantitative findings with qualitative insights drawn from semi-structured interviews with senior key informants and from open-ended survey responses, providing the contextual depth and organizational texture that quantitative scales alone cannot supply.

The fourth objective is to derive actionable implications for banking institutions, human resource managers, and policymakers seeking to foster genuine employee engagement with digital transformation rather than mere surface-level compliance.

The chapter is organized as follows. Section 3.2 reviews relevant literature and develops the theoretical framework including the hypotheses. Section 3.3 describes the research methodology in full. Section 3.4 presents both quantitative and qualitative results. Section 3.5 discusses the findings in relation to theory and context. Section 3.6 articulates implications for theory and practice. Section 3.7 acknowledges limitations and proposes directions for future research. Section 3.8 conclusion.

3.2 Literature Review and Theoretical Framework

3.2.1 Digital Transformation in the Banking Sector: Beyond Technology

Digital transformation in banking is a term that risks being understood too narrowly if it is interpreted primarily as a program of technology investment. In reality, as Porfírio et al. (2024) articulate clearly, meaningful digital transformation requires a fundamental reconfiguration of organizational culture, employee mindset, leadership orientation, and strategic identity. Technology provides the tools, but transformation depends on the human and organizational capacity to deploy those tools in ways that genuinely change how value is created, how customers are served, and how internal processes are organized and improved. Banks that invest heavily in technology platforms without investing equivalently in the organizational conditions that enable their effective use routinely find that their digital transformation programs deliver considerably less than their technical specifications promise (Verhoef et al., 2021; Vial, 2019).

The theoretical distinction between digitization, the conversion of analog processes to digital formats, and digital transformation, the fundamental reorganization of value creation enabled by digital capabilities, is crucial here. Many banking institutions in developing economies are at the digitization stage, implementing digital channels and payment systems on top of essentially unchanged organizational processes, mindsets, and capability structures. Genuine digital transformation requires moving beyond this stage to redesign processes around digital capabilities, to develop genuinely new service propositions, and to build the organizational culture and human capital that sustain continuous digital innovation. Achieving this transition is the central challenge of digital banking management in contexts like Lao PDR (Schilirò, 2024; Vial, 2019).

The urgency of this challenge has intensified as the competitive landscape of financial services has been reshaped by fintech entrants. Digital-first financial service providers have established new customer expectations around speed, convenience, personalization, and 24-hour availability that traditional banks are now under pressure to match. This competition is particularly consequential for the younger, digitally native customer segments that are increasingly central to banks' growth strategies and that have the least tolerance for service experiences that fail to meet digital expectations. In this competitive environment, digital capability has moved from being a source of competitive advantage to a minimum condition of institutional survival in modern financial services markets (Vial, 2019).

For banking institutions in developing economies, including Lao PDR, this competitive pressure is compounded by the structural conditions described in Chapter 1. The country continues to rely heavily on cash-based transactions, particularly outside urban centers, where financial literacy levels remain limited and digital infrastructure is underdeveloped. Internet penetration and digital adoption rates in Lao PDR trail regional comparators significantly (OECD, 2021), creating a context in which the banks most exposed to pressure for digital transformation are simultaneously operating in an environment where the conditions supporting that transformation, including customer digital readiness, telecommunications infrastructure, and regulatory clarity, remain in active development. Employees within these institutions therefore face a particularly demanding version of the digital transformation challenge: they must build digital capability and deliver digital services in an environment that is often not yet fully equipped to support either.

3.2.2 The Under-Researched Employee Perspective

Despite the central role of employees in determining whether digital transformation initiatives achieve their intended outcomes, the academic literature on digital banking has paid disproportionate attention to customer-facing dynamics and comparatively little to the organizational interior where implementation actually occurs. Reviews of the technology adoption literature consistently document this imbalance, noting that the dominant frameworks and empirical studies are calibrated for customer or end-user contexts in which adoption is voluntary, while the mandatory, organizationally embedded adoption experiences of employees remain comparatively under-theorized and under-studied (Verhoef et al., 2021; Vial, 2019).

This gap is consequential. Employees perform multiple and interconnected roles in digital transformation that collectively determine whether technology investments translate into organizational capability. As primary internal users, they must learn to operate new systems effectively, integrate digital tools into existing workflows, and adapt their professional practices to the requirements of digital service delivery. As institutional agents, they can either facilitate or constrain organizational change, depending on whether their engagement with digital transformation is genuine and proactive or reluctant and performative. As customer-facing intermediaries, they shape the quality of the digital service experience that customers encounter, since their own confidence, competence, and engagement with digital systems directly affects their ability to guide and reassure customers who are navigating the transition to digital banking. As organizational informants, they possess the detailed operational knowledge needed to identify system limitations,

flag usability problems, and contribute to the continuous improvement of digital systems and processes (Kane, 2019).

Research consistently demonstrates that digital transformation initiatives fail not because of technical inadequacies but because of human and organizational factors that are under-managed and under-resourced. Insufficient training leaves employees unable to use systems effectively regardless of their potential. Poorly designed systems create friction and frustration that erode engagement over time. Organizational resistance to change, arising from concerns about job security, increased workload, and loss of established professional competencies, can create active opposition to transformation programs. Communication failures that leave employees without a clear understanding of why transformation is happening, what is expected of them, and how their concerns will be addressed generate anxiety and disengagement that are difficult to recover from once they become entrenched (Kane, 2019; Vial, 2019). In mandatory adoption contexts, these human and organizational failure modes are particularly acute because employees cannot opt out of the transformation: they must engage with it whether or not the organizational conditions support that engagement, and the quality of the engagement they can achieve under unsupportive conditions is systematically lower than what the organization needs.

Recent research on bank leadership in the context of digital transformation provides important empirical grounding for these arguments. A qualitative study of senior banking executives across Indonesian banks identified six critical leadership practices that enable meaningful employee work experience during digital transformation: agile leadership that promotes experimentation and psychological safety, technology-forward leadership that integrates digital tools strategically, emotional intelligence in managing virtual and hybrid teams, recognition systems that celebrate innovation, regulatory and ethical balance that maintains compliance while enabling innovation, and co-creation approaches that involve customers and staff in service design (Fransiska et al., 2025). These practices operate across individual, team, and organizational levels simultaneously, reflecting the multi-level character of the leadership challenge in banking digital transformation and the inadequacy of frameworks that address only one level at a time.

3.2.3 Barriers and Challenges to Employee Digital Adoption

The literature identifies several interrelated categories of barrier that constrain employee adoption and engagement in banking digital transformation contexts, particularly in developing economies. Understanding these barriers is important not only for its practical implications but

because each barrier corresponds to a theoretical construct in the extended UTAUT model developed in section 3.2.5.

Infrastructure and resource constraints represent the most foundational category. Many banking institutions in developing economies, including Lao PDR, continue to operate on legacy IT systems that were designed for a pre-digital era and that resist integration with modern digital platforms. The costs of replacing or substantially upgrading these systems are substantial, and the technical complexity of managing the transition while maintaining operational continuity creates significant implementation risks. Even where new systems are deployed, the broader digital infrastructure that surrounds the workplace, including telecommunications reliability, power stability, and device quality, affects the consistency and quality of employees' experience with digital systems. Within the UTAUT framework, these conditions are captured by the facilitating conditions construct, which reflects employees' perceptions of the organizational and technical infrastructure available to support system use (Venkatesh et al., 2003). When this infrastructure is genuinely inadequate, even employees who are highly motivated and capable will find their digital engagement constrained by factors outside their individual control.

Security and risk concerns represent a second significant barrier category, one that is particularly consequential in the banking sector where the financial and reputational consequences of data breaches or system failures are substantial. Employees who handle sensitive customer financial data through digital systems carry a heightened awareness of the potential negative consequences of system vulnerabilities, including fraud, data loss, and regulatory penalties. These concerns, even when they do not prevent system use, can generate anxiety that undermines the confidence and fluency that characterize genuine digital engagement. In mandatory adoption contexts, where employees must use systems regardless of their security concerns, perceived risk may not prevent usage but it can systematically erode the psychological quality of that usage, producing a form of anxious compliance rather than confident engagement. Recent UTAUT-based research on banking sector digital adoption has confirmed that perceived risk remains a significant determinant of engagement quality even in mandatory contexts (Apau et al., 2025).

Knowledge and capability gaps constitute a third barrier category with direct theoretical implications. Employees who lack adequate digital skills or who have received insufficient training to use new systems effectively will perceive those systems as effortful and frustrating rather than efficient and enabling. This perception is captured in the UTAUT's effort expectancy construct,

which reflects the perceived ease of system use. In contexts where digital literacy levels vary significantly across the workforce, a single-speed training approach is unlikely to be adequate: employees with strong prior digital experience may find standardized training too slow and basic, while those with limited prior digital exposure may find it too fast and technically demanding. The design of differentiated, needs-sensitive training programs that build genuine capability across the full range of digital competence levels present in the workforce is therefore a critical organizational challenge (Muduli & Choudhury, 2024; Venkatesh et al., 2003).

In developing economies, security and risk concerns carry a unique operational weight for bank employees. Unlike mature banking environments with fully internal cybersecurity operations centers, commercial banks in developing economies, including Lao PDR, often rely at least in part on third-party software applications developed by foreign technology vendors, a pattern documented in neighboring Vietnam's banking sector, where Nguyen et al. (2024) identified vendor and supply-chain dependencies as one of the two most consequential categories of cybersecurity risk facing the country's financial system. While this outsourcing model enables rapid app deployment, it introduces structural vulnerabilities, software integration delays, and dependency on external security patching.

Employees, particularly frontline customer support and back-office operations staff, find themselves positioned at the nexus of these vulnerabilities. They must operate complex, externally developed software architectures while reassuring a risk averse customer base that expresses anxieties regarding digital fraud, malware, and cybercrime. When foreign developed banking apps experience vulnerabilities, interface bugs, or system delays, bank employees bear the operational burden of customer distress, manual error correction, and institutional compliance pressure. This heightens their perception of operational risk and reinforces the need for strong organizational support and clear regulatory protocols.

Organizational resistance and cultural factors represent a fourth barrier category that operates at both the individual and collective level. At the individual level, employees may experience concerns about whether digital systems will make their specific skills and competencies obsolete, whether increased digital monitoring will reduce their autonomy, or whether the additional learning demands of digital transformation constitute an unfair increase in their workload without commensurate recognition or reward. At the collective level, organizational cultures that have historically valued established practices, hierarchical decision-making, and risk avoidance may

generate institutional inertia that slows or deflects digital transformation regardless of the formal mandates supporting it. As Schein (2010) argued, organizational culture operates primarily at the level of deep shared assumptions that are often invisible to insiders and highly resistant to change through surface-level interventions such as policy announcements or training programs. Effective culture transformation in support of digital engagement requires sustained leadership commitment, consistent behavioral modeling from the top of the organization, and genuine openness to the reorganization of power and process that digital ways of working often require (Hung, 2024).

Regulatory and policy challenges represent the fifth and final barrier category with specific relevance to the Lao banking context. The regulatory environment in Lao PDR is actively evolving, with the Bank of the Lao PDR and government digital economy strategy generating a stream of directives, guidelines, and compliance requirements that banks must interpret and implement, often with limited lead time and limited regulatory guidance on implementation specifics. This creates a situation in which employees may feel simultaneously over-regulated, in the sense of being subject to mandates that constrain their operational flexibility, and under-supported, in the sense of receiving insufficient clarity or resource commitment from the regulatory environment to implement those mandates effectively. Research in developing economy banking contexts has documented that regulatory ambiguity and implementation gaps are among the most consistently cited sources of employee anxiety and disengagement in digital transformation programs (OECD, 2021; Porfírio et al., 2024).

3.2.4 Theoretical Foundation: The UTAUT Model and Its Limitations

To systematically investigate the determinants of employee digital engagement and digital transformation adoption in the Lao banking sector, this chapter anchors its analysis in the Unified Theory of Acceptance and Use of Technology (UTAUT), originally developed by Venkatesh et al. (2003). UTAUT represents the most comprehensive and widely validated theoretical synthesis available in the technology acceptance literature, integrating the core constructs of eight previously competing frameworks into a unified model with documented explanatory power substantially exceeding that of any of its predecessors. Its four core constructs, namely Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC), have been validated across a broad range of organizational and technological contexts, providing a solid and credible theoretical foundation for the present analysis.

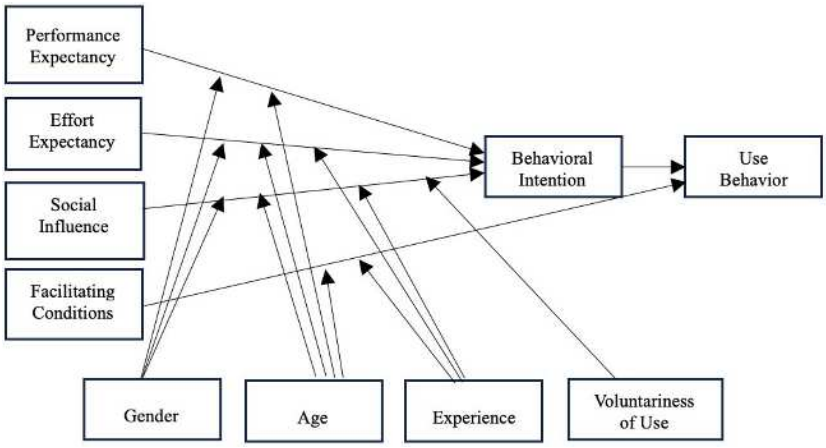


Figure 10. The Unified Theory of Acceptance and Use of Technology (UTAUT) model

Performance Expectancy (PE) refers to the degree to which using a system is believed to produce improvements in job performance, including faster task completion, reduced error rates, enhanced service quality, and greater overall operational effectiveness. In the banking sector, PE encompasses employee beliefs about whether digital systems genuinely improve their capacity to serve customers, manage transactions, and fulfil their professional responsibilities more effectively than the pre-digital alternatives. Effort Expectancy (EE) captures the perceived ease of system use, including the usability of the interface, the clarity of the system's logic, the intuitive fit between the system's design and employees' existing mental models of their work, and the learning demands associated with achieving competent system use. Social Influence (SI) reflects the degree to which employees perceive that significant others in their organizational environment, including supervisors, senior colleagues, and regulatory authorities, expect them to use and actively engage with digital systems. In the hierarchical organizational cultures characteristic of the Lao banking sector, this construct carries particular theoretical weight, since authority structures shape the normative expectations employees internalize. Facilitating Conditions (FC) represent employees' perceptions of the organizational and technical support available to enable effective system use, including IT infrastructure quality, training access, and the availability of technical assistance.

Despite its strengths, UTAUT presents several limitations that require direct acknowledgement before the specific extensions introduced in this chapter can be justified. The first limitation concerns the voluntariness assumption. UTAUT was developed primarily in organizational contexts where technology adoption, while organizationally encouraged, involves some degree of individual choice. Its primary outcome variable, behavioral intention, reflects an

individual's conscious decision to use or not use a system. In mandatory adoption contexts, where employees have no genuine choice about whether to use mandated systems, behavioral intention as a construct loses its primary theoretical function. As noted in section 3.1.1, what matters in mandatory contexts is not the binary intention to use but the quality and depth of the engagement that develops around mandated use. This limitation motivates the replacement of behavioral intention with digital engagement as the primary mediating outcome in the present model.

The second limitation concerns the model's limited treatment of institutional and regulatory influences. UTAUT incorporates social influence as a construct that captures peer and authority expectations, but it does not model the broader institutional environment that shapes those expectations in highly regulated sectors like banking. In the Lao PDR context, where the regulatory environment actively mandates digital transformation and where compliance with central bank directives is non-negotiable, the regulatory dimension of the adoption environment is not adequately captured by the individual-level social influence construct. A dedicated Regulatory Influence construct, grounded in institutional theory (DiMaggio and Powell, 1983), is needed to represent this structural dimension of the adoption environment.

The third limitation concerns the treatment of organizational culture. While social influence captures interpersonal normative pressure, it does not reach the deeper level of shared values, assumptions, and norms that constitute organizational culture and that shape employees' fundamental orientation toward change, innovation, and digital engagement. As Schein (2010) and subsequent researchers in the digital transformation domain have argued (Dasgupta & Gupta, 2012; Hung, 2024), organizational culture is among the most powerful determinants of digital transformation outcomes, and it operates through mechanisms that social influence measures do not capture. A dedicated Organizational Culture (OC) construct is therefore required to adequately represent this dimension of the adoption environment.

The fourth limitation concerns the inadequate treatment of perceived risk, which in the standard UTAUT model is subsumed within other constructs rather than explicitly modeled. In the banking sector, where the financial, reputational, and regulatory consequences of digital system failures can be severe, employee risk perceptions about digital systems are a theoretically independent and empirically significant dimension of the adoption environment that deserves explicit representation (Apau et al., 2025). A dedicated Perceived Risk (PR) construct allows the

negative influence of risk perceptions on digital engagement to be modeled transparently rather than absorbed into construct composites.

3.2.5 The Modified UTAUT Model for Mandatory Adoption in Developing Economy Banking

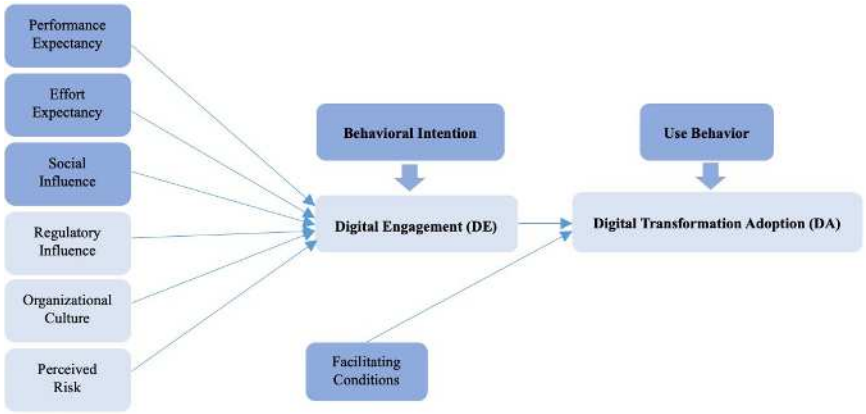


Figure 11. UTAUT modified model

The theoretical limitations identified in section 3.2.4 motivate two conceptual adaptations to the UTAUT framework and three construct extensions, together yielding the modified model that guides the empirical analysis in this chapter.

The first conceptual adaptation replaces Behavioral Intention (BI) with Digital Engagement (DE) as the primary mediating construct. DE is conceptualized as a multidimensional psychological state that captures the vigor, dedication, and absorption with which employees interact with digital systems in their organizational roles (Schaufeli et al., 2006). Unlike BI, which reflects a conscious forward-looking decision, DE reflects an ongoing relationship with digital work that encompasses motivational investment, confidence and competence in use, proactive orientation toward system improvement, and alignment with the organization's digital transformation goals. This conceptualization draws on the work engagement tradition in organizational psychology (Bakker & Demerouti, 2008; Schaufeli et al., 2006) and adapts it to the specific domain of employee-technology interaction in the banking sector.

Recent research provides direct empirical support for this conceptualization. A study of employee digital engagement in the context of organizational digital transformation across multiple sectors found that the quality of engagement, capturing employees' genuine investment in and positive orientation toward digital work, was a substantially stronger predictor of transformation outcomes than simple system usage frequency, and that the determinants of high-quality

engagement differed meaningfully from those of mere compliance (Sibassaha et al., 2025). Similarly, Fransiska's et al. (2025) study of banking digital transformation leadership identified the creation of meaningful digital work experience as the central leadership challenge, and found that the most effective leaders were those who moved their teams from compliance to genuine engagement through a combination of capability development, psychological safety, and clear transformational vision.

The second conceptual adaptation replaces Use Behavior with Digital Transformation Adoption (DA) as the ultimate dependent outcome variable. DA is conceptualized not simply as the frequency or duration of system use but as the degree to which digital systems have been effectively integrated into employees' daily workflows, contributing to measurable improvements in process quality, service delivery, and organizational capability. This broader conceptualization reflects the argument that the ultimate goal of digital transformation is not system usage per se but the organizational capability improvement that effective system usage produces, and that a measure of adoption that captures only usage frequency misses the most important dimensions of successful transformation outcomes.

The three construct extensions introduced in the modified model are Regulatory Influence (RI), Organizational Culture (OC), and Perceived Risk (PR). Regulatory Influence captures the degree to which external institutional pressures, including central bank directives, national digital economy strategy mandates, and internal compliance requirements, shape employees' relationship with digital systems. Grounded in the institutional theory of DiMaggio and Powell (1983), RI reflects both the coercive force of regulatory mandates and the normative legitimacy they confer on digital transformation efforts. OC captures the shared values, norms, and practices that characterize the organization's internal environment, with specific attention to dimensions relevant to digital transformation: leadership vision clarity, collaborative orientation, tolerance for learning from failure, and the degree to which innovative behavior is recognized and rewarded (Hung, 2024; Schein, 2010). PR captures employees' concerns about the potential negative consequences of digital system use, including data security vulnerabilities, transaction processing failures, fraud exposure, and reputational risks associated with system failures in customer-facing contexts (Apau et al., 2025).

Together, the original UTAUT constructs and these three extensions, mediated by Digital Engagement (DE) and producing Digital Transformation Adoption (DA) as the ultimate outcome,

constitute the theoretical model tested in this chapter. The full model is presented as Figure 11 in the dissertation.

3.2.6 Measurement Theory and Construct Operationalization

The measurement framework in this study maintains a principled distinction between reflective and formative measurement models, following the established criteria for distinguishing between these specifications articulated by Jarvis et al. (2003). This distinction is methodologically essential because the choice of measurement model determines how reliability, validity, and construct relationships should be assessed and interpreted within the PLS-SEM analytical framework.

The outcome variables, Digital Engagement (DE) and Digital Transformation Adoption (DA), are operationalized as reflective constructs. A reflective specification is appropriate when the indicators are understood as manifestations of an underlying latent construct: each indicator reflects the same underlying psychological state or behavioral outcome, such that the indicators are expected to be intercorrelated and interchangeable as expressions of the construct (Hair et al., 2022). For DE, this means that all indicators, whether capturing motivational investment, confidence in digital use, or proactive orientation toward digital work, are expected to move together as expressions of the same underlying engagement state. For DA, indicators reflecting workflow integration, process improvement, and service quality enhancement are similarly expected to reflect the same underlying adoption phenomenon.

The antecedent variables are operationalized as formative constructs. A formative specification is appropriate when indicators are understood as distinct components that together define the construct, such that each indicator contributes a unique dimension and removing any indicator would change the conceptual content of the construct (Hair et al., 2022). For constructs like Regulatory Influence (RI), which is defined by its multiple distinct institutional dimensions including formal regulatory mandates, compliance monitoring, and national strategy alignment, a formative specification correctly reflects the assumption that these dimensions are not interchangeable but are separately necessary components of the construct's meaning. Similarly, Organizational Culture (OC) as defined in this study incorporates distinct dimensions of leadership, collaboration, innovation orientation, and recognition systems that are jointly constitutive rather than interchangeable reflections.

Performance Expectancy (PE) is operationalized through items capturing employees' beliefs that digital systems improve their transaction processing speed, reduce error rates, enhance service delivery quality, and improve overall work effectiveness. Effort Expectancy (EE) is captured through items reflecting the perceived ease of learning and operating digital systems, including interface clarity and the intuitiveness of system logic. Social Influence (SI) is measured through items reflecting the normative pressure from supervisors and senior colleagues to engage with and promote digital systems. Facilitating Conditions (FC) are captured through items assessing the quality of IT infrastructure, access to training programs, and the availability of technical support. Regulatory Influence (RI) is measured through items reflecting employees' perceptions of the clarity and consistency of regulatory mandates, the degree to which regulatory requirements create genuine motivation for digital engagement, and the adequacy of regulatory guidance for implementation. Organizational Culture (OC) is operationalized through items capturing leadership vision communication, collaborative work orientation, openness to experimentation, and recognition of innovative digital behavior. Perceived Risk (PR) is measured through items reflecting concerns about data security, system failure, fraud exposure, and reputational risk associated with digital system use.

3.2.7 Research Hypotheses

The theoretical arguments developed in the preceding sections generate the following set of hypotheses, each of which reflects a specific predicted relationship within the modified UTAUT framework.

H1: Performance Expectancy (PE) positively influences Digital Engagement (DE). Employees who believe that digital systems will genuinely enhance their professional performance are more likely to invest the psychological energy and motivation that constitute high-quality digital engagement. The perceived performance value of digital tools provides the intrinsic motivational foundation for engaged interaction with those tools (Venkatesh et al., 2003).

H2: Effort Expectancy (EE) positively influences Digital Engagement (DE). Systems that are perceived as easy to use and accessible reduce the cognitive and emotional costs of digital interaction, freeing psychological resources for the kind of absorbed, motivated engagement that goes beyond compliance. Conversely, systems perceived as difficult or confusing impose a cognitive burden that undermines engagement quality even when use is mandated (Muduli & Choudhury, 2024; Venkatesh et al., 2003).

H3: Social Influence (SI) positively influences Digital Engagement (DE). In hierarchical organizational cultures, normative expectations from supervisors and senior colleagues carry substantial motivational force. When employees perceive that important organizational authorities actively support and model digital engagement, they are more likely to develop their own genuine engagement with digital systems, not merely as a compliance response but as a reflection of internalized professional norms (Fransiska et al., 2025; Venkatesh et al., 2003).

H4: Regulatory Influence (RI) positively influences Digital Engagement (DE). Clear, consistent, and well-supported regulatory mandates for digital transformation confer institutional legitimacy on the transformation effort and signal its non-negotiable importance, which can foster employee engagement by clarifying the stakes and the expectations associated with digital competence development. Where regulatory influence is experienced as clear and supportive rather than ambiguous and arbitrary, it is expected to contribute positively to engagement quality (DiMaggio & Powell, 1983; Porfírio et al., 2024).

H5: Organizational Culture (OC) positively influences Digital Engagement (DE). Organizational cultures characterized by clear leadership vision for digital transformation, collaborative norms, psychological safety for learning from digital failures, and genuine recognition of digital innovation create the enabling conditions within which genuine employee engagement can develop and sustain itself. Culture provides the ambient psychological environment that determines whether employees experience digital transformation as a shared organizational journey or an individually imposed burden (Hung, 2024; Schein, 2010; Sibassaha et al., 2025).

H6: Perceived Risk (PR) negatively influences Digital Engagement (DE). Although employees in mandatory adoption contexts are required to use digital systems regardless of their risk perceptions, persistent concerns about data security, system failures, and fraud exposure create a form of cognitive and emotional load that undermines the confidence, motivation, and absorption that characterize genuine engagement. Risk anxiety produces defensive rather than proactive interaction with digital systems, reducing engagement quality even when usage compliance is maintained (Apau et al., 2025; Bilal et al., 2025).

H7: Facilitating Conditions (FC) positively influence Digital Transformation Adoption (DA). Adequate organizational and technical infrastructure, including reliable IT systems, accessible training, and responsive technical support, enables the translation of employee digital engagement

into effective organizational adoption. In resource-constrained environments, facilitating conditions may function as a threshold variable: below a minimum level of infrastructure and support adequacy, even highly engaged employees may be unable to achieve meaningful adoption outcomes, while above this threshold, improvements in facilitating conditions amplify the adoption impact of a given level of engagement (Apau et al., 2025; Venkatesh et al., 2003).

H8: Digital Engagement (DE) positively influences Digital Transformation Adoption (DA). Digital Engagement is theorized as the critical mediating construct in the model, translating the combined effects of the antecedent organizational and institutional factors into actual adoption outcomes. Engaged employees, who interact with digital systems with vigor, dedication, and absorbed competence, are expected to demonstrate higher levels of genuine system integration, more effective workflow transformation, and stronger contribution to organizational digital capability than employees who use systems merely in compliance with mandates (Bakker & Demerouti, 2008; Schaufeli et al., 2006).

3.3 Methodology

3.3.1 Research Design

This chapter employs a mixed-methods research design that integrates quantitative survey data with qualitative insights from semi-structured interviews and open-ended survey responses. The philosophical foundation for this design choice draws on the pragmatist tradition in social research methodology (Creswell & Clark, 2017; Dawadi et al., 2021), which holds that research design decisions should be guided primarily by what the research questions require rather than by a prior commitment to any single methodological paradigm. The research questions addressed in this chapter are simultaneously structural, in the sense that they concern the causal relationships between identifiable organizational and institutional factors and digital engagement outcomes, and interpretive, in the sense that they require contextual understanding of how those causal mechanisms actually operate in the specific organizational and cultural environment of Lao banking. A mixed-methods design that combines the structural explanatory power of quantitative modeling with the interpretive depth of qualitative investigation is therefore the most appropriate methodological choice.

The quantitative component serves the primary analytical function: it enables systematic testing of the theoretical model across a substantial and organizationally diverse sample, producing generalizable estimates of the direction and magnitude of the relationships between the constructs.

The qualitative component serves a sequential explanatory function: it enriches and contextualizes the quantitative findings by illuminating the mechanisms, experiences, and organizational dynamics that the numerical results describe but cannot fully explain (Creswell & Clark, 2017). Together, the two components produce an account of employee digital engagement in the Lao banking sector that is both analytically rigorous and contextually grounded.

3.3.2 Target Population and Sampling Strategy

The target population for this study is the workforce of banks operating in Lao PDR, with specific focus on employees involved in digital banking operations across functional areas including information technology, customer service, finance, credit, audit, and operations. The decision to focus on banks, rather than the broader financial sector including microfinance institutions and cooperatives, reflects the study's interest in the mandatory digital transformation context: banks are the institutions most directly subject to the Bank of the Lao PDR's digital infrastructure mandates and are the primary sites of the kind of large-scale digital system implementation that the theoretical model is designed to explain.

A two-stage sampling strategy was employed to achieve both institutional and individual representativeness within the available research resources. At the first stage, institutional access was sought from all 36 banks operating in Lao PDR as of 2025 through formal written requests submitted to each bank's senior management. The formal approval process was necessary given the hierarchical nature of organizational governance in Lao PDR, where research access to employees typically requires explicit senior management endorsement before individual participation is considered appropriate. Of the 36 banks approached, 26 agreed to participate, representing a 75 percent institutional participation rate that provides meaningful sector coverage across banks of different sizes, ownership structures (State-Owned Commercial, specialized, Joint State Commercial, Private, Subsidiary, and Foreign Commercial Bank Branch), and stages of digital maturity.

At the second stage, a purposive sampling approach was employed within each participating bank to ensure representation across the functional diversity of the digital banking workforce. Employees were targeted from IT departments, customer service divisions, finance and accounting functions, credit operations, audit and compliance, and general banking operations. This cross-functional approach is important because the experience of digital transformation, and the organizational and institutional factors that shape digital engagement, differs meaningfully across

functional roles: IT employees experience digital transformation primarily through system implementation challenges, customer service employees experience it primarily through the service quality demands it creates, and audit and compliance employees experience it primarily through the regulatory accountability dimensions it introduces.

3.3.3 Quantitative Data Collection

The quantitative instrument was a structured questionnaire developed from the validated UTAUT scales of Venkatesh et al. (2003), supplemented with additional items developed to capture the context-specific constructs of Regulatory Influence (RI), Organizational Culture (OC), Digital Engagement (DE), and Digital Transformation Adoption (DA) that the standard UTAUT does not measure. All items were adapted to reflect the banking sector context and translated into the Lao language by a professional translator with expertise in banking and financial services terminology. A back-translation procedure was performed to verify translation accuracy, and minor adjustments were made where back-translation revealed semantic drift from the original English items.

A pre-test was conducted with a small group of bank employees, including staff from both technical and non-technical roles, to identify potential ambiguities in item phrasing, cultural resonances that might distort item interpretation, and practical difficulties with the questionnaire format. The pre-test revealed that certain standard UTAUT items required simplification of technical language for clarity with non-IT employees, and that some items needed contextual anchoring to specific digital banking systems currently in use in Lao PDR to ensure respondents were evaluating real rather than hypothetical technology experiences. These adjustments were incorporated before the main data collection commenced.

The main survey was conducted between March and April 2025. Given the variable internet reliability across banking locations in Vientiane and the organizational preference for direct researcher engagement indicated by participating banks during the access negotiation process, surveys were administered in person at each participating bank's premises. This approach also reduced the risk of incomplete responses that characterizes online survey administration and enabled the research team to clarify any questions about item meaning in real time. A total of 354 valid responses were obtained, representing the analytical sample for the quantitative component of the study.

3.3.4 Qualitative Data Collection

To complement and contextualize the quantitative findings, semi-structured interviews were conducted with five key informants representing diverse strategic and operational perspectives on digital transformation in the Lao banking sector. The informant group included senior managers with cross-functional responsibilities, IT specialists with direct implementation experience, and project leaders who had managed digital transformation programs within their institutions. This diversity of perspective ensures that the qualitative data captures both the strategic framing of digital transformation from leadership positions and the operational realities encountered by those responsible for implementation.

The interview protocol was designed around a set of open thematic areas including organizational readiness for digital transformation, the most significant barriers to employee digital engagement, the role of regulatory influence in shaping organizational behavior, the cultural characteristics that facilitate or impede digital engagement, and the leadership practices that have proven most effective in fostering genuine rather than superficial adoption. The protocol was structured to be exploratory rather than confirmatory, allowing informants to introduce themes and dynamics not anticipated by the theoretical framework while ensuring that the interview addressed the key constructs of the model.

Each interview lasted between 45 and 90 minutes and was conducted in the Lao language to maximize informant comfort and expressiveness. With the explicit written permission of participants, all sessions were audio-recorded and subsequently transcribed verbatim. The transcripts were initially analyzed in Lao to preserve cultural nuance and contextual meaning, with key passages translated into English for presentation in the study's findings. Open-ended survey responses from the questionnaire were analyzed alongside the interview data to provide a larger and more demographically diverse qualitative dataset.

3.3.5 Data Analysis Approach

The quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) implemented through SmartPLS 4. The choice of PLS-SEM over covariance-based SEM reflects several considerations that align with the specific characteristics of this study. PLS-SEM accommodates the combination of reflective and formative measurement models employed in the study, which covariance-based SEM handles less efficiently. It is robust with the sample size obtained and does not require multivariate normality assumptions. It is well suited to

studies with both confirmatory and exploratory dimensions, consistent with the mixed confirmatory and exploratory character of the theoretical model testing in this chapter (Hair et al., 2022).

3.3.5.1 Measurement Model Assessment Procedure

Before testing the structural relationship, the measurement model was evaluated to ensure that all constructs met the required standards of reliability and validity. This study follows a structured two-stage procedure based on established PLS-SEM guidelines (Hair et al., 2022). The process begins by distinguishing between reflective and formative constructs, as each type requires a different evaluation approach.

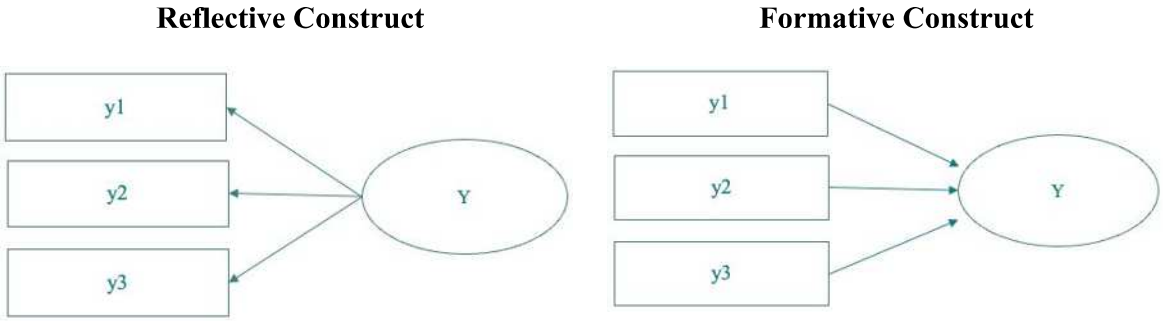


Figure 12. Assessment of Reflective and Formative Measurement Models

Source: Adapted from Hair et al. (2022)

As shown in Figure 12, the evaluation starts with identifying the type of construct. Reflective constructs are assessed in terms of reliability and validity, while formative constructs are evaluated based on the contribution and distinctiveness of their indicators. If any criteria are not satisfied, the model is revised by removing or adjusting indicators. Only after all contracts meet the required thresholds does the analysis proceed to the structural model.

3.3.5.2 Assessment of Reflective Constructs

Reflective constructs were assessed using a step-by-step procedure focusing on indicator reliability, internal consistency, convergent validity, and discriminant validity. The decision process for retaining or removing indicators is presented in Figure 13.

As illustrated in Figure 13, the assessment begins with examining the outer loadings of each indicator. Indicators with loadings above 0.70 are retained, as they demonstrate adequate reliability. For indicators with loadings between 0.04 and 0.70, removal is considered based on whether their

exclusion improves composite reliability and average variance extracted. Indicators with loadings below 0.40 are removed, as they do not sufficiently represent the construct.

After confirming indicator reliability, internal consistency is evaluated using Cronbach's alpha and composite reliability (CR), with values above 0.07 considered acceptable. Convergent validity is assessed using the average variance extracted (AVE), where values above 0.50 indicate that the construct explains a sufficient proportion of variance in its indicators.

Finally, discriminant validity is examined using the Heterotrait-Monotrail (HTMT) ratio of correlations. Values below 0.85 indicate that the constructs are empirically distinct from one another (Henseler et al., 2015).

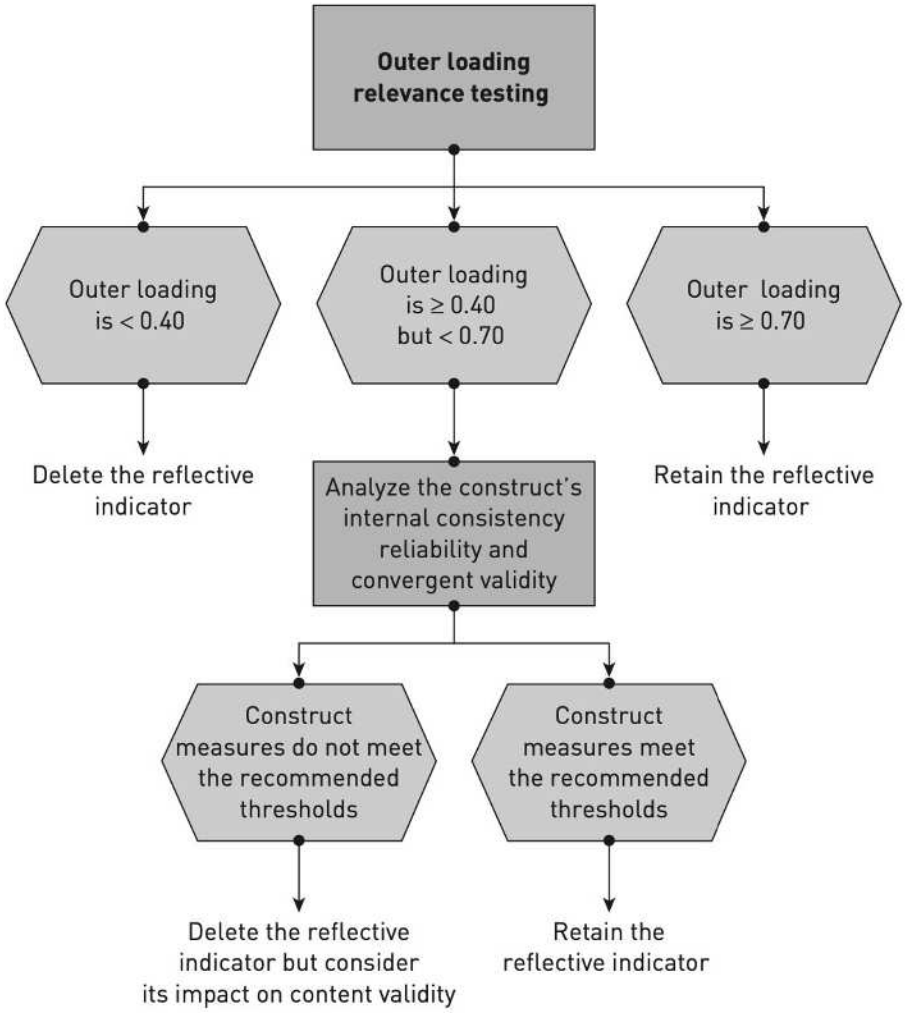


Figure 13. Outer Loading Relevance testing

Source: Adapted from Hair et al. (2022)

3.3.5.3 Assessment of Formative Constructs

Formative constructs were evaluated using different approach, focusing on the contribution and relevance of each indicator rather than internal consistency. The decision-making process is summarized in Figure 14.

As shown in Figure 14, the assessment begins with checking collinearity among indicators using the variance inflation factor (VIF). Values below 3.0 indicate that multicollinearity is a concern. Indicators with high VIF values are reviewed and may be removed or revised.

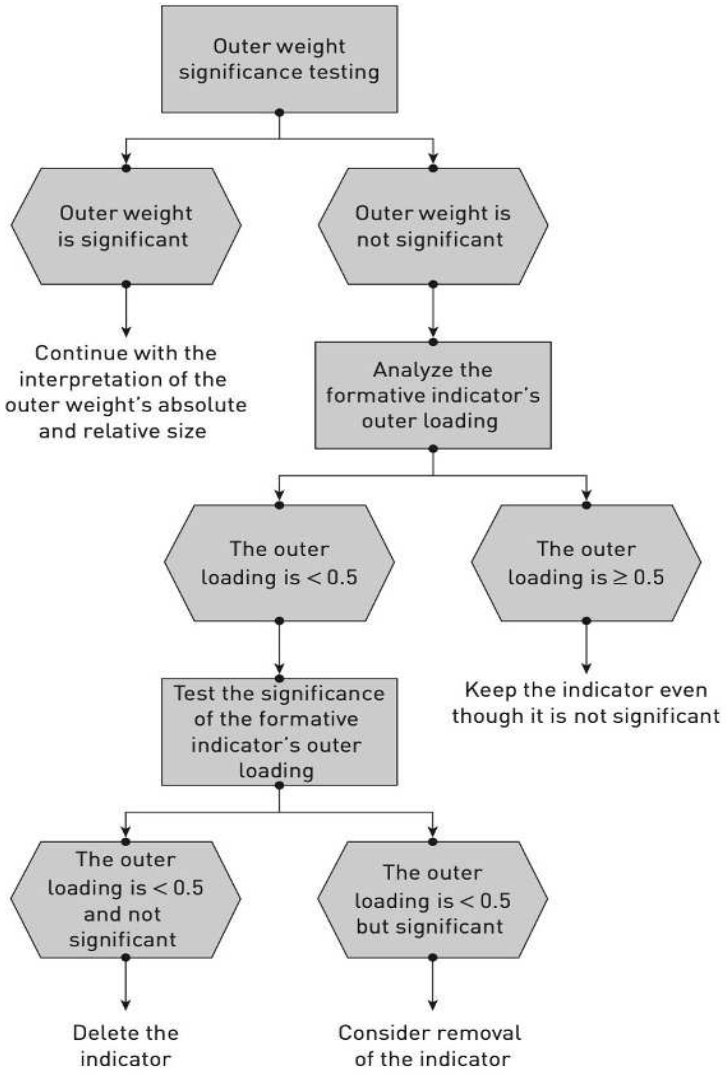


Figure 14. Decision-Making Process for Keeping or Deleting Formative Indicators

Source: Adapted from Hair et al. (2022)

Next, the significance and relevance of each indicator are assessed through their outer weights. A bootstrapping procedure with 5,000 resamples is used to determine statistical significance. Indicators with significant weights ($p<0.05$) are considered to contribute meaningfully to the constructs. For indicators with non-significant weights, theoretical relevance is carefully considered before deciding whether to retain or remove them. This step ensures that the construct remains both statistically sound and theoretically meaningful (Hair et al., 2022).

3.3.5.4 Structural Model Evaluation

Once the measurement model meets all required criteria, the structural model is evaluated. The hypothesized relationships are tested using bootstrapping with 5,000 resamples, which provides path coefficients, confidence intervals, and significance levels.

The explanatory power of the model is assessed using the coefficient of determination (R^2) for endogenous constructs. Effect sizes are evaluated using Cohen's f^2 to determine the relative impact of each predictor. In addition, predictive relevance is examined using Stone–Geisser's Q^2 values obtained through a blindfolding procedure (Hair et al., 2022).

3.3.5.5 Qualitative Analysis

The qualitative data were analyzed using thematic analysis following the six-phase procedure described by Braun and Clarke (2006). This process began with familiarization through repeated reading of the data, followed by the generation of initial codes that captured meaningful patterns. These codes were then grouped into candidate themes, which were reviewed and refined to ensure clarity, coherence, and distinction.

The final themes were defined and named, and the results were organized into a structured narrative. The analysis was primarily inductive, allowing themes to emerge from the data. At the same time, the theoretical framework provided a useful lens for interpreting the findings and understanding their broader significance within the context of digital banking adoption in Lao PDR.

3.3.6 Ethical Considerations

The research protocol was submitted to and received formal ethical approval from the relevant institutional review body prior to data collection commencing. All participants provided written informed consent that described the research purpose, their right to withdraw from participation at any time without consequence, the specific uses to which their responses would be put, and the data security and confidentiality measures in place. Anonymity was protected by

ensuring that individual responses could not be linked to specific individuals or institutions in the study's analysis or reporting. Data were stored securely with access restricted to the primary research team. Reporting at the institutional level employed aggregation and anonymization procedures to prevent the identification of specific banks from the study's findings, a commitment that was important to securing the participation of banks that might otherwise have been concerned about reputational exposure from participation in a study of their digital transformation challenges.

3.4 Results

3.4.1 Sample Characteristics

The final sample of 354 employees drawn from 26 banks across Lao PDR provides a demographically diverse and professionally representative basis for examining digital transformation adoption dynamics in the sector. The descriptive characteristics presented in Table 5 are important not merely as background information but as interpretive context for understanding the structural findings that follow.

Table 5. Descriptive analysis

Demographic profile of participants (N=354).

Variable	N	%
Gender		
Male	191	53.95
Female	163	46.05
Age		
19-27	92	25.99
28-36	143	40.4
37-45	89	25.14
46-54	27	7.63
55 and more	3	0.85
Status		
Single	159	44.92
Married	189	53.39
Divorced	5	1.41
Widowed	1	0.28
Education		
Under Bachelor	13	3.67
Bachelor	285	80.51

Master	55	15.54
PhD	1	0.28
Banks		
State-Owned Commercial Bank	128	36.16
Specialized Bank	4	1.13
Joint State Commercial Bank	94	26.55
Private Bank	72	20.33
Subsidiary Bank	45	12.71
Foreign Commercial Bank Branch	11	3.11
Department		
IT/Technology	52	14.73
Marketing	23	6.52
Customer service	72	20.4
Finance & Accounting	50	14.16
Operations/bank office	33	9.35
Credit	44	12.46
Audit	45	12.75
Risk and compliance	8	2.27
Manager/Leader	12	3.4
Other	14	3.97
Working experience		
0-6	197	55.65
7-13	93	26.27
14-20	46	12.99
21+	18	5.08
Best DX for their bank		
Very advanced	198	55.93
Moderately advanced	98	27.68
Still developing	40	11.3
Limited	18	5.08
Usage per week		
Every day	271	76.55
3 - 4 times	46	12.99
1 - 2 times	20	5.65
Less than 1 time	6	1.69
None	11	3.11

Barriers for DX		
Resistance employees	26	7
Security & fraud concerns	188	53
High costs & budget limitations	167	47
Regulatory and legal challenges	80	23
Organizational culture and readiness	123	35
Challenges faced for DX		
Difficulty in using digital banking tools	73	21
Lack of proper training or support.	116	32
Technical issues (e.g., system errors, downtime)	192	54
Security and fraud concerns.	120	34
Customer resistance or low adoption	60	17
Regulatory and compliance restrictions	66	19
Concern for DX		
Data privacy and security risks	246	69
Job displacement due to automation	36	10
Complexity of new technologies	77	21
Reliability of digital banking systems	107	30
Resistance to change within the organization	40	11

The gender distribution is relatively balanced, with male respondents accounting for approximately 54 percent of the sample and female respondents comprising the remaining 46 percent. This near-parity reflects the increasing gender diversity within the Lao banking workforce and reduces the likelihood that gender composition introduces systematic bias into the findings.

The age profile of the sample skews toward younger and mid-career employees. The largest group falls within the 28 to 36 age brackets at approximately 40 percent, followed by those aged between 19 and 27 at roughly 26 percent, and those between 37 and 45 at approximately 25 percent. Employees above the age of 45 constitute a small minority. This distribution is significant for interpreting the results: younger employees generally bring greater prior familiarity with digital technologies, while mid-career employees represent the segment most directly responsible for implementing digital transformation at the operational level. Together, these two groups constitute the primary workforce driving day-to-day digital banking operations in Lao PDR.

Educational attainment across the sample is high, with approximately 80.5 percent holding at least a bachelor's degree and a further 15.5 percent holding postgraduate qualifications. Only a

small minority report educational levels below the bachelor's degree. This educational profile is consistent with the professional standards of the banking sector and suggests that respondents have the foundational cognitive and academic capacity to engage with complex digital systems, meaning that capability gaps are more likely to be training-specific and system-specific rather than reflecting fundamental educational deficits.

The sample spans a meaningful range of institutional types, including state-owned commercial banks at approximately 36 percent, joint state commercial banks at around 27 percent, private banks at approximately 20 percent, and subsidiary, specialized, and foreign commercial bank branches accounting for the remainder. This institutional diversity is a strength of the study, as it ensures that the findings reflect experiences across banks at different stages of digital maturity and operating under different ownership structures and governance regimes.

Functionally, respondents represent a broad cross-section of departmental roles. Customer service, information technology, finance and accounting, credit, audit, and operations together account for the majority of the sample, with smaller representations from marketing, risk and compliance, and management. This functional breadth ensures that the study captures both the technical dimensions of digital transformation, as experienced by IT and operations staff, and the frontline service dimensions, as experienced by customer-facing and relationship management employees.

Work experience within the sample is concentrated in the earlier career stages, with over 55 percent reporting fewer than seven years in the banking sector. This distribution reinforces the age profile findings and suggests that the Lao banking sector's digital transformation is being navigated primarily by a relatively young and professionally early-stage workforce that may be digitally capable but institutionally less experienced.

Respondents' perceptions of their institution's digital transformation maturity reveal a broadly optimistic picture at the aggregate level, with approximately 56 percent characterizing their bank as very advanced in digital transformation and a further 28 percent describing it as moderately advanced. Only around 16 percent characterize their institution as still developing or limited in digital capability. However, when these self-assessments are read alongside the operational challenges reported in the same survey, they suggest that employees may be evaluating their institution's digital ambition and infrastructure investment rather than the actual depth of

transformation achieved in daily workflows, a distinction that the qualitative findings elaborate upon.

The usage frequency data confirm that digital systems are deeply embedded in the daily working lives of the survey respondents. Approximately 77 percent report using digital banking systems every day, with a further 13 percent using them three to four times per week. Together, these figures indicate that over 90 percent of the sample are high-frequency digital system users, which means that the study is examining sustained engagement dynamics rather than the initial adoption decisions that dominate much of the technology acceptance literature.

The barriers and challenges data provide early empirical grounding for the study's theoretical constructs. Security and fraud concerns were identified as a barrier to digital transformation by approximately 53 percent of respondents, while high costs and budget limitations were cited by 47 percent. Organizational culture and readiness were identified by 35 percent, and regulatory and legal challenges by 23 percent. At the individual operational level, technical issues such as system errors and downtime were the most commonly cited challenge at 54 percent, followed by lack of proper training or support at 32 percent and security concerns at 34 percent. These patterns anticipate several of the key structural findings of the study, particularly the significance of facilitating conditions and the prominence of security anxiety in the qualitative data despite its statistical non-significance in the quantitative model.

The concern data further reveal that data privacy and security risks are the most widely held concern about digital transformation at 69 percent, followed by system reliability at 30 percent and the complexity of new technologies at 21 percent. Job displacement concerns, at 10 percent, are comparatively modest, suggesting that Lao banking employees are more anxious about the technical and security dimensions of digital transformation than about its implications for their employment security.

Taken together, these demographic and contextual characteristics describe a workforce that is young, educated, high-frequency digital system users who operate across a range of institutional types and functional roles. They bring digital familiarity but face significant operational constraints in terms of infrastructure quality, training adequacy, and regulatory clarity. This profile provides an appropriate and theoretically relevant empirical foundation for the structural analysis that follows.

3.4.2 Measurement Model Assessment

Before the structural relationships between constructs can be meaningfully interpreted, it is necessary to establish that the measurement model provides a reliable, valid, and appropriately specified foundation for those relationships. The measurement model assessment addresses three fundamental questions: whether the indicators of each reflective construct are internally consistent, whether each construct's indicators share sufficient common variance, and whether the constructs are sufficiently distinct from one another to support separate interpretation.

Table 6. Path Coefficients-Confidence intervals bias corrected

	Path	Sample mean (M)	Bias	2.50%	97.50%
DE -> DA	0.831	0.826	-0.005	0.731	0.935
EE -> DE	0.124	0.121	-0.003	0.005	0.251
FC -> DA	0.095	0.1	0.006	-0.023	0.203
OC -> DE	0.19	0.197	0.007	0.041	0.338
PE -> DE	0.222	0.218	-0.004	0.096	0.349
PR -> DE	0.067	0.071	0.004	-0.05	0.177
RI -> DE	0.18	0.176	-0.004	0.055	0.304
SI -> DE	0.208	0.211	0.003	0.062	0.353

Table 7. Outer Weights

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	VIF
DA1 <- DA	0.365	0.365	0.007	50.739	0	4.079
DA2 <- DA	0.349	0.349	0.006	62.909	0	4.207
DA3 <- DA	0.346	0.346	0.005	63.855	0	4.267
DE1 <- DE	0.36	0.36	0.009	40.755	0	4.055
DE2 <- DE	0.362	0.362	0.009	39.89	0	4.301
DE3 <- DE	0.346	0.346	0.008	43.203	0	3.237
EE1 -> EE	0.42	0.416	0.084	4.974	0	1.566
EE3 -> EE	0.69	0.691	0.074	9.377	0	1.566
FC1 -> FC	0.061	0.059	0.094	0.649	0.516	2.102

FC2 -> FC	0.507	0.501	0.089	5.702	0	1.949
FC3 -> FC	0.155	0.16	0.109	1.417	0.157	2.306
FC4 -> FC	0.422	0.419	0.096	4.415	0	2.373
OC1 -> OC	0.484	0.487	0.108	4.495	0	2.149
OC3 -> OC	0.349	0.342	0.151	2.315	0.021	2.384
OC4 -> OC	0.286	0.285	0.117	2.448	0.014	2.602
PE1 -> PE	0.392	0.39	0.096	4.098	0	2.751
PE2 -> PE	0.171	0.171	0.09	1.893	0.058	2.242
PE3 -> PE	0.321	0.317	0.109	2.935	0.003	2.417
PE4 -> PE	0.251	0.253	0.105	2.381	0.017	2.657
PR1 -> PR	0.016	0.013	0.089	0.183	0.854	1.446
PR2 -> PR	0.881	0.872	0.112	7.896	0	2.36
PR3 -> PR	0.143	0.147	0.143	1.005	0.315	2.29
RI1 -> RI	0.194	0.191	0.101	1.915	0.056	2.496
RI2 -> RI	0.631	0.628	0.095	6.661	0	2.639
RI3 -> RI	0.049	0.047	0.088	0.558	0.577	1.841
RI4 -> RI	0.28	0.281	0.087	3.236	0.001	1.874
SI1 -> SI	0.462	0.455	0.101	4.578	0	2.176
SI2 -> SI	0.335	0.335	0.094	3.576	0	2.599
SI3 -> SI	-0.008	-0.006	0.094	0.09	0.928	2.234
SI4 -> SI	0.341	0.341	0.089	3.814	0	2.544

Table 8. Outer Loadings

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
DA1 <- DA	0.944	0.943	0.015	63.678	0
DA2 <- DA	0.903	0.902	0.02	44.913	0
DA3 <- DA	0.895	0.893	0.021	41.999	0
DE1 <- DE	0.914	0.912	0.017	53.438	0
DE2 <- DE	0.918	0.917	0.018	50.446	0
DE3 <- DE	0.877	0.877	0.036	24.162	0

EE1 -> EE	0.834	0.83	0.044	19.144	0
EE3 -> EE	0.942	0.94	0.026	36.591	0
FC1 -> FC	0.738	0.73	0.059	12.471	0
FC2 -> FC	0.903	0.896	0.029	30.63	0
FC3 -> FC	0.799	0.793	0.058	13.717	0
FC4 -> FC	0.885	0.878	0.035	25.107	0
OC1 -> OC	0.914	0.908	0.036	25.518	0
OC3 -> OC	0.878	0.871	0.047	18.609	0
OC4 -> OC	0.878	0.87	0.037	23.738	0
PE1 -> PE	0.915	0.908	0.029	31.99	0
PE2 -> PE	0.816	0.81	0.046	17.832	0
PE3 -> PE	0.879	0.871	0.04	22.122	0
PE4 -> PE	0.875	0.868	0.036	24.552	0
PR1 -> PR	0.553	0.544	0.092	6.034	0
PR2 -> PR	0.995	0.988	0.013	79.48	0
PR3 -> PR	0.801	0.795	0.065	12.371	0
RI1 -> RI	0.832	0.824	0.046	18.027	0
RI2 -> RI	0.952	0.946	0.021	45.361	0
RI3 -> RI	0.637	0.631	0.073	8.727	0
RI4 -> RI	0.737	0.732	0.062	11.856	0
SI1 -> SI	0.9	0.893	0.032	28.031	0
SI2 -> SI	0.89	0.883	0.033	26.887	0
SI3 -> SI	0.728	0.721	0.06	12.111	0
SI4 -> SI	0.858	0.851	0.041	20.72	0

Table 9. Construct Reliability and Validity

	Cronbach's alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average variance extracted (AVE)
Digital Engagement (DE)	0.93	0.931	0.955	0.877
Digital Transformation Adoption (DA)	0.938	0.939	0.961	0.89

For the two reflective outcome constructs, Digital Engagement (DE) and Digital Transformation Adoption (DA), the outer loadings reported in Table 8 confirm strong and significant relationships between each indicator and its designated construct. DE indicators load between 0.877 and 0.918, and DA indicators load between 0.895 and 0.944, all well above the commonly applied threshold of 0.70 and all statistically significant at the $p < 0.001$ level. These loading values confirm that each indicator is a reliable and substantively important reflection of its underlying construct.

For the formative antecedent constructs, the outer weights reported in Table 7 reveal which indicators contribute most meaningfully to defining each construct's content. For Performance Expectancy (PE), PE1 carries the strongest weight at 0.392, followed by PE3 at 0.321 and PE4 at 0.251, with PE2 approaching but not reaching significance. For Effort Expectancy (EE), EE3 dominates with a weight of 0.690, reflecting that the more complex usability dimension of the construct is its primary defining component. For Social Influence (SI), SI1, SI2, and SI4 carry significant positive weights, while SI3 shows a near-zero and non-significant weight, suggesting that this particular indicator does not contribute meaningfully to defining social influence in this sample. For Organizational Culture (OC), OC1, OC3, and OC4 all carry significant positive weights. For Regulatory Influence (RI), RI2 and RI4 are the strongest contributors, with RI1 approaching significance, while RI3 shows minimal contribution. For Perceived Risk (PR), PR2 dominates overwhelmingly at 0.881, while PR1 and PR3 contribute minimally and non-significantly, suggesting that the construct is primarily anchored in a single dominant concern rather than evenly distributed across multiple dimensions.

Variance inflation factor (VIF) values for all formative indicators fall within acceptable ranges, with no value exceeding 4.5 and the majority well below 3.0, confirming that multicollinearity among indicators does not threaten the stability of the formative weight estimates.

The reflective constructs satisfy the standard reliability and validity criteria for PLS-SEM. Cronbach's alpha and composite reliability values exceed 0.80 for all reflective constructs, and average variance extracted values exceed the 0.50 threshold, confirming convergent validity. Discriminant validity was confirmed using the Heterotrait-Monotrait (HTMT) ratio of correlations, as recommended by Henseler et al. (2015), with all inter-construct HTMT values falling below the 0.85 threshold, indicating that the reflective constructs are sufficiently distinct from one another to support independent structural interpretation.

3.4.3 Structural Model Results

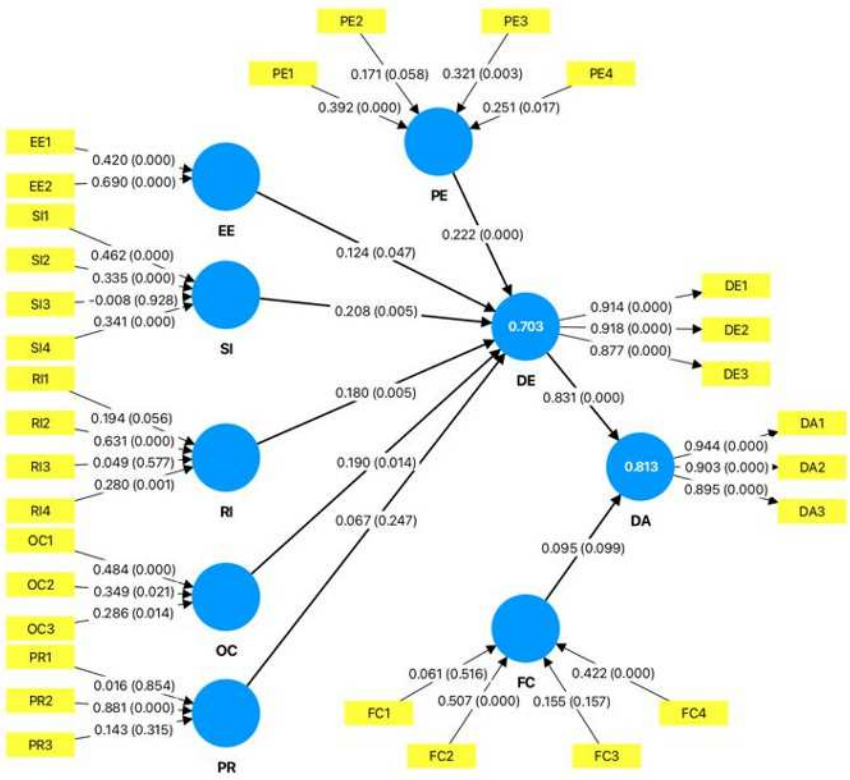


Figure 15. UTAUT model from PLS-SEM

Table 10. Path coefficients, p-values

	Path	P values	Result
DE -> DA	0.831	0.000	Supported
EE -> DE	0.124	0.047	Supported
FC -> DA	0.095	0.099	Not supported
OC -> DE	0.19	0.014	Supported
PE -> DE	0.222	0.000	Supported
PR -> DE	0.067	0.247	Not supported
RI -> DE	0.185	0.005	Supported
SI -> DE	0.208	0.005	Supported

3.4.3.1 Predictors of Digital Engagement

Performance Expectancy (PE) emerges as the strongest predictor of DE ($\beta = 0.222$, $p < 0.001$), confirming Hypothesis 1. Employees who believe that digital systems will enhance their professional performance through faster transaction processing, reduced error rates, and improved service delivery demonstrate substantially higher levels of digital engagement. These finding position perceived performance benefit as the primary motivational foundation of meaningful digital engagement in the Lao banking sector.

Organizational Culture (OC) is the second strongest predictor of DE ($\beta = 0.190$, $p = 0.014$), confirming Hypothesis 5. This result carries significant theoretical and practical weight: it means that the quality of the organizational environment, specifically the clarity of leadership vision, the collaborative orientation of the workplace, and the degree to which digital innovation is actively supported and recognized, is nearly as powerful a driver of employee digital engagement as employees' beliefs about the performance benefits of the technology itself. Technology and culture, in other words, are co-equal drivers of engagement.

Social Influence (SI) demonstrates a significant positive effect on DE ($\beta = 0.208$, $p = 0.005$), confirming Hypothesis 3. The perception that supervisors, senior colleagues, and peers support and expect digital engagement constitutes a meaningful normative driver of engagement, particularly in the high power-distance organizational culture of the Lao banking sector, where authority expectations carry substantial behavioral weight.

Regulatory Influence (RI) exerts a significant positive effect on DE ($\beta = 0.180$, $p = 0.005$), confirming Hypothesis 4. External institutional mandates from the Bank of the Lao PDR and the national digital economy strategy create legitimacy and urgency for digital transformation that translate into measurable increases in employee engagement beyond the effects of organizational and individual-level factors.

Effort Expectancy (EE) shows a significant positive effect on DE ($\beta = 0.124$, $p = 0.047$), confirming Hypothesis 2. While this effect is the smallest among the significant predictors, it remains theoretically meaningful: systems that are perceived as easier to use generate higher engagement, and the relative modesty of this effect suggests that employees in the Lao banking context are willing to invest effort in systems they believe will improve their performance, even when those systems are not maximally user-friendly.

Perceived Risk (PR) does not demonstrate a statistically significant relationship with DE (β = 0.067, p = 0.247), failing to support Hypothesis 6. This finding, which is discussed in depth in section 3.5.5, represents one of the most theoretically significant results of the study and requires careful interpretation in the context of the qualitative evidence.

3.4.3.2 Predictors of Digital Transformation Adoption

Digital Engagement (DE) is the strongest and most significant predictor of DA (β = 0.831, p < 0.001), providing strong support for Hypothesis 8. The magnitude of this path coefficient is striking and confirms the central theoretical claim of the modified UTAUT model: that in mandatory adoption contexts, the key variable determining whether digital transformation achieves meaningful organizational outcomes is not simply whether employees use digital systems, which is ensured by mandate, but how deeply and genuinely they engage with those systems. Highly engaged employees translate their psychological investment into effective workflow integration, process improvement, and substantive digital capability development in ways that compliant but disengaged employees do not.

Facilitating Conditions (FC) shows a positive but statistically non-significant direct effect on DA (β = 0.095, p = 0.099), failing to support Hypothesis 7 at the conventional 5 percent threshold. This finding is discussed in detail in section 3.5.4. The direction of the effect is consistent with theoretical expectations, and the near-significant p-value suggests a trend that may reach significance in larger or more homogeneous samples. The qualitative evidence provides important context for interpreting this result.

3.4.3.3 Mediation Analysis

Indirect effects analysis confirms that Digital Engagement (DE) significantly mediates the relationships between all five statistically significant antecedent factors, namely Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Regulatory Influence (RI), and Organizational Culture (OC), and Digital Transformation Adoption (DA). This two-stage mediated structure, in which organizational and institutional antecedents shape the quality of employee engagement, which in turn drives actual adoption outcomes, validates the core theoretical architecture of the modified UTAUT model and confirms that Digital Engagement (DE) is not merely a correlate of adoption but its primary psychological mechanism.

3.4.4 Qualitative Findings: Open-Ended Survey Responses

The thematic analysis of open-ended survey responses provides important contextual depth that the structural model cannot supply. Four thematic areas emerge with sufficient consistency and richness to merit detailed discussion.

3.4.4.1 Summary of Open-Ended Questionnaire Responses

Table 11. Summary of open-ended questions

Question Topic	Key Themes Identified	Relevance to Discussion / Model Constructs
1. Most Valuable Features *(Question 46)*	**Efficiency and Performance Gains:** • Speed, time-saving, and convenience were the most cited benefits. • Reduced paperwork and fewer human errors were also highly valued.	• Strongly supports the finding that **Performance Expectancy (PE)** is the most significant driver of engagement. Employees are motivated by tangible benefits that improve their work.
2. Challenges Faced *(Question 47)*	**Technical and Systemic Issues:** • "Security concern" and "systemic risk" were the most frequent challenges. • Unstable internet connectivity was another common problem. **Human and Knowledge Gaps:** • Difficulty in "learning and understanding" new systems. • A personal "readiness for change" was seen as a hurdle.	• The security concerns validate that **Perceived Risk (PR)** is a major issue for employees, even if it doesn't predict their behavior. • Technical and knowledge gaps highlight barriers related to **Effort Expectancy (EE)** and reinforce that **Facilitating Conditions (FC)** are currently insufficient.
3. Desired Training & Support *(Question 48)*	**Consistent and Practical Training:** • Overwhelming demand for "regular training" (e.g., quarterly). • Requests for "technology usage training" and practical manuals/guides. **Specialized Skill Development:** • Specific requests for "security and privacy training" and training on new tools like AI.	• This is powerful evidence for the interpretation of **Facilitating Conditions (FC)** as a critical, unfulfilled need. The lack of adequate training is a primary barrier identified by employees themselves.
4. Suggested Improvements *(Question 49)*	**System and Infrastructure Enhancement:** • The need for more "stability" and "easy-to-use" systems.	• Reinforces that **FC** (system quality, budget) and **EE** (ease of use) are current weaknesses. • The call for regulatory and

	• Desire for more functions, especially "cross-bank transfer" capabilities. **High-Level Organizational & Regulatory Support:** • Suggestions for increased budgets, better "organizational readiness," and for the government to "develop regulations."	organizational support aligns perfectly with the qualitative findings on the importance of **Regulatory Influence (RI)** and **Organizational Culture (OC)** as institutional-level enablers.

The themes presented in Table 11 represent the final outcomes of the thematic analysis process, following the coding, refinement, and interpretation stages outlined by Braun and Clarke (2006).

The most valuable features that employees identify in digital systems cluster consistently around efficiency and performance gains. Respondents emphasize speed, time savings, and reduction in manual paperwork as the most meaningful contributions of digital banking systems to their working lives. The practical relief that digital tools provide from error-prone manual processing tasks is cited repeatedly and with evident personal significance. This qualitative pattern provides direct empirical grounding for the quantitative primacy of PE: the performance benefits that employees value most are not abstract or aspirational but immediate and operational, embedded in the texture of daily working practice.

The challenges respondents describe reveal a landscape of practical difficulty that the summary statistics of the structural model do not fully convey. Security concerns and systemic risk feature most prominently, cited by a majority of open-ended respondents with a specificity and emotional weight that contrasts sharply with the non-significance of the PR construct in the quantitative model. Unstable internet connectivity, system downtime, and authentication failures are described as sources of daily operational frustration. Knowledge and capability gaps, including difficulties in learning new system features and adapting to rapidly changing digital interfaces, are cited frequently and with a degree of resignation that suggests these are experienced as chronic rather than transitional challenges. These qualitative accounts confirm that FC are not merely statistically significant as a structural predictor; they are experientially central to employees' working lives in ways that the quantitative coefficient may understate.

Training and support requests are the most actionable dimension of the qualitative data. Respondents articulate a remarkably consistent and specific demand for regular, structured, and

practically oriented training rather than the one-off or theoretically focused programs they report having received. Requests for hands-on simulation environments, step-by-step operational manuals in the Lao language, and specialized training in cybersecurity protocols and emerging technologies such as artificial intelligence reflect both the seriousness with which employees take their professional development responsibilities and the degree to which current institutional provision falls short of what they need. These responses constitute a direct organizational needs assessment embedded within the study's empirical data.

The improvement suggestions offered by employees span three strategic levels that map cleanly onto the study's theoretical constructs. At the technical level, respondents call for more stable and reliable system interfaces, improved cross-bank transfer capabilities, and enhanced mobile application performance. At the organizational level, they request clearer digital transformation leadership, larger technology budgets, and dedicated cross-functional transformation teams. At the regulatory level, they call for clearer guidelines from the central bank, faster approval processes for digital banking innovations, and government investment in shared digital infrastructure including national Know Your Customer systems (KYC). These suggestions demonstrate that employees possess a sophisticated understanding of the multi-level systemic challenge of digital transformation and are not merely passive recipients of organizational mandates but active participants with genuine insights into the barriers they face.

3.4.4.2 Semi-Structured Interview Findings

The thematic analysis of five semi-structured interviews with senior managers, IT specialists, and project leaders provides institutional-level perspectives that complement and deepen the survey findings. Table 12 organizes the themes that emerged across interviews according to the constructs of the modified UTAUT model.

Table 12. Thematic analysis of interviews

Overarching Theme (UTAUT Construct)	Specific Concept Mentioned	Frequency (N=5)	Representative Quote(s)
Performance Expectancy (PE)	**Speed / Time-Saving**	5	"Operations have become more convenient, saving time..." (Interview 5)

			"This transition aims to modernize processes, enabling faster... services" (Interview 1)
	Convenience / Improved Service	5	"...more convenient, and more responsive banking services..." (Interview 1) "...improve service delivery and enhance customer convenience." (Interview 2)
Effort Expectancy (EE)	**System Complexity / Lack of Intuitive Design**	3	"Some system features may be too complex or confusing for practical use." (Interview 2) "Fundamentally, many Lao people still rely on bank staff to help them... going fully digital is very challenging. It could lead to confusion and errors." (Interview 5)
Social Influence (SI)	**Top-Down Expectations & Peer Influence**	4	"Leadership must have a clear vision... Resistance is often stronger among senior staff who are less receptive to change." (Interview 2) "[We] organized internal competitions to encourage staff to practice online transactions." (Interview 3)
Organizational Culture (OC)	**Leadership & Vision**	5	"Leadership must have a clear vision and understanding of digital processes." (Interview 2) "Leaders must be knowledgeable and skilled—not only in IT but also with a global vision." (Interview 5)
	Employee Mindset / Culture	4	"Digital transformation... encompass[es] mindset and organizational culture." (Interview 1) "Our bank may not be very ready, mainly due to the personnel and the traditional organizational culture." (Interview 4)
Facilitating Conditions (FC) - BARRIERS	**Lack of Human Capital / Expertise**	5	"The real challenge lies with the bank's own personnel... In Laos, we have very few experts in this area, so we often have to hire foreign consultants." (Interview 4)

	Financial Constraints / High Costs	4	"...the larger issue is funding. Local banks must develop systems from scratch, increasing the financial burden." (Interview 1)
	Insufficient Training & Support	4	"Service delivery may be limited if personnel are not adequately trained." (Interview 2) "More communication and awareness campaigns are needed to educate customers effectively." (Interview 1)
Regulatory Influence (RI) - BARRIERS	**Slow Approval Processes**	4	"...delays in product approval... should be expedited to facilitate innovation." (Interview 1) "Long delays can slow down implementation and harm the bank's reputation..." (Interview 5)
	Lack of Clear Guidelines	4	"The central bank doesn't yet have regulations to support such innovations." (Interview 4) "...the central bank might have basic requirements but no detailed implementation guidelines. So, banks have to figure things out themselves." (Interview 5)
	Need for Centralized Government Infrastructure (e.g., KYC)	4	"A centralized data infrastructure from the government is needed to support interconnectivity." (Interview 1) "If the government could support KYC infrastructure, it would help with identity verification." (Interview 4)
Perceived Risk (PR)	**Security & Fraud Concerns**	4	"Integration with the central bank's system is critical to ensure security and trust." (Interview 1) "...leverage for... fraud detection with greater accuracy than human capabilities." (Interview 1)
Strategic Context: The Customer-Side Imperative	**Low Customer Adoption / Cultural Preference for Traditional Methods**	5	"Customer adoption remains the most significant barrier. Culturally, many Lao consumers prefer traditional, familiar methods." (Interview 3) "Many are still afraid to use them due to concerns about safety or cybercrime. So, awareness must be raised." (Interview 5)

3.4.4.3 Strategic Leadership and Organizational Vision

All five informants identified the quality of leadership as the foundational determinant of digital transformation success, with a consistency and emphasis that makes this the strongest theme across the interview dataset. The specific leadership qualities they describe go beyond seniority or technical knowledge to encompass strategic vision, communication clarity, and the ability to create organizational conditions in which employees feel genuinely supported rather than merely directed. One senior manager observed that transformation efforts become fragmented without leaders who understand digital processes at a substantive level. Another noted that the most effective leaders combine technical understanding with a genuinely global perspective on the future of banking, positioning Lao institutions within an international trajectory rather than treating digital transformation as a locally bounded compliance exercise. These observations directly corroborate the quantitative finding that Organizational Culture is the second strongest predictor of DE, since it is precisely the leadership dimensions of culture, vision clarity, collaborative orientation, and resource commitment, that inform both the quantitative construct and the interview narratives.

3.4.4.4 Human Capital and Financial Constraints

All five informants identified the scarcity of qualified personnel as the most severe structural constraint on digital transformation progress, a consensus that represents the strongest thematic agreement across the entire interview dataset. The specific form this scarcity takes is not simply a lack of IT-capable employees but a near-absence of staff who combine operational banking knowledge with genuine digital technology expertise. One IT specialist described this dual competency requirement as practically impossible to meet from the domestic labor market, necessitating the engagement of expensive foreign consultants for system design and implementation, creating institutional knowledge gaps that persist after consultants depart and generating long-term dependency on external expertise rather than building internal capability. Four informants also cited budget constraints as a significant compounding factor, noting that high implementation costs force institutions to sequence digital transformation initiatives in ways that leave critical systems under-resourced and that limit the scope and consistency of training programs. These human capital and financial constraint narratives illuminate the operational reality behind the near-significant FC path and help explain why this construct is experienced as deeply consequential by employees even when its statistical path coefficient falls just short of conventional significance thresholds.

3.4.4.5 Regulatory Dynamics

Four informants expressed a nuanced and at times ambivalent relationship with the regulatory environment, acknowledging that regulatory mandates provide legitimacy and directional clarity for digital transformation while simultaneously observing that regulatory processes create operational impediments that slow implementation. Approval timelines for new digital products and services were consistently described as misaligned with the pace of technological development, with one project leader noting that a product approved after a year-long review process may face a market and technological landscape that has already moved on. The absence of detailed implementation guidelines in some regulatory areas was described as particularly burdensome, as institutions are left to design compliance approaches independently, diverting resources and expertise from transformation itself toward regulatory interpretation. These observations enrich the interpretation of the Regulatory Influence construct beyond its quantitative path coefficient: regulatory influence in the Lao banking sector is not a uniformly positive or negative force but a structurally ambivalent one that simultaneously drives and constrains the transformation it mandates.

3.4.4.6 Customer Readiness and Security

All five informants identified customer-side barriers as a significant contextual constraint on internal transformation efforts. The cultural preference among many Lao consumers for face-to-face banking transactions, the low levels of digital literacy in certain demographic and geographic segments, and the persistent anxiety about cybersecurity that many customers express collectively create an environment in which bank employees must manage not only their own digital engagement but also the adoption anxieties of the customers they serve. This customer-side dimension of the transformation challenge does not appear directly in the modified UTAUT model, which focuses on the employee experience, but it is relevant to interpreting why employee digital engagement is necessary but not sufficient for successful digital transformation: transformation requires alignment between internal organizational capability and external customer readiness that no amount of employee engagement alone can produce.

Security emerged as a universal and unequivocal priority across all interview participants. Every informant described security as a foundational condition for the institutional credibility of digital banking, with one senior manager characterizing a major security breach as potentially capable of permanently destroying customer trust. This institutional-level concern with security mirrors the employee-level concern documented in the survey responses and, when placed alongside

the non-significant Perceived Risk path in the quantitative model, completes the theoretical picture described as the hygiene factor interpretation in the discussion section that follows.

3.5 Discussion

3.5.1 Performance Expectancy as Primary Driver of Digital Engagement

The finding that PE is the strongest individual predictor of DE ($\beta = 0.222$, $p < 0.001$) is theoretically coherent with the UTAUT framework's core proposition that beliefs about performance outcomes constitute the primary motivational foundation of technology-related behavior (Venkatesh et al., 2003). In the organizational context of the Lao banking sector, this relationship takes on a specific and practically grounded character. Employees are not engaging with digital systems in pursuit of hedonic satisfaction or social recognition; they are engaging because they believe, and their qualitative responses confirm this belief, that digital systems make their work meaningfully faster, less error-prone, and more effective in delivering the quality of service their customers need. The performance benefit is immediate, operational, and personally felt rather than abstract or strategically distant.

This finding also carries a practical implication about the mechanism through which performance expectancy exerts its effect. The qualitative data reveal that the performance benefits employees most value are reduction in manual processing, faster transaction completion, and reduced incidence of paperwork errors. These are precisely the kinds of tangible, daily-experience improvements that Venkatesh et al. (2003) identified as central to performance expectancy's motivational force and that Kane (2019) highlighted as the benefits most likely to overcome employee resistance to digital transformation when they are experienced directly rather than merely communicated. The implication for implementation strategy is that demonstrating performance benefits through actual use, via pilot programs, peer demonstration, and structured experimentation, is likely to be more effective than communicating them through managerial announcement.

There is also a theoretically important point about what the primacy of PE implies in a mandatory adoption context. In voluntary technology adoption, performance expectancy motivates the initial adoption decision. In mandatory contexts, where adoption is required regardless of individual motivation, performance expectancy operates differently: it motivates the quality and depth of engagement with an already-required technology. Employees who believe the system genuinely helps them do their work better invest more psychological energy in learning to use it well, are more likely to seek out advanced features, and are more likely to advocate for system

improvements. Those who do not share this belief comply with the minimum requirements that mandatory use entails but invest little beyond that. This distinction between motivating adoption and motivating engagement quality is, in essence, why the shift from behavioral intention to DE as the primary mediating construct is theoretically justified in mandatory contexts.

3.5.2 The Critical Role of Organizational Culture

The substantial effect of OC on DE ($\beta = 0.190$, $p = 0.014$) reflects a relationship that both the quantitative model and the qualitative data document with unusual clarity and consistency. All five interview informants identified the quality of organizational leadership and culture as a primary determinant of digital transformation progress, and the specific dimensions of culture they describe, vision clarity, collaborative resource allocation, institutional readiness for change, and the psychological safety to learn from digital failures, map directly onto the construct's theoretical foundations in Schein's (2010) conceptualization of organizational culture as deep shared assumptions that govern behavioral responses to change.

The near-equivalence of the OC and PE path coefficients is itself an important finding. It means that, in the Lao banking context, the organizational environment in which employees work is almost as powerful a driver of their digital engagement as their beliefs about what the technology can do for them. Technology and culture are, in this model's terms, co-equal motivational forces. This finding resonates with the argument advanced by Vial (2019) and Verhoef et al. (2021) that digital transformation is fundamentally an organizational and cultural challenge that technology investment alone cannot resolve: the Lao banking data provide direct empirical evidence that employees in a developing economy banking context are as sensitive to the organizational culture surrounding digital transformation as they are to the intrinsic performance properties of the digital systems themselves.

The qualitative data illuminate the specific mechanisms through which organizational culture exerts this effect. Leaders who communicate a clear and compelling vision of where digital transformation is taking the organization provide employees with a sense of purpose and direction that sustains engagement through the difficulties and frustrations of learning new systems and navigating infrastructure constraints. Leaders who model digital engagement themselves, demonstrating competence with and enthusiasm for digital tools in their own working practice, normalize digital engagement as a professional expectation rather than an exceptional demand. Organizations that recognize and reward digital innovation signal to employees that their digital

efforts are valued beyond mere compliance. These cultural mechanisms are consistent with the organizational behavior literature on transformational leadership and its effects on employee motivation and performance (Fransiska et al., 2025), and they suggest that banks seeking to enhance digital engagement should treat leadership development as a direct digital transformation investment rather than a separate organizational development activity.

The intersection of organizational culture with Lao national cultural characteristics adds a further dimension to this finding that deserves explicit discussion. As Cieslak and Valor (2025) noted in the literature review, Lao society is characterized by high power distance and strong collectivist orientations that shape how employees respond to organizational directives and peer norms. In this cultural context, the quality and consistency of leadership vision carry normative weight that goes beyond its direct informational content: when senior leaders visibly commit to digital transformation, they create a normative expectation that digital engagement is a professional and social obligation, not merely an organizational instruction. This cultural amplification of leadership effects may partly explain why OC registers so strongly in the Lao banking context and why the interview informants, without exception, began their accounts of digital transformation challenges with reflections on leadership.

3.5.3 Regulatory Influence as Institutional Pressure

The significant effect of RI on DE ($\beta = 0.180$, $p = 0.005$) confirms the theoretical value of incorporating this construct as an extension of the standard UTAUT framework and validates the institutional theory argument, developed in section 3.1.2, that coercive isomorphic pressures from the regulatory environment shape employee behavior in ways that individual-level motivational variables do not capture (DiMaggio & Powell, 1983). In the Lao banking sector, the Bank of the Lao PDR's digital infrastructure mandates and the national digital economy strategy create an institutional climate in which digital engagement is not merely professionally desirable but institutionally compulsory. The path coefficient confirms that this compulsion, when experienced by employees as clear and legitimate rather than arbitrary or punitive, translates into genuinely higher levels of engagement rather than merely higher levels of surface compliance.

The qualitative data, however, introduce an important qualification that the quantitative path coefficient cannot capture. Four of the five interview informants described regulatory processes that, while providing strategic direction and institutional legitimacy for digital transformation, simultaneously create operational impediments through slow product approval timelines and

insufficient implementation guidance. This dual character of regulatory influence, simultaneously enabling at the strategic level and constraining at the operational level, suggests that regulatory influence is not a uniformly positive construct but a structurally ambivalent one. The quantitative path coefficient captures its net positive effect, but the qualitative evidence reveals that this net positive effect is the result of a trade-off between strategic enablement and operational constraint that the simple path estimate conceals. For policymakers, this means that strengthening the positive effect of regulatory influence requires not just clearer mandates but faster and more guidance-rich implementation processes that translate strategic direction into operational clarity.

This finding resonates with Porfírio et al. (2024) argument that the quality of regulatory frameworks, rather than merely their existence, determines whether external institutional pressures facilitate genuine transformation or merely enforce surface-level compliance. In the Lao context, the regulation currently leans toward the enabling end of this spectrum for many institutions, producing the positive net effect observed in the quantitative model, but the qualitative evidence suggests that significant improvements in implementation speed and guideline clarity could substantially strengthen this positive effect.

3.5.4 The Facilitating Conditions Paradox

The near-significant direct effect of FC on DA ($\beta = 0.095$, $p = 0.099$) is one of the most substantively important and theoretically provocative findings of the study, and its interpretation requires engagement with both the quantitative evidence and the qualitative data.

At the statistical level, the failure to achieve significance at the conventional 5 percent threshold means that the direct path from FC to DA is not supported as hypothesized. This is a finding that must be reported honestly. At the same time, the direction and near-significance of the effect, combined with the overwhelming qualitative evidence of severe FC constraints across both survey responses and interview accounts, suggests that the absence of statistical significance reflects the particular configuration of this sample rather than the irrelevance of the construct in the Lao banking context.

The qualitative data make clear that FC deficiencies are among the most acutely felt operational challenges in the Lao banking workforce. Insufficient training programs, unstable internet connectivity, unreliable system interfaces, limited technical support, and severe shortages of qualified personnel collectively constitute a facilitating conditions environment that falls

significantly below what employees need to translate their engagement into effective adoption. Every interview informant identified human capital scarcity as the most critical facilitating conditions constraint, and the survey open-ended responses are saturated with operational accounts of how infrastructure limitations constrain what employees can achieve regardless of how engaged they are.

The most theoretically compelling interpretation of this pattern is that FC operates as a threshold variable in resource-constrained environments, consistent with the argument developed in section 3.2.3 of the theoretical framework. When basic infrastructure and support conditions fall below a minimum threshold, as they do for many employees in this sample, improvements in those conditions produce limited measurable effect on adoption outcomes because the systemic shortfalls are too severe and too widespread to be overcome at the margins. The threshold effect means that FC will not register as a significant predictor in a standard linear model when the sample is dominated by observations where conditions fall below the threshold. Future research employing non-linear modeling approaches, such as polynomial regression, would be needed to formally test this threshold hypothesis. What the present data confirm, however, is that the qualitative experience of FC inadequacy is real, pervasive, and consequential in ways that the linear quantitative model only partially reflects.

3.5.5 The Perceived Risk Puzzle

The non-significant relationship between PR and DE ($\beta = 0.067$, $p = 0.247$) in the context of qualitative data where security concerns are among the most prominent and emotionally charged themes presents what appears to be a sharp contradiction but is, on careful examination, a theoretically coherent and practically important finding.

The most compelling theoretical explanation for this pattern draws on the institutional and organizational framing developed in Section 3.1.2 In mandatory adoption contexts, where employees are required to use digital systems as a condition of employment, security concerns do not function in the same way they do in voluntary adoption settings (Venkatesh et al., 2012; Venkatesh et al., 2003). In voluntary contexts, perceived risk directly influences the adoption decision because users can choose not to adopt when risk feels unacceptable (Featherman & Pavlou, 2003). In voluntary contexts, perceived risk directly influences the adoption decision because users can choose not to adopt when risk feels unacceptable (Featherman & Pavlou, 2003). In contrast, in mandatory contexts, this exit option is unavailable, as employee behavior is shaped by institutional

and organizational pressures that enforce compliance (DiMaggio & Powell, 1983). Employees who perceive significant security risks must continue using the systems regardless, as their professional obligations leave no alternative. Under these conditions, perceived risk cannot predict differential levels of engagement in the way that standard adoption models anticipate, because the behavioral decision that risk perceptions would normally influence has already been structurally determined. As a result, risk operates less as a motivational driver and more as a background psychological condition that employees manage alongside their work demands, with its influence attenuated by the overriding imperative of organizational compliance.

A third consideration concerns the organizational locus of security responsibility. The interview informants, without exception, described security as fundamentally an institutional responsibility rather than an individual employee concern. Security infrastructure, fraud detection systems, and incident response protocols are organizational assets managed at the institutional level; individual employees are expected to follow security protocols but are not responsible for security architecture or outcomes. This institutionalization of security responsibility may psychologically decouple individual perceived risk from individual engagement decisions in ways that do not operate in consumer adoption contexts where individuals bear more direct personal responsibility for their own security management.

Despite the non-significance of PR in the quantitative model, the qualitative data make unmistakably clear that security anxiety is a real, pervasive, and potentially consequential feature of the digital banking working environment in Lao PDR. As Apau et al. (2025) demonstrated in the context of consumer digital banking adoption, security concerns function as foundational conditions whose adequacy is necessary for sustained engagement even when their variation does not predict differential engagement levels among those already engaged. The practical implication for banking institutions is therefore not that security investment can be deprioritized but that security must be managed as a foundational institutional obligation, a non-negotiable minimum condition for maintaining the workforce's operating confidence in digital systems, rather than as a differentiating investment that drives stronger engagement at the margin.

3.5.6 Digital Engagement as the Critical Mediator

The powerful relationship between DE and DA ($\beta = 0.831$, $p < 0.001$), alongside the significant mediation of all five antecedent effects through DE, provides the most direct empirical validation of the chapter's central theoretical innovation. The replacement of BI with DE as the

primary mediating construct is not merely a terminological adjustment; it reflects a genuine theoretical claim about what drives organizational adoption outcomes in mandatory contexts, and the data strongly support that claim.

The magnitude of the DE path coefficient deserves comment. A beta of 0.831 indicates that DE accounts for the overwhelming majority of the explained variance in DA suggesting that the quality of employees' psychological relationship with digital systems, their motivational investment, confidence, and proactive engagement, is the dominant organizational mechanism through which antecedent factors translate into actual adoption outcomes. This finding is consistent with the organizational behavior argument, advanced by Kane (2019) and Schaufeli et al. (2006), that the critical determinant of whether technology investments achieve their intended organizational outcomes is not the technology itself but the human relationship with it. In the Lao banking context, where infrastructure constraints, human capital limitations, and regulatory ambiguities all create challenging conditions for digital implementation, the psychological quality of employee engagement with digital systems is what determines whether digital transformation delivers on its organizational promise or merely delivers the appearance of it.

The mediation results also confirm that the five significant antecedent constructs, Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Regulatory Influence (RI), and Organizational Culture (OC), do not independently drive adoption but operate through a common pathway of employee engagement quality. This finding validates the modified UTAUT model's architectural logic and provides a clear practical message: improving any of these antecedent conditions is likely to enhance adoption outcomes, but it does so by strengthening the quality of employee engagement rather than by directly changing adoption behavior. Interventions that simultaneously address multiple antecedent dimensions, for example a program that combines performance benefit demonstration with leadership culture development and structured training provision, will have amplified effects because they strengthen engagement through multiple pathways simultaneously.

3.5.7 Integration of Quantitative and Qualitative Findings

The mixed-methods design of this chapter produces a richer and more reliable account of digital transformation dynamics in the Lao banking sector than either methodological approach could achieve independently. The quantitative model identifies which factors are statistically significant drivers of engagement and adoption and estimates the relative magnitude of their effects.

The qualitative data explain why those effects operate as they do, what they feel like from inside the employee experience, and what the quantitative coefficients miss or understate.

The most important integrative insight concerns the relationship between the quantitative non-significance of PR and FC's near-significance and the qualitative prominence of these themes in employee narratives. The statistical results, read in isolation, might suggest that security concerns and infrastructure limitations are less important than the quantitative model implies. Read alongside the qualitative evidence, however, a different picture emerges: both operate as threshold conditions whose effects are partially invisible to standard linear structural models because they function through mechanisms of minimum adequacy rather than through proportional linear influence. This integrative insight has implications that extend beyond the Lao banking context, suggesting that researchers working in resource-constrained and institutionally regulated environments should routinely complement quantitative structural models with qualitative evidence that can reveal the non-linear and threshold dynamics that coefficients alone cannot capture.

3.6 Implications

3.6.1 Theoretical Contributions

This chapter advances the technology adoption literature in four substantive ways that collectively constitute its theoretical contribution.

The first and most fundamental contribution is the conceptualization and empirical validation of DE as a theoretically appropriate alternative to BI in mandatory technology adoption contexts. The standard UTAUT framework, as Venkatesh et al. (2003) developed it, was designed for contexts in which adoption is a matter of individual choice. In organizational settings where technology use is institutionally mandated, BI loses its theoretical function because it cannot predict what is already structurally determined. DE, grounded in Schaufeli et al.'s (2006) work engagement framework and adapted for the technology-organization interface, captures what actually varies in mandatory contexts: the depth, quality, and psychological richness of employees' relationship with digital systems. The strong empirical performance of this construct, accounting for 83 percent of the explained variance in DA, validates its theoretical standing and invites replication in other mandatory adoption contexts across different organizational and national settings.

The second contribution is the empirical demonstration of institutional factors as significant determinants of employee digital engagement. By incorporating RI and OC as theoretically

grounded extensions of the UTAUT framework, this study shows that individual-level motivational variables are necessary but not sufficient to explain digital engagement in regulated developing economy contexts. The significant effects of both institutional constructs confirm that adoption models developed in voluntary, individualistic, and lightly regulated Western contexts require institutional enrichment before they can adequately represent the determinants of digital behavior in contexts like Lao PDR. This finding extends the broader theoretical argument, developed across this dissertation, that technology adoption research must be contextually calibrated rather than universally applied.

The third contribution is the threshold reinterpretation of both FC and PR in resource-constrained environments. The evidence that both constructs operate as foundational conditions rather than as differentiating predictors, with consequences that are largely invisible to standard linear structural models, represents a methodological and theoretical insight with implications for adoption research methodology more broadly. It suggests that researchers working in resource-constrained contexts should approach the quantitative non-significance of practically important constructs with interpretive caution and should routinely complement structural models with qualitative evidence capable of revealing the threshold and hygiene factor dynamics that path coefficients alone cannot detect.

The fourth contribution is the empirical documentation of the post-adoption landscape in a mandatory organizational context, showing that the quality of organizational and institutional conditions, specifically leadership culture, performance benefit clarity, and social normative support, are the primary determinants of the engagement quality that drives meaningful adoption. This complements the post-adoption findings in Chapter 4's customer adoption analysis, where Seamless Experience (SE) and Habit (HT) emerge as the dominant drivers of continued engagement, by demonstrating that supply-side and demand-side adoption dynamics, while structurally different, both ultimately reduce to the quality of the experience, whether organizational or technological, that surrounds the digital activity in question.

3.6.2 Practical Implications for Banking Institutions

The findings yield a clear and prioritized set of practical recommendations for banking institutions in Lao PDR and comparable developing economy contexts.

The primacy of PE suggests that the most effective strategy for enhancing employee digital engagement is not to mandate use more forcefully but to demonstrate performance benefits more convincingly. Banks should invest in structured pilot programs that allow employees to experience digital system benefits directly in their own work contexts, in peer-led demonstration programs that leverage early adopters as performance benefit ambassadors, and in internal communication that makes visible the efficiency gains, error reductions, and service quality improvements that digital systems deliver. Measurement systems that track these performance outcomes at the team and individual level can provide the concrete performance evidence that sustains engagement beyond the initial novelty period.

The critical role of OC argues for treating leadership development as a direct digital transformation investment. Banks should identify and cultivate leaders who combine digital understanding with the communication skills and interpersonal authority needed to create genuine organizational commitment to digital transformation. Structured change management programs, internal digital transformation communication campaigns, and recognition systems that reward both leadership and employee digital innovation should be integrated components of digital transformation strategy rather than optional supplements to technology investment.

The near-significant FC finding, read alongside the overwhelmingly consistent qualitative evidence of severe infrastructure and training gaps, argues for substantial investment in the foundational support conditions of digital banking work. Training programs should be regular, practically oriented, and differentiated by role and prior digital experience level rather than delivered as one-size-fits-all sessions. Technical support systems should be responsive and staffed by personnel with genuine digital banking expertise. Infrastructure investments in system stability and connectivity reliability should be treated as prerequisites for meaningful adoption rather than as optional enhancements.

Security should be treated as a non-negotiable institutional priority regardless of its statistical non-significance as a predictor of engagement. The qualitative evidence confirms that security failures would rapidly destroy the working confidence on which digital banking operations depend, making security investment a protective rather than a differentiating expenditure.

3.6.3 Policy Implications

The findings carry four specific policy implications for the Bank of the Lao PDR and relevant government agencies.

The ambivalent character of RI, simultaneously enabling at the strategic level and constraining at the operational level, argues urgently for reform of approval timelines and implementation guideline adequacy. The current gap between the strategic mandate for digital transformation and the operational clarity and speed with which that mandate is implemented is imposing real costs on banking institutions and their employees. Regulatory sandboxes that allow controlled experimentation with innovative digital products without full approval cycles, combined with detailed implementation guidelines that reduce the need for institutions to develop compliance approaches independently, would substantially improve the operational dimension of regulatory influence.

The human capital constraint identified as critical by all five interview informants argues for coordinated investment in digital finance education across the university and vocational training system. The specific dual competency requirement, combining banking operational knowledge with digital technology expertise, that institutions cannot currently meet from the domestic labor market represents a structural gap that neither banks nor regulators can address in isolation. Government coordination of financial services and digital technology curricula, professional certification programs, and international knowledge exchange initiatives is required.

National digital infrastructure investment remains, as the World Bank (Beschorner et al., 2022) has argued at the country level, the foundational precondition for digital transformation in financial services. The connectivity and system reliability limitations documented in this study at the employee level provide micro-level behavioral evidence of the macro-level infrastructure argument, confirming that the costs of infrastructure inadequacy are felt not only in aggregate economic terms but in the daily working experiences of the banking sector workforce.

Finally, the development of a comprehensive national cybersecurity framework for digital financial services, including data protection legislation, minimum security standards for banking systems, and consumer protection mechanisms for digital financial risks, addresses simultaneously the security concerns of both the employee workforce documented in this chapter and the customer-facing security anxieties documented in Chapter 4.

3.7 Limitations and Future Research

3.7.1 Study Limitations

Several limitations should be acknowledged when interpreting the findings of this chapter.

The sample, while large by the standards of PLS-SEM-based organizational studies, covers 27 of the 36 banks operating in Lao PDR. The nine non-participating banks may differ systematically from participating institutions in terms of digital maturity, ownership structure, or organizational culture, introducing a participation bias whose direction and magnitude cannot be determined from the available data. The findings should therefore be interpreted as representative of the participating sample rather than as definitive characterizations of the entire Lao banking sector.

The cross-sectional research design captures a snapshot of employee perceptions and behaviors at a single point in time during a rapidly evolving process. Digital transformation in Lao PDR is accelerating, with new regulatory initiatives, technology investments, and organizational changes occurring continuously. The relationships documented in this study may evolve as the transformation process matures, as infrastructure improves, and as the workforce accumulates digital experience. Longitudinal research is needed to track these dynamics and to determine whether the relative importance of the constructs identified here changes as the transformation process progresses.

The self-report nature of all survey measures creates residual vulnerability to response bias. The assurance of anonymity was designed to minimize social desirability effects, but the possibility that employees' responses reflect perceived organizational expectations rather than genuine perceptions cannot be entirely ruled out. Objective performance data from bank operations systems, combined with survey-based attitudinal measures, would provide a stronger methodological foundation for future studies.

The measurement of the Perceived Risk (PR) construct, which in this study is dominated by a single indicator (PR2 with an outer weight of 0.881), suggests that the construct as operationalized may not be capturing the full dimensionality of employee security concerns. Future research should develop more differentiated measurement approaches that distinguish personal risk perceptions, institutional risk assessments, and customer protection concerns as conceptually and empirically separable dimensions.

The geographic focus on Lao PDR limits direct generalizability to other national contexts. While the developing economy setting and mandatory adoption framework have potential applicability to other ASEAN banking sectors at similar stages of digital transformation, institutional environments, regulatory frameworks, and cultural characteristics vary sufficiently across the region that replication studies are needed before broader generalization is warranted.

3.7.2 Future Research Directions

The limitations above point toward five research directions of particular theoretical and practical value.

Longitudinal panel studies tracking the same employees over two to four years would provide evidence on how DE evolves as employees accumulate digital experience, as infrastructure improves, and as the regulatory environment develops. Questions of particular interest include whether the relative importance of PE and OC as engagement drivers shifts as digital systems become more familiar, and whether the FC threshold effect becomes more visible as some institutions cross the threshold while others remain below it.

Comparative cross-national studies testing the modified UTAUT model in other developing economy banking contexts within the ASEAN region, including Cambodia, Myanmar, and Vietnam, would establish whether the construct relationships identified in Lao PDR are specific to its particular institutional and cultural configuration or generalizable to comparable developing economy settings. Comparisons with more digitally advanced ASEAN economies would provide evidence on how the relative importance of institutional constructs versus individual motivational constructs shifts with the level of digital maturity.

Advanced non-linear modeling approaches, including polynomial regression, response surface analysis, and fuzzy-set qualitative comparative analysis, should be applied to formally test the threshold and configurational dynamics that the present study hypothesizes for FC and PR. These methods are better suited than standard linear PLS-SEM to detecting the kind of threshold and asymmetric effects that the theoretical arguments and qualitative evidence suggest may be operating in resource-constrained environments.

Research examining the supply-demand interface between employee digital engagement and customer digital adoption would address the most significant gap identified in the qualitative data: that employee transformation and customer transformation must progress together for digital

banking to achieve its organizational and social goals. A multi-level study connecting employee-level DE data with customer-level adoption outcome data from the same banking institutions would provide the first empirical test of whether and how organizational capability improvements translate into customer adoption gains.

Finally, future research should develop dedicated measurement scales for DE as a domain-specific construct, rather than adapting general work engagement scales. The theoretical distinctiveness of DE as a form of person-technology psychological relationship warrants bespoke measurement instruments that capture its specific dimensions, including technology-specific confidence, proactive digital problem-solving orientation, and alignment with organizational digital transformation goals, more precisely than general engagement scales allow.

3.8 Conclusion

This chapter has provided a comprehensive examination of the organizational, institutional, cultural, and psychological factors that shape bank employees' digital engagement and digital transformation adoption in Lao PDR. Through a rigorous mixed-methods investigation combining structural equation modeling of survey data from 354 employees across 26 banks with qualitative evidence from semi-structured interviews and open-ended survey responses, the study has tested and refined a theoretically motivated extension of the UTAUT framework designed for mandatory adoption contexts in developing economies.

The central empirical finding is that employee DE is the primary mechanism through which organizational and institutional antecedents translate into digital transformation adoption outcomes, accounting for the large majority of explained variance in adoption and confirming the theoretical validity of replacing BI with DE in mandatory adoption contexts. Among the antecedents of DE, PE and OC emerge as the two dominant drivers, followed by SI, RI, and EE. Together, these five constructs account for 68 percent of the variance in DE, demonstrating the explanatory power of the modified UTAUT framework when appropriately extended and adapted for the Lao banking context.

The non-significance of PR and the near-significance of FC, interpreted in light of the qualitative evidence, reveal a pattern that is theoretically important beyond its statistical expression: both constructs operate as foundational threshold conditions whose effects are partially invisible to linear structural models but experientially central to employees' working lives. Security must be

treated as a non-negotiable institutional obligation rather than a differentiating predictor. Infrastructure and training must be treated as threshold prerequisites for meaningful adoption rather than optional enhancements. These insights have direct implications for both banking institution strategy and regulatory and government policy.

Theoretically, the chapter contributes the conceptualization and empirical validation of DE as a construct for mandatory adoption contexts, the demonstration of institutional factor significance in developing economy technology adoption, the threshold reinterpretation of FC and PR, and the documentation of the post-mandatory-adoption landscape in which organizational and cultural quality determines engagement depth. These contributions extend the UTAUT literature in directions that are directly relevant to the growing body of research on digital transformation in institutionally constrained and resource-limited organizational environments.

Having examined the supply side of digital banking transformation through the organizational and employee lens of this chapter, the dissertation's Chapter 4 examines the demand side through the lens of customer adoption, exploring how the infrastructure constraints, trust challenges, and habitual engagement dynamics that employees navigate internally are experienced by customers in their own digital banking journeys. The connections between these two analytical perspectives, and what they together reveal about the multi-level challenge of digital banking transformation in Lao PDR, are brought into synthesis in the dissertation's concluding chapter.

Chapter 4: Customer experience – A Customer-centric Model of digital banking acceptance and usage

4.1 Introduction

Chapter 3 examined the internal organizational dynamics that enable or constrain employee adoption of digital banking technologies in Lao PDR. Building on this foundation, the present chapter shifts attention to the demand side by exploring the factors that influence customers' acceptance and continued use of digital banking services within a context shaped by infrastructural and institutional constraints.

The global financial services industry is undergoing a profound transformation as digital technologies reshape how financial services are delivered and consumed. This transformation is driven not only by rapid technological advancements but also by changing consumer expectations for convenience, accessibility, and efficiency. In developing economies, this shift carries particular importance. Digital financial services have the potential to significantly expand access to financial systems, enabling broader financial inclusion and reaching populations that have traditionally been excluded from formal banking services (Amnas et al., 2023; Apau et al., 2025; Farzin et al., 2021).

The Lao People's Democratic Republic is currently at a critical stage in this transformation process. The government has articulated an ambitious vision to expand the digital economy from approximately 3 percent to 10 percent of gross domestic product by 2040 (Beschorner et al., 2022). This national agenda highlights the strategic importance of digital transformation and underscores the need to better understand how digital services are adopted and used by customers.

Despite this strong policy direction, the path toward widespread digital adoption remains complex. Existing evidence indicates that Laos continues to face structural challenges, including limited digital infrastructure, relatively slow and costly internet connectivity, low levels of digital literacy among segments of the population, and a regulatory environment that is still evolving in areas such as data protection and cybersecurity (Beschorner et al., 2022). While the country benefits from a young population with growing familiarity with digital technologies, these constraints create a unique and challenging environment for digital banking adoption.

In this context, the success of digital transformation depends not only on organizational readiness, as discussed in Chapter 3, but also on customers' willingness to adopt and consistently use digital banking services. Initial adoption alone is insufficient. The long-term value of digital banking emerges only when customers integrate these services into their daily routines and rely on

them as their primary mode of financial interaction. Understanding what drives both acceptance and sustained use is therefore essential for achieving meaningful transformation outcomes.

To address this need, this study adopts the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as its theoretical foundation. This framework has been widely recognized for its ability to explain technology adoption behavior across different contexts (Venkatesh et al., 2012). However, recent research suggests that in developing and infrastructure constrained environments, not all components of the model exert equal influence. Instead, a more focused set of factors, particularly those related to user experience and habitual behavior, may play a more decisive role in shaping usage patterns.

Accordingly, this chapter goes beyond the direct application of existing models and adopts a data driven approach to refine and adapt the framework to the Lao context. By examining the relationships between key constructs, Behavioral Intention, and actual Use Behavior, this study aims to develop a more nuanced and contextually grounded understanding of digital banking usage. In doing so, it contributes to the literature by identifying the factors that most strongly influence sustained engagement and by offering practical insights for policymakers and financial institutions seeking to enhance digital transformation adoption in Lao PDR.

4.1.1 Beyond Initial Adoption: The Challenge of Sustained Use and Habit Formation

A central premise of this chapter is the distinction between initial adoption and sustained use. Much of the technology acceptance literature has traditionally focused on the factors that encourage individuals to adopt a new system for the first time. While this perspective is important, it provides only a partial understanding of user behavior.

In the context of digital banking, long term success depends not only on attracting users but also on ensuring that they continue to use the service regularly. The benefits of digital transformation for both financial institutions and customers are realized only when digital channels become embedded in everyday routines. When usage remains occasional, customers continue to rely on traditional banking channels, which limits efficiency gains and increases operational costs for institutions.

This study therefore places particular emphasis on habitual use, defined as behavior that becomes automatic through repeated practice. The importance of habit in technology usage has been well established in recent research, particularly in post adoption contexts where continued use is

more relevant than initial acceptance (Venkatesh et al., 2012). Habit formation reflects a deeper level of engagement in which users no longer actively evaluate the system but instead incorporate it into their daily activities. Empirical studies in the FinTech context further reinforce this perspective by demonstrating that habit is a strong predictor of continued usage. For instance, research on e wallet adoption shows that users who develop habitual usage patterns are significantly more likely to continue using these services over time (Kilani et al., 2023). This sustained engagement is often reinforced by factors such as convenience, accessibility, and the frequency of financial activities, which collectively support the integration of digital banking into everyday routines.

The characteristics of the sample used in this study support this focus. A substantial proportion of respondents' report using digital banking almost every day, indicating that they are experienced users rather than first time adopters. This shifts the analytical focus from understanding adoption decisions to examining the factors that sustain and strengthen continued usage.

4.1.2 Infrastructure Constraints and the User Experience

A second defining feature of this study is its explicit consideration of how infrastructural conditions shape user experience. In many developed economies, where high speed internet, reliable electricity, and advanced devices are widely available, users are generally able to distinguish between issues related to application design and those arising from external infrastructure.

In contrast, in environments such as Lao PDR, where infrastructural limitations are more pronounced, this distinction becomes less clear. When users encounter problems, whether related to slow connectivity, system errors, or device limitations, they are unlikely to differentiate between these sources. Instead, they perceive the experience as a single, integrated service outcome. A failed transaction, for example, is experienced simply as a failure of the digital banking service, regardless of its technical cause.

A critical requirement for evaluating technology acceptance in infrastructure-constrained environments is recognizing how user perceptions diverge from those in mature digital markets. In developed economies, where household internet access and fixed broadband speeds are far higher on average than in Lao PDR (OECD, 2025), connectivity and server uptime are largely taken for granted as stable background conditions. Under such conditions, a user who encounters an issue on a banking application might reasonably be expected to attribute the fault to a software bug or user error rather than to their underlying connection, since infrastructure failure is comparatively rare.

In Lao PDR, however, infrastructural fragility creates a fundamentally different cognitive experience. Users routinely navigate high latency, sudden data disconnections, packet drops, and high mobile data costs relative to income. When a transaction fails, times out, or delays payment confirmation, the user cannot distinguish whether the failure stems from a poorly designed application interface, which relates to Effort Expectancy, or underlying telecommunications instability, which relates to Facilitating Conditions. A failed transaction is experienced holistically as an unreliable digital banking system.

Furthermore, this experiential friction interacts directly with cultural financial habits. Many consumers in Laos, mirroring patterns in regional neighbors like Vietnam, maintain a historical preference for keeping savings in physical cash at home rather than depositing money in bank accounts (MicroSave, 2022; Wilson, 2019). When an unstable connection causes a mobile banking transfer to freeze or delay confirmation, it triggers anxieties regarding financial loss. This infrastructural instability continuously reinforces the perceived security of physical cash retention over digital deposits.

This perspective is consistent with recent research emphasizing the importance of holistic user experience in digital services, particularly in emerging markets where service delivery depends on the interaction between technological systems and external infrastructure (Azmir, 2025). It suggests that traditional models, which treat system quality and infrastructure as separate constructs, may not fully capture user perceptions in such contexts.

Building on this insight, this study introduces the concept of Seamless Experience (SE) as an empirically grounded construct that reflects users' integrated perception of service quality. This construct encompasses not only the usability and functionality of the application but also the reliability and consistency of the broader technological environment in which the service operates. By capturing this unified perception, the model aims to provide a more accurate representation of how customers evaluate and respond to digital banking services in infrastructure constrained settings.

4.1.3 Chapter Objectives and Structure

This chapter pursues four specific objectives:

1. **To systematically test and refine the UTAUT2 framework** through iterative model specification, addressing statistical challenges including multicollinearity and discriminant validity issues that emerge when applying comprehensive models to specific contexts.
2. **To identify the most parsimonious and robust set of predictors** of Behavioral Intention and Use Behavior in the Lao digital banking context, moving beyond automatic application of all UTAUT2 constructs to data-driven identification of what actually matters.
3. **To develop and** validate **Seamless Experience** as a second-order construct capturing the unified perception of application quality and infrastructure reliability in infrastructure-constrained environments.
4. **To provide strategic recommendations** based on Importance-Performance Map Analysis and qualitative insights, identifying priority areas for enhancing digital banking user experience.

The chapter proceeds as follows: Section 4.2 reviews relevant literature and presents the theoretical foundation; Section 4.3 describes the methodology including the iterative model refinement process; Section 4.4 presents the model development journey from initial comprehensive model through systematic refinement to final parsimonious model; Section 4.5 reports results including structural path analysis and Importance-Performance Map Analysis (IPMA); Section 4.6 discusses findings, theoretical contributions, and the role of security as a foundational factor; Section 4.7 articulates managerial implications; and Section 4.8 acknowledges limitations and future research directions.

4.2 Literature Review and Theoretical Framework

4.2.1 Digital Banking Adoption in Developing Economies

The global proliferation of digital banking has generated a substantial and growing body of scholarship, much of which was examined through the bibliometric analysis presented in Chapter 2. However, as that analysis revealed, the intellectual landscape of digital banking research has developed unevenly: a disproportionate concentration of empirical work has been situated within developed economies characterized by mature digital infrastructure, stable regulatory systems, and relatively high levels of financial and technological literacy. The dynamics of adoption in

developing economies, where infrastructural fragility, regulatory uncertainty, and deeply heterogeneous user capabilities collectively produce conditions that are fundamentally different from those assumed in dominant theoretical models, remain comparatively under-researched. This gap is not merely a bibliographic curiosity but represents a substantive theoretical problem, insofar as conclusions generated in one context may be systematically misleading when applied to another.

The importance of context-sensitivity in digital banking adoption research has been articulated across multiple strands of scholarship. A broad concern, advanced by scholars working in the tradition of sociotechnical systems theory, is that technology adoption is not an individual-level psychological phenomenon alone, but is also shaped by the social, institutional, and material infrastructures within which individuals are embedded (Bhattacharya & Sinha, 2022). In developed economies, these infrastructures are often sufficiently stable and uniform that they can be treated as background constants rather than active variables. In developing economies, by contrast, they become foregrounded as primary determinants of whether adoption is even possible, regardless of individual motivation, attitude, or intention. This distinction carries significant implications for the design, application, and interpretation of technology adoption models.

Recent empirical work has begun to address this gap, though the field remains fragmented and geographically uneven. Amnas et al. (2023) examined fintech adoption in developing economy contexts and emphasized the centrality of trust when formal institutional protections such as consumer protection legislation, deposit insurance frameworks, and regulatory oversight are weak or inconsistently applied. Their argument is theoretically important: in contexts where institutional trust cannot be assumed, interpersonal and organizational trust must perform the regulatory work that formal institutions perform elsewhere. Apau et al. (2025) extended this line of reasoning by integrating security, risk, and trust as theoretically grounded additions to UTAUT2 specifically for mobile banking applications in contexts where regulatory oversight is limited and data protection frameworks are nascent. Their work suggests that the standard UTAUT2 constructs, though valuable, may systematically underweight the cognitive burden imposed on users who must navigate financial technology without the protective scaffolding that institutional infrastructure provides in more developed settings.

The role of social dynamics in adoption has also received renewed attention in developing economy contexts. Farzin et al. (2021) investigated the mechanisms of word-of-mouth communication in mobile banking adoption, demonstrating that social influence may operate

through qualitatively different channels in collectivist cultural settings than in individualistic ones. Whereas adoption models derived from Western contexts tend to conceptualize social influence as a relatively direct and linear process, collectivist settings may produce more complex patterns in which family networks, community norms, and interpersonal trust hierarchies mediate and sometimes amplify the effect of social recommendation. Khan et al. (2017), examining online banking adoption across developing Asian economies, similarly found that cultural dimensions including collectivism and uncertainty avoidance functioned as significant moderators of the relationships between UTAUT2 constructs and behavioral intention, reinforcing the argument that adoption models require cultural calibration rather than direct transplantation.

Collectively, these studies converge on a set of propositions that are highly relevant to the Lao context. First, adoption models developed in Western, individualistic, infrastructure-rich environments may systematically mis specify the relationships between motivational and behavioral variables when applied to developing economies with collectivist cultures, infrastructure constraints, and evolving regulatory frameworks. Second, constructs such as trust and perceived security, which occupy a secondary or moderating role in many standard models, may function as primary determinants of adoption in contexts where formal institutional protections are limited. Third, social influence mechanisms may be qualitatively different in collectivist societies, requiring theoretical elaboration beyond the linear formulations found in standard frameworks.

The Lao context exemplifies these challenges in a particularly concentrated form. The World Bank's 2022 assessment documented that while Laos possesses a young, digitally inclined population with meaningful potential for technology adoption, the country faces severe structural impediments that constrain this potential (Beschorner et al., 2022). These include among the most expensive and slowest internet connectivity in Southeast Asia, limited national coverage of reliable mobile network infrastructure, low aggregate levels of digital literacy particularly outside urban centers, and regulatory frameworks for data protection and cybersecurity that remain in early stages of development. Empirical evidence from the financial inclusion landscape in Lao PDR corroborates this constrained environment. Despite some progress, only about 47 percent of adults are formally served by financial institutions, while a substantial proportion of the population continues to rely on informal financial services. This suggests that financial inclusion in Laos remains "broad but not deep," with limited engagement in advanced financial products and payment systems. Structural barriers, including limited accessibility, low financial literacy, and infrastructural constraints,

further reinforce the continued dominance of cash-based transactions and the weak adoption of modern financial instruments. These structural realities imply that even motivated and capable users may face significant barriers to adoption that lie beyond their individual control, a condition insufficiently captured by conventional technology adoption frameworks, which typically assume the existence of enabling infrastructure (BOL, 2019).

At the same time, Lao PDR has witnessed meaningful, if incremental, progress in its digital financial infrastructure. The launch of the Lao Payment and Settlement System in 2020, the introduction of standardized QR payment codes, the granting of the country's first e-wallet license to M-Money in the same year, and the subsequent modernization of core banking systems at BCEL and the Agriculture Promotion Bank through partnerships with external fintech firms all point to a sector in active, if uneven, transformation (Beschorner et al., 2022). The Lao PDR central bank has also engaged in cross-border digital payment initiatives, including a 2022 Memorandum of Understanding with the National Bank of Cambodia to facilitate interoperable transactions. These developments create a dynamic and somewhat paradoxical context in which the formal financial system is undergoing rapid technological transformation while a large portion of the population remains under-banked and structurally excluded from the benefits of that transformation. Understanding the factors that shape digital banking adoption in this environment thus requires a theoretical framework sensitive to both the motivational dimensions of individual users and the structural dimensions of the context within which they act.

The broader ASEAN fintech landscape provides comparative context for situating the Lao case. Research examining fintech development across ASEAN nations has consistently found that the region is characterized by significant heterogeneity, with countries such as Singapore, Malaysia, and Thailand operating at substantially higher levels of fintech maturity than their neighbors, including Lao PDR, Myanmar, and Cambodia (Beschorner et al., 2022). Within this regional hierarchy, the determinants of adoption diverge considerably across national contexts. In higher-maturity settings, adoption research tends to focus on hedonic motivation, convenience, and feature sophistication, while in lower-maturity settings, the foundational concerns of trust, security, infrastructure reliability, and cost become dominant. The present study, situated in one of the region's least digitally mature economies, is therefore positioned at a theoretically productive frontier where standard models are most likely to require elaboration.

4.2.2 The UTAUT2 Framework for Consumer Technology Adoption

This study is grounded in the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), developed by Venkatesh et al. (2012) as an extension of the original UTAUT model (Venkatesh et al., 2003). The intellectual genealogy of UTAUT2 is itself noteworthy: Venkatesh et al. (2003) synthesized eight previously competing theoretical frameworks, including the Technology Acceptance Model (Davis, 1989), the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (Ajzen, 1991), and the Innovation Diffusion Theory (Rogers, 1995), among others, into a unified model that has since achieved widespread adoption in the information systems literature. UTAUT was designed primarily for organizational contexts in which technology adoption is partly shaped by managerial directives and organizational norms. UTAUT2 extends the framework for consumer settings by incorporating additional constructs that are more germane to individual, voluntary adoption decisions.

The theoretical parsimony and integrative breadth of UTAUT2 have made it the dominant framework in digital banking adoption research over the past decade. Its explanatory power is well established: Venkatesh et al. (2012) demonstrated that the model accounts for approximately 74 percent of variance in behavioral intention, substantially outperforming any of its predecessors individually. This explanatory advantage has been confirmed in a range of banking and fintech contexts. Jafri et al. (2024), in a systematic literature review of trust and security in fintech adoption, found UTAUT2 variables to be among the best-utilized predictors across 26 empirical studies spanning 2009 to 2022. Bajunaied et al. (2023), integrating UTAUT2 with a trust-theoretic model for fintech adoption, confirmed that the framework provides a theoretically coherent and empirically productive basis for examining behavioral intention in digital financial services.

The flexibility of UTAUT2 is also a recognized theoretical strength. Unlike more rigid frameworks, UTAUT2 accommodates the inclusion of contextually relevant additional constructs without compromising internal coherence, making it well suited to contexts where standard variables may need supplementation. This property has made it the preferred vehicle for context-specific elaboration in developing economy studies. Khan et al. (2017) augmented UTAUT2 with perceived security for developing economy applications and found that performance expectancy, facilitating conditions, habit, perceived security, and price value were validated as significant antecedents of behavioral intention. Similarly, the extended UTAUT2 with trust constructs has been applied in early-stage mobile banking environments in Jordan, where the basic model was

insufficient to capture the full range of adoption-relevant dynamics (Alalwan et al., 2018). These precedents establish a robust scholarly tradition of contextual adaptation that the present study extends and builds upon in the specific context of Lao PDR.

The seven core constructs of UTAUT2 merit detailed elaboration, as their theoretical content and empirical behavior form the foundation of this study's analytical framework.

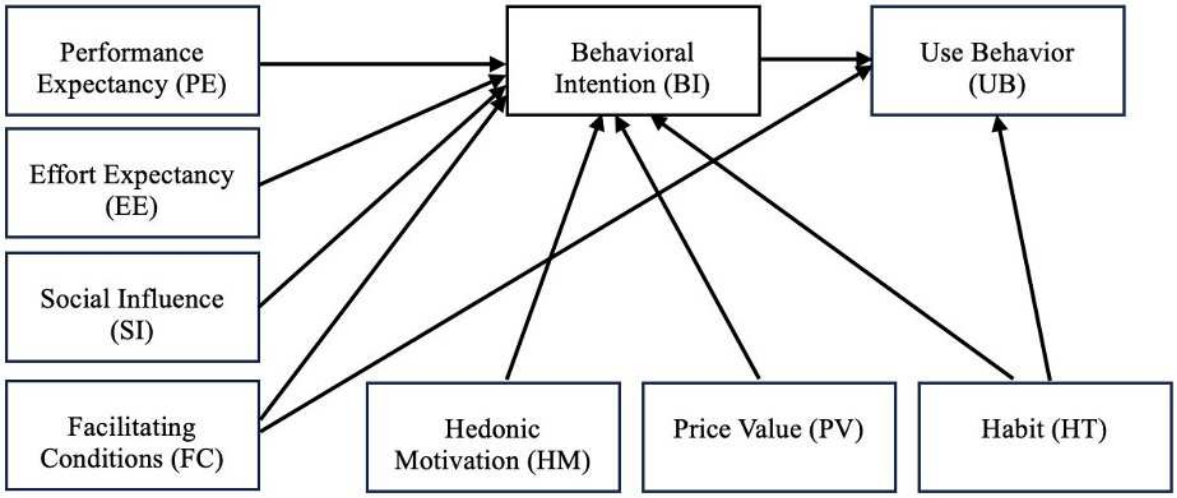


Figure 16. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

Performance Expectancy (PE) represents the degree to which a user believes that using a given technology will provide benefits in performing relevant activities. In the context of digital banking, performance expectancy encompasses beliefs about improved transactional convenience, the speed and reliability of financial transfers, enhanced capacity for financial management, and broader access to services that would otherwise require physical branch visits or intermediaries. Drawing on expectancy theory in its broader form, performance expectancy is theoretically grounded in the proposition that individuals adopt technologies when they believe those technologies will help them achieve outcomes they value. In developing economy contexts, this construct takes on particular significance because the baseline of convenience offered by existing banking infrastructure may be considerably lower than in developed settings, potentially amplifying the perceived relative advantage of digital alternatives for users who do have access.

Effort Expectancy (EE) captures the degree of ease associated with using the technology. This includes perceptions of user-friendliness, the cognitive and behavioral demands of learning to operate the system, the clarity and intuitiveness of the interface, and the overall usability of the

service. In digital banking literature, effort expectancy has been identified as a significant driver of adoption, particularly during the early stages of engagement when users are navigating unfamiliar interfaces and workflows. A meta-analysis of digital financial services adoption by Ramayanti et al. (2025) identified perceived ease of use as one of the best predictors of adoption behavior, second only to perceived usefulness. In infrastructure-constrained contexts, the assessment of effort may be complicated by the inability to distinguish clearly between usability failures attributable to poor interface design and connectivity failures attributable to inadequate network infrastructure, a problem that is elaborated in section 4.2.3.

Social Influence (SI) reflects the extent to which consumers perceive those important others, including family members, friends, colleagues, and respected community figures, believe they should use the technology. In collectivist cultural settings, the theoretical weight of social influence is expected to be amplified relative to findings from individualistic Western contexts. Lao society, characterized by strong Confucian-influenced family structures and a strong orientation toward collective identity and social harmony, represents a context in which social influence may operate through multiple overlapping channels simultaneously, including direct recommendation, observational learning, and normative pressure. Farzin et al. (2021) found that word-of-mouth communication in mobile banking adoption follows qualitatively different patterns in collectivist societies, with community-level endorsement playing a role that individual-level social influence models do not fully capture.

Facilitating Conditions (FC) represent the extent to which consumers believe that the organizational and technical infrastructure exists to support technology use. In the standard UTAUT2 formulation, facilitating conditions encompass perceptions of internet reliability, device capability, technical support availability, and compatibility between the new technology and existing practices and systems. As is discussed extensively in section 4.2.3, this construct assumes special and theoretically heightened significance in infrastructure-constrained settings, where it may shift from a background enabler to a foreground determinant of whether adoption is possible at all.

Hedonic Motivation (HM) captures the intrinsic pleasure or enjoyment derived from using the technology. Though digital banking is fundamentally a utilitarian activity, hedonic motivation has been found to play a meaningful secondary role in adoption intention, particularly in contexts where competing alternatives exist and where users have some latitude in their choice of platform. In practice, hedonic motivation may be more relevant in early adoption stages or among younger,

digitally native user populations for whom the novelty and experiential qualities of a digital interface constitute part of the value proposition.

Price Value (PV) reflects the cognitive trade-off between the perceived benefits of the technology and its associated monetary costs. In the Lao context, where mobile data costs are high relative to average incomes, where transaction fees may represent non-trivial proportions of the amounts being transferred, and where the price sensitivity of users may be considerably greater than in higher-income economies, price value may exert a particularly strong influence on adoption behavior. Evidence from Bangladesh by (Bajwa et al., 2023) confirmed that perceived cost savings were a significant positive predictor of mobile banking adoption intention, reinforcing the relevance of this construct in price-sensitive developing economy contexts.

Habit (HT) represents the extent to which individuals tend to perform behaviors automatically, without conscious deliberation, as a result of accumulated learning and repeated performance. Theoretically, habit occupies a distinctive position in UTAUT2 because it operates at a qualitatively different level from the other constructs: whereas performance expectancy, effort expectancy, social influence, and the other motivational factors capture the cognitive and affective antecedents of behavioral intention, habit captures the transition from intentional, deliberate action to automatic, routinized behavior. This distinction has significant implications for understanding the behavior of experienced users, as is elaborated below. A meta-analysis by Ramayanti et al. (2025) identified habit as one of the best predictors of intention to use digital management and payment services among experienced users, confirming the theoretical primacy of this construct in mature adoption stages.

In the standard UTAUT2 model, performance expectancy, effort expectancy, social influence, hedonic motivation, price value, and habit predict behavioral intention, while facilitating conditions and habit also directly predict use behavior. Behavioral intention mediates the relationship between most antecedents and actual use. The theoretical logic underlying these structural relationships reflects the broader decision-theoretic tradition in information systems research, in which attitude formation precedes intentional commitment, and intentional commitment precedes behavioral enactment, subject to enabling or constraining conditions in the environment.

4.2.3 Limitations of Standard Models in Infrastructure-Constrained Contexts

While UTAUT2 provides the most comprehensive and empirically validated framework currently available for understanding technology adoption in consumer contexts, its direct application to infrastructure-constrained environments such as Lao PDR reveals several theoretically significant limitations that warrant careful and critical examination. These limitations are not merely technical concerns about model fit or variable selection; they reflect deeper epistemological tensions between the assumptions embedded in the model's design and the realities of the context to which it is being applied. Identifying and theorizing these limitations is not merely an exercise in critique, but is itself a theoretical contribution that motivates the model refinement undertaken in subsequent chapters of this study.

4.2.3.1 The Assumption of Infrastructure Sufficiency

The most fundamental limitation of UTAUT2 in infrastructure-constrained settings is its implicit assumption that the basic material conditions necessary for technology use are present and sufficiently uniform across users that they need not be modeled explicitly. UTAUT2 was developed and validated primarily in contexts where stable internet connectivity, consistent electricity supply, reliable mobile network coverage, and adequate device capability are widely available and largely taken for granted. In such settings, facilitating conditions typically capture perceptions of organizational support, technical assistance availability, and compatibility with existing systems. The infrastructural substrate is treated as a constant rather than a variable.

In Lao PDR, this assumption does not hold. Research on digital transformation in banking across developing economies consistently identifies infrastructural deficiencies as primary determinants of adoption outcomes rather than merely background enabling conditions (Bhattacharya & Sinha, 2022; Ononiwu et al., 2024). When connectivity is unreliable, when network outages are frequent, and when device capabilities are heterogeneous across the user population, facilitating conditions shift from a moderating variable to a potential threshold variable that determines whether meaningful engagement with the technology is possible at all. This shift has direct implications for how the construct should be operationalized and how its relationships with other constructs should be theorized. The present study therefore treats facilitating conditions not merely as a predictor of behavioral intention but as a potential boundary condition whose influence may be non-linear and whose threshold effects may shape the operation of all other constructs in the model.

Recent empirical work on the relationship between digital finance and banking stability in developing economies provides corroborating evidence for this theoretical position. Research across multiple developing country samples has documented non-linear, U-shaped relationships between the level of digital financial development and banking outcomes, with the implication that certain threshold levels of infrastructure development must be reached before the positive effects of digital finance become manifest (Bakry et al., 2026). These findings from the macro level are theoretically consistent with the individual-level argument advanced here: just as digital finance requires an infrastructure threshold at the national level to produce positive systemic outcomes, individual users may require an infrastructure threshold at the local level to experience the performance benefits that would motivate continued adoption.

4.2.3.2 The Boundary Between Effort and Infrastructure

A related and theoretically distinct limitation concerns the assumed conceptual distinctiveness of UTAUT2's constructs. The model presupposes that respondents can differentiate meaningfully between, for example, the usability demands of the interface (effort expectancy) and the material conditions that enable or prevent access to the service (facilitating conditions). In practice, this distinction may become difficult to maintain in infrastructure-constrained environments.

When a user encounters a transaction failure during a mobile banking session, the cognitive attribution of that failure may be indeterminate: the user cannot easily distinguish between a poorly designed interface, a server error, an authentication failure, and a network connectivity problem. The phenomenological experience is one of system failure, and the user's global evaluation of usability absorbs both interface quality and infrastructure reliability into an undifferentiated holistic judgment. This suggests that in infrastructure-constrained contexts, the boundary between effort expectancy and facilitating conditions may be empirically blurred in ways that standard measurement instruments, designed for contexts where these categories are more cleanly separable, may fail to detect. The analytical implication is that researchers working in such contexts must be attentive to the possibility that these two constructs will exhibit higher correlations and more complex interaction patterns than standard theory predicts.

4.2.3.3 Non-Linearity and Threshold Effects

UTAUT2, in its standard formulation, assumes linear relationships between its predictor constructs and behavioral outcomes. Each unit increase in performance expectancy, effort

expectancy, or any other predictor is expected to produce a proportionate and constant change in behavioral intention and use behavior. This linear assumption is theoretically reasonable in contexts where the relevant constructs are operating within their normal ranges for the user population in question. In resource-constrained environments, however, several constructs may operate in a distinctly non-linear manner.

Facilitating conditions, in particular, may exhibit a threshold effect: below a minimum level of infrastructure quality and availability, improvements in facilitating conditions may produce little or no measurable effect on use behavior, because inadequate infrastructure prevents meaningful engagement regardless of user motivation, attitude, or intention. Once the threshold is reached, however, further improvements may produce accelerating positive effects, as users who are already motivated and capable begin to translate that motivation and capability into actual use. This kind of non-linear relationship is theoretically important because it implies that standard linear regression approaches will systematically underestimate the effect of facilitating conditions at high levels and overestimate it at low levels, producing misleading parameter estimates and potentially misleading policy conclusions. Empirical research on the relationship between digital financial inclusion and economic growth has documented analogous threshold effects at the macro level, with non-monotonic influence patterns observed across different levels of financial inclusion development (Qing, 2024). The present study extends this insight to the individual level.

4.2.3.4 The Temporal Dynamics of Adoption: From Intention to Habit

A further limitation of UTAUT2 in the context of this study concerns its relative emphasis on adoption-stage variables relative to post-adoption and continuance-stage variables. The model was originally calibrated against samples that include substantial proportions of non-adopters or early adopters for whom constructs such as social influence and hedonic motivation are particularly salient. As users accumulate experience with a technology over time, the cognitive landscape of their relationship with that technology changes substantially. Initial adoption decisions are deliberate, effortful, and relatively sensitive to informational inputs including social recommendation, interface impressions, and cost assessments. Over time, however, frequent use tends to produce habituation: behaviors that were once consciously deliberated become automatized, and the cognitive resources previously devoted to evaluating whether and how to use the technology are progressively freed for other purposes.

For samples of experienced and frequent digital banking users, this temporal dynamic has significant theoretical implications. Research on post-adoption behavior and continuance intention has consistently found that habit becomes an increasingly dominant predictor of use behavior as user experience accumulates, while the influence of social influence and hedonic motivation tends to decline (Laradi et al., 2025). Ramayanti et al.'s (2025) meta-analysis confirmed that habit is among the best predictors of both intentions to use and actual use in digital payment contexts, and that its relative importance increases substantially as adoption matures.

This temporal dimension of adoption theory has a direct bearing on how UTAUT2 should be interpreted and applied in the present study. Given that the majority of respondents in this investigation are experienced and frequent users of digital banking services, the standard UTAUT2 model's emphasis on initial adoption motivations may not optimally capture the dynamics of continued use. The theoretical expectation is that habit and accumulated experience will exhibit stronger relationships with use behavior in this sample than models designed primarily for adoption-stage populations would predict, while constructs such as hedonic motivation and social influence may exhibit attenuated relationships. This expectation motivates a data-driven process of construct evaluation and model refinement rather than unreflective application of the standard model.

4.2.3.5 Trust and Perceived Security as Foundational Constructs

A final and critically important limitation of the standard UTAUT2 framework, particularly salient in developing economy contexts, is its inadequate treatment of trust and perceived security as independent theoretical constructs. In the standard model, security and trust concerns are partially absorbed into effort expectancy (insofar as security features affect usability) and facilitating conditions (insofar as perceived institutional support shapes confidence in the system), but neither is modeled as a primary and independent antecedent of behavioral intention.

A growing body of research argues that this treatment is theoretically insufficient in contexts where formal institutional trust cannot be assumed. Jafri et al. (2024), in a systematic review of trust and security in fintech adoption in banking, found that trust and perceived security consistently emerged as among the most influential predictors of behavioral intention across diverse developing country contexts, and that their effects were not reducible to performance expectancy or effort expectancy. Amnas et al. (2023) argued that in developing economies where regulatory frameworks for consumer protection and data security are nascent, trust must be understood as a primary cognitive construct that users must actively construct and maintain, rather than a background

assumption supported by institutional infrastructure. Apau et al. (2025) extended this reasoning empirically, demonstrating that the integration of trust and security into UTAUT2 substantially improves explanatory power in mobile banking adoption studies in contexts with limited regulatory oversight.

The theoretical rationale for treating trust as a primary construct in developing economy banking contexts draws on institutional theory as well as individual-level cognitive frameworks. Institutions serve as carriers of trust at the societal level: when regulatory frameworks, deposit insurance schemes, and consumer protection mechanisms are robust, individuals can extend trust to financial technologies without extensive individual-level evaluation of their security properties. When these institutions are weak or nascent, however, the trust work that institutions normally perform must be done at the individual level, meaning that individual users must assess the trustworthiness of financial technology providers on the basis of more limited and less reliable signals. This substantially increases the cognitive demands of adoption and makes trust perceptions a more variable and theoretically consequential determinant of adoption behavior than standard models anticipate.

4.2.3.6 Toward a Contextualized and Elaborated Framework

Taken together, these limitations suggest that while UTAUT2 provides an indispensable theoretical foundation for this study, it cannot be applied without critical reflection and contextual elaboration. The model requires adaptation along several dimensions: the role of facilitating conditions must be theorized as potentially non-linear and threshold-dependent; the boundary between effort expectancy and facilitating conditions must be treated as empirically uncertain; the relative emphasis on adoption-stage motivational constructs must be recalibrated for a sample of experienced users, with greater theoretical weight accorded to habit and satisfaction; and trust and perceived security must be introduced as primary constructs rather than absorbed into other variables.

This process of theoretically motivated and empirically validated model refinement constitutes one of the central contributions of the present study. Rather than treating UTAUT2 as a fixed template to be applied uniformly, this research approaches the framework as a theoretically rich but context-sensitive instrument that must be evaluated, adapted, and enriched through engagement with the specific empirical realities of digital banking adoption in Lao PDR. The following sections outline the specific extensions and modifications introduced into this study's

research model, along with the theoretical justification for each, drawing on the literatures reviewed above.

4.2.4 Initial Hypotheses Based on UTAUT2

Based on the standard UTAUT2 framework, initial hypotheses were formulated:

H1: Performance Expectancy (PE) will have a significant positive effect on Behavioral Intention (BI).

H2: Effort Expectancy (EE) will have a significant positive effect on Behavioral Intention (BI).

H3: Social Influence (SI) will have a significant positive effect on Behavioral Intention (BI).

H4: Hedonic Motivation (HM) will have a significant positive effect on Behavioral Intention (BI).

H5: Price Value (PV) will have a significant positive effect on Behavioral Intention (BI).

H6: Habit (HT) will have a significant positive effect on Behavioral Intention (BI).

H7: Facilitating Conditions (FC) will have a significant positive effect on Behavioral Intention (BI).

H8: Facilitating Conditions (FC) will have a significant positive effect on Digital Transformation Adoption (DA).

H9: Habit (HT) will have a significant positive effect on Digital Transformation Adoption (DA).

H10: Behavioral Intention (BI) will have a significant positive effect on Digital Transformation Adoption (DA).

However, as detailed in subsequent sections, the empirical analysis revealed that this comprehensive model suffered from significant statistical problems necessitating systematic refinement.

4.3 Methodology

4.3.1 Research Design and Philosophical Approach

4.3.1.1 Philosophical Grounding

Every empirical study is shaped by underlying assumptions about the nature of reality and how knowledge about that reality can be obtained. Making these assumptions explicit is particularly important in this research, where methodological choices and model refinement play a central role in the study's contribution. To ensure clarity and coherence, the philosophical positioning of the

study is articulated in terms of its ontological, epistemological, and methodological foundations, following the structured logic commonly outlined in methodological frameworks such as (Saunders et al., 2023).

Ontologically, this study adopts a realist perspective, assuming that phenomena such as digital banking adoption behavior and its underlying psychological determinants exist independently of the researcher's observation. Constructs including habit, seamless experience, and behavioral intention are therefore treated as reflecting real underlying patterns that can be empirically investigated, even though they are not directly observable.

Epistemologically, the study adopts a post-positivist stance. Post-positivism shares with classical positivism a commitment to systematic, empirically grounded inquiry and to the view that knowledge claims must be tested against observable evidence (Scotland, 2012). It departs from strict positivism, however, in acknowledging that theoretical models provide approximate rather than perfect representations of social reality, that measurement instruments inevitably contain some degree of error, and that the researcher's choices in model specification and construct definition inevitably introduce a degree of interpretive judgement into the analytical process (Pretorius, 2024). This acknowledgement is particularly important in the present study, which involves not just the testing of a pre-specified theoretical model but an iterative process of model refinement in which theoretical judgements are made in response to empirical findings. The post-positivist stance provides the epistemological foundation for treating this iterative process as a legitimate form of knowledge production rather than a deviation from scientific norms.

The study's reasoning strategy is primarily deductive: it begins with an established theoretical framework, the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), and uses empirical data to evaluate the explanatory adequacy of that framework in the Lao PDR context. However, the model refinement process also introduces an inductive dimension, as diagnostic findings from the initial model specification prompt the development of a new theoretical construct, Seamless Experience (SE), that was not specified in the original framework. This movement between deductive testing and inductive construct development constitutes an abductive reasoning loop, which is widely recognized in information systems methodology as appropriate in contexts where established theories require adaptation to novel empirical conditions (Saunders et al., 2023). The pragmatist dimension of the study is expressed specifically in its integration of a qualitative supplement alongside the primary quantitative analysis, following the principle that multiple sources

of evidence should be drawn upon when they each contribute uniquely to understanding the phenomenon of interest.

Building on these philosophical foundations, the study adopts a quantitative research design with a distinctive methodological emphasis on systematic and iterative model refinement guided by rigorous diagnostic evaluation. Rather than simply applying UTAUT2 as a fixed template and reporting which hypothesized paths are significant, the study treats the model as a theoretically motivated starting point that requires empirical evaluation and, where necessary, contextually grounded adaptation. This design choice is justified by the theoretical arguments developed in section 4.2, which identified several limitations of the standard UTAUT2 framework when applied in infrastructure-constrained developing economy settings. The methodology is therefore structured to be responsive to those limitations rather than blind to them.

The refinement process is conducted in a transparent and systematic manner, with each analytical step documented and justified through both statistical diagnostic criteria and theoretical reasoning. This transparency serves the twin purposes of enhancing the credibility and replicability of the analysis and demonstrating that model refinement is not an opportunistic exercise in data fitting but an integral and principled part of theory development in context-sensitive research.

4.3.1.2 Research Questions

This study is organized around three primary research questions that directly motivate the methodological choices described in this section:

First, what are the most significant determinants of digital banking behavioural intention and actual use among experienced users in Lao PDR, and how do these determinants relate to those identified in the UTAUT2 framework? Second, do the constructs of the UTAUT2 framework maintain their conceptual distinctiveness and empirical independence when applied in an infrastructure-constrained developing economy context, or do certain constructs require reconceptualization? Third, to what extent does the resulting model provide a more accurate and parsimonious account of digital banking adoption dynamics in Lao PDR than the standard UTAUT2 specification?

These questions are empirically addressed through the two-stage quantitative analysis described in section 4.3.5, with the qualitative component described in section 4.3.6 providing supplementary contextual interpretation.

4.3.2 Sample and Data Collection

4.3.2.1 Target Population and Sampling Strategy

The target population for this study consists of bank customers in Lao PDR who have prior experience using digital banking services. The decision to focus on experienced rather than first-time or prospective users reflects the study's theoretical emphasis, developed in section 4.2.3, on understanding sustained usage and habit formation rather than initial adoption decisions. This is an important distinction: the psychological dynamics of continued use among experienced users differ substantially from those governing initial adoption, and an appropriate sample must be aligned with the theoretical phenomena under investigation.

Participants were recruited through a convenience sampling approach using multiple channels, including visits to bank branches, online dissemination through social media platforms, and referrals from existing respondents. The use of multiple recruitment channels was a deliberate strategy to reduce the concentration bias that would result from relying on any single channel alone, thereby improving the representativeness of the convenience sample within the constraints of the available research resources. It is important to acknowledge, as all robust convenience sampling discussions should, that this approach produces a sample that is not randomly selected from the full population of Lao digital banking users and therefore does not support statistical generalization to that population in the formal sense. The findings should be interpreted as representative of digitally active, predominantly urban, and relatively educated digital banking users in Lao PDR, which is precisely the theoretical population of most relevance to the study's questions about sustained use and habit formation.

This targeted sampling is, in fact, theoretically appropriate rather than merely a pragmatic necessity. Research on post-adoption behaviour consistently demonstrates that the dynamics of continued engagement, including habit formation and the role of seamless experience, are most clearly observable among users who have accumulated sufficient experience with a technology to have developed established usage patterns (Bhattacherjee, 2001; Laradi et al., 2025). A population-representative sample including many infrequent or non-users would introduce considerable noise into the analysis of these dynamics and would reduce the study's ability to identify the specific mechanisms that sustain digital banking engagement among active users. The targeted sample therefore enhances theoretical validity even while it limits external generalizability.

4.3.2.2 Common Method Bias

Because both predictor and outcome constructs were measured through the same self-report questionnaire administered on a single occasion, the study is potentially vulnerable to common method variance, a source of systematic bias that can artificially inflate correlations between constructs and thereby distort structural estimates (Jarvis et al., 2003). Several procedural steps were taken during questionnaire design to minimize this risk. Predictor and outcome items were organized in separate sections of the instrument, with intervening demographic questions serving as a cognitive buffer. Respondents were assured of full anonymity to reduce social desirability bias. The use of an objective, frequency-based measure for the key outcome variable of use behavior, rather than a Likert-scaled perceptual item, further reduces the risk of common method inflation in the most important structural relationship. The issue of common method variance is acknowledged as a residual limitation and is discussed further in the study's limitations section.

4.3.2.3 Data Collection Period and Instrument

Data were collected over a two-month period from March to April 2025. A structured questionnaire was developed to capture demographic characteristics, perceptions of digital banking across the UTAUT2 constructs, and actual usage behavior. The core measurement scales were adapted from Venkatesh et al. (2012), who developed and validated the original UTAUT2 instrument. Items were reviewed and adjusted to ensure their cultural and contextual relevance to the Lao banking environment, including the replacement of culturally specific examples with references to the digital banking services and transaction types most prevalent in Lao PDR. A pilot administration of the questionnaire with twenty respondents drawn from the target population was conducted prior to full deployment to verify item clarity, check for floor or ceiling effects in item distributions, and confirm that the instrument produced adequate response variability across all constructs. Minor revisions to item phrasing were made based on pilot feedback before the full data collection commenced.

4.3.3 Sample Characteristics

The final sample comprises 128 respondents whose demographic and usage characteristics are described below. Understanding these characteristics is essential for interpreting the study's findings and for situating the sample within the broader population of digital banking users in Lao PDR.

The age distribution is strongly skewed toward younger respondents, with approximately 75 percent falling between 18 and 27 years of age. More specifically, 31 percent are within the 18 to 22 age group and 44 percent within the 23 to 27 age group. Respondents aged 28 to 32 represent 15 percent of the sample, those aged 33 to 37 account for 6 percent, and only 4 percent are aged above 38. This distribution is consistent with the broader demographic pattern of digital technology adoption in Lao PDR, where younger individuals who have grown up in an environment of increasing smartphone penetration are disproportionately represented among active digital banking users. The age profile of the sample reflects the population most theoretically relevant to this study's focus on habit formation and sustained use.

Educational attainment is high, with 89 percent of respondents holding at least a bachelor's degree. This profile is consistent with the literature on digital banking adoption in developing economies, which consistently identifies education as a strong predictor of digital capability and technology adoption readiness (Amnas et al., 2023). The high educational level of the sample is also consistent with the targeted sampling approach, as bank customers with regular access to digital banking services in urban Lao PDR are likely to be among the more educated segments of the population.

The gender distribution is relatively balanced, with 54 percent female and 46 percent male respondents, reducing the risk that gender composition introduces systematic bias into the findings.

The most theoretically significant characteristic of the sample is its usage profile. Approximately 62.5 percent of participants report using digital banking services on an almost daily basis, and a further 23.4 percent use them several times per week. This means that approximately 86 percent of the sample consists of high-frequency users, confirming that the recruitment strategy successfully targeted the experienced-user population for whom the study's theoretical focus on sustained use and habit formation is most relevant and most observable.

4.3.4 Measurement Instruments

4.3.4.1 Construct Operationalization

The study employs multi-item reflective measurement scales to operationalize the constructs derived from the UTAUT2 framework. A reflective measurement model is appropriate when the items are understood as observable manifestations of an underlying latent construct, such that all items are expected to be positively intercorrelated and interchangeable as indicators of the same

conceptual entity (Jarvis et al., 2003). This specification is appropriate for all first-order constructs in the model, where each item reflects a different facet of the same underlying perception or orientation.

All measurement items were adapted from the validated instrument developed by Venkatesh et al. (2012) and were adjusted to reflect the digital banking context and the specificities of the Lao PDR setting. Performance Expectancy (PE) captures the extent to which respondents perceive digital banking to enhance their efficiency, save time, and provide practical benefits in everyday financial activities. Effort Expectancy (EE) reflects perceived ease of learning and operating digital banking systems, including the clarity of the interface and the degree of cognitive effort required. Social Influence (SI) represents the extent to which individuals perceive that important others influence their decision to use digital banking, reflecting social pressure and normative expectations. Facilitating Conditions (FC) assess respondents' perceptions of the availability of resources and support necessary to use digital banking, including access to technology, knowledge, and assistance. Hedonic Motivation (HM) captures the degree of enjoyment or pleasure derived from using digital banking services. Price Value (PV) reflects the cognitive evaluation of whether the benefits of digital banking justify its associated monetary costs. Habit (HT) represents the extent to which digital banking usage has become automatic and integrated into the user's daily routine. Behavioral Intention (BI) reflects the strength of the respondent's intention to continue using digital banking services in the future. Digital Transformation Adoption (DA) reflects the extent to which respondents actively use digital banking services as part of their financial activities. It captures the degree to which digital banking has been integrated into users' everyday practices, including the frequency, regularity, and reliance on digital channels for conducting financial transactions.

4.3.4.2 Higher-Order Construct Specification

The final model introduces Seamless Experience (SE) as a higher-order construct composed of Effort Expectancy and Facilitating Conditions. Following the established criteria for distinguishing reflective from formative measurement at the higher-order level (Becker et al., 2012; Hair et al., 2022), SE is specified as a reflective-formative higher-order construct. The first-order constructs, Effort Expectancy (EE) and Facilitating Conditions (FC), are each measured reflectively, meaning that their respective items are treated as manifestations of the underlying first-order latent variable. At the higher-order level, however, EE and FC are treated as formative dimensions of

Seamless Experience, meaning that they are conceptually distinct components that together constitute the higher-order construct rather than interchangeable reflections of it.

This formative specification at the higher-order level is theoretically justified by the argument, developed in section 4.4.2, that interface usability (Effort Expectancy) and infrastructural reliability (Facilitating Conditions) are qualitatively distinct dimensions of the digital banking experience that jointly and interdependently determine whether users perceive that experience as seamless. A user could perceive the interface as usable while simultaneously experiencing unstable connectivity, or could enjoy reliable infrastructure while navigating a poorly designed application. Neither dimension alone determines the seamlessness of the experience; both are necessary and distinct contributors. This asymmetric conceptual relationship, in which each dimension contributes independently to the higher-order construct without being interchangeable with the other, is the defining criterion for formative specification at the higher-order level (Jarvis et al., 2003). Under this specification, the validity of Seamless Experience is assessed not through average variance extracted or HTMT criteria, which apply to reflective constructs, but through redundancy analysis for convergent validity and variance inflation factor assessment for the collinearity of the formative weights.

4.3.4.3 Measurement Scale and Reliability

All perceptual construct items were measured using a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). A seven-point rather than five-point scale was selected to maximize response variability and to provide greater sensitivity to attitudinal differences among respondents, which is particularly valuable in an educated sample with the capacity to make fine-grained distinctions among scale points (Ibrahim, 2024). In contrast to these perceptual measures, use behavior was operationalized as an objective, frequency-based indicator measuring the number of times per week the respondent used digital banking services. This approach provides a more concrete and behaviourally grounded measure of actual usage than a subjective self-evaluation and reduces the risk of common method inflation in the relationship between behavioral intention and use behavior.

All multi-item reflective constructs demonstrated strong internal consistency, with Cronbach's alpha coefficients exceeding 0.80. Convergent validity was confirmed through average variance extracted values exceeding the 0.50 threshold across all constructs, indicating that the items within each construct share more variance with their designated latent variable than with the error

term (Hair et al., 2022). These results provide confidence in the reliability and convergent validity of the measurement model and confirm that the instrument functioned as intended in the Lao PDR context.

4.3.5 Analytical Approach: Two-Stage Process

The analytical strategy employed in this study reflects its core methodological commitment to systematic and empirically grounded model refinement. Rather than proceeding directly to the estimation and reporting of a single pre-specified structural model, the analysis was organized into two sequential stages: a diagnostic stage designed to evaluate the adequacy of the full UTAUT2 model specification in the study context, and a refinement stage in which the structural model was adapted in response to diagnostic findings. This two-stage strategy is consistent with best practice in structural equation modeling research and is particularly appropriate in contexts where the direct applicability of an established theoretical framework cannot be assumed (Hair et al., 2022).

4.3.5.1 Justification for PLS-SEM

A fundamental methodological choice concerns the selection of partial least squares structural equation modeling (PLS-SEM) rather than covariance-based structural equation modeling (CB-SEM) as the primary analytical technique. This choice requires explicit justification, as the relative merits of the two approaches have been the subject of ongoing methodological debate in information systems research (Hair et al., 2022).

PLS-SEM was selected for this study on the basis of four substantive considerations. First, the study has both confirmatory and exploratory dimensions: while the initial UTAUT2 model represents a confirmatory theoretical test, the model refinement process is inherently exploratory in character. PLS-SEM is better suited than CB-SEM for studies that combine predictive and exploratory objectives, while CB-SEM is more appropriate for purely confirmatory theory testing (Hair et al., 2022). Second, PLS-SEM is more robust than CB-SEM with smaller samples. With 128 respondents and an initial model specification of considerable complexity, PLS-SEM's greater statistical efficiency at modest sample sizes represents a meaningful practical advantage (Reinartz et al., 2009). Third, PLS-SEM does not impose the assumption of multivariate normality, which is an important advantage given that survey data collected in developing economy contexts may exhibit non-normal distributions due to ceiling or floor effects in certain constructs, particularly among high-engagement users for whom usage-related perceptions may cluster at the upper end of the scale. Fourth, the study's inclusion of a higher-order construct with a formative measurement

specification at the higher-order level is well accommodated by SmartPLS, which provides dedicated functionality for the estimation of such structures (Hair et al., 2022).

It is important to acknowledge the limitation associated with this choice. Because PLS-SEM is variance-based rather than covariance-based, its model fit statistics do not carry the same confirmatory interpretation as those produced by CB-SEM. The standardized root mean square residual (SRMR), comparative fit index (CFI), and normed fit index (NFI) reported for the final model should therefore be interpreted as indicators of approximate rather than exact fit, and the study's contribution to theory confirmation is appropriately characterized as exploratory-predictive rather than strictly confirmatory.

Stage 1: Diagnostic Analysis Using cSEM in R

The first analytical stage involved estimating the full initial UTAUT2 model, incorporating all seven antecedent constructs as predictors of behavioral intention, using the cSEM package in R. The cSEM package implements composite-based structural equation modeling and provides particularly rich diagnostic functionality, making it well suited for the purposes of this stage (Chuah et al., 2021). The primary objective was not hypothesis testing but diagnostic evaluation of model adequacy.

Four diagnostic criteria were applied. Bootstrap admissibility rates were used to assess overall model stability: a model is considered admissible when its estimated correlation matrix is positive definite and all parameter estimates fall within theoretically permissible bounds, and a model with a high proportion of inadmissible bootstrap resamples is fundamentally mis-specified relative to the data structure (Chuah et al., 2021). An admissibility rate of approximately 70 to 80 percent or above is generally taken as the minimum threshold for reliable estimation. Multicollinearity among predictor constructs was assessed using variance inflation factors (VIF), with values exceeding 5 indicating potentially problematic collinearity that can bias path coefficient estimates and reduce interpretive clarity (Hair et al., 2022). Discriminant validity was evaluated using the Heterotrait-Monotrait (HTMT) ratio of correlations, which has been demonstrated to be more sensitive to discriminant validity failures than the traditional average variance extracted criterion (Henseler et al., 2015), with values above 0.85 indicating insufficient empirical distinction between construct pairs. Finally, overall model fit was assessed to determine the degree to which the model structure adequately represents the observed data patterns.

Stage 2: Model Refinement and Final Estimation Using SmartPLS

The second stage was guided by the diagnostic findings from Stage 1 and involved a structured process of model refinement. This process proceeded in two steps. The first step addressed the severe multicollinearity identified between Effort Expectancy and Facilitating Conditions through the reconceptualization of these constructs into the higher-order construct Seamless Experience, as described in detail in section 4.4.2. The second step addressed the remaining model instability and the presence of consistently weak and non-significant structural paths through systematic path testing, in which alternative model specifications were evaluated against criteria of stability, significance, explanatory power, and theoretical coherence, resulting in the parsimonious final model described in section 4.4.3.

The final model was estimated using SmartPLS, which was selected for its robust bootstrapping procedures for significance testing, its dedicated capabilities for higher-order construct estimation, and its implementation of Importance-Performance Map Analysis (IPMA), an analytical technique that extends the interpretive value of PLS-SEM findings by mapping the relative importance of predictors against their current performance levels, thereby generating directly actionable guidance for practitioners (Henseler et al., 2015).

4.3.5.2 Two-Stage Approach for Higher-Order Construct

The estimation of Seamless Experience as a higher-order construct followed the two-stage approach recommended in the PLS-SEM literature (Becker et al., 2012). In the first stage, the full measurement model was estimated in SmartPLS to obtain latent variable scores for the first-order constructs, Effort Expectancy and Facilitating Conditions. In the second stage, these latent variable scores were used as manifest indicators of Seamless Experience within the structural model. This approach is preferable to the repeated indicator method because it avoids the artificial inflation of parameter estimates that can result when the same items are used both as indicators of the first-order constructs and as proxies for the higher-order construct (Hair et al., 2022).

4.3.6 Qualitative Data Integration

Although the primary design of this study is quantitative, a supplementary qualitative component was incorporated to enrich the contextual interpretation of the statistical findings. It is important to be transparent about the scope and purpose of this component: it is designed to serve an interpretive rather than a confirmatory function, providing illustrative evidence that helps to

explain and contextualize the relationships observed in the structural model rather than constituting an independent qualitative study in its own right.

Qualitative data were collected through open-ended questions embedded within the survey instrument. Respondents were invited to describe the main challenges they encounter when using digital banking services, the nature of the security concerns they experience, and suggestions they might have for improving digital banking platforms. Of the 128 respondents, 94 provided substantive responses to at least one open-ended question, representing a response rate of approximately 73 percent for the qualitative component.

The responses were analyzed using a structured content analysis procedure. An initial coding framework was developed deductively from the theoretical constructs of the study, with categories corresponding to issues of system usability, connectivity and infrastructure, security and trust, and cost. An inductive pass through the data was subsequently conducted to identify themes that emerged from the responses but were not anticipated by the deductive framework. Two broad additional themes emerged inductively: the inability of users to distinguish whether service disruptions originated from the application or the network, which directly supports the conceptualization of Seamless Experience as a unified construct, and concerns about the limited availability of digital banking support services in non-urban areas. Inter-rater reliability was not formally assessed, as the analysis was conducted by the researcher alone, which represents a recognized limitation of this component. The potential for researcher bias in coding is acknowledged, and the qualitative findings are accordingly presented as illustrative and interpretive rather than as independently verified evidence.

The integration of qualitative and quantitative findings follows the principle of sequential explanatory integration, in which the quantitative analysis is conducted first and its results are then interpreted with reference to the qualitative themes (Dawadi et al., 2021). The qualitative data neither replicate nor replace the quantitative findings but provide the contextual texture that transforms statistical relationships into human experiences, illuminating, for example, why users in Lao PDR experience effort expectancy and facilitating conditions as a single holistic construct rather than as empirically distinct dimensions.

4.4 The Model Development Journey: From Comprehensive to Parsimonious

One of the distinctive contributions of this study lies in its transparent documentation of the full model development process. Many technology acceptance studies present only their final model, leaving readers without insight into the analytical decisions that shaped it. This study takes a different approach, tracing the complete progression from the initial comprehensive UTAUT2 specification through two stages of refinement to the final parsimonious model. This transparency serves several important purposes beyond mere procedural accountability.

At the methodological level, detailed documentation of the refinement process allows future researchers to evaluate whether the diagnostic criteria and refinement decisions were applied consistently and appropriately, and to replicate or adapt the approach in other contexts. At the theoretical level, it demonstrates that model refinement is not an opportunistic exercise in data fitting but a disciplined process in which each analytical decision is grounded in both empirical evidence and theoretical reasoning. At the epistemological level, it honestly reflects the abductive nature of the research process, which moves iteratively between deductive testing, diagnostic discovery, and inductive construct development. Finally, it is worth acknowledging a genuine limitation of this approach: because the model refinement was conducted within a single dataset, there is a risk of capitalizing on sample-specific patterns that may not generalize to other populations. The final model represents the most theoretically coherent and statistically robust structure identifiable within this dataset, but its generalizability should be evaluated through replication in future studies, ideally using the refined model as a pre-specified structure in a confirmatory design.

4.4.1 Model 1: The Initial Comprehensive UTAUT2 Model

The analysis began with a comprehensive model specification grounded in the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) framework. This initial model incorporated all seven antecedents, namely Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Price Value (PV), and Habit (HT), as predictors of Behavioral Intention (BI).

One contextually motivated modification was introduced relative to the original UTAUT2 framework. The outcome variable of Use Behavior was reconceptualized in this study as Digital Transformation Adoption (DA), reflecting the broader theoretical orientation of this dissertation. Rather than treating the outcome simply as a measure of system usage frequency, DA captures the extent to which individuals have integrated digital financial services into their everyday lives as a

constituent element of an ongoing personal and societal digital transformation. Accordingly, Behavioral Intention (BI), Facilitating Conditions (FC), and Habit (HT) were specified as predictors of Digital Transformation Adoption (DA), consistent with the original UTAUT2 structural paths from these constructs to use behavior.

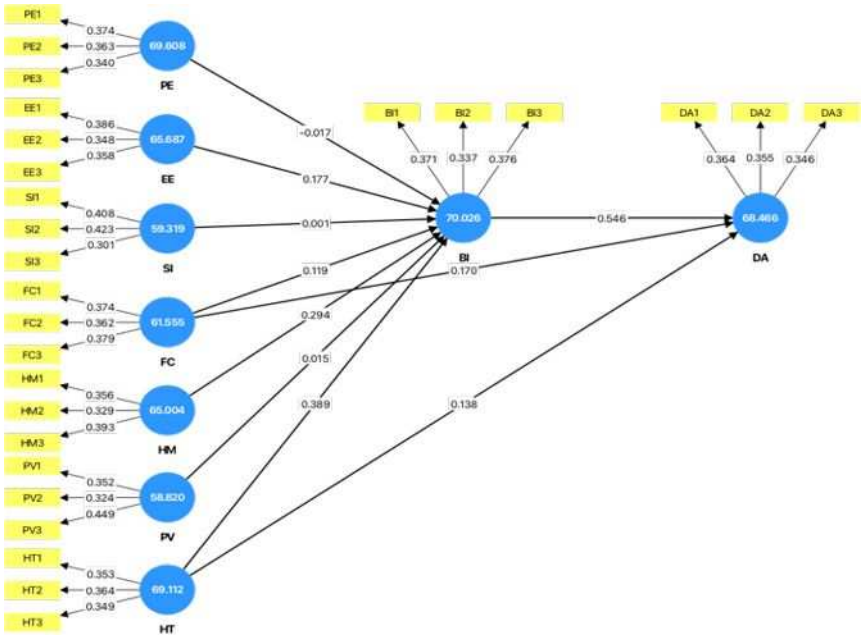


Figure 17. (Model 1) The Initial Full UTAUT2 Model

While this initial model closely follows the established UTAUT2 structure, its diagnostic evaluation using cSEM in R revealed three critical problems that fundamentally challenged its validity in the present context.

4.4.1.1 Problem 1: Severe Model Instability

The first major concern was related to model stability. Bootstrap analysis revealed that only approximately 15 to 20 percent of resampled models produced admissible solutions, falling dramatically short of the 70 to 80 percent threshold that indicates sufficient model stability for reliable inference (Chuah et al., 2021). An inadmissible solution occurs when the resampled model produces a correlation matrix that is not positive definite, meaning that the estimated covariance structure is mathematically inconsistent and the resulting parameter estimates cannot be trusted. A 15 to 20 percent admissibility rate is not merely a marginal shortfall; it constitutes strong evidence of fundamental model misspecification and independently signals that the full UTAUT2 structure does not adequately represent the data-generating process in this population.

4.4.1.2 Problem 2: Pervasive Multicollinearity

The second issue concerned multicollinearity among predictor constructs. Variance inflation factor analysis revealed especially severe multicollinearity between Effort Expectancy and Facilitating Conditions, with VIF values exceeding 7.0, substantially above the threshold of 5 that Hair et al. (2022) identify as indicative of problematic collinearity. This level of collinearity means that the two constructs share so much common variance that their individual path coefficients to BI become unstable and uninterpretable, since even small changes in the data produce large swings in the estimated coefficients. Additional, though less severe, multicollinearity was observed among other predictor pairs, further contributing to estimation instability.

4.4.1.3 Problem 3: Poor Discriminant Validity

The third issue relates to discriminant validity, which assesses whether constructs are empirically distinct. Discriminant validity assessment using the HTMT criterion revealed several construct pairs that failed to achieve acceptable empirical distinctiveness. Most notably, the HTMT ratio between HT and BI exceeded 0.90, the conservative threshold recommended by Henseler et al. (2015) as indicating insufficient distinction. This finding suggests that, for experienced digital banking users in Lao PDR, habitual usage and future behavioral intention have become so closely intertwined that respondents do not meaningfully differentiate between them in their self-reports, which is itself a theoretically significant finding about the nature of advanced-stage technology adoption.

4.4.1.4 Interpretation of Problems

These three diagnostic findings are not merely technical inconveniences. Taken together, they provide substantive empirical evidence that the standard UTAUT2 framework, as specified for initial adoption studies in developed economy contexts, cannot be applied without modification in the present setting. The severe overlap between Effort Expectancy (EE) and Facilitating Conditions (FC) indicates that Lao digital banking users experience usability and infrastructure reliability as aspects of a single holistic service quality rather than as conceptually and empirically separate dimensions. The blurred boundary between Habit (HT) and Behavioral Intention (BI) reflects the theoretical expectation, developed in section 4.2.3, that for experienced users in the post-adoption stage, intentional deliberation and habitual automaticity converge into a single behavioral disposition. These insights provide the empirical justification and theoretical motivation for the model refinements described in the sections that follow.

4.4.2 Model 2: Construct Reconceptualization Through Seamless Experience

The first major refinement addressed the multicollinearity between Effort Expectancy (EE) and Facilitating Conditions (FC). Rather than resolving this issue by simply removing one of the collinear constructs, which would have discarded theoretically meaningful variance, the problem was treated as an empirical signal pointing to a deeper conceptual reality about how users in infrastructure-constrained environments experience digital banking services.

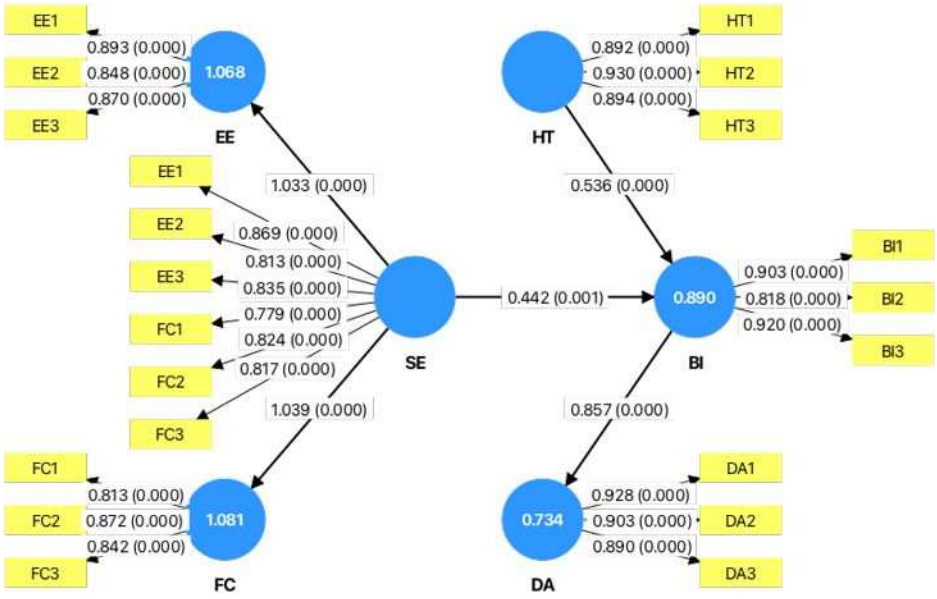


Figure 18. (Model 2) Construct Re-conceptualization for Conceptual and Empirical Clarity

4.4.2.1 Theoretical Rationale

The theoretical argument for reconceptualizing EE and FC as dimensions of a unified higher-order construct is grounded in the phenomenological observation that users do not analytically decompose their digital banking experience into separate judgments about interface usability and infrastructure reliability. As the qualitative data document in detail, when users encounter service disruptions, whether in the form of application crashes, slow transaction processing, login failures, or timeout errors, they experience these as manifestations of a single, undifferentiated quality of service unreliability rather than as failures attributable to identifiable technical causes. The experience of seamlessness, or its absence, is a holistic perception that arises from the combined functioning of the application and the infrastructure that supports it.

This phenomenological unity is precisely what the higher-order construct SE is designed to capture. SE reflects the extent to which users perceive their digital banking interactions as smooth,

reliable, and uninterrupted. Its two first-order dimensions, EE and FC, contribute independently and complementarily to this perception: a genuinely seamless experience requires both an interface that demands minimal cognitive effort and an infrastructure that delivers consistent and dependable service. When either element fails, the experience is disrupted regardless of the quality of the other. This conceptualization aligns with service quality literature in which the perceived quality of a service encounter is understood as an emergent property of multiple contributing dimensions rather than a simple average of them (Hair et al., 2022).

The theoretical rationale is also consistent with the broader argument, advanced in section 4.2.3, that the boundary between effort expectancy and facilitating conditions is epistemologically uncertain in infrastructure-constrained contexts because users cannot reliably distinguish between usability failures and connectivity failures from the standpoint of their experiential engagement with the technology.

4.4.2.2 Empirical Support from Qualitative Data

The qualitative data collected in this study provide direct empirical support for the SE conceptualization. Respondents consistently described their digital banking difficulties in holistic terms, referring to "the app not working" or "problems connecting" without attributing those difficulties to specific underlying causes. Several respondents explicitly noted uncertainty about whether problems originated from the application or the internet, and many described their overall assessment of digital banking quality in terms of reliability and consistency rather than in terms of specific feature satisfaction or interface design. These patterns of expression confirm that the holistic perception captured by SE reflects genuine cognitive and experiential reality for this user population rather than an artificial construct created for statistical convenience.

4.4.2.3 Contextual Support from National Digital Infrastructure

The reconceptualization is further reinforced by the structural conditions of the Lao digital infrastructure environment. As documented by the World Bank assessment discussed in section 4.2.1 (Beschorner et al., 2022), Lao PDR experiences significant constraints in internet speed, reliability, and coverage. In such an environment, the quality of the digital banking experience is inherently co-determined by application design and infrastructure performance in a way that makes their conceptual separation both analytically fragile and empirically unjustified.

4.4.2.4 Statistical Implementation and Outcomes

The introduction of SE as a higher-order construct produced substantial improvements in model diagnostics. Multicollinearity was effectively resolved, with VIF values reduced to below 3.0 for all predictor constructs. Model stability improved considerably, with bootstrap admissibility rates rising to approximately 50 to 60 percent. While this improvement was significant, the admissibility rate remained below the target threshold, indicating that further structural refinement was warranted.

4.4.3 Model 3 (Final Model G): Structural Path Optimization for Parsimony

Building on the construct reconceptualization achieved in Model 2, the second refinement step involved systematic evaluation of all remaining structural paths to identify and retain only those that demonstrated consistent statistical significance, theoretical coherence, and meaningful explanatory contribution.

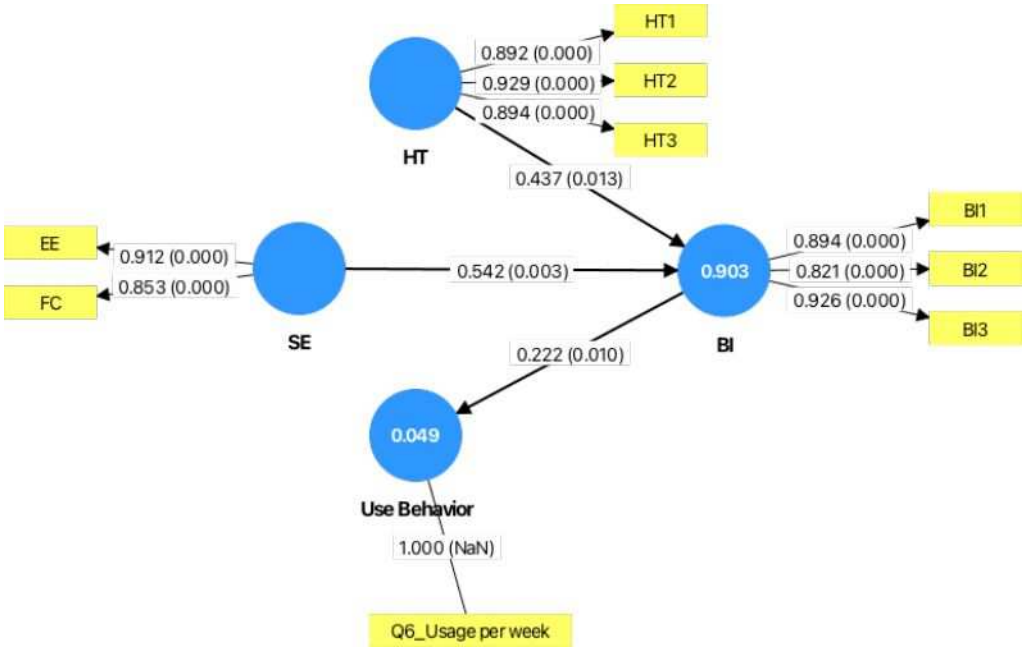


Figure 19. (Model G) Bootstrapping Results – Structural Model

4.4.3.1 The Principle of Parsimony

Parsimony is a foundational principle in scientific model building, reflecting the recognition that models which achieve comparable explanatory power with fewer parameters are to be preferred for reasons of both statistical stability and theoretical clarity (Hair et al., 2022). Overly complex models risk fitting sample-specific noise rather than capturing stable structural relationships, and

they provide less actionable guidance for practitioners who need clear and prioritized insights. The path optimization process therefore sought to identify the minimal set of constructs that could jointly account for the variance in BI that the full Model 2 specification explained.

4.4.3.2 Systematic Path Testing

A series of alternative structural specifications were tested, each evaluated against four criteria: bootstrap admissibility rate, statistical significance of path coefficients at the five percent level, the R-squared value for BI as the primary outcome, and theoretical coherence with post-adoption behavior theory. This process revealed consistent patterns across specifications.

PE consistently showed weak and non-significant path coefficients to BI across all tested specifications. This finding is theoretically coherent with the Expectation-Confirmation Model (Bhattacherjee, 2001): among experienced users whose performance expectations have already been confirmed or disconfirmed through extensive usage, performance beliefs no longer function as motivating forces that discriminate between higher and lower levels of continued engagement. In a sample where 86 percent use digital banking almost daily, the benefits of the technology are not in question; what matters is the quality of the experience and the strength of established routines.

SI exhibited consistently minimal and non-significant effects on BI. This pattern is consistent with the theoretical proposition, advanced in the UTAUT literature, that social influence diminishes as usage becomes experienced and voluntary (Venkatesh et al., 2003). Experienced users rely progressively less on normative social pressure and progressively more on their own accumulated experiential judgements when sustaining their digital banking engagement. Additionally, within a sample of already-active users whose social networks are likely to include many fellow digital banking users, the variance in social influence perceptions is naturally constrained, further limiting its discriminating power.

HM produced consistently non-significant path estimates, a finding consistent with the well-established distinction between utilitarian and hedonic technology systems. Digital banking is paradigmatically utilitarian; users engage with it to achieve financial outcomes rather than for the enjoyment of the activity itself. In a post-adoption context where the novelty of the technology has worn off, hedonic considerations carry even less weight in sustaining engagement.

PV similarly demonstrated weak and non-significant effects, which is consistent with the sample's educational and occupational profile. Research consistently finds that price value is more

influential among economically constrained users or those evaluating adoption for the first time (Venkatesh et al., 2012). Active and educated users who have already committed to digital banking are less likely to engage in ongoing cost-benefit recalculation as a determinant of their continued use.

4.4.3.3 The Final Parsimonious Model (Model G)

Through this systematic refinement process, the final model, referred to as Model G, was established. It retains SE and HT as the sole predictors of BI, with DA predicted exclusively by BI, constituting a fully mediated relationship.

The performance improvements associated with Model G are substantial. Bootstrap admissibility rates reached approximately 89.8 percent, comfortably exceeding the 70 to 80 percent threshold that indicates robust model stability. All VIF values fall below 3.0, confirming the absence of problematic multicollinearity. Model fit indices confirm adequate fit with the observed data: the standardized root mean square residual (SRMR) is 0.032, well below the 0.08 threshold recommended by Hu and Bentler (1999); the comparative fit index (CFI) reaches 0.956; and the normed fit index (NFI) is 0.955, both comfortably exceeding the conventional 0.90 threshold. Both structural paths, from Seamless Experience to Behavioral Intention and from Habit to Behavioral Intention, are statistically significant and substantively meaningful.

4.4.3.4 Theoretical Interpretation of the Final Model

The final model offers a clear, parsimonious, and theoretically grounded account of digital banking engagement dynamics among experienced users in an infrastructure-constrained environment. SE emerges as the primary environmental determinant of continued BI, capturing the extent to which the digital banking service functions reliably and without disruption from the user's perspective. When the experience is smooth and consistent, users maintain strong intentions to continue engaging with the service; when it is unreliable or effortful, those intentions weaken regardless of the user's general positive attitudes toward digital banking. This finding directly addresses the theoretical argument, developed in section 4.2.3, that FC function as a threshold variable in infrastructure-constrained contexts: when the combined quality of application design and infrastructure falls below an acceptable standard, it suppresses continued engagement irrespective of the user's motivation.

HT, as the second retained predictor, operates at a qualitatively different level from SE. It captures the degree to which the behavior has become automated and routine, reflecting accumulated experience rather than ongoing evaluation. For users who have developed strong digital banking habits, the decision to use the service is no longer a deliberate motivational calculation but an automatic response to situational cues, consistent with the dual-process theoretical tradition and with the post-adoption behavior literature (Laradi et al., 2025). The co-presence of SE and HT as the two retained predictors thus reflects the two primary forces sustaining digital banking engagement among experienced users: the environmental quality that keeps usage rewarding enough to maintain, and the behavioral automaticity that makes usage the path of least resistance.

The full mediation of DA by BI suggests that actual usage frequency is primarily a function of the strength of users' intentional commitment to digital banking rather than of any direct effect of HT or SE on behavior independently of intention. This mediated structure is theoretically coherent with the intention-behavior gap literature, which recognizes BI as the proximal determinant of voluntary behavior, and it implies that interventions aimed at improving adoption rates should focus primarily on strengthening users' intentions, which in this context means enhancing seamlessness and supporting habit formation, rather than on direct behavioral incentives alone.

The absence of constructs such as PE may initially appear unexpected. However, this finding reflects the characteristics of the sample. Among experienced users, the functional benefits of digital banking are already well understood and no longer serve as a differentiating factor. Instead, variations in user behavior are more strongly explained by the quality of experience and the strength of habitual engagement.

4.5 Results: The Final Structural Model

4.5.1 Model Fit and Quality Indices

Before interpreting the substantive findings, it is necessary to establish that the final structural model, referred to throughout this study as Model G, meets the minimum standards of statistical adequacy required for structural equation modeling. Without this foundation, structural path coefficients and explanatory power statistics cannot be meaningfully interpreted, because they would reflect a model that is potentially mis specified or unstable. The evaluation reported here addresses three distinct dimensions of model quality: stability, discriminant structure, and global fit.

Model stability was assessed through bootstrapping with 5,000 resamples, yielding an admissibility rate of 89.8 percent. As discussed in section 4.3.5, an admissibility rate in this range, comfortably above the 70 to 80 percent threshold, indicates that the estimated parameter values are robust to resampling variation and are not the product of an unstable or ill-conditioned covariance structure (Chuah et al., 2021). This level of admissibility represents a dramatic improvement over the initial Model 1, which achieved only 15 to 20 percent admissibility, and confirms that the iterative refinement process successfully identified a model structure that is genuinely compatible with the data-generating process in this population.

Multicollinearity diagnostics confirm that the retained constructs are sufficiently distinct to allow reliable individual estimation of path coefficients. All variance inflation factor values fall well below the conservative threshold of 3.0, a marked improvement from the values exceeding 7.0 that characterized the EE-FC relationship in the initial model, and indicate that collinearity no longer constitutes a threat to the interpretability of the structural estimates (Hair et al., 2022).

Global model fit is assessed through three complementary indices. The standardized root mean square residual stands at 0.032, which is substantially below the recommended cutoff of 0.08 recommended by Hu and Bentler (1999), indicating minimal discrepancy between the model-implied and observed correlation matrices. The comparative fit index reaches 0.956 and the normed fit index 0.955, both exceeding the 0.95 threshold widely adopted in the structural equation modeling literature as indicative of excellent fit (Hair et al., 2022). These fit statistics, while interpreted with the appropriate caution appropriate for PLS-SEM as noted in section 4.3.5, collectively provide strong evidence that Model G constitutes an accurate and well-fitting representation of the underlying data structure.

Taken together, the diagnostics confirm that Model G satisfies both statistical and methodological standards for structural model evaluation and provides a reliable basis for hypothesis testing and substantive interpretation.

4.5.2 Structural Path Coefficients and Hypothesis Testing

The structural results present a parsimonious but theoretically coherent account of BI and its downstream effect on DA. Two constructs, SE and HT, emerge as the primary drivers of BI, while BI itself serves as the sole direct predictor of DA, producing a fully mediated structural chain.

4.5.2.1 Seamless Experience as the Primary Driver

SE exerts the strongest influence on BI ($\beta = 0.542$, $p < 0.01$), confirming it as the most powerful predictor of users' intention to continue engaging with digital banking services. The magnitude of this effect is notable: it indicates that more than half of the variation in BI attributable to SE reflects the degree to which users perceive their digital banking interactions as smooth, reliable, and uninterrupted. This finding is discussed in depth in section 4.6.1 in the context of the literature on infrastructure-constrained adoption environments.

4.5.2.2 Habit as the Secondary Driver

HT exerts a substantively meaningful and statistically significant effect on BI ($\beta = 0.437$, $p = 0.013$), confirming that among experienced users, digitally embedded routines serve as a powerful sustaining force for continued engagement. The near-equivalent magnitude of the HT path relative to SE is itself theoretically significant, as it suggests that for this population, intentional deliberation and automatic behavioral disposition operate as roughly co-equal forces in sustaining digital banking engagement. This finding is elaborated in section 4.6.2.

4.5.2.3 Behavioral Intention and Digital Transformation Adoption

BI exerts a positive and statistically significant effect on DA, confirming the theoretical expectation that stronger intentions translate into more frequent behavioral engagement. The magnitude of this path is comparatively modest, however, and the model's explanatory power for DA, at $R^2 = 0.049$, is considerably lower than its explanatory power for BI. This asymmetry is discussed in section 4.6.5.

4.5.2.4 Explanatory Power

The R^2 of 0.654 for BI indicates that SE and Habit together account for approximately 65 percent of the variance in users' intentions, which is a substantively strong result that compares favorably with published PLS-SEM studies in comparable digital banking contexts. For reference, a recent open banking study using PLS-SEM found that user satisfaction with the usage experience explained 62 percent of variance in continuance use intention (Althinayyan & Alojail, 2024), and the present model's explanatory power at 65 percent using only two parsimonious predictors is therefore a meaningful achievement. The considerably lower R^2 for digital transformation adoption is addressed in detail in section 4.6.5.

4.5.3 Importance-Performance Map Analysis (IPMA)

To translate the structural path coefficients into targeted, actionable managerial strategies, an Importance-Performance Map Analysis (IPMA) was executed using SmartPLS. IPMA complements the standard structural path analysis by jointly considering each construct's total effect on the target criterion, which functions as the index of importance, alongside its current average performance level across respondents, providing a strategic map that identifies where intervention is likely to yield the greatest returns (Hair et al., 2022). Rather than relying on rigid external benchmarks, this analysis evaluates the current performance scores against their maximum theoretical ceiling (100) on the latent variable scale, allowing for a precise evaluation of the unfulfilled operational room for improvement.

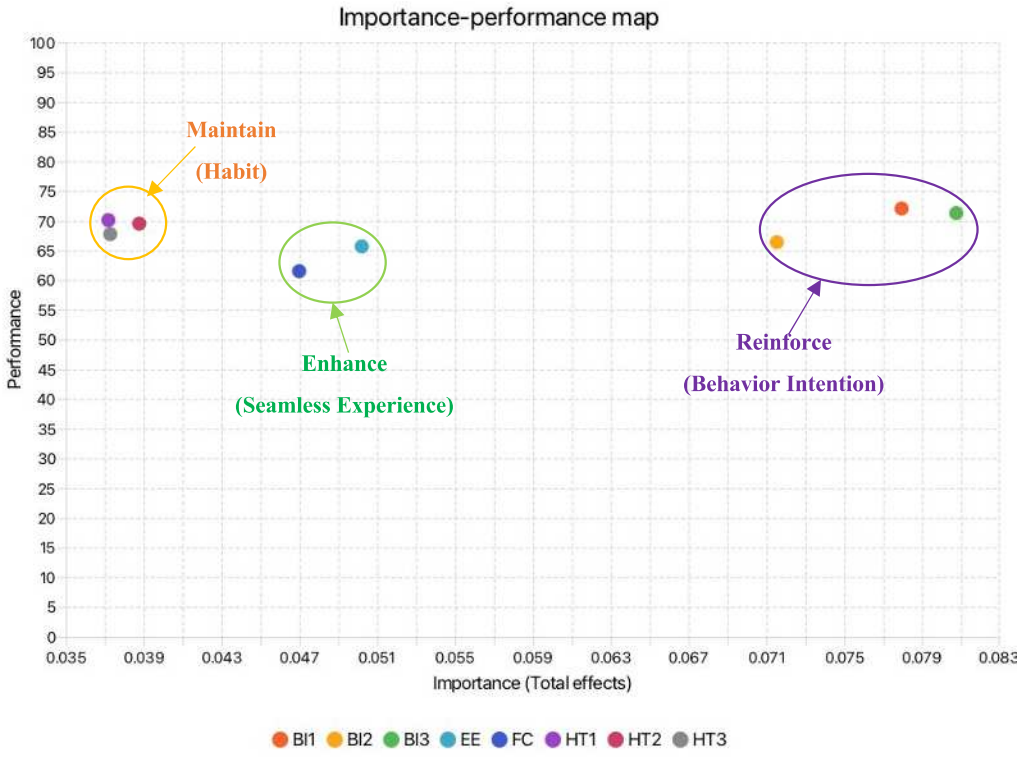


Figure 20. (Model G) Importance-Performance Map Analysis (IPMA)

As illustrated in Figure 19, the empirical output reveals that the core behavioral drivers have achieved relatively high baseline performance levels, though distinct operational gaps remain open. Behavioral Intention (BI) captures the highest overall importance (0.081) and exhibits a relatively high latent performance score of approximately 72. Similarly, Habit (HT) demonstrates a strong baseline performance score near 70. While these scores indicate a well-established and successful

baseline digital engagement among active users, they also reveal a critical room for growth, representing an unfulfilled performance gap of approximately 28% and 30% respectively from absolute optimization. These deficits reveal that banks cannot rest on current behavioral momentum; rather, they must actively capture this unfulfilled capacity by minimizing the friction points that prevent intention from translating into automated usage routines.

Within the components of SE, a meaningful and localized performance gap is evident. FC, which captures users' perceptions of infrastructural reliability, network availability, and technical support, demonstrates relatively high importance but comparatively lower performance than EE, which captures interface usability and ease of interaction. This pattern directly reflects the structural realities of the Lao PDR digital environment described in section 4.2.1: while application usability has been improving as Lao banks invest heavily in software interface development, the underlying telecommunications infrastructure remains a binding constraint that suppresses the overall quality of the SE.

When quantified on the latent scale, the higher-order construct Seamless Experience (SE) is isolated in the lower-right quadrant, designated as the critical Enhance Zone. It exhibits a vital total importance score of 0.049 but demonstrates the lowest relative performance score across the entire ecosystem at approximately 63, revealing a severe 37% absolute performance gap. This substantial 37% operational deficit represents an immediate bottleneck where network provider instability actively drags down usability far below customer expectations. This gap analysis implies that while banks have successfully fostered relatively high customer intent and daily usage habits, these routines are currently bounded by the infrastructure-driven deficit in the seamless experience.

The IPMA findings therefore yield a clear strategic hierarchy: resolving the 37% performance gap in Seamless Experience represents the most actionable, high-leverage entry point for managers. Closing this infrastructure-driven deficit serves as the necessary catalyst to systematically eliminate operational friction, unlock the remaining 28% to 30% performance room in user intention and habit, and successfully maximize future digital banking outcomes. These strategic implications are developed in section 4.7.

4.5.4 Qualitative Findings: Barriers and Security Concerns

The qualitative analysis of open-ended survey responses provides important contextual texture that supplements and deepens the structural findings. Of the 128 respondents, 94 provided

substantive responses to at least one open-ended question, yielding rich thematic material organized around three primary categories: technical and usability challenges, infrastructure constraints, and security concerns.

Technical and usability difficulties were the most frequently cited category of challenge, with respondents describing problems including application instability, slow transaction processing, session timeouts during active transactions, and difficulty understanding certain system features. Closely interwoven with these are infrastructural concerns, particularly unstable internet connections and service interruptions, with respondents frequently describing uncertainty about whether disruptions originated from the application or the network. This inability to distinguish between the two sources of failure is itself empirically significant: it validates, from the ground level of lived user experience, the theoretical argument for Seamless Experience as a unified construct. As one category of response exemplifies, users do not assess the app and the internet separately; they assess whether the service works.

Security concerns feature prominently across the qualitative responses and were cited by approximately 26.56 percent of respondents as a primary challenge. The concerns expressed range from fears of hacking and unauthorized account access to anxieties about the consequences of transaction failures during unstable connectivity, where funds may appear debited before a transaction is confirmed. These narratives underscore that security anxiety in the Lao PDR context is not purely abstract but is concretely tied to the infrastructure fragility already identified in the quantitative model. The absence of security as a significant predictor in the final structural model, despite its prominence in qualitative responses, is addressed in detail in section 4.6.4.

4.6 Discussion

4.6.1 Seamless Experience as Primary Driver of Behavioral Intention in Infrastructure-Constrained Contexts

The emergence of SE as the strongest predictor of BI ($\beta = 0.542$) is simultaneously an empirical finding, a theoretical contribution, and a contextual diagnosis of the digital banking landscape in Lao PDR. It demands discussion at each of these levels.

At the empirical level, the finding converges with a growing body of literature documenting the centrality of service reliability and infrastructure quality in DA across developing economy contexts. Research across multiple developing country settings has consistently identified unstable internet connectivity, system downtime, and transaction processing failures as among the most

significant barriers to sustained digital banking engagement (Baptista & Oliveira, 2017; Shaikh et al., 2015). More recently, empirical evidence from Pakistan confirmed that FC, operationalized as users' perceptions of the availability of resources and infrastructure to support digital banking, ranked among the most significant predictors of actual digital banking usage alongside trust and risk perceptions (Bajwa et al., 2023). The present finding strengthens and extends this evidence base by demonstrating that in a context where infrastructure constraints are even more pronounced, as they are in Lao PDR relative to Pakistan, the reliability of the service experience may not merely be one important predictor among several but may become the dominant organizing principle of users' intentional relationship with the technology.

At the theoretical level, the finding challenges the assumption of construct universality that underlies the standard UTAUT2 framework. In the original model, EE and FC are specified as conceptually and empirically distinct constructs, and this specification has generally held in developed economy contexts where the two dimensions are sufficiently separable in users' cognitive assessments of digital banking. The present study demonstrates that this separability is not universal but context-dependent: in infrastructure-constrained environments, the phenomenological reality of digital banking use produces a collapsed, holistic judgment of service quality in which usability and infrastructure reliability are experienced as aspects of a single evaluative construct. This is consistent with the theoretical argument advanced by Tarhini et al. (2015) that in resource-constrained environments, users form integrated perceptions of system performance in which ease of use and supporting conditions are inseparable, and with Alalwan et al. (2018) empirical documentation of the convergence between usability and infrastructural reliability in mobile payment contexts in developing economies.

The conceptualization of SE as a higher-order construct that captures this integrated perception is, in this sense, not merely a statistical convenience but a theoretical claim about the nature of digital service evaluation in contexts where infrastructure cannot be taken for granted. In digital banking, reliability has a dual character: it encompasses both the reliability of the application itself (the concern of interface design and software engineering) and the reliability of the infrastructure that makes the application accessible (the concern of telecommunications policy and investment). SE captures both, and the IPMA evidence confirms that infrastructure reliability currently represents the more constraining of the two dimensions.

A further theoretical implication concerns what might be called the digital-native paradox. The sample in this study consists predominantly of young, educated digital natives for whom technology engagement is a natural and habituated aspect of daily life. One might expect that digital literacy and technology familiarity would attenuate the influence of infrastructure constraints, as capable users might be better able to work around connectivity limitations or tolerate service disruptions. The evidence suggests otherwise: even among this high-capability, high-motivation user population, seamless experience remains the strongest predictor of behavioral intention. This finding reinforces the argument, developed in section 4.2.3, that infrastructural constraints constitute a gatekeeper barrier that cannot be overcome through individual capability, motivation, or attitude alone. As Laradi et al. (2025) note, even when banks successfully implement digital transformation, delivering a seamless customer experience across multiple channels requires supporting infrastructure that is simply not yet uniformly available in many developing economies. The implication is that individual-level adoption interventions, however well designed, face a structural ceiling imposed by the national digital infrastructure environment.

4.6.2 Habit as Sustaining Force of Post-Adoption Engagement

The significant effect of HT on BI ($\beta = 0.437$) is theoretically coherent with the post-adoption literature developed in section 4.2.3, but the finding deserves discussion at two levels: what the structural path tells us about the role of HT in sustaining engagement, and what the IPMA results tell us about where HT currently stands as a strategic lever for digital banking institutions in Lao PDR. These two levels of interpretation lead to somewhat different conclusions, and conflating them would obscure one of the more nuanced insights the analysis produces.

At the structural level, the near-equivalence of the HT path coefficient to that of SE is itself the most theoretically interesting aspect of the finding. It suggests that for this population of high-frequency, experienced users, continued digital banking engagement is maintained through two roughly co-equal forces operating in parallel. SE addresses the environmental dimension: whether the service is reliable and consistent enough to remain worth engaging with. HT addresses the behavioral dimension: whether usage has become sufficiently routinized that it persists as a matter of daily practice rather than renewed deliberation. These two forces are not interchangeable. A user with strong habits but deteriorating SE will eventually find that frustration erodes even well-established routines. Equally, a user who enjoys a highly SE but has not yet developed habitual patterns of use is more vulnerable to disengagement when competing demands on their attention

arise. Together, the two constructs form a complementary architecture of sustained engagement, which is particularly relevant in the Lao PDR context where service reliability is variable and where the risk of occasional frustrating experiences is non-trivial.

This interpretation is well supported by the post-adoption literature. Research on continuance intention in mobile banking has consistently found that habit becomes an increasingly dominant predictor of continued use as user experience accumulates, while the influence of the deliberative motivational constructs that drive initial adoption progressively declines (Laradi et al., 2025). Baptista and Oliveira's (2017) meta-analysis, reviewed in section 4.2.2, confirmed that HT is among the strongest and most consistent predictors of digital payment service continuance among experienced users. Bhattacherjee's (2001) Expectation-Confirmation Model similarly established that as usage matures, satisfaction from prior experience and the confirmation of earlier expectations become more powerful drivers of continuance than forward-looking motivational assessments, a shift that places habitual automaticity at the center of post-adoption behavior rather than at its periphery.

For the sample in this study, where approximately 86 percent use digital banking almost daily or several times per week, this transition from deliberate choice to embedded routine is well advanced. Their continued engagement is no longer primarily driven by asking themselves whether digital banking is useful or convenient; those questions were settled long ago through accumulated experience. What sustains their engagement is the degree to which digital banking has become the natural and automatic response to everyday financial situations, reinforced each time the service delivers a sufficiently reliable and frictionless experience. This is precisely the complementary logic that the near-equal path coefficients for SE and HT reflect.

However, reading the structural path finding alongside the IPMA results introduces an important qualification to this picture. While HT is a statistically significant predictor of BI in the structural model, the IPMA analysis reveals that its current performance level among this sample is already high relative to the other constructs in the model. In practical terms, this means that the users in this study have already, for the most part, developed the habitual digital banking patterns that the model identifies as significant. HT has formed. The strategic implication of this finding, therefore, is not that banks should invest heavily in HT cultivation among their existing active user base, where diminishing marginal returns are likely, but rather that the priority lies in two other directions. First, protecting and reinforcing the service conditions, particularly SE, that allow existing habits to be

maintained without disruption. Second, extending the HT formation process to the much larger population of potential users who have not yet crossed into regular engagement, for whom the pathway to habitual use has not yet been established. For these groups, repeated positive service experiences are the mechanism through which habits eventually form, which returns strategic attention, once again, to the primacy of SE as the enabling condition for everything else the model identifies.

4.6.3 The Absence of Traditional Adoption Predictors

The systematic elimination of PE, SI, HM, and PV from the final model through iterative diagnostic testing is not a finding that should be passed over lightly. In technology acceptance research, the absence of expected predictors can be just as theoretically informative as their presence, provided that the absence is interpreted through the lens of the specific context and sample rather than treated as an anomaly requiring correction. In the present study, the non-significance of these four constructs reflects a coherent and theoretically predictable pattern tied to the post-adoption stage of the sample and the infrastructure-constrained character of the Lao PDR context. Each construct warrants individual discussion.

4.6.3.1 Performance Expectancy

The non-significance of PE is perhaps the most important of the four absences to explain, since performance expectancy is typically the strongest predictor of BI in standard UTAUT2 applications. The key to understanding this finding lies in recognizing the distinction between initial adoption and sustained use. When someone is deciding whether to adopt digital banking for the first time, their beliefs about whether the technology will make their financial life easier, faster, and more convenient are genuinely uncertain and therefore motivationally active. But for the sample in this study, where 86 percent use digital banking almost daily or several times per week, that uncertainty is long resolved. These users already know that digital banking works and what it can do for them. Their performance expectations have been confirmed through months or years of repeated use, which means that PE no longer varies enough across individuals to meaningfully predict who holds stronger or weaker behavioral intentions. It is not that performance benefits have become unimportant; it is that they are now a settled background assumption rather than a differentiating motivational force.

This interpretation is directly consistent with the Expectation-Confirmation Model (ECM) developed by Bhattacherjee (2001), which was introduced in the literature review as the dominant

theoretical framework for understanding post-adoption continuance. The ECM argues that in post-adoption stages, the cognitive processes governing continued use shift from prospective performance evaluation toward retrospective confirmation of prior expectations. Once those expectations have been confirmed through experience, performance beliefs lose their predictive power over continued intentions. The present finding provides empirical evidence of this transition in the Lao PDR digital banking context, where the combination of experienced users and a relatively narrow range of banking functionality means that performance perception has effectively reached saturation.

4.6.3.2 Social Influence

The non-significance of SI in this sample is consistent with the temporal argument that the role of social pressure diminishes as usage transitions from an externally motivated behavior to a self-directed, internalized one. As the literature review discussed, Venkatesh et al. (2012) acknowledged within the original UTAUT2 framework that SI is expected to be more powerful in mandatory or early-adoption contexts where users have limited personal experience to draw on and therefore rely more heavily on the evaluations of others. For the experienced users in this study, that reliance on social input has been largely superseded by their own accumulated knowledge of what digital banking delivers and how reliably it delivers it.

There is also a sample-specific statistical explanation. Because all respondents are already active users operating within social networks where digital banking is normalized, the variance in SI perceptions across the sample is naturally constrained. When everyone already perceives that their family, colleagues, and peers use and endorse digital banking, SI cannot discriminate between those with stronger and weaker intentions, because it is uniformly high. This restriction of range limits the construct's ability to predict variation in BI regardless of its true theoretical importance in other contexts or at earlier adoption stages. Farzin et al. (2021), whose work on word-of-mouth communication in mobile banking adoption was reviewed in section 4.2.1, similarly found that SI mechanisms operate differently across adoption stages and population segments, reinforcing the argument that its non-significance here reflects sample characteristics rather than general irrelevance.

4.6.3.3 Hedonic Motivation

The non-significance of HM requires the least elaboration but is nonetheless worth grounding in the theoretical framework established in this dissertation. As section 4.2.2 noted, HM

was incorporated into UTAUT2 specifically to extend the framework to consumer contexts where the intrinsic pleasure of using a technology contributes independently to adoption intentions, particularly in settings where technology use is discretionary and where competing alternatives differ meaningfully in their experiential quality. Digital banking, however, is a paradigmatically utilitarian activity. Users engage with it to transfer money, pay bills, check balances, and manage their financial accounts, not for the pleasure of the interaction itself. For experienced users who have long since moved past novelty, the emotional valence of the activity is further reduced: digital banking transactions are routine and functional, and the enjoyment of their smooth completion is absorbed entirely into the SE construct rather than constituting an independent motivational force. The non-significance of HM in the final model is therefore a theoretically expected rather than surprising finding in this context.

4.6.3.4 Price Value

The non-significance of Price Value is interpretable through the lens of both sample composition and adoption stage. As Venkatesh et al. (2012) established in the original UTAUT2 framework, PV is most motivationally active when users are making fresh adoption decisions and when the monetary cost of technology use represents a non-trivial proportion of their disposable resources. For the predominantly young, educated, and urban sample in this study, who are already committed active users, the ongoing cost of digital banking, whether in terms of transaction fees or mobile data consumption, is unlikely to represent a live variable in their continued engagement calculus. The cost-benefit assessment has already been made and settled in favor of adoption; what governs continued use is no longer whether the service is worth its cost but whether it delivers a reliably satisfactory experience. This is precisely the post-adoption dynamic that the Expectation-Confirmation Model (Bhattacherjee, 2001) predicts, where prior experience and satisfaction crowd out the forward-looking motivational assessments that include price sensitivity.

Taken together, the non-significance of these four constructs tells a coherent theoretical story about what governs digital banking engagement when users are experienced and when the context is infrastructure-constrained. For such users, in such a context, what matters is not whether the service is beneficial, socially endorsed, enjoyable, or cost-efficient, all of which are effectively established and non-variable dimensions of their relationship with digital banking. What matters is whether the service works reliably enough to sustain the behavioral routines they have built around it, and whether those routines are sufficiently embedded to persist through the occasional frustration

that infrastructure constraints inevitably produce. These are exactly the dimensions that SE and HT capture, and their co-emergence as the sole predictors of BI in the final model reflects the internal coherence of the empirical findings rather than a limitation of the analytical approach.

4.6.4 Security and Trust as Foundational Conditions Beyond the Predictive Model

The pattern that emerges from setting the qualitative and quantitative findings side by side is one of the most intellectually interesting aspects of this study. Qualitatively, security anxiety is among the most prominent themes across the open-ended responses, cited by approximately 26.56 percent of respondents as a primary challenge and present in some form across nearly all narrative accounts. Quantitatively, security-related perceptions did not survive the diagnostic refinement process and are absent from the final structural model. On the surface, this looks like a contradiction. In practice, it points toward a theoretically important distinction that has direct implications for how security should be understood in the context of digital banking adoption in developing economies.

The most compelling explanation draws on the foundational theoretical logic articulated in the literature review, where trust and perceived security were framed not merely as predictors but as threshold prerequisites for digital banking engagement. As section 4.2.3 discussed in detail, the argument advanced by Amnas et al. (2023) and Apau et al. (2025) is that in developing economy contexts, where formal institutional protections such as deposit insurance, consumer protection legislation, and data security regulation are nascent or weakly enforced, trust cannot be assumed as a background constant. Instead, users must actively construct and maintain a sufficient level of security confidence through their own cognitive evaluations before they are willing to engage at all. This framing suggests that security operates not as a factor that drives stronger intentions among those already engaged but as a gating condition that determines whether engagement is possible in the first place.

When this threshold logic is applied to the present findings, the apparent paradox dissolves. The quantitative sample consists, by definition, of users who have already crossed the security threshold to the degree necessary to sustain active and frequent digital banking use. Among this group, individual differences in security perception do not translate into meaningful differences in BI because everyone in the sample has resolved the fundamental security question sufficiently to maintain engagement. The variance in security perceptions that would be needed to predict differential BI is simply not present in a sample selected, implicitly, by virtue of being active users. Those for whom security concerns proved prohibitive, either at the point of initial adoption or as a

result of negative experiences, are not in the sample at all; they are among the large proportion of Lao adults who remain outside the digital banking user population.

The qualitative prominence of security anxiety, coexisting with continued active use, is best understood as evidence of a pragmatic accommodation that experienced users make. They acknowledge that their digital banking activities carry security risks that they cannot fully evaluate or control. They have made a working judgment that those risks are manageable within their current usage patterns, often mentioning specific behaviors such as avoiding sensitive transactions over public Wi-Fi or limiting the amounts held in mobile wallet accounts as self-imposed protective strategies. This accommodation is inherently fragile and context-dependent. As Jafri et al. (2024) documented in their systematic review of trust and security in fintech adoption across 26 empirical studies, trust and security perceptions are critical determinants of initial BI and are closely tied to the institutional environment in which digital financial services operate. Where that institutional environment is strengthened through clearer regulation, stronger consumer protection, and more robust cybersecurity frameworks, the security threshold shifts upward, requiring higher security confidence for adoption to occur, but also making the accommodation more stable and sustainable for those who have adopted.

The World Bank's assessment of Lao PDR's digital ecosystem, reviewed in section 4.2.1, explicitly identified cybersecurity, data protection, and consumer protection as priority areas for legal and regulatory strengthening (Beschorner et al., 2022). This national-level recommendation aligns precisely with what the user-level qualitative data reveal: that security anxiety in the Lao digital banking context reflects not only individual risk perceptions but genuine institutional gaps in the regulatory environment that creates the conditions for security confidence. Addressing these institutional gaps is therefore not merely a matter of improving individual users' subjective perceptions of security through better communication or more visible security features; it is a matter of building the regulatory and institutional infrastructure that allows security confidence to rest on genuine rather than merely perceived protections.

The practical implication for banking institutions is clear. Security must be treated as a non-negotiable foundation for digital banking strategy, not because it drives stronger intentions among current users, but because its failure would immediately destroy the fragile pragmatic accommodation that sustains those users' engagement, and because it is likely a primary barrier preventing a much larger population of potential users from crossing the adoption threshold at all.

The distinction between security as a threshold condition and security as a differentiating predictor does not diminish the urgency of security investment; if anything, it intensifies it by revealing that security failures carry disproportionate consequences relative to their statistical visibility in models built on active-user samples.

4.6.5 The Modest Prediction of Use Behavior

The R^2 of 0.049 for DA, measured as usage frequency per week, stands in sharp contrast to the R^2 of 0.654 achieved for BI. This asymmetry deserves direct attention rather than passing acknowledgement, both because it could be misread as a fundamental weakness of the model and because understanding why it arises carries genuine theoretical significance.

The most immediate explanation is statistical and straightforward: a construct with limited variance cannot be explained with high R^2 values regardless of how good the predictors are, because there is insufficient variation in the outcome for those predictors to account for. With approximately 86 percent of the sample using digital banking almost daily or several times per week, the distribution of usage frequency scores is strongly skewed toward the high end of the scale. The majority of respondents have, in effect, already reached the ceiling of what the DA measure captures. Explaining variation in usage frequency among a population where nearly everyone uses the service at near-maximum frequency is analogous to trying to explain variation in running speed among a group of professional sprinters: there is genuine variation in the underlying capability and motivation, but the measurement instrument is not sensitive enough to the relevant range to detect it.

Beyond the ceiling effect, there is a deeper theoretical point about the nature of the intention-behavior relationship in experienced user populations. The literature reviewed in section 4.2.3 established, through the Expectation-Confirmation Model (Bhattacherjee, 2001) and subsequent post-adoption research including Nguyen and Nguyen (2023), that in post-adoption stages, behavior is increasingly governed by contextual triggers and established routines rather than by contemporaneous intentional states. For a committed, habituated user, the question of whether to use digital banking on a given occasion is rarely a conscious decision mediated by the strength of their current intention; it is a contextually cued automatic response. Under these conditions, the statistical relationship between measured behavioral intention and measured usage frequency is expected to be attenuated precisely because behavior has, to a meaningful degree, become decoupled from the deliberative intentional processes that intention measurement captures.

There is also a measurement specificity issue that is worth acknowledging honestly. DA was operationalized as a single-item measure of usage frequency per week, which captures one dimension of digital banking engagement but leaves unmeasured the depth, breadth, and value of that engagement. A user who checks their balance daily but never uses digital banking for transfers, bill payments, or investment products may record a higher usage frequency than a user who conducts all their significant financial transactions digitally but does so less often. Frequency is a legitimate proxy for adoption intensity, but it is an imperfect one, and the low R^2 may partly reflect the gap between what BI captures, a general orientation toward continued digital banking engagement, and what the usage frequency measure captures, one specific and relatively narrow behavioral dimension. Future research employing a richer, multidimensional operationalization of DA, encompassing breadth of functionality used, monetary transaction volume, and degree of channel substitution, may find that the relationship between BI and adoption outcomes is stronger and more nuanced than the present single-item measure allows.

Despite the modest R^2, the positive and statistically significant path from BI to DA remains an important result. It confirms the theoretical chain: stronger SE perceptions and more established habitual routines produce stronger BI, and stronger BI translate into more frequent digital banking use, even if the magnitude of that final link is attenuated by the properties of this specific sample. The model does not fail to predict adoption; it describes adoption dynamics accurately for a population that has largely already adopted, which is precisely the theoretical population this study set out to understand.

4.7 Managerial Implications and Strategic Recommendations

The findings of this study carry direct and substantive implications for banking practitioners, digital technology strategists, and policymakers operating in Lao PDR and in comparable developing economy settings. These implications are derived specifically from the structure of the final model and from the prioritization logic provided by the IPMA analysis, which jointly identify where the largest gaps between importance and performance currently lie and where targeted investment is therefore most likely to produce meaningful gains in digital transformation adoption. Three strategic priorities emerge from this analysis, organized in a sequence that reflects the theoretical interdependencies that the model reveals.

4.7.1 Priority One: Closing Seamless Experience Gap

The IPMA analysis identifies the FC dimension of SE as the construct with the largest gap between its importance for DA and its current performance level among respondents. Given that SE carries the strongest path coefficient to BI in the final model ($\beta = 0.542$), closing this gap represents the single most impactful area of investment available to banking institutions in Lao PDR. The specific improvement pathways differ in terms of whether they lie within individual banks' direct control or require coordinated action at the sectoral and policy levels.

Within the direct reach of individual banks, the most immediately actionable improvements concern application design and engineering. A consistent theme across the qualitative responses is the experience of application crashes, transaction failures, and session timeouts, particularly under conditions of slow or intermittent connectivity. Users experiencing these failures cannot reliably distinguish whether the problem originates in the application itself or in the underlying network infrastructure, and as the theoretical rationale for the SE construct established, they do not attempt to make this distinction: they experience the failure holistically as a breakdown in the overall service. This insight has a direct design implication. Applications must be engineered to function reliably under the connectivity conditions that Lao PDR's telecommunications infrastructure actually delivers, rather than under the optimal conditions that well-resourced development environments tend to assume. Lightweight application architectures that minimize data consumption, asynchronous transaction processing that allows users to submit requests without waiting for immediate server responses, and graceful error handling that provides clear and honest feedback when failures occur are design principles that directly address the most commonly reported sources of service disruption.

Interface clarity and navigational simplicity also deserve sustained attention. The qualitative data include recurring references to difficulties in understanding certain system features, which suggests that the EE dimension of SE remains partially constrained by interface design decisions that are within banks' direct control to improve. As the World Bank assessment of the Lao digital ecosystem noted, low digital literacy levels outside urban centers remain a significant structural challenge (Beschorner et al., 2022), and interface design that assumes high prior technological sophistication will systematically exclude the segments of the population most in need of facilitated access. A tiered interface design offering simplified navigation for less experienced users alongside feature-rich functionality for experienced users represents a practical response to this heterogeneity.

Beyond application design, the FC dimension of SE reflects the quality of the broader support environment surrounding digital banking use, including the availability of technical assistance when problems occur and the compatibility of digital banking services with the devices and connectivity options available to users. The qualitative data suggest that uncertainty about where to seek help and how quickly problems will be resolved compounds the frustration users experience when service disruptions occur. Accessible, responsive technical support channels, staffed by personnel with genuine digital banking expertise rather than generic customer service training, would reduce this compounding effect and help users maintain their pragmatic accommodation to residual service uncertainty rather than allowing individual frustrating experiences to erode their overall intentions.

At the sectoral and policy levels, the constraints on SE extend to the quality of the national telecommunications infrastructure, which no individual bank can unilaterally address. The World Bank has consistently identified digital infrastructure investment as a foundational precondition for meaningful digital financial inclusion, and the IPMA evidence in this study provides direct behavioral evidence, from the perspective of experienced users themselves, that infrastructure reliability is the most constraining dimension of the current digital banking experience in Lao PDR. Banking institutions, individually and collectively through the Bank of Lao PDR, are positioned to translate this user-level evidence into advocacy for national-level infrastructure investment and for clearer regulatory frameworks governing telecommunications quality standards in financially sensitive applications.

4.7.2 Priority Two: Sustaining and Extending Habit

While Habit already demonstrates high performance among the active users in this sample, the strategic significance of this finding extends beyond the current user base to the much larger population of potential users who have not yet developed habitual digital banking engagement. The IPMA analysis indicates that among existing users, further investment in HT cultivation offers diminishing marginal returns; the habits are already formed. The strategic priority is therefore to understand what enabled habit formation among current users and to extend those conditions to populations for whom the pathway to habitual use remains incomplete.

The literature review established, drawing on the post-adoption research of Laradi et al. (2025), and Bhattacherjee (2001), that HT formation depends on the accumulation of repeated, positively reinforced interactions under consistent conditions. Banks can actively design for HT

formation by ensuring that the transaction types users need most frequently, such as balance checks, transfers to regular recipients, and bill payments, are accessible with minimal navigational complexity and maximal reliability. Every reliably completed transaction reinforces the behavioral association between a financial task and the digital channel, gradually building the automatic response pattern that constitutes genuine HT. Every failed or frustrating transaction weakens that association, which is precisely why SE and HT are theoretically and empirically interdependent: the quality of the service experience is the substrate on which habits are formed or prevented from forming.

Consistency of experience is particularly important for HT formation among new and transitional users. Frequent interface redesigns, changes to authentication procedures, or shifts in the navigation structure of the application disrupt the contextual stability on which HT depends by forcing users back into deliberate, effortful learning mode. Banks should approach major interface changes with caution, introducing them incrementally and providing transitional guidance to minimize the disruption to established usage patterns.

For populations that have not yet entered regular digital banking use, facilitated first-experience programs represent the most direct pathway to HT formation initiation. This is particularly relevant given the collectivist social context of Lao PDR identified in the literature review, where Farzin et al. (2021) found that word-of-mouth communication and peer facilitation operate through community and family networks in ways that amplify adoption effects. Peer-based adoption facilitation programs, in which existing active users demonstrate digital banking to family members and community contacts in familiar social settings, leverage exactly these collectivist dynamics and may be considerably more effective than individual-directed marketing campaigns in extending digital banking engagement to segments of the population that have not yet adopted.

4.7.3 Priority Three: Establishing Security as a Non-Negotiable Foundation

The discussion in section 4.6.4 established that security operates as a threshold prerequisite for digital banking engagement rather than as a differentiating predictor of BI among established users. The strategic implication of this finding is not that security investment can be deprioritized because security does not appear in the predictive model; it is precisely the opposite. Security is the foundational condition without which the SE and Habit-based engagement architecture documented in this study cannot exist. Its absence, or its catastrophic failure through a significant security incident, would destroy the fragile pragmatic accommodation that current users have made and

would prevent the much larger population of potential users, for whom security anxiety is likely a primary adoption barrier, from ever entering the digital banking ecosystem.

The qualitative findings reveal that users in this sample carry genuine and persistent security anxiety about hacking, data breaches, unauthorized transactions, and the consequences of transaction failures during connectivity disruptions. This anxiety coexists with continued active use because users have judged, implicitly, that the current level of security is sufficient for their patterns of engagement. This judgment is provisional and conditional. It can be disrupted by a major security incident, by negative social transmission of security failures within users' community networks, or by deteriorating confidence in the regulatory environment.

Banks in Lao PDR should respond to this reality on two levels. At the technical level, robust security implementation, encompassing strong authentication, real-time fraud detection, transaction verification, and rapid incident response, is non-negotiable regardless of its statistical invisibility in the behavioral model. At the communicative level, transparent and accessible communication about the security measures in place, including what protections users can rely on and what recourse is available if something goes wrong, is essential to stabilizing the security confidence that underpins current users' continued engagement. Amnas et al. (2023) argued that in developing economy contexts where institutional protections are limited, trust is something that individual users must actively construct and maintain, and that banks have a direct responsibility to provide the informational foundation on which that trust construction can rest. Security communication is not a marketing activity; it is a trust infrastructure investment.

At the national level, the World Bank's recommendation that Laos strengthen its regulatory framework in cybersecurity, data protection, and consumer protection (Beschorner et al., 2022) represents the institutional complement to individual banks' technical and communicative security investments. The security confidence of digital banking users ultimately rests not only on their trust in their own bank but on their confidence in the broader regulatory environment that governs what banks are required to do and what protections users can claim if things go wrong. Strengthening this institutional environment is a shared responsibility of regulators, policymakers, and banking institutions acting collectively.

4.7.4 Strategic Sequencing: Building Adoption from the Foundation Up

The three strategic priorities described above are related not merely additively but structurally. Security provides the enabling foundation without which the adoption architecture cannot be built. SE provides the primary driver of BI once the security foundation is in place. HT formation provides the mechanism through which strong behavioral intentions are consolidated into stable, self-reinforcing usage patterns over time. This sequential relationship means that investments in SE deliver their full potential only when security confidence is already sufficient to sustain engagement through occasional disruptions, and investments in habit cultivation are most effective when they occur in an environment of reliable and consistently rewarding service experiences.

For banking institutions in Lao PDR, this sequential logic suggests a clear organizational priority structure. Security infrastructure and communication deserve the status of foundational investments that are never traded off against visible features or short-term cost efficiencies. Application reliability and facilitating conditions investments represent the highest-leverage area for improving behavioral intention and should be treated as the primary driver of digital adoption strategy in infrastructure-constrained settings. Habit cultivation through deliberate service design and targeted facilitation programs for underserved populations represents the long-term consolidation mechanism that transforms one-time or occasional users into the kind of habitual, high-frequency users that this study's sample represents.

4.8 Limitations and Future Research Directions

4.8.1 Study Limitations

Every empirical study carries limitations that define the boundaries within which its findings should be interpreted. Engaging honestly with these boundaries is not a concession of weakness but a demonstration of the intellectual rigor that makes findings trustworthy. The limitations described below are presented not to diminish the contribution of this study but to situate it accurately within the landscape of what the data, the sample, and the design can and cannot support.

4.8.1.1 Sample Composition and Generalizability

The most consequential limitation concerns the composition of the sample. The 128 respondents are predominantly young (approximately 75 percent aged between 18 and 27 years), highly educated (89 percent holding at least a bachelor's degree), and concentrated among high-frequency digital banking users (approximately 86 percent using the service almost daily or several times per week). This profile is theoretically well suited to the study's focus on post-adoption

behavior and habit formation, and the recruitment strategy was deliberately oriented toward this population. However, it means that the findings speak most directly to the digitally active, educated, urban segment of Lao PDR's digital banking user population and should be applied with caution to other demographic groups.

Older users, rural residents, economically constrained users, and those with limited prior technology exposure, all of whom face different combinations of adoption barriers and motivational dynamics, are substantially underrepresented. For these populations, the constructs that proved non-significant in the present study, including SI, PV, and FC as standalone predictors, may operate quite differently. Research on digital banking adoption in developing economies has consistently found that social influence mechanisms, in particular, operate more powerfully in collectivist cultural contexts among users who lack the personal experience to make independent evaluations (Farzin et al., 2021; Khan et al., 2022), which is precisely the situation of potential adopters and novice users who are absent from this sample. The external generalizability of the final model is therefore appropriately understood as limited to experienced, active digital banking users in comparable urban developing economy settings, pending replication with more diverse samples.

4.8.1.2 Cross-Sectional Research Design

The data were collected at a single point in time, between March and April 2025, which means that the study provides a snapshot of adoption dynamics at one moment in a rapidly evolving context. Digital banking in Lao PDR is a sector in active transformation, as section 4.2.1 documented in detail. The infrastructure constraints that the IPMA analysis identifies as the most performance-limited dimension of SE may look substantially different in two or three years if national telecommunications investment accelerates. The relative importance of HT and SE as predictors of BI may shift as new user populations adopt and as the experiential basis of habit formation changes with improving infrastructure. Cross-sectional data cannot speak to these temporal dynamics, which represent some of the most theoretically interesting questions that this study's findings open up.

4.8.1.3 Common Method Variance

As acknowledged in section 4.3.2, the simultaneous collection of predictor and outcome data through a single self-report instrument creates residual vulnerability to common method variance even when procedural remedies are applied (Jarvis et al., 2003). The use of an objective frequency-based measure for the key behavioral outcome reduces this risk for the most critical structural path,

but the correlations among the perceptual predictor constructs may still carry some inflation from shared method variance. Future research combining survey-based measures of the attitudinal predictors with objective behavioral data drawn from bank transaction records would provide a stronger test of the structural relationships identified here.

4.8.1.4 Measurement Scope of Digital Transformation Adoption

The operationalization of DA as a single-item measure of weekly usage frequency is appropriate for capturing basic adoption intensity but does not reflect the full range of behaviors that constitute genuine digital transformation at the individual level. Breadth of functionality used, monetary transaction volume, degree of digital channel substitution, and the integration of digital banking into broader personal financial management practices are all dimensions of adoption that this measure leaves unaddressed. Future research employing a richer, multidimensional operationalization of digital transformation adoption is likely to find stronger and more nuanced predictive relationships than the present study can demonstrate.

4.8.1.5 Absence of Dedicated Security and Trust Measurement

The study did not include a dedicated security or trust construct in the final model, which reflects the empirical findings but also reflects a measurement limitation. The security-related perceptions that appear prominently in the qualitative data are diverse in character, encompassing personal risk perceptions, trust in the bank as an institution, confidence in the regulatory environment, and experience with or knowledge of security incidents. A more differentiated measurement approach, distinguishing these dimensions and measuring them with multi-item scales, might reveal more nuanced relationships between security-related variables and both behavioral intention and actual adoption outcomes, particularly if extended to samples that include potential adopters for whom security concerns are more likely to function as active predictors rather than resolved threshold conditions.

4.8.2 Future Research Directions

The limitations described above point toward several specific and theoretically motivated research directions that would extend and deepen the contribution of this study.

4.8.2.1 Diverse and Segmented Sampling

The most direct extension of this study is replication with more demographically diverse samples. Research that deliberately recruits older adults, rural users, lower-education segments, and potential users alongside active users would allow the model's structural relationships to be tested

across demographic boundaries and would establish whether SE and HT remain the dominant predictors across all segments or whether certain populations are more strongly governed by constructs such as SI, PV, or Perceived Security that proved non-significant in the present educated, urban, experienced-user sample. Khan et al. (2023) demonstrated that demographic and cultural moderators substantially affect the strength of UTAUT2 relationships, and segmented sampling designs would provide the variance necessary to test these moderation effects in the Lao PDR context.

4.8.2.2 Longitudinal Research

A panel study tracking the same users over two to four years would provide the most rigorous evidence available on the temporal dynamics that the cross-sectional design of this study can only theorize. Specific longitudinal questions of high theoretical value include whether SE perceptions improve as Lao PDR's telecommunications infrastructure develops and whether this improvement is accompanied by a corresponding strengthening of behavioral intentions; whether HT strength continues to grow with extended experience or plateaus after a certain threshold; and whether the relationships among constructs remain stable or evolve as the digital banking ecosystem matures. The post-adoption literature reviewed in section 4.2.3, drawing on Bhattacherjee (2001) and the Expectation-Confirmation Model tradition, provides strong theoretical grounds for expecting these temporal dynamics to be substantial and substantively interesting.

4.8.2.3 Comparative Cross-Context Research

One of the most significant open questions arising from this study is whether SE as a unified higher-order construct is specific to infrastructure-constrained developing economy contexts or whether it also emerges in settings with more reliable digital infrastructure. A comparative study testing the separability of EE and FC across ASEAN economies at different levels of digital maturity, comparing Lao PDR with, for example, Thailand, Vietnam, and Singapore, would provide direct evidence for or against the context-sensitivity argument that motivates the SE construct. If the construct separability holds in infrastructure-rich contexts but collapses in infrastructure-constrained ones, as the theoretical argument predicts, this would represent strong cross-context validation of the present study's contribution. The regional fintech maturity heterogeneity documented in the ASEAN fintech literature reviewed in section 4.2.1 provides a natural comparative framework for such a study.

4.8.2.4 Security and Trust as Dynamic Threshold Constructs

The finding that security operates as a threshold prerequisite rather than a differentiating predictor opens a specific methodological challenge for future research: standard linear regression-based SEM is not well suited to testing threshold effects because it assumes symmetric, proportional relationships between predictors and outcomes. Research employing non-linear modeling approaches, including polynomial regression and response surface analysis, would provide formal tests of whether the relationship between security perceptions and adoption outcomes exhibits the threshold structure that the theoretical argument and qualitative evidence in this study suggest. Additionally, research that deliberately samples both current adopters and non-adopters would restore the variance in security perceptions that is attenuated in active-user samples, potentially revealing security and trust as significant predictors in a sample where the full range of security confidence levels is represented.

4.8.2.5 Integrating Organizational and Customer-Level Analysis

This dissertation examines digital banking transformation at multiple levels, including organizational and human resource dimensions in Chapter 3 and customer adoption dynamics in this chapter. A natural and theoretically motivated extension is research that explicitly models the linkages between organizational capability, service delivery quality, and customer adoption outcomes. The SE construct developed in this study is, ultimately, a customer-level perception of what organizational and infrastructural investments produce. Research that traces the organizational antecedents of seamless experience, including employee digital capability, service design quality, and organizational commitment to digital reliability, would complete the theoretical chain that this dissertation has assembled from two separate analytical levels and would provide a more comprehensive account of what drives digital banking transformation than either level alone can offer.

4.9 Conclusion

This chapter has pursued a dual purpose: to produce an empirically grounded and methodologically rigorous account of DA among experienced users in Lao PDR, and to demonstrate what happens when established theoretical frameworks are subjected to the discipline of real data from a context they were not designed for. The findings that emerge from this dual purpose are, in the author's view, more theoretically interesting than a clean confirmation of the UTAUT2

framework would have been, precisely because they reveal the conditions under which that framework holds and the conditions under which it requires fundamental adaptation.

The empirical core of the chapter's contribution is the identification of SE and HT as the two dominant determinants of BI among experienced digital banking users in an infrastructure-constrained environment, accounting together for approximately 65 percent of the variance in BI, which then translates into actual DA. These two constructs are not simply the survivors of a model-thinning process; they are theoretically meaningful and empirically interpretable in ways that speak directly to the specific conditions of the Lao PDR digital banking context. SE captures the most pressing practical reality of digital banking in a country where internet connectivity is expensive, slow, and unreliable: that the quality of the service experience depends inseparably on the joint performance of application design and supporting infrastructure, and that users evaluate this joint performance as a single holistic entity rather than as two separable dimensions. HT captures the post-adoption dynamic that governs a population of experienced, high-frequency users for whom digital banking is no longer a deliberate choice but an established routine, sustained more by automatic behavioral patterns than by renewed motivational deliberation.

The central theoretical contribution of this chapter is the development and empirical validation of SE as a higher-order construct that represents a genuinely novel reconceptualization of the EE and FC dimensions of UTAUT2. The theoretical argument for this construct is not merely that the two standard constructs were collinear in this dataset; it is that the collinearity reflects a genuine feature of how users in infrastructure-constrained environments experience digital banking. The distinction between interface usability and infrastructure reliability, which is conceptually and empirically meaningful in contexts where infrastructure can be taken for granted, collapses in contexts where it cannot, because users have no reliable basis for attributing service failures to one source rather than the other. SE captures this phenomenological reality, and its development as a construct with explicit theoretical grounding and empirical validation represents a contribution that extends beyond Lao PDR and beyond digital banking to any technology domain where the quality of the service experience is jointly determined by application design and supporting infrastructure.

The secondary theoretical contribution is the systematic documentation of the post-adoption construct landscape, showing that the deliberative motivational constructs central to UTAUT2, specifically PE, SI, HM, and PV, lose their predictive power when the sample consists of experienced users for whom the fundamental adoption decision has long since been resolved. This

is not a finding about these constructs being unimportant in general; it is a finding about when they matter and when they have been superseded by the confirmation of experience and the consolidation of habit. The ECM tradition (Bhattacherjee, 2001; Nguyen & Nguyen, 2023) provides the theoretical framework within which this transition is predictable, and the present study provides direct empirical evidence of it in the Lao PDR context.

The third theoretical contribution is the reframing of security and trust as threshold prerequisites rather than differentiating predictors among established users. This reframing, grounded in the institutional trust arguments of Amnas et al. (2023) and the systematic evidence of Jafri et al. (2024), reconciles the apparent paradox between qualitative prominence and quantitative absence in a way that has direct implications for both theory and practice. For theory, it points toward the need for adoption models designed for active-user samples to differentiate between enabling conditions and motivational drivers rather than treating all constructs as belonging to the same explanatory tier. For practice, it means that security investment cannot be evaluated through its statistical contribution to behavioral intention models built on experienced-user samples; it must be evaluated through its role in sustaining the foundational confidence on which all engagement rests and in enabling the transition from non-adoption to adoption for the large proportion of Lao adults who remain outside the digital banking ecosystem.

For practitioners, the findings deliver a message that is both strategically clear and operationally demanding. In infrastructure-constrained developing economies, the path to sustained digital transformation adoption runs primarily through service reliability. Before feature sophistication, before hedonic engagement, before social marketing, there must be a service that works when users need it to, consistently and dependably enough that they can build their financial routines around it with confidence. This is the insight that the SE construct encodes, and it is the insight that the IPMA analysis confirms through the performance gap in FC. For policymakers, the message is equally direct: behavioral evidence of the kind this study provides makes visible, at the level of individual user experience, what development economists have been arguing at the macro level for years. Digital infrastructure is not a luxury to be addressed after financial inclusion; it is the foundational prerequisite without which financial inclusion through digital channels cannot meaningfully occur.

For researchers, the methodological approach demonstrated in this chapter offers a template for more intellectually honest engagement with established theoretical frameworks in new empirical

contexts. Beginning with the comprehensive specification, subjecting it to rigorous diagnostic scrutiny, and following the evidence through principled and theoretically motivated model refinement rather than mechanical template application: this is what it means to take both theory and context seriously at the same time. The result is not a weaker confirmation of what was already known but a richer account of what actually governs DA in an environment that the original framework's designers never had in mind, and a set of refined hypotheses and a new construct that future researchers in similar contexts can build upon.

Having examined the demand-side dynamics of digital banking transformation through the lens of customer adoption in this chapter, and the supply-side organizational and human resource dimensions in Chapter 3, the dissertation now turns to synthesizing these complementary analytical perspectives into an integrated multi-level framework in the concluding chapter. The connections between organizational capability, service delivery quality, infrastructure investment, and customer adoption outcomes that have been implied separately across the two empirical chapters are brought into explicit theoretical relationship, completing the multi-level account of digital banking transformation in Lao PDR that this dissertation set out to construct.

Chapter 5: Synthesis, Implications, and Conclusions

5.1 Introduction: The Value of Looking Across Levels

This dissertation began with a deceptively simple observation: that digital banking transformation in Lao PDR is failing to reach its potential not because the necessary technologies are unavailable, but because the human, organizational, and infrastructural conditions that enable those technologies to deliver genuine value remain inadequately understood and insufficiently addressed. The three studies that constitute this dissertation were designed in response to that observation, and this concluding chapter brings their findings together in a synthesis that is the dissertation's most important intellectual contribution.

Each study illuminated a different dimension of the transformation challenge. Chapter 2's bibliometric analysis of 2,084 publications from 2000 to 2023 established the global intellectual context, revealing both what the international scholarly community has learned about digital banking adoption and what it has consistently neglected. Chapter 3's employee-centric investigation, drawing on survey data from 354 bank employees across 26 banks alongside qualitative evidence from semi-structured interviews, examined the organizational supply side of digital transformation: how the internal conditions of banking institutions shape employees' psychological engagement with digital systems and how that engagement drives actual transformation outcomes. Chapter 4's customer-centric investigation, using survey and qualitative data from 128 experienced digital banking users, examined the demand side: what keeps customers using digital banking services habitually despite the infrastructural constraints of the Lao PDR digital environment, and why the quality of that experience is determined more by infrastructure reliability than by technological sophistication.

What makes this chapter more than a summary of those three studies is the integration it performs. When the findings from Chapter 2, Chapter 3, and Chapter 4 are placed in conversation with one another, patterns emerge that no individual study could have revealed. The same infrastructural constraints that employees in Chapter 3 identify as limiting their ability to serve customers effectively are experienced by customers in Chapter 4 as the primary determinant of their service satisfaction. The security concerns that are pervasive in both the employee and customer qualitative data but statistically non-significant in both quantitative models point toward a theoretical insight about the role of security as a foundational condition rather than a differentiating predictor that neither study could have reached alone. The gap between official assessments of

digital transformation maturity and the operational realities experienced by both employees and customers reveals a pattern of institutional optimism that policy recommendations must account for.

This chapter synthesizes these cross-level insights into five interconnected contributions. It identifies the convergent themes that run across all three studies. It articulates the theoretical contributions of the dissertation to the technology acceptance literature, to organizational change theory, and to the scholarship on digital transformation in developing economies. It proposes an integrated multi-level framework that maps the integrated explanatory architecture of digital banking transformation in Lao PDR and comparable contexts. It derives comprehensive practical implications for banking institutions, policymakers, and technology providers. And it acknowledges the limitations of the research honestly while proposing a future research agenda that the dissertation's findings motivate.

5.2 Convergent Themes Across Studies

Despite examining different stakeholder groups through different analytical methods and at different levels of analysis, the three studies converge repeatedly on the same fundamental forces governing digital banking transformation in Lao PDR. This convergence is not incidental; it reflects the systemic character of the transformation challenge, in which the same structural conditions produce analogous constraints for employees working inside banking institutions and for customers using those institutions' digital services. Five convergent themes deserve particular attention.

5.2.1 Infrastructure Quality as Binding Constraint

Across all three studies, infrastructural quality emerges not as one factor among many but as the binding constraint that determines the upper limit of what digital transformation can achieve regardless of how well other conditions are managed.

The bibliometric analysis in Chapter 2 identifies infrastructure limitations and the associated digital divide as among the most persistently documented challenges in the global digital banking literature. The consistent appearance of infrastructure-related themes across two decades of publications confirms that this is not a transitional problem that resolves itself as digital banking matures, but a structural feature of developing economy contexts that requires deliberate and sustained policy attention. The OECD (2021) documents this explicitly in the ASEAN context, noting that uneven infrastructure development across the region creates conditions in which the

same digital banking application can deliver vastly different user experiences depending on local connectivity quality.

In Chapter 3, the direct effect of Facilitating Conditions (FC) on Digital Transformation Adoption (DA), while approaching but not reaching conventional significance at the 5 percent level, is nevertheless associated with the most consistently and emotionally described barrier in the qualitative data. Every interview informant identified infrastructure and human capital constraints as the most severe structural limits on digital transformation progress, and survey open-ended responses are saturated with operational accounts of how connectivity failures, system instability, and inadequate technical support constrain what employees can accomplish regardless of their motivation or capability (Muduli & Choudhury, 2024; Venkatesh et al., 2003). The threshold variable interpretation developed in Chapter 3 provides the theoretical framework for understanding why this constraint is only partially visible in the linear structural model: below a minimum adequacy threshold, improvements in facilitating conditions produce limited measurable effect on adoption outcomes because the systemic shortfalls are too severe to overcome at the margins.

In Chapter 4, infrastructure reliability is not merely a background factor but the most performance-constrained dimension of the Seamless Experience (SE) construct that governs customer behavioral intention. The Importance-Performance Map Analysis (IPMA) identifies Facilitating Conditions (FC), capturing network reliability and connectivity quality, as exhibiting the largest gap between their importance for Digital Transformation Adoption (DA) and their current performance level among respondents. Qualitative responses from experienced customers confirm that connectivity failures are not occasional frustrations but daily operational realities that fundamentally shape the quality of the digital banking experience. As Beschorner et al. (2022) documented at the national level, Lao PDR's internet connectivity remains among the most expensive and slowest in the ASEAN region, and this structural reality permeates every level of the digital transformation challenge.

The cross-level convergence on infrastructure as the binding constraint carries a clear and practically significant implication that no amount of bank-level investment can fully address: sustainable digital banking transformation in Lao PDR ultimately depends on national-level telecommunications investment that is beyond the direct control of individual banking institutions. This does not mean that banks cannot act; the application-level resilience strategies discussed in Chapter 4 and the internal infrastructure investment strategies discussed in Chapter 3 are both

valuable. But it means that the ceiling on what those strategies can achieve is determined by the quality of the national digital infrastructure that provides their substrate, and raising that ceiling requires coordinated policy action that individual market actors cannot substitute for.

5.2.2 Security and Trust as Foundational Conditions

Security and trust constitute a second major convergent theme, and the way they appear across the studies reveals an important theoretical insight that neither study could have generated independently.

The bibliometric analysis in Chapter 2 confirms that security concerns have been among the most persistently documented challenges in digital banking adoption research throughout the entire 2000 to 2023 period, appearing in approximately 8.95 percent of the studies reviewed and ranking among the most frequently examined barriers to adoption globally. The sustained prominence of security themes across two decades of research confirms that this is not a transitional adoption challenge that disappears as digital banking becomes more familiar, but a recurring structural concern that requires ongoing institutional attention. As Apau et al. (2025) and Jafri et al. (2024) document in the literature reviews of Chapters 3 and 4 respectively, trust and perceived security consistently emerge as critical determinants of behavioral intention across diverse developing country contexts.

In Chapter 3, Perceived Risk (PR) does not emerge as a statistically significant predictor of Digital Engagement (DE), despite being cited as a major concern by over 53 percent of survey respondents and by all five interview informants as a primary institutional priority. In Chapter 4, security concerns are similarly prominent in qualitative data, with approximately 26.56 percent of open-ended respondents citing security fears as their primary challenge, while security constructs do not appear in the final structural model. The parallel appearance of this pattern in both studies, security that is psychologically pervasive but statistically non-significant as a predictor among established users, is one of the most theoretically productive findings of the dissertation.

The explanation developed across Chapters 3 and 4 is that security functions as a threshold prerequisite rather than a differentiating motivational variable in samples of experienced and active users. Both employee and customer samples consist, by definition, of individuals who have already achieved a sufficient level of security confidence to sustain active engagement with digital banking systems. Their security anxiety is real and persistent, but it has been managed to the point of

pragmatic accommodation rather than resolved. The institutional locus of security responsibility in the employee context, where organizations are perceived as bearing primary accountability for security architecture, and the hygiene factor dynamic in the customer context, where security adequacy enables engagement rather than driving it above a baseline level, together explain why statistical models built on active-user samples consistently fail to capture the motivational significance of security concerns that qualitative data reveal.

The cross-study implication is that security's importance cannot be evaluated from behavioral models of established users. The appropriate populations for revealing security's true role as an adoption barrier are potential adopters and recently abandoned users, neither of whom appear in either study's sample. This limitation motivates a specific future research direction, and it argues forcefully against the temptation to interpret statistical non-significance of security in established-user models as evidence that security investment can be deprioritized. As Amnas et al. (2023) argued in the literature review, in developing economy contexts where institutional protections are limited, security confidence is something users must actively construct and maintain, and the fragility of that construction means that a single significant security incident could rapidly destroy the engagement architecture that both Chapter 3 and Chapter 4 document.

5.2.3 Engagement and Habit as Mechanisms to Sustained Adoption

Both empirical studies converge on the insight that sustainable digital transformation depends not on achieving initial use but on developing the psychological depth of engagement and behavioral automaticity that transforms occasional or compliant use into genuine digital transformation. This convergence is expressed differently across the two contexts, but the underlying dynamic is the same.

In Chapter 3, the replacement of BI with DE as the primary mediating construct reflects the recognition that in mandatory adoption contexts, what varies across employees is not whether they use digital systems but how deeply, confidently, and proactively they engage with them. The strong path from DE to DA ($\beta = 0.831$, $p < 0.001$) confirms that this depth of engagement is the primary organizational mechanism through which antecedent conditions translate into genuine adoption outcomes. Engaged employees integrate digital tools into their workflows, seek out advanced features, contribute to system improvement through feedback, and serve customers more effectively through their digital interactions. Compliant but disengaged employees do the minimum their role requires and no more. The difference between these two behavioral patterns determines whether

digital transformation delivers on its organizational promise (Porfírio et al., 2024; Schaufeli et al., 2006).

In Chapter 4, HT emerges as the second strongest predictor of BI ($\beta = 0.437$, $p = 0.013$), reflecting the equivalent dynamic in the customer context. For experienced users who use digital banking services daily or several times per week, the decision to engage with the service is no longer a deliberate motivational calculation but an automatic contextually triggered response. This habituation represents the demand-side equivalent of genuine employee engagement: in both cases, digital banking has become sufficiently integrated into the individual's working or daily life that it operates below the threshold of conscious deliberation, sustaining engagement through routine rather than through renewed intention (Bhattacherjee, 2001; Laradi et al., 2025).

The cross-study implication is that digital transformation strategy must be oriented toward depth of engagement rather than breadth of adoption. The relevant question is not how many employees or customers are using digital banking systems but how deeply those systems have been integrated into their professional practices or daily financial lives. This reframing has consequences for how success is measured, how investments are prioritized, and how interventions are designed. The most effective interventions in both contexts are those that strengthen the conditions supporting genuine engagement and habitual use rather than those that simply increase compliance or initial trial.

5.2.4 Organizational and Institutional Context as Decisive Structural Forces

Both empirical studies demonstrate that individual-level adoption dynamics cannot be understood independently of the organizational and institutional contexts within which they are embedded. This finding directly challenges the methodological individualism of standard technology acceptance models, which treat adoption as primarily a function of individual psychological evaluations and treat context as background.

In Chapter 3, Organizational Culture emerges as the second strongest predictor of DE ($\beta = 0.190$, $p = 0.014$), and RI exerts a significant positive effect ($\beta = 0.180$, $p = 0.005$). Together, these findings confirm that the quality of employees' digital engagement is determined in roughly equal measure by their beliefs about the technology's performance benefits and by the organizational and institutional environment in which they work. This near-parity between individual-level PE and organizational-level OC is one of the most theoretically important findings of Chapter 3, because it

establishes that no amount of performance benefit communication will produce genuine engagement in organizational cultures that are risk-averse, hierarchically rigid, or insufficiently supportive of digital innovation. Technology and culture, as Vial (2019) and Verhoef et al. (2021) argued in the literature review, are co-equal determinants of digital transformation outcomes.

In Chapter 4, the customer model does not directly model organizational variables, but the centrality of SE implicitly reflects the organizational capabilities that determine service quality. The reliability of digital banking applications, the quality of the supporting infrastructure, and the consistency of the service experience across different usage contexts are all outcomes of organizational and institutional decisions made by banks and policymakers. Customers experience organizational competence or incompetence through the seamlessness or disruption of their digital banking interactions, and their behavioral intentions are shaped by those experiential outcomes rather than by any direct assessment of the organizational factors that produce them. The institutional regulatory assessment by the World Bank (Beschorner et al., 2022), which identifies cybersecurity, data protection, and consumer protection as priority areas for regulatory development in Lao PDR, provides the institutional context for understanding why customers' security anxieties are not merely perceptual but reflective of genuine institutional gaps.

The cross-study implication is that digital transformation strategy must be conceived and managed at the organizational and institutional level rather than primarily at the individual level. Training programs, communication campaigns, and incentive structures all matter, but they matter most when they are embedded in organizational cultures that support digital engagement and institutional environments that provide clear regulatory direction, adequate infrastructure, and credible consumer protection. In the absence of these enabling conditions, individual-level interventions produce compliance at best and disengagement at worst.

5.2.5 Practical Performance Over Technological Sophistication

The fifth and final convergent theme concerns the nature of what stakeholders actually value in their digital banking experiences. Across both empirical studies, the consistent finding is that practical performance benefits and reliable service experience matter more than technological sophistication or feature richness.

In Chapter 3, PE is the strongest predictor of DE ($\beta = 0.222$, $p < 0.001$), and the qualitative data reveal that the performance benefits employees value most are operational and immediate:

faster transaction processing, reduced error rates, less manual paperwork, and more efficient customer service. These are the mundane but consequential productivity gains that justify the effort of learning and adapting to new digital systems. Advanced features, innovative interfaces, and cutting-edge technological capabilities barely appear in the qualitative evidence. What employees want is systems that work reliably and that make their jobs genuinely easier (Kane, 2019; Venkatesh et al., 2003).

In Chapter 4, the elimination of HM, PE, PV, and SI from the final structural model, and the emergence of SE as the dominant predictor, tells the same story from the customer perspective. For experienced digital banking users in an infrastructure-constrained environment, what governs their continued intention to use digital banking services is not the technological sophistication of the application or the range of features available but the fundamental question of whether the service works reliably when they need it to. A simple, fast, and consistently available service outperforms a feature-rich but unreliable one in this context, and the IPMA evidence confirms that infrastructure reliability is the most performance-constrained dimension of what users actually receive relative to what they need.

This convergence across the employee and customer contexts challenges technology-centric approaches to digital transformation that prioritize innovation and feature development over operational excellence and reliability. In infrastructure-constrained developing economy contexts, the most valuable investment is not in the next technological capability but in the foundational reliability of the current capability, because reliability is the precondition for the trust, habit, and genuine engagement that sustainable adoption requires.

5.3 Theoretical Contributions

This dissertation advances the scholarly literature in four interconnected ways, each building on and reinforcing the others within the multi-level framework that the dissertation constructs.

5.3.1 Digital Engagement as a Theoretically Grounded Alternative to Behavioral Intention

The first and most conceptually significant contribution is the development and empirical validation of DE as a theoretically appropriate alternative to BI in mandatory organizational adoption contexts. The behavioral intention construct assumes that individuals exercise meaningful discretion over whether to adopt a technology, a condition that does not hold when technology use is organizationally mandated. In the Lao banking sector, as in banking sectors more broadly,

employees use digital systems because their employment requires it. The theoretically meaningful question in such contexts is not whether they intend to use the system but how deeply, confidently, and proactively they engage with it.

DE, grounded in Schaufeli et al.'s (2006) work engagement framework and translated into the technology adoption domain, captures this dimension through three interrelated elements: motivational investment in digital work, confidence in one's own digital capabilities, and proactive orientation toward digital improvement. The strong empirical performance of DE as a mediating construct in Chapter 3, accounting for the large majority of the explained variance in DA, validates this theoretical claim and invites replication across other mandatory adoption contexts in banking and beyond. The construct has potential applicability to any organizational context where technology adoption is institutionally required and where the theoretically consequential variation is in engagement quality rather than adoption intention.

5.3.2 Seamless Experience and the Context-Sensitivity of Construct Separability

The second theoretical contribution is the development and empirical validation of SE as a higher-order construct that reconceptualizes the relationship between EE and FC in infrastructure-constrained environments. The standard UTAUT2 framework treats these as conceptually and empirically distinct constructs, reflecting the assumption that users can meaningfully distinguish between their evaluations of interface usability and their evaluations of the infrastructure that makes the interface accessible. In contexts where infrastructure is reliable, this distinction is psychologically real: users experience interface design and connectivity quality as separate dimensions of their technology engagement.

In Lao PDR, where connectivity is unreliable and infrastructure failures are a daily operational reality, this distinction collapses. Users cannot attribute service disruptions to specific technical causes because the subjective experience of disruption is the same whether its source is application code, server infrastructure, or telecommunications network. The convergence of EE and FC into a single holistic SE perception is therefore not merely a statistical finding but a phenomenological claim about how users in infrastructure-constrained environments actually evaluate digital banking quality (Venkatesh et al., 2012). The development and validation of the SE construct provide a theoretically grounded alternative to the standard two-construct specification for use in developing economy research contexts, and its potential applicability extends beyond digital

banking to any technology domain where service quality is jointly determined by application design and supporting infrastructure.

5.3.3 Threshold and Hygiene Factor Reinterpretations of Security and Infrastructure

The third theoretical contribution concerns the reinterpretation of security and infrastructure as foundational conditions that operate through threshold and hygiene factor mechanisms rather than through the linear, differentiating predictor relationships that standard adoption models assume. Both the security finding in Chapters 3 and 4 and the near-significant FC finding in Chapter 3 exhibit the same pattern: they are experientially central to stakeholders' digital banking lives, qualitatively prominent in the open-ended and interview data, but statistically non-significant as predictors in linear structural models built on active-user samples.

The theoretical explanation is that both constructs operate at the level of enabling conditions rather than motivating variables. Below a minimum threshold of infrastructure adequacy or security confidence, digital banking engagement is impossible or deeply compromised regardless of motivation, attitude, or intention. Above that threshold, variations in infrastructure quality or security confidence among established users do not produce the proportional incremental improvements in engagement or adoption that standard linear models would predict. The constructs determine whether the adoption architecture can exist, not how high it can reach once it exists (Amnas et al., 2023; Apau et al., 2025; Venkatesh et al., 2003).

This reinterpretation has methodological as well as theoretical implications. It suggests that researchers working in resource-constrained and institutionally regulated environments should routinely complement structural models with qualitative evidence capable of revealing threshold and enabling condition dynamics that path coefficients alone cannot detect, and should resist the temptation to interpret statistical non-significance as evidence of practical irrelevance for constructs that qualitative data consistently highlight as experientially central.

5.3.4 Multi-Level Framework as a Theoretical Contribution in Itself

The fourth theoretical contribution is the multi-level analytical framework that the dissertation constructs, which advances understanding of digital transformation as a systemic, cross-level phenomenon rather than an aggregation of individual adoption decisions. By integrating macro-level bibliometric findings, organizational-level employee adoption dynamics, and individual-level customer experience into a coherent analytical architecture, the dissertation

demonstrates how structural constraints at the national and institutional levels set the parameters within which organizational and individual-level interventions can operate, and how organizational capability on the supply side determines the quality of customer experience on the demand side.

This cross-level integration responds directly to the gap identified in the bibliometric analysis of Chapter 2, which documents the field's persistent fragmentation by analytical level and its corresponding inability to address the interactions among structural, organizational, and individual factors that determine digital transformation outcomes in complex developing economy contexts. The framework's value is not merely descriptive; it identifies where in the multi-level system the binding constraints are located and therefore where the most high-leverage interventions are available, which is itself a theoretical contribution to the strategic management of digital transformation.

5.4 Integrated Framework for Digital Banking Transformation in Developing Economies

The convergent themes and theoretical contributions identified in the preceding sections can be synthesized into an integrated framework that maps the causal architecture of digital banking transformation in developing economies such as Lao PDR. This framework conceptualizes digital transformation as a multi-level, multi-stakeholder process in which outcomes at each level are jointly determined by conditions operating at higher levels and by the quality of human engagement operating within those conditions.

The convergent findings and theoretical contributions are synthesized in the integrated multi-level framework presented in Figure 21. The framework connects the macro-level research landscape with organizational and customer-level mechanisms while distinguishing empirically tested relationships from theoretically proposed cross-level linkages.

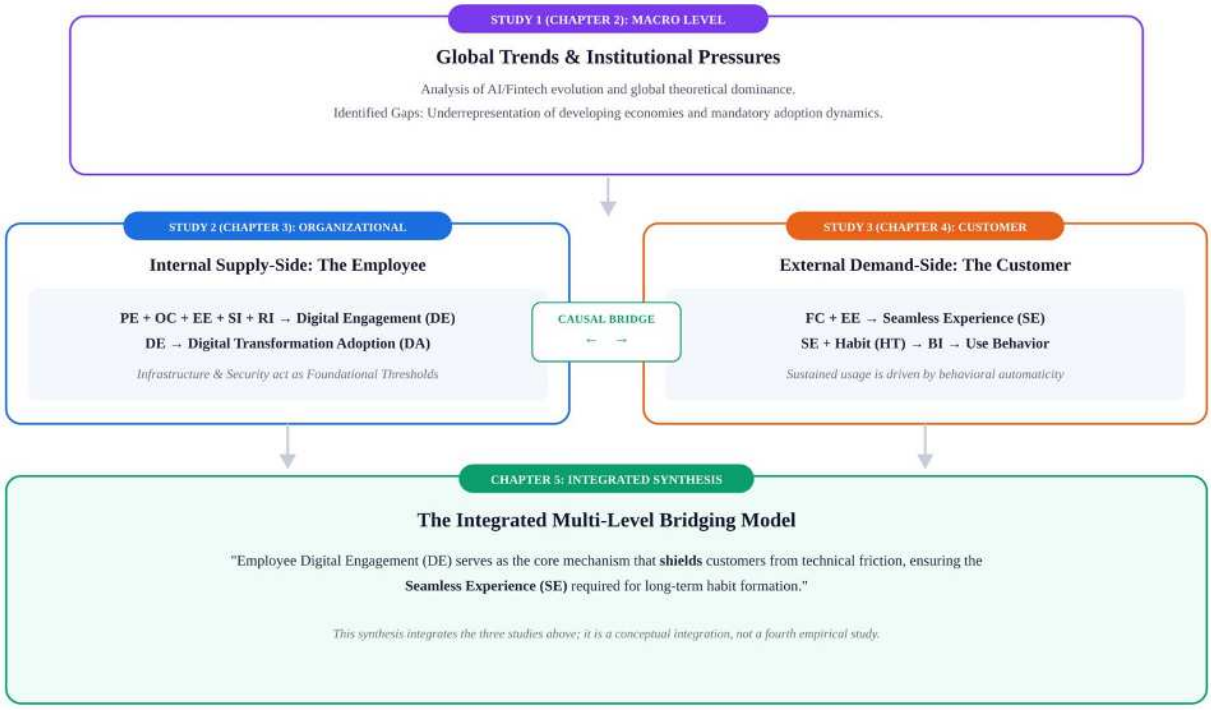


Figure 21. Integrated Multi-Level Bridging Model for Digital Banking Transformation in Lao PDR

At the macro level, the global research landscape establishes the knowledge base within which local digital banking initiatives are positioned. The bibliometric findings of Chapter 2 document the dominant theoretical frameworks, methodological patterns, and empirical challenges that constitute this knowledge base. They also reveal the critical gaps in that knowledge base, particularly the underrepresentation of developing economy contexts and mandatory adoption dynamics, that motivate the theoretical adaptations introduced in this dissertation. Global technological developments in artificial intelligence, blockchain, and fifth-generation mobile communications define the evolving menu of digital banking capabilities, while global research on security, trust, financial inclusion, and infrastructure constraints identifies the recurring challenges that local implementations must navigate.

At the institutional level, the national regulatory environment and the quality of national digital infrastructure together establish the enabling conditions and boundary constraints within which organizational digital transformation occurs. The Bank of the Lao PDR's digital infrastructure mandates create the coercive institutional pressure that drives strategic commitment to digital transformation across the banking sector, consistent with the institutional isomorphism theory of (DiMaggio & Powell, 1983). The quality of the national telecommunications infrastructure

establishes the ceiling on what that commitment can deliver. As the empirical findings across Chapters 3 and 4 demonstrate, this institutional ceiling is currently the binding constraint on digital transformation outcomes, and raising it requires policy action that is beyond the reach of individual banking institutions acting alone.

At the organizational level, the internal conditions of banking institutions determine how effectively the mandated transformation is implemented and how much of its potential the institutional enabling conditions allow to be realized. OC shapes the psychological environment within which employees engage with digital systems (Hung, 2024; Schein, 2010; Sibassaha et al., 2025). Leadership vision clarity and the collaborative orientation of the workplace determine whether PE translates into genuine DE or merely into compliant system use. FC, specifically the quality of training, technical support, and internal infrastructure, determine whether engaged employees can translate their motivation into effective adoption outcomes. The Chapter 3 findings establish PE and OC as the primary organizational levers, operating through DE as the mediating mechanism.

At the individual level, the framework differentiates between the supply-side employee adoption dynamics examined in Chapter 3 and the demand-side customer adoption dynamics examined in Chapter 4. For employees, DE mediates the translation of antecedent organizational and institutional conditions into DA outcomes. For customers, the SE of their digital banking interactions, shaped by the joint quality of application design and infrastructure reliability, determines their BI, which HT then reinforces and sustains in the post-adoption stage. Security operates as a foundational condition at both levels, enabling continued engagement when sufficiently assured and threatening to dissolve it when significantly compromised.

The framework is distinguished by its emphasis on the cross-level feedback mechanisms that prevent it from being merely a hierarchy of independent causal chains. Employee digital engagement, shaped by organizational conditions and institutional pressure, directly determines the quality of the digital services that customers experience through their interactions with banking staff. When employees are genuinely engaged and competent in digital banking operations, they serve customers more effectively, answer questions more confidently, and resolve problems more rapidly, all of which improve the customer's SE and support habit formation. Conversely, when employees are disengaged or inadequately supported by FC, customer service quality suffers in ways that are experientially real to customers regardless of the quality of the underlying technology. The supply

side and demand side of digital transformation are not independent; they are connected through the quality of human banking service delivery.

5.5 Comprehensive Practical Implications

5.5.1 For Banking Institutions

The most consequential organizational investment that banking institutions in Lao PDR can make in their digital transformation programs is in the conditions that produce genuine DE rather than mere compliance. The primary finding of Chapter 3, that PE is the strongest predictor of DE, argues that the most effective engagement strategy is not to communicate the strategic importance of digital transformation but to demonstrate its operational benefits concretely and personally. Pilot programs that allow employees to experience directly how digital systems reduce their processing time, minimize their error rates, and improve their customer service effectiveness create the performance belief foundation that sustains engagement more durably than any number of strategic announcements or training presentations.

The near-equivalent importance of OC to PE in predicting DE argues that leadership development and culture change must be treated as direct digital transformation investments rather than as separate organizational development activities. Banks that invest in digital capability infrastructure without simultaneously investing in leaders who can create and sustain a culture of digital engagement are building on a foundation that will not bear the weight of genuine transformation. The qualitative evidence from Chapter 3, particularly the consistent identification by all five interview informants of leadership clarity and cultural readiness as primary determinants of transformation success, reinforces this argument empirically (Hung, 2024; Sibassaha et al., 2025).

For customer-facing strategy, the IPMA evidence from Chapter 4 provides a clear and prioritized investment map. FC, specifically infrastructure reliability and technical support availability, exhibit the largest performance gap relative to their importance for DA, making infrastructure-focused investments the highest-leverage customer experience improvement available to banking institutions. Application-level investments in connectivity resilience, lightweight architecture, and graceful degradation under poor connectivity conditions can partially compensate for national infrastructure limitations within the application layer, and these investments are within the direct control of individual banking institutions in a way that national telecommunications infrastructure is not.

Security must be treated as a foundational organizational obligation rather than a strategic differentiator. The hygiene factor dynamics identified in both Chapter 3 and Chapter 4 mean that security investment does not directly drive measurable increases in engagement or adoption among established users, which can create organizational pressure to deprioritize security in favor of visible feature development. Resisting this pressure requires an organizational understanding that security failures carry disproportionate and potentially irreversible consequences for institutional trust, consequences that cannot be compensated by the marginal improvements in feature richness that competing security investment would enable.

5.5.2 For Policymakers and Regulators

The binding constraint that infrastructural quality imposes on digital banking transformation in Lao PDR, documented empirically at both the employee and customer levels and confirmed contextually by the World Bank's national-level assessment (Beschorner et al., 2022), argues that the most consequential policy action available to the Government of Lao PDR is sustained, coordinated investment in national telecommunications infrastructure. The ceiling that current infrastructure quality imposes on digital banking adoption cannot be raised by any number of organizational interventions by individual banking institutions; it requires government-level investment in broadband expansion, mobile network reliability, and shared digital payment infrastructure.

The ambivalent character of RI documented in Chapter 3, simultaneously enabling digital transformation at the strategic level through clear mandates and constraining it at the operational level through slow approval processes and insufficient implementation guidance, provides specific direction for regulatory reform. Streamlining product approval timelines, developing detailed implementation guidelines that reduce the regulatory interpretation burden on individual institutions, and introducing regulatory sandbox mechanisms that allow controlled innovation without full approval cycle requirements would substantially improve the operational dimension of regulatory influence without compromising its strategic enabling function. The OECD (2021) has similarly advocated for adaptive, technology-neutral regulatory approaches in the ASEAN digital financial services context, and the Lao findings provide direct behavioral evidence supporting this recommendation.

The development of a comprehensive national cybersecurity and data protection framework specifically for digital financial services addresses simultaneously the security concerns of the

employee workforce documented in Chapter 3 and the customer security anxieties documented in Chapter 4. As Amnas et al. (2023) argued in the Chapter 4 literature review, in developing economy contexts where institutional protections are limited, users must construct and maintain trust individually in the absence of the institutional scaffolding that formal consumer protection and regulatory oversight provide in more developed markets. Strengthening that institutional scaffolding would raise the security confidence baseline across both employee and customer populations in ways that individual banking institutions cannot achieve unilaterally.

Human capital development for the banking sector requires coordinated action between educational institutions, government agencies, and the banking industry. The severe dual-competency shortage identified in Chapter 3, the near-impossibility of finding staff who combine genuine banking operations knowledge with real digital technology expertise, represents a structural constraint on transformation that no individual bank can address through its own hiring and training programs. National-level programs that integrate financial services and digital technology curricula at university and vocational levels, supported by professional certification frameworks and international knowledge exchange initiatives, are necessary complements to the firm-level training investments that individual banks can make.

5.5.3 For Technology Providers

Technology providers serving the Lao banking sector, and developing economy banking sectors more broadly, must orient their product design philosophy around the operational realities that the empirical evidence documents rather than around the technological capabilities that their products make available. The consistent finding across both Chapter 3 and Chapter 4 that practical reliability matters more than feature sophistication in infrastructure-constrained environments argues for design philosophies that prioritize stability, lightweight architecture, and graceful performance degradation under poor connectivity conditions over the feature richness that might be compelling in better-resourced markets.

The SE construct developed in Chapter 4 provides a design specification for what banking customers in developing economy contexts actually need: a service experience that is smooth, reliable, and uninterrupted from the user's perspective, regardless of whether disruptions originate in the application or the network. Meeting this specification requires investment in server redundancy, efficient data compression, asynchronous processing, offline functionality for non-

time-critical operations, and robust error handling that provides clear and honest feedback when failures occur rather than silent failures or cryptic error messages.

5.6 Limitations of the Dissertation

Engaging honestly with the limitations of this research is not merely a convention of academic writing but a substantive responsibility toward the readers, practitioners, and policymakers who might act on its findings. Four categories of limitation deserve explicit acknowledgement.

The geographic specificity of the empirical studies is the most consequential limitation for generalizability. The employee and customer investigations are situated entirely within Lao PDR, a country with particular combinations of infrastructure quality, regulatory framework, cultural characteristics, and banking sector composition that may not be shared by other developing economies to which the findings might appear applicable. While the theoretical framework constructed across Chapters 3 and 4 is intended to have broader applicability, its external validity in other national contexts must be established through replication rather than assumed.

The cross-sectional design of both empirical studies captures conditions at a single point in time during a rapidly evolving digital transformation process. Digital banking in Lao PDR is changing: infrastructure is being invested in, regulatory frameworks are developing, and user populations are gaining experience. The relationships documented in this dissertation may evolve as these structural conditions change, and the parsimonious models that best fit the data in early 2025 may require revision as the transformation landscape develops. Longitudinal research is needed to track these dynamics.

The self-report nature of all survey data, combined with the active-user composition of both samples, creates limitations on what the quantitative models can capture. The absence of security as a significant predictor in both structural models reflects the composition of active-user samples rather than the absence of security's importance, a limitation that applies to any behavioral study that samples established users rather than the full range of potential adopters. Common method variance remains a residual concern despite the procedural remedies employed, and the possibility that some structural path estimates are inflated by shared method artifacts cannot be entirely ruled out (Jarvis et al., 2003).

The absence of empirical cross-level linkage testing is the final significant limitation. While the integrated framework proposed in section 5.4 argues for specific causal connections between

organizational and customer levels, the dissertation does not provide empirical tests of these cross-level relationships. The argument that employee DE influences customer SE through service quality is theoretically compelling and empirically supported by each study's findings independently, but the direct cross-level path has not been estimated. Future research that simultaneously samples employees and the customers they serve at the same banking institutions would provide the multi-level empirical evidence that the theoretical framework requires.

5.7 Future Research Agenda

The limitations above motivate a specific and theoretically coherent research agenda, organized around five priorities that collectively address the most consequential gaps in the current evidence base.

The first priority is longitudinal research tracking digital banking stakeholders, both employees and customers, over a period of two to four years. This would provide the temporal evidence needed to assess how DE evolves as organizational culture and leadership quality change, how the relative importance of HT and BI shifts as usage experience accumulates. The Expectation-Confirmation Model tradition, reviewed in section 4.2.3 (Bhattacherjee, 2001), provides strong theoretical grounds for expecting meaningful temporal dynamics in the determinants of post-adoption behavior that cross-sectional research cannot detect.

The second priority is comparative cross-national research testing the portability of the framework's key theoretical claims across different developing economy contexts. The ASEAN regional context provides a natural comparative laboratory, with countries at different levels of digital maturity from Lao PDR, Cambodia, and Myanmar at the lower end through Thailand and Vietnam in the middle to Singapore at the upper end. A comparative study testing whether SE emerges as a unified construct only in infrastructure-constrained contexts or also in more infrastructure-rich environments, and whether the institutional factor significance observed in Chapter 3 generalizes across regulatory environments, would substantially strengthen the theoretical contributions of this dissertation (Farzin et al., 2021).

The third priority is research explicitly designed to test the cross-level linkages proposed in the integrated framework. A multi-level study that samples employees and the customers they serve at the same banking institutions, and that models the path from employee DE through service delivery quality to customer SE, would provide the empirical foundation for the cross-level claims

that the present dissertation makes theoretically but cannot support empirically. This research design would also enable examination of whether organizational culture effects that are directly observable at the employee level are perceptible to customers through their service experience, which is a theoretically important question about the transmission mechanism through which organizational conditions shape customer outcomes.

The fourth priority is research on the non-user and potential adopter populations that are absent from both empirical studies in this dissertation. Both the employee and customer samples consist of active users, meaning that the constructs most likely to predict the adoption decision itself, including security concerns, PV, and SI, are systematically underrepresented because the adoption decision has already been made by all sample members. Research that includes non-adopters alongside established users would restore the variance needed to reveal these constructs' true predictive importance and would provide evidence directly relevant to the financial inclusion agenda that motivates the national digital transformation strategy.

The fifth priority is research employing non-linear and configurational analytical methods to formally test the threshold and enabling condition dynamics that the present dissertation theorizes but can only demonstrate indirectly through the combination of qualitative evidence and the interpretation of near-significant or non-significant path coefficients. Polynomial regression and response surface analysis could formally test whether FC exhibit the threshold effects that the Chapter 3 findings suggest. Fuzzy-set Qualitative Comparative Analysis could identify the specific configurations of antecedent conditions that are jointly necessary or sufficient for high DE or high SE, providing a richer and more practically actionable account of what combinations of conditions produce successful digital transformation (Apau et al., 2025; Venkatesh et al., 2012).

5.8 Concluding Reflections

This dissertation set out to understand digital banking transformation in Lao PDR not as a technology management problem but as a human and organizational challenge that technology enables but cannot resolve. The findings justify this framing. Across three studies examining the global literature, the organizational supply side, and the individual demand side of digital transformation, the consistent conclusion is that the limiting factors in Lao PDR's digital banking journey are not technological but human, organizational, and infrastructural. The technologies are available. What is insufficient are the organizational conditions that enable employees to engage genuinely with those technologies, the infrastructure reliability that allows customers to trust and

habitualize their use of them, and the institutional frameworks that create the security confidence on which all digital engagement ultimately rests.

The two theoretical constructs that emerge as this dissertation's most distinctive contributions, DE and SE, are both expressions of this human-centric conclusion. DE captures what distinguishes a banking workforce that has genuinely embraced digital transformation from one that has merely complied with its mandates. SE captures what distinguishes a digital banking service that has earned the habitual loyalty of its users from one that has merely achieved initial adoption. Both constructs locate the explanatory action not in technology features but in the quality of the human and institutional relationship with technology.

For banking institutions in Lao PDR and comparable developing economies, this conclusion argues for a strategic reorientation that many will find uncomfortable: away from technology investment as the primary lever of digital transformation and toward organizational culture, human capital development, and infrastructure reliability as the foundations on which technology investment can deliver its potential. This does not mean reducing technology investment. It means ensuring that technology investment is accompanied by the organizational and human investments that determine whether the technology deployed actually produces the transformation intended.

For policymakers, the conclusion is equally direct. The national digital economy goal of expanding the digital economy to 10 percent of GDP by 2040 will not be achieved through banking sector technology mandates alone. It requires national infrastructure investment, regulatory reform, cybersecurity framework development, and human capital development across the educational and professional training system. These are complex, long-horizon policy challenges, but the behavioral evidence assembled across this dissertation makes clear that they are the binding constraints on the transformation that the national strategy envisions.

For the international scholarly community, this dissertation offers a specific and practically grounded argument for the theoretical adaptation rather than the mechanical application of technology acceptance frameworks in developing economy research. The standard models were built on assumptions of voluntarism, infrastructure sufficiency, and institutional stability that do not hold in the contexts where the digital banking transformation challenge is most acute. Adapting those models to account for mandatory adoption dynamics, infrastructure constraints, and institutional pressures is not merely an empirical refinement but a theoretical necessity, and the

constructs and frameworks developed in this dissertation offer one productive path toward that adaptation.

Digital banking transformation in developing economies is, at its heart, a story about whether the promise of technology can be made real for the people it is intended to serve. That promise requires not only the deployment of capable technologies but the building of the human, organizational, and institutional conditions that allow those technologies to be used confidently, reliably, and sustainably by all stakeholders at every level of the financial system. This dissertation has sought to contribute, through rigorous multi-level empirical investigation, to the understanding of what those conditions are and how they can be built.

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Appendixes

Appendix 1. Questionnaire for Bank Employees

Section 1: General Information

Please choose the most relevant answer for each question.

1. What is your age (specify in year):

   ……

2. Gender:
   - Male
   - Female
   - Other
3. What is your highest education?
   - No formal education
   - Bachelor's degree
   - Master's degree
   - Doctorate or higher
   - Other (please specify): ……..
4. What is your current role in the bank?
   - IT/Technology
   - Customer service
   - Operations/bank office
   - Marketing/Sales
   - Risk & Compliance
   - Finance & Accounting
   - Management/Leadership
   - Other (specify): …….
5. How long have you been working in the banking industry?

   ……

Section 2: Awareness and perceptions of digital transformation

Please choose the most relevant answer for each question.

6. How would you describe your bank's current progress in digital transformation?
   - Very advanced – we are fully digital and always adopting new innovations.
   - Moderately advanced – We use digital banking tools but still rely on traditional methods.
   - Still developing – We are implementing digital solutions, but adoption is slow.
   - Limited – Our bank still heavily relies on manual/traditional processes.
7. What do you think are the biggest barriers to digital transformation in banking? (Select all that apply.)
   - Resistance from employees

- Security & fraud concerns
- High costs & budget limitations
- Regulatory and legal challenges
- Organizational culture and readiness
- Other (specify): …….

8. What challenges have you faced while using digital banking? (Select all that apply.)
   - Difficulty in using digital banking tools
   - Lack of proper training or support.
   - Technical issues (e.g., system errors, downtime).
   - Security and fraud concerns.
   - Customer resistance or low adoption.
   - Regulatory and compliance restrictions.
   - Other (specify): …….
9. What concerns do you have about digital banking? (Select all that apply.)
   - Data privacy and security risks.
   - Job displacement due to automation.
   - Complexity of new technologies.
   - Reliability of digital banking systems.
   - Resistance to change within the organization.
   - Other (specify): …….

Section 3: UTAUT Constructs

Please indicate the extent to which you agree with the following statements. *(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)*

Constructs		**1**	**2**	**3**	**4**	**5**
Performance Expectancy (PE)	The speed of digital banking technology improves my work efficiency.					
	The accuracy of digital banking tools enhances decision-making in my role.					
	The variety of features offered by the technology supports various aspects of my job.					
	Digital training improves my ability to perform tasks more efficiently using digital banking tools					
Effort Expectancy (EE)	The bank's digital tools are user-friendly and require minimal training.					
	The bank provides clear guidance on how to effectively use digital banking tools.					
	Digital banking tools can be easily integrated into my daily work processes without significant difficulty.					

Social Influence (SI)	My colleagues believe digital banking tools improve work efficiency.					
	My managers expect employees to integrate digital banking tools into daily operations.					
	Employees receive sufficient support to use digital banking tools effectively					
	The organizational culture emphasizes digital competency as an essential requirement for employee growth					
Facilitating Conditions (FC)	The bank provides adequate technical support when employees encounter issues.					
	Regular training sessions help employees develop the necessary digital skills.					
	The IT infrastructure at my bank ensures smooth operation of digital banking services.					
	My colleagues possess strong digital skills, which facilitate the adoption of banking technologies.					
Regulatory Influence (RI)	Government regulations require banks to comply with specific digital security standards.					
	Compliance policies set by the bank influence how employees use digital banking tools.					
	Strict regulations make it difficult for banks to implement digital banking innovations.					
	A lack of clear digital banking regulations creates uncertainty about adoption strategies.					
Organizational Culture (OC)	My bank actively promotes digital transformation and provides the necessary resources.					
	A clear vision for digital transformation within my department helps bank employees adapt to new technologies.					
	Employees in my bank possess the required digital skills and are capable of implementing digital transformation effectively					
	Departments and units within my bank support and facilitate digital transformation initiatives					

	Departments across the bank collaborate effectively to build the capabilities needed for digital transformation					
Perceived Security Risk (PR)	Concerns about cybersecurity risks discourage employees from fully utilizing digital banking tools.					
	My bank has clear policies and protocols to mitigate security risks in digital transactions.					
	Employees are trained to recognize and respond to potential security threats in digital banking tools.					
Digital Engagement (DE)	I intend to continue using digital financial technologies in my daily work.					
	I will recommend digital financial technologies to my colleagues.					
	I feel confident that I will continue using digital financial tools in the future.					
Digital Transformation Adoption (DA)	I actively seek out new digital banking tools and services to improve work efficiency.					
	I am willing to adapt to new digital banking technologies introduced by my organization.					
	I believe digital transformation is essential for the long-term success of the banking sector.					

Section 4: Open-Ended Feedback

Please provide your thoughts in the spaces provided.

1. What feature of digital banking do you find most valuable for your work?
2. What challenges have you faced while integrating digital banking tools into your workflow?
3. What training or support would help you use digital banking tools more effectively?
4. What improvements would you suggest for better adoption of digital transformation in your workplace?

Appendix 2. Questionnaire for Bank Customers

Section 1: Demographics

Please choose the most relevant answer for each question.

1. What is your age (specify in year):

   ……

2. Gender:
   - Male
   - Female
   - Other
3. What is your highest education?
   - No formal education
   - Bachelor's degree
   - Master's degree
   - Doctorate or higher
   - Other (specify): ……
4. Employment Status:
   - Student
   - Employed
   - Self-employed
   - Unemployed
   - Retired
5. How often do you use digital financial services in a week (e.g., mobile banking, e-wallets, online transactions)?
   - Never
   - 1-2 times
   - 3-5 times
   - 6-10 times
   - More than 10 times
   - Almost/every day
6. What types of digital financial services do you use most often?
   - Mobile banking apps
   - E-wallets
   - Online banking (via desktop or web browser)
   - QR code payments
   - Other (specify): _____:

Section 2: awareness and perceptions of digital transformation

Please choose the most relevant answer for each question.

7. How familiar are you with advanced banking technologies such as AI-driven analytics, blockchain, and open banking frameworks?
    - Very familiar
    - Somewhat familiar
    - Not very familiar
    - Not familiar at all
8. What do you think are the biggest barriers to digital transformation in banking? (Select all that apply.)
    - Resistance from customers
    - High costs and budget limitations
    - Security and fraud concerns
    - Lack of clear regulations and consumer protections
    - Difficulties in understanding or using new technologies
    - Lack of internet access/reliable network
    - Other (please specify): ……..

Section 3: Constructs Based on UTAUT2

Please indicate the extent to which you agree with the following statements. *(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)*

Constructs		1	2	3	4	5
Performance Expectancy (PE)	The speed of digital banking services allows me to complete transactions efficiently.					
	The accuracy of digital banking transactions improves my financial management.					
	The variety of features in digital banking (e.g., bill payment, fund transfers) supports my financial needs.					
Effort Expectancy (EE)	The interface of digital banking applications is intuitive and easy to navigate.					
	Digital banking services provide clear instructions that simplify usage.					
	The learning process for digital banking services is quick and straightforward.					
Social Influence (SI)	My family members influence my decision to use digital banking services.					
	My friends or colleagues encourage me to use digital banking services.					
	The bank actively promotes digital banking usage through advertisements or incentives.					
Facilitating Conditions (FC)	I have a reliable internet connection and necessary devices to access digital banking.					
	The bank provides adequate customer support when I encounter issues with digital banking.					
	The security measures provided by the bank ensure safe digital transactions.					
Hedonic Motivation (HM)	Using digital banking services makes financial management more enjoyable.					
	The innovative features of digital banking make the experience engaging.					
	I feel a sense of satisfaction when using digital banking services.					
Price Value (PV)	The cost of using digital banking services is justified by its convenience.					
	Free or low-cost transactions encourage me to use digital banking.					
	Digital banking services provide better value compared to traditional banking.					
Habit (HA)	I instinctively choose digital banking over traditional banking methods.					
	Using digital banking has become a routine part of my financial activities.					
	I feel uncomfortable managing my finances without digital banking services.					
Behavioral Intention (BI)	I intend to continue using digital banking services in the future.					
	I will encourage others to adopt digital banking services.					
	I prefer digital banking over in-person banking for most transactions.					
Digital Transformation Adoption (DA)	I actively seek out new digital banking tools and services to improve my financial management.					
	I am willing to adapt to new digital banking technologies introduced by financial institutions.					
	I believe digital transformation is essential for the long-term success of banking services.					

Section 3: Open-Ended Feedback

Please provide your thoughts in the spaces provided.

1. What features of digital banking do you find most valuable?
2. What challenges have you faced while using digital banking services?
3. What improvements would you like to see in digital banking services?
4. What concerns do you have about security when using digital banking?
5. What additional features would encourage you to use digital banking more frequently?