

MINISTRY OF FINANCE
UNIVERSITY OF FINANCE – MARKETIN

BUI THI TO LOAN

**DIGITAL TECHNOLOGY ADOPTION AND THE
COMPETITIVENESS OF LOGISTICS SERVICE
PROVIDERS IN VIETNAM: THE MEDIATING
ROLES OF AGILE MANAGEMENT AND VALUE
CREATION SERVICE**

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DOCTORAL THESIS SUMMARY

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CHAPTER 1. INTRODUCTION

1.1. Research Background and Significance

1.1.1. Practical Context

In the context of digital transformation and the Fourth Industrial Revolution, the logistics industry is facing increasing pressure to enhance competitiveness through the adoption of digital technologies. In Vietnam, despite the rapid growth of the logistics service sector, most logistics service providers (LSPs) remain small and medium-sized enterprises with limited technological capabilities and system integration capacity. In practice, although many firms have invested in digital technologies, these investments have not yet been effectively transformed into competitiveness.

1.1.2. Academic context

Previous studies have primarily considered digital technology as a strategic resource that directly influences firms' operational performance or competitiveness. However, the mechanism through which digital technology adoption is transformed into competitiveness via organizational and service capabilities has not been sufficiently clarified, particularly in the context of logistics firms operating in developing economies such as Vietnam.

1.2. Research issue

1.2.1. Review of Related Studies

The literature review was conducted in two stages, including bibliometric analysis and a systematic literature review. In the first stage, bibliometric analysis techniques were employed using Biblioshiny software within the Bibliometrix package in R to identify research trends, knowledge structures, and major themes related to

digital technology adoption, dynamic capabilities, and competitiveness in the logistics sector.

Subsequently, a systematic literature review was conducted following the PRISMA framework, covering 95 studies selected from reputable academic databases. The review focused on theoretical approaches, research model structures, and the relationships among variables within the context of digital transformation in logistics.

1.2.2. Synthesis of Theories and Relationships Among Research Variables

The review findings indicate that previous studies have predominantly approached digital technology adoption through the TOE framework or Dynamic Capability Theory (DCT) to explain firms' adaptability and resource reconfiguration capabilities. Existing studies have also reported significant relationships among digital technology adoption, Agile Management (AM), Value Creation Service (VCS), and competitiveness. However, these relationships have largely been examined separately and have not yet been integrated into a process-based mechanism explaining how logistics firms transform digital technology into sustainable competitiveness. Moreover, the boundary role of Employee Autonomy (EA) and the differences associated with firm size have not been comprehensively examined in the context of logistics firms in Vietnam.

In addition, although the TOE framework and DCT have been widely adopted in digital transformation research, these two theoretical perspectives have generally been applied independently. The mediating roles of AM and VCS, as well as the boundary conditions related to Employee Autonomy and firm size, therefore remain insufficiently explored in the Vietnamese logistics context.

1.3. Gap of research

1.3.1. Theoretical gaps in TOE integration

Current studies have primarily employed the TOE framework to identify and categorize factors influencing technology adoption at the organizational level, without adequately linking these factors to the operational mechanisms of DCT.

Specifically, technological, organizational, and environmental factors are commonly treated as independent antecedent conditions rather than being conceptualized as enablers of the micro-foundations of dynamic capabilities, including sensing, seizing, and reconfiguring

1.3.2. Gap in metabolic mechanisms

Previous studies examining the mediating mechanisms between technology and business outcomes have primarily focused on infrastructure-related capabilities, such as information technology capability, digital innovation capability, or digital transformation maturity. However, these studies have not sufficiently clarified the operational mechanisms through which technology is transformed into market-oriented competitiveness.

In the context of logistics service providers (LSPs), prior research has highlighted the importance of execution-oriented capabilities, such as AM and VCS, in enabling firms to adapt to environmental changes and enhance customer service performance. Nevertheless, these capabilities have often been examined separately as either independent or outcome variables, rather than being systematically conceptualized and validated as mediating mechanisms linking technology and competitiveness.

Accordingly, a significant research gap remains regarding the operationalization of process-based mediating mechanisms that explain how technology is transformed into value through dynamic capabilities. Based on this perspective, the dissertation proposes AM and VCS as

two operational mediating mechanisms corresponding to the core processes of DCT, including sensing, seizing, and reconfiguring. These mechanisms provide a clearer explanation of how competitiveness is developed within logistics firms.

1.3.3. Gap in Theoretical Integration and Model Validation

Although previous studies have separately addressed the TOE framework, DCT, and competitiveness, there remains a lack of an integrated theoretical framework capable of fully connecting these elements within a unified structure. Existing studies have either focused on the direct relationship between technology and operational performance or examined dynamic capabilities independently, without adequately explaining the transformation process through which technological, organizational, and environmental conditions are translated into competitive outcomes via specific operational mechanisms.

This research gap highlights the need for the development of an integrated mechanism-based framework, in which:

- (1) Adoption of Digital Technology (ADT) is not merely considered an outcome of technological, organizational, and environmental conditions, but is re-conceptualized as an enabler of the micro-foundations of dynamic capabilities, including sensing associated with environmental conditions, seizing associated with organizational capabilities, and reconfiguring associated with technological transformation.
- (2) Dynamic capabilities are operationalized at both the process and service levels, where AM represents process-level dynamic capability, while VCS reflects value realization at the service level.
- (3) Logistics Service Providers' Competitiveness (LCOM) is viewed as a strategic outcome that reflects firms' ability to sustain and renew long-term competitiveness in highly dynamic environments.

1.4. Research Questions

- (1) How does the relationship between ADT and Logistics Service Providers' Competitiveness (LCOM) operate in the context of logistics firms in Vietnam?
- (2) Within this relationship, does ADT directly affect LCOM, or are there other conditions and mechanisms that explain this relationship?
- (3) What managerial implications can be derived from investigating this issue to enhance the competitiveness of logistics firms in the context of digital transformation.

1.5. Research Objective

1.5.1. General Research Objective

Based on the practical challenges faced by logistics service providers (LSPs) in Vietnam during the digital transformation process, together with the existing research gaps in explaining the mechanism through which competitiveness is developed from ADT, this study aims to analyze and validate the mechanism by which ADT influences Logistics Service Providers' Competitiveness (LCOM) through the mediating roles of AM and VCS, under the moderating effect of Employee Autonomy (EA).

1.5.2. Specific research objectives

This study pursues the following specific objectives:

- (1) To analyze and validate the relationship between ADT and LCOM in the context of logistics service providers (LSPs) in Vietnam facing increasing digital transformation pressures
- (2) To examine the direct and indirect effects of ADT on LCOM through the mediating roles of AM and VCS, while also investigating the moderating effect of EA on competitiveness.
- (3) To analyze the differences in the transmission mechanism among ADT, AM, VCS, and LCOM across different groups of logistics firms based on firm size using Multi-Group Analysis

(MGA), thereby clarifying the competitiveness development characteristics of small and medium-sized enterprises (SMEs). Based on the research findings, the study proposes managerial implications tailored to different groups of logistics firms in order to promote digital technology adoption and enhance LCOM in the context of service digital transformation.

1.6. The research subject and scope

1.6.1. Subject research

The research subject of this dissertation is the process and mechanism through which ADT is transformed into LCOM in Vietnam within the context of digital adoption

1.6.2. Scope of research

a. Scope of Content

This study focuses on examining the mechanism through which ADT influences LCOM, both directly and indirectly through two mediating variables: AM and VCS. In addition, the study investigates the moderating effect of EA on the relationship between AM and LCOM.

b. Geographical Scope

The survey subjects consist of logistics service providers (LSPs) operating within the territory of Vietnam, including both domestic enterprises and foreign-invested firms.

c. Time Scope

The study was conducted during the period from 2024 to 2026, including: (1) the stage of theoretical review, model development, and research design in 2024; (2) the stage of data collection, processing, and analysis during the second and third quarters of 2025; and (3) the stage of dissertation completion and managerial implication development from the second quarter of 2026 onward.

1.7. Contributions of the Dissertation

1.7.1. Theoretical Contributions

First, this study contributes to extending DCT within the context of digital transformation efforts among logistics service providers (LSPs) by clarifying the transformation mechanism through which technological capability is translated into competitiveness. Specifically, the study repositions ADT as a foundational capability that activates the micro-foundations of dynamic capabilities within the DCT framework.

Based on this perspective, the dissertation establishes a multi-layer transformation mechanism in which AM is conceptualized as a process-level dynamic capability, reflecting firms' ability to reconfigure and coordinate operational activities in dynamic environments. Subsequently, VCS is viewed as a service-level value realization mechanism through which operational improvements are transformed into customer-perceived value and market competitiveness. In addition, the study extends the role of EA by conceptualizing it as an organizational enabler that strengthens the effectiveness of dynamic capabilities at the process level.

1.7.2. Empirical Contributions

From an empirical perspective, the research findings support the integrated model in explaining how technological capability is transformed into competitiveness through mediating mechanisms at both the process and service levels. The results confirm that the impact of digital technology does not occur through a simple direct relationship, but rather through a structured causal process in which AM and VCS function as bridging mechanisms between the technological foundation and Logistics Service Providers' Competitiveness (LCOM).

CHAPTER 2. LITERATURE

2.1. Theoretical foundation

2.1.1. Dynamic Capability Theory (DCT)

Dynamic Capability Theory (DCT) provides an appropriate theoretical lens for explaining this mechanism through three micro-foundations: sensing, seizing, and reconfiguring, which enable firms to continuously adapt and restructure their resources in dynamic environments (Teece, 2007).

2.1.2. Technology–Organization–Environment Framework (TOE Framework)

This dissertation adopts the TOE framework from a more integrative perspective. Specifically, TOE is not only used to structure the higher-order construct of Adoption of Digital Technology (ADT), but is also linked to the micro-foundations of DCT. In particular, environmental factors such as competitive pressure and trading partner pressure support firms in sensing market opportunities and external pressures; organizational factors such as top management support facilitate the seizing process through resource allocation and strategic decision-making; while technological factors such as relative advantage and compatibility enable the transformation and reconfiguration of operational processes and systems

2.2. Conceptualization of constructs

2.2.1. Digital Technology Adoption (ADT)

In this study, ADT is conceptualized as a foundational digital capability that reflects a firm's ability to adopt, integrate, and exploit digital technologies across technological, organizational, and environmental dimensions. The TOE framework is employed as a structural framework to organize the components of this capability rather than as a direct explanatory model of relationships among variables.

More importantly, this study argues that the TOE dimensions not only represent conditions for technology adoption, but also correspond to the micro-foundations of dynamic capabilities. Specifically, environmental factors such as competitive pressure and trading partner pressure facilitate the sensing process by enabling firms to identify market opportunities and external pressures. Organizational factors, such as top management support, facilitate the seizing process through decision-making and resource mobilization. Meanwhile, technological factors, including relative advantage and compatibility, enable firms to transform and reconfigure operational processes and systems (Teece, 2007; Vo Thai et al., 2024).

Accordingly, ADT is defined as a foundational organizational capability that reflects a firm's ability to adopt, integrate, and exploit digital technologies across technological, organizational, and environmental dimensions in order to improve operational performance, activate dynamic capability mechanisms, create service value, and enhance competitiveness.

(1) Relative Advantage (RA)

Relative Advantage (RA) reflects the extent to which digital technology is perceived by firms as providing significant improvements in operational efficiency, productivity, organizational image, and business performance compared with existing solutions (Rogers, 1995; Nguyen et al., 2022; Liu & Cao, 2022).

From the perspective of DCT, RA primarily activates the sensing process, through which firms recognize opportunities to improve service performance and competitiveness via technology adoption. Therefore, RA reflects a firm's capability to perceive technological value at both operational and market levels.

(2) Compatibility (COM)

Compatibility (COM) reflects the extent to which digital technology aligns with a firm's operational processes, existing systems, organizational culture, and working practices (Rogers, 2003; Peng et al., 2012; Liu & Cao, 2022).

From the DCT perspective, COM supports the transforming process, in which firms reconfigure operational processes, systems, and practices to exploit technology without causing operational disruptions. Therefore, COM reflects the firm's capability to integrate and synchronize technology within the organization.

(3) Top Management Support (TMS)

Top Management Support (TMS) reflects the degree of strategic commitment by senior management in directing, participating in, and accepting risks associated with digital technology implementation (Tornatzky & Fleischer, 1990; Ghobakhloo & Ching, 2019; Gangwar et al., 2015).

In this study, TMS is conceptualized as a component of ADT, representing the firm's capability to mobilize and coordinate strategic resources for technology implementation. From the DCT perspective, TMS primarily supports the seizing process, in which firms make investment decisions, establish strategic priorities, and organize technology deployment. Therefore, TMS reflects the firm's capability for strategic coordination and commitment in digital transformation.

(4) Competitive Pressure (CP)

Competitive Pressure (CP) is not viewed merely as an external force directly influencing firms, but rather as a component of ADT that reflects a firm's capability to recognize and respond to competitive pressures in digitalized business environments.

From the DCT perspective, CP activates the sensing process by enabling firms to recognize threats to competitive advantage and the

need for innovation. Therefore, CP reflects a firm's capability to perceive competitive signals from the external environment.

(5) Trading Partner Pressure (TPP)

Trading Partner Pressure (TPP) reflects the extent to which firms are required to comply with technological standards when connecting and collaborating with business partners, thereby representing technical and operational pressures within inter-organizational digital environments. From the DCT perspective, TPP supports both the sensing process, through recognizing inter-organizational integration requirements, and the seizing process, through implementing appropriate technological solutions to satisfy partner standards and operational expectations.

2.2.2. *Agile Management – Logistics, AM*

AM in logistics is defined as the capability of logistics firms to promptly recognize environmental changes, coordinate and process information with relevant stakeholders, and flexibly adjust operational activities in order to respond rapidly to customer requirements and market fluctuation

2.2.3. *Value Creation Service (VCS)*

VCS is defined as the capability of LSPs to transform operational and technological capabilities into customer-perceived service value through reliability, speed, transparency, responsiveness, and related service attributes during the logistics service delivery process.

2.2.4. *Logistics Service Providers' Competitiveness (LCOM)*

LCOM is defined as the capability of firms to continuously create, sustain, and reconfigure competitive advantages through the realization of service value, thereby reinforcing market position and expanding business opportunities in dynamic and digitalized environments.

2.2.5. *Employee Autonomy (EA)*

EA is defined as the extent to which employees in logistics firms possess the authority and capability to make independent, flexible, and responsible decisions in the execution of their tasks in order to effectively implement operational improvements and adapt to service requirements in digitalized environment

2.3. Integrated theoretical framework

Based on DCT, this study proposes a process-based theoretical framework to explain how LSPs transform ADT into LCOM in dynamic environments.

(1) ADT as an Enabler of DCT Micro-Foundations

In this dissertation, ADT is conceptualized as a foundational digital capability structured according to the TOE framework, including technological factors (relative advantage and compatibility), organizational factors (top management support), and environmental factors (competitive pressure and trading partner pressure).

(2) Process-based dynamic capability: Agile Management – Logistics, AM)

Building upon ADT, firms develop AM, which is conceptualized as a process-based dynamic capability. In this context, AM reflects a firm's ability to continuously adjust, innovate, and reconfigure operational processes in order to adapt to changes and uncertainties in the business environment.(Teece, 2007).

(3) Service-level value realization mechanism: Value Creation Service – VCS)

VCS reflects the way operational improvements are transformed into service reliability, delivery speed, information transparency, responsiveness, and related customer-perceived benefits. It therefore functions as a bridge between internal capabilities and market value,

enabling firms to convert operational effectiveness into tangible value for customers.

(4) Market- and strategic-level outcome: Logistics Competitiveness – LCOM)

At the final level, LCOM is positioned as a market- and strategic-level outcome, reflecting a firm's capability to generate service value from operational activities, transform value-creating services into competitive advantage, and sustain as well as renew such advantages in dynamic environments.

Accordingly, competitiveness is not viewed as a static state of competitive advantage, but rather as a dynamic competitiveness capability that reflects a firm's ability to maintain a superior market position over time.

(5) Multi-layer mediation with controlled direct effects

The proposed theoretical framework suggests a multi-layer mediation mechanism in which AM mediates the relationship between ADT and VCS, while VCS subsequently mediates the relationship between AM and LCOM. Accordingly, this forms a transformation chain of $ADT \rightarrow AM \rightarrow VCS \rightarrow LCOM$.

Nevertheless, the study also acknowledges that part of the value may be generated directly from digital technology adoption without fully passing through all mediating mechanisms. **(6)Organizational enabling condition: Employee Autonomy – EA)**

Within the proposed model, EA is assigned two roles:

Direct moderating role: EA moderates the relationship between AM and LCOM. Specifically, when EA is high, AM is more effectively transformed into competitive advantage; conversely, when EA is low, the effectiveness of AM is constrained.

Foundational enabling role: EA also influences the effectiveness of the overall transformation mechanism by accelerating decision-

making processes, enhancing the implementation of operational improvements, and reducing operational delays.

2.4. Research Hypotheses

H1: Adoption of Digital Technology (ADT) positively influences Agile Management (AM).

H2: Adoption of Digital Technology (ADT) positively influences Value Creation Service (VCS).

H3: Adoption of Digital Technology (ADT) positively influences Logistics Service Providers' Competitiveness (LCOM).

H4: Agile Management (AM) positively influences Logistics Service Providers' Competitiveness (LCOM).

H5: Value Creation Service (VCS) positively influences Logistics Service Providers' Competitiveness (LCOM).

H6: Agile Management (AM) positively influences Value Creation Service (VCS).

H7: Employee Autonomy (EA) moderates the relationship between Agile Management (AM) and Logistics Service Providers' Competitiveness (LCOM).

H8: Agile Management (AM) mediates the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM).

H9: Value Creation Service (VCS) mediates the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM).

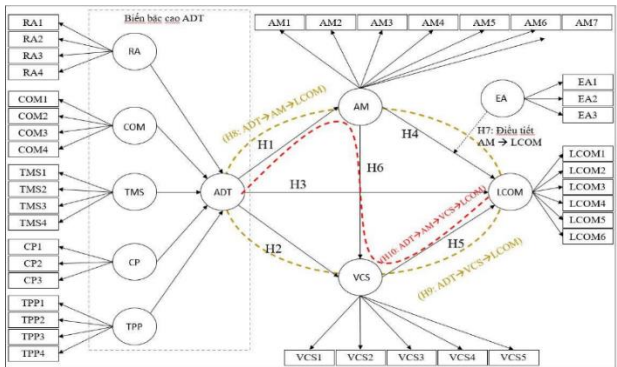
H10: Agile Management (AM) and Value Creation Service (VCS) sequentially mediate the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM)..

2.5. Research model

Based on the process-oriented dynamic capability framework established in the previous sections, this study develops a research model to operationalize the proposed concepts, relationships, and mechanisms into latent constructs and observed variables for quantitative analysis.

The mediating variables in the model include Agile Management (AM) and Value Creation Service (VCS), which respectively represent process-level mechanisms and service-level value realization mechanisms. The dependent variable, Logistics Service Providers' Competitiveness (LCOM), reflects firms' capability to sustain competitive advantage in dynamic environments. In addition, the model incorporates Employee Autonomy (EA) as a moderating variable to examine the role of organizational conditions in shaping the relationship between Agile Management and competitiveness.

Based on the proposed hypotheses, the research model includes both direct and indirect relationships among the constructs, in which ADT affects LCOM both directly and indirectly through AM and VCS, while the relationship between AM and LCOM is examined under the moderating influence of EA.



Hình 2.1. Research Model

CHAPTER 3. METHODOLOGY

3.1. Research Approach

This study is grounded in a post-positivist perspective, aiming to validate the theoretical model developed based on DCT and the TOE framework. From this perspective, research phenomena can be identified and empirically examined through conceptual constructs and hypothesized relationships, although measurements may still be influenced by contextual conditions and methodological limitations (Guba & Lincoln, 1994; Creswell & Creswell, 2018).

Specifically, the qualitative phase was conducted first to refine and validate the measurement scales, followed by the quantitative phase to test the research model and hypotheses using large-scale survey data (Creswell & Plano Clark, 2018)

3.2. Research Design

This study adopts a mixed-methods design, combining qualitative and quantitative approaches to ensure rigor in theory development, scale refinement, and research model validation. The research design was implemented through three sequential stages corresponding to the development, refinement, and empirical validation of the research model within the context of logistics firms in Vietnam.

In the first stage, qualitative research was conducted to develop the research model and refine the measurement scales through literature review and expert interviews. The second stage involved a pilot survey to preliminarily assess the reliability and appropriateness of the measurement scales. The third stage consisted of the official quantitative study conducted through a survey of logistics firms in Vietnam, with data analyzed using CB-SEM to test the research model and hypotheses.

3.2.1. Development of the Research Model

This stage aimed to identify research gaps, establish the theoretical framework, and develop the proposed research model. The process corresponded to the completion of the research proposal, literature review, and formulation of the research hypotheses. The study employed a combination of methods, including: (1) systematic literature review (Tranfield et al., 2003); (2) content analysis and theoretical synthesis (Creswell & Creswell, 2018); and (3) qualitative analysis to validate the logical relationships among the constructs within the research model (Eisenhardt, 1989; Gioia et al., 2013; Ridder, 2014)

3.2.2. Scale Refinement Through Qualitative Research

The qualitative research stage was subsequently conducted to validate the conceptual definitions and refine the measurement scales for the constructs in the research model following established scale development procedures (Churchill Jr., 1979; MacKenzie et al., 2011). The study involved eight experts, including scholars and logistics managers, to ensure multidimensional perspectives in the evaluation and refinement of the scales.

As a result, the measurement scales employed in the dissertation not only maintained their theoretical grounding from international studies but also reflected the operational context of logistics firms in Vietnam. This provided a solid foundation for the pilot survey and subsequent quantitative research stages.

3.2.3. Pilot Survey and Preliminary Scale Assessment

Prior to the official survey, a pilot test was conducted to evaluate the clarity of the questionnaire and preliminarily assess the reliability of the measurement scales. According to the recommendation of Hair et al. (2010), a sample size ranging from 50 to 100 observations is considered appropriate for preliminary reliability assessment using

Cronbach's Alpha. Based on this guideline, the study collected 80 survey responses from logistics service providers operating in Vietnam

3.2.4. Official Survey and Model Validation Stage

The official quantitative research stage was conducted to test the proposed research model and hypotheses. The study employed a cross-sectional survey design to collect data at a single point in time from logistics service providers operating in Vietnam. This research design is appropriate for examining the causal relationships among the constructs within the proposed model under the current operational context of logistics firm

3.3. Development and Refinement of Measurement Scales

3.3.1. Procedure for Scale Selection and Adaptation

The development and refinement of the measurement scales in this study followed established recommendations for scale development and adaptation (Churchill Jr., 1979; MacKenzie et al., 2011; DeVellis & Thorpe, 2021). The procedure consisted of four main steps: (1) reviewing and selecting original scales with clear theoretical foundations; (2) evaluating contextual relevance for logistics firms in Vietnam; (3) translating and adapting the scales according to standardized procedures (Beaton et al., 2000; World Health Organization, 2010); and (4) assessing content validity through expert interviews and participant verification (Lincoln & Guba, 1985).

3.3.2. Review of Measurement Scales Related to the Research Constructs

3.3.2.1. Dimensions Related to the TOE Framework

Based on the TOE framework and the findings from the qualitative study, the ADT construct in this dissertation consists of five dimensions: Relative Advantage (RA), Compatibility (COM), Top Management Support (TMS), Competitive Pressure (CP), and Trading Partner Pressure (TPP). Among these, the scales for RA, COM, and CP

were adapted from Liu and Cao (2022), while the scales for TMS and TPP were adopted from Gangwar et al. (2015). These measurement scales have been validated in previous studies and satisfy the reliability and validity requirements recommended by Hair et al. (2019)

3.3.2.2. Review of the Agile Management in Logistics (AM) Scale

For the Agile Management (AM) construct, the study by Coşkun and Erturgut (2025) was identified as the most appropriate source for scale adoption. This scale reflects firms' capabilities in rapid operational decision-making, flexible operational coordination, and adaptation to market fluctuations within the context of logistics service providers (LSPs), which is consistent with the process-oriented dynamic capability perspective adopted in the theoretical framework of this dissertation.

3.3.2.3. Value Creation Service (VCS)

Among the existing studies, the scale developed by Fernandes et al. (2018) was identified as the most appropriate for adoption. First, the conceptual content of the Logistics Service Quality (LSQ) scale is consistent with the concept of Value Creation Service (VCS), as its indicators reflect core capabilities such as communication, responsiveness, information reliability, and delivery accuracy, factors that directly create value for customers.

3.3.2.4. Employee Autonomy (EA)

For the Employee Autonomy (EA) construct, this study adopted the scale developed by Coşkun and Erturgut (2025). The scale reflects employees' capability to proactively make decisions and handle situations in highly dynamic logistics environments, which is consistent with the dynamic capability perspective adopted in this study.

In addition to its conceptual and contextual suitability for the logistics sector, the observed variables in the original study also

demonstrated satisfactory reliability and measurement validity according to CB-SEM standards (Hair et al., 2019)

3.3.2.5. Logistics Service Providers' Competitiveness (LCOM)

Within this context, the scale developed by Cardoso et al. (2023) was selected due to its high compatibility with the conceptual framework of this study. Specifically, competitiveness was approached as an outcome of digital technology adoption associated with operational performance, innovation capability, value creation, and adaptability in dynamic competitive environments, which is consistent with the conceptualization of LCOM developed in this dissertation.

3.3.3. Data and Scale Refinement Methods

3.3.3.1. Design of Qualitative Data Collection and Analysis

The scale refinement stage was conducted through semi-structured interviews, allowing in-depth exploration of issues from the perspectives of “why,” “how,” and “within the Vietnamese context” (Patton, 2002). In addition, the study employed the card sorting technique to support experts in evaluating and grouping the dimensions within the TOE framework according to their practical relevance (Spencer et al., 2003).

Following the interviews, the qualitative data were analyzed using open coding and axial coding procedures to develop themes through thematic analysis, following the guidelines of Braun and Clarke (2006). The identified themes and observed variables were then assessed for their suitability to be retained in the content analysis and subsequent scale refinement process

3.3.3.2. Expert Selection Method and Number of Experts

The number of experts was determined based on the principle of data saturation, meaning that data collection was concluded when no substantially new information emerged and responses began to repeat across interviews (Malterud et al., 2016).

The study employed purposive sampling, focusing on information-rich informants with extensive knowledge and direct experience in logistics management and operations (Creswell & Poth, 2018; Patton, 2002; Guest et al., 2013). The expert group included frontline operational managers, middle managers involved in digital solution implementation, business owners, and senior executives at logistics service providers (LSPs)

The diversity of positions and professional experience among the experts contributed to capturing multidimensional perspectives regarding the practical suitability of the measurement scales within the Vietnamese logistics industry context.

3.3.3.3. Adoption, Translation, and Localization of Measurement Scales

Most of the original measurement scales were developed within international contexts. Therefore, direct translation may lead to semantic inconsistencies or fail to accurately reflect the operational realities of Vietnamese third-party logistics (3PL) firms, which are predominantly small and medium-sized enterprises (SMEs)

3.3.4. Results of Scale Refinement

The qualitative research results indicate that the measurement scales adopted from international studies were generally appropriate for the context of Vietnamese logistics firms; however, several adjustments were necessary regarding wording and contextual relevance. The experts confirmed that the five research constructs adequately reflected issues related to logistics operations and digital transformation, while also suggesting revisions to improve clarity, reduce overlap, and better align the scales with industry practices.

Following the review and refinement process, the final measurement scale consisted of 40 observed variables across five research constructs: Adoption of Digital Technology (ADT), Agile

Management (AM), Value Creation Service (VCS), Employee Autonomy (EA), and Logistics Service Providers' Competitiveness (LCOM)

3.4. Research Sample and Data Collection

3.4.1. Research Population and Sampling Method

The research population consists of all logistics service providers (LSPs) operating throughout Vietnam. Previous studies on the national logistics system in Vietnam indicate that logistics activities are not evenly distributed across regions but tend to concentrate within major economic corridors and logistics hubs where infrastructure, enterprises, and trade connectivity are highly developed (Banomyong et al., 2015). Among these regions, Southern Vietnam, particularly Ho Chi Minh City and its neighboring provinces, plays a central role, accounting for a substantial proportion of the country's cargo flow and logistics activities.

3.4.2. Data Collection

Data were collected from May to November 2025 through two methods: online surveys using Google Forms and paper-based questionnaires. Completed questionnaires were returned either electronically or collected directly. A total of 450 questionnaires were distributed, of which 402 valid responses were obtained, corresponding to a response rate of 89.3%.

3.4.3. Sample Size and Statistical Power

The adequacy of the sample size was confirmed based on the requirements of CB-SEM and statistical power analysis using G*Power software (Faul et al., 2009), conducted with the following parameters: significance level (α) = 0.05, statistical power = 0.95, and medium effect size = 0.15.

3.5. Quantitative Analysis

3.5.1. Descriptive Analysis and Data Screening

Before conducting advanced analyses, the collected data were screened and cleaned to ensure validity and reliability.

3.5.2. Reliability Assessment of Measurement Scales Using the Official Sample

After data screening, the internal consistency of the measurement scales was assessed using Cronbach's Alpha to examine the consistency among observed variables within the same construct (Nunnally & Bernstein, 1994; Hair et al., 2010).

3.5.3. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was conducted to examine the initial factor structure of the measurement scales within the context of logistics service providers (LSPs) in Vietnam, while also assessing convergent and discriminant validity prior to performing Confirmatory Factor Analysis (CFA).

3.5.4. Measurement Model Assessment (CFA)

In this dissertation, first-order CFA was conducted using CB-SEM to evaluate the fit of the measurement model and the quality of the latent constructs. Model fit was assessed based on the following criteria: χ^2/df (≤ 3), CFI and TLI (≥ 0.90), and RMSEA and SRMR (≤ 0.08) (Hu & Bentler, 1999; Kline, 2023).

For higher-order constructs, second-order CFA was employed to validate the multidimensional structure. The first-order constructs were required to satisfy CFA criteria before being incorporated into the second-order model. Convergent validity was evaluated through standardized factor loadings and the statistical significance of the relationships

Finally, the overall measurement model was reassessed based on model fit, reliability, convergent validity, and discriminant validity criteria.

Only after these conditions were satisfied were the higher-order constructs included in the SEM analysis.

3.5.5. Structural Model Assessment (CB-SEM)

After confirming the measurement model, the structural model was tested using CB-SEM to examine the causal relationships among the research constructs. For models involving higher-order constructs and moderating effects, the study adopted the two-step procedure recommended by Anderson and Gerbing (1988) and Hair et al. (2019). Specifically, the first step estimated the baseline model (without the moderating variable) to test the direct relationships, while the second step incorporated the interaction variable into the model to evaluate the moderating effect.

3.5.6. Testing the Mediating Roles of Variables in the Structural Model

In this study, mediation effects were assessed based on the significance of indirect effects. A mediating effect was confirmed when the confidence interval did not include zero. In addition, the type of mediation (full or partial mediation) was determined based on the combination of the significance of both direct and indirect paths, following the guidelines of Hair et al. (2019). Specifically, the study tested three major mediation mechanisms within the model:

- H8: Agile Management (AM) mediates the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM): $ADT \rightarrow AM \rightarrow LCOM$.
- H9: Value Creation Service (VCS) mediates the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM): $ADT \rightarrow VCS \rightarrow LCOM$.
- H10: Agile Management (AM) and Value Creation Service (VCS) sequentially mediate the relationship between Adoption of Digital Technology (ADT) and Logistics Service Providers' Competitiveness (LCOM): $ADT \rightarrow AM \rightarrow VCS \rightarrow LCOM$.

3.5.7. Multi-Group Analysis (MGA)

Multi-Group Analysis (MGA) was conducted within the CB-SEM framework to examine differences in structural coefficients across groups of firms categorized by enterprise size.

3.5.8. Common Method Bias (CMB)

Common Method Bias (CMB) was assessed to examine the potential influence of measurement method bias arising from the use of self-reported data collected from a single source.

CHAPTER 4. RESULTS AND DISCUSSION

4.1. Characteristics of the Survey Sample

The research sample was collected from logistics service providers (LSPs) operating in Vietnam, with the majority located in the Southern region. The descriptive statistics indicate that the sample exhibited diversity in terms of firm type, enterprise size, years of operation, and respondents' job positions. The participating firms included small, medium-sized, and large enterprises, thereby providing a relatively comprehensive representation of the characteristics of the logistics industry in Vietnam. Most respondents held managerial positions or possessed experience in logistics operations and digital transformation, thereby contributing to the reliability and representativeness of the research data.

4.2. Data Analysis Results

The reliability testing results indicate that all measurement scales in the research model satisfied the recommended thresholds for Cronbach's Alpha and item-total correlation coefficients. Inappropriate observed variables were removed to ensure the internal consistency of the scales. These findings confirm that the measurement scales achieved satisfactory reliability and were suitable for subsequent analyses.

4.3. Exploratory Factor Analysis – EFA

The EFA results indicate that the observed variables converged appropriately into the proposed theoretical factors. The KMO and Bartlett's Test results satisfied the recommended thresholds, confirming the suitability of the data for factor analysis. In addition, the total variance explained reached an acceptable level, and all factor loadings exceeded the recommended threshold, thereby confirming the preliminary convergent and discriminant validity of the measurement scales.

4.4. Confirmatory Factor Analysis (CFA)

The CFA results indicate that the measurement model achieved a good fit with the empirical data, as all model fit indices satisfied the recommended thresholds. The standardized factor loadings of the observed variables were statistically significant and reached acceptable values.

4.5. SEM results

4.5.1. Structural Model Assessment (SEM) Without the Moderating Variable

SEM analysis was employed to simultaneously examine the direct and indirect relationships among Adoption of Digital Technology (ADT), the mediating mechanisms including Agile Management (AM) and Value Creation Service (VCS), and the outcome variable, Logistics Service Providers' Competitiveness (LCOM).

The overall SEM results demonstrate that the model achieved an excellent fit with the empirical data. Notably, the Chi-square test was not statistically significant ($p = 0.292 > 0.05$), indicating that the model was not rejected, which is relatively uncommon in SEM studies with large sample sizes. In addition, the CFI, TLI, and RMSEA indices all exceeded the recommended thresholds, further confirming the strong goodness-of-fit of the proposed model (Appendix Table PL4.12, Chapter 4 Appendix).

4.5.2. Moderating Role of Employee Autonomy (EA)

The regression results indicate that the interaction term INT (ZAM $\times$ ZEA) was not statistically significant ($\beta = -0.013$; $p = 0.771$), suggesting that Employee Autonomy (EA) does not moderate the relationship between Agile Management (AM) and Logistics Service Providers' Competitiveness (LCOM).

However, both Agile Management (AM) ($\beta = 0.417$; $p < 0.001$) and Employee Autonomy (EA) ($\beta = 0.253$; $p < 0.001$) demonstrated significant and independent direct effects on LCOM

4.5.3. General Conclusion of the CB-SEM Analysis

The CB-SEM analysis results indicate that the theoretical model achieved a very good fit with the survey data, as all model evaluation indices exceeded the recommended thresholds. In addition, all hypotheses from H1 to H6 were statistically supported at a high significance level ($p < 0.001$), thereby reinforcing the suitability of the proposed theoretical framework.

4.5.4. Multi-Group Analysis (MGA)

The MGA results indicate that the impact of Adoption of Digital Technology (ADT) on Agile Management (AM) remained strong and stable across all three groups of firms ($\beta = 0.40\text{--}0.50$; $p < 0.001$), highlighting the foundational role of digital technology in enhancing organizational agility

However, the value creation mechanism differed according to firm size. In small and medium-sized enterprises (SMEs), ADT exerted a stronger effect on Value Creation Service (VCS), suggesting that these firms rely more heavily on technology to improve service quality. In contrast, among large enterprises, Agile Management (AM) emerged as the most influential factor affecting VCS ($\beta = 0.419$; $p < 0.001$), reflecting the increasingly important role of operational agility in transforming technology into service value.

4.5.5. Common Method Bias (CMB) Assessment

The results indicate that the differences between the standardized factor loadings and structural path coefficients across the two models were minimal ($\Delta < 0.05$), which is substantially lower than the recommended threshold reported in previous studies (Table 4.11). These findings suggest that variance caused by the measurement

method did not significantly affect the relationships within the research model (

4.5.6. Robustness Testing of the Model with Control Variables

The control variables did not demonstrate statistically significant effects on Logistics Service Providers' Competitiveness (LCOM). This finding indicates that the proposed capability transformation mechanism possesses strong robustness and is not substantially influenced by the basic organizational characteristics of logistics firms.

4.6. Discussion of Research Findings

Bootstrap analysis was further conducted to examine the indirect effects and the mediating roles of Agile Management (AM) and Value Creation Service (VCS) within the capability transformation chain. The Bootstrap results provide strong empirical evidence confirming that the impact of Adoption of Digital Technology (ADT) on Logistics Service Providers' Competitiveness (LCOM) does not occur solely through a direct path, but is primarily transmitted through organizational capabilities following a multi-layer transformation logic. This finding is particularly important because it reinforces the process-based approach underlying the proposed theoretical framework, rather than the linear perspective commonly adopted in prior studies that view digital technology as a direct source of competitiveness.

In addition, Multi-Group Analysis (MGA) was conducted to assess the stability and boundary conditions of the capability transformation mechanism across different firm sizes. The results indicate that the ADT → AM → VCS → LCOM mechanism does not operate identically across enterprise groups, suggesting that dynamic capabilities in logistics are context-dependent and influenced by organizational maturity and the level of digital development.

Regarding Employee Autonomy (EA), the findings reveal that EA did not play the expected moderating role. However, the results also suggest that EA may function as a foundational organizational condition that supports the capability transformation process within logistics service providers (LSPs). This finding opens a new perspective for explaining the role of autonomy in the context of digital transformation in logistics within developing economi

CHAPTER 5. CONCLUSION AND MANAGERIAL IMPLICATIONS

5.1. Theoretical Contributions of the Study

From a theoretical perspective, this study contributes to extending the Dynamic Capability Theory (DCT) approach within the context of digital logistics by proposing a multi-layer capability transformation mechanism from ADT $\rightarrow$ AM $\rightarrow$ VCS $\rightarrow$ LCOM. In this mechanism, Adoption of Digital Technology (ADT) is conceptualized as a foundational capability that activates the micro-foundations of dynamic capabilities; Agile Management (AM) represents a process-level dynamic capability that enables firms to adapt, reconfigure, and coordinate operations flexibly; while Value Creation Service (VCS) reflects the service-level value realization layer through which operational capabilities are transformed into competitive value for customers and the market.

The findings demonstrate that competitiveness in digital logistics does not arise directly from technology itself, but rather from a firm's capability to transform technology into organizational capabilities and service value aligned with actual operational contexts.

The study also contributes to the conceptualization and measurement of Adoption of Digital Technology (ADT) by configuring the construct based on the TOE framework. The second-order CFA results confirm that ADT is a higher-order construct formed by technological, organizational, and environmental dimensions. This finding clarifies the role of the TOE framework as a digital capability configuration framework rather than a direct explanatory theory of competitiveness formation. Furthermore, the study contributes to clarifying the complementary relationship between TOE and DCT within digital logistics research

5.2. Managerial Implications

The findings indicate that in small and medium-sized enterprises (SMEs), digital technology continues to play a dominant role in generating value and enhancing competitiveness. In contrast, in large enterprises, competitiveness increasingly depends on the capability for agile management and the realization of service value. These findings suggest that dynamic capability mechanisms do not operate under a universal configuration, but instead vary according to the developmental context and organizational maturity of firms

5.3. Limitations and Future Research Directions

This study acknowledges several limitations and proposes future research directions to further develop the process-oriented dynamic capability approach within the context of digital logistics. Future studies may include longitudinal research designs to examine the dynamic nature of the capability transformation mechanism; reconceptualizing Employee Autonomy (EA) as a foundational organizational condition; extending the model toward configurational and non-linear approaches; validating the model across different institutional contexts; and integrating additional boundary conditions and complementary capabilities into the transformation mechanism from digital technology adoption to the competitiveness of logistics service providers (LSPs) across varying institutional environments and levels of organizational maturity