THE IMPACT OF THE POPULARIZATION OF MOBILE PAYMENT ON THE OPERATIONAL EFFICIENCY OF UNIVERSITY MERCHANTS: A CASE STUDY OF WUHAN UNIVERSITY TOWN IN CHINA

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This Independent Study Has Been Approved as a Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

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ABSTRACT

The rapid proliferation of mobile payment technologies has fundamentally transformed transactional behaviors in commercial ecosystems, particularly within university towns where digitally engaged students drive high-frequency transactions. This study examined how the popularization of mobile payment, measured through awareness, usage frequency, user satisfaction, and usage depth, impacted the operational efficiency of merchants in Wuhan University Town, China. Adopting a quantitative methodology, data were collected via online questionnaires distributed to 400 university merchants across diverse business types, including food and beverage, retail, and services. Descriptive statistics and Pearson correlation analyses were employed to evaluate relationships between variables. Results revealed significant positive correlations between all dimensions of mobile payment popularization and operational efficiency. Enhanced awareness reduced transactional errors, frequent usage accelerated checkout processes, elevated satisfaction fostered sustained adoption, and deeper functional utilization enabled data-driven inventory and customer management. These findings underscore that mobile payment integration streamlines operational workflows, reduces costs, and optimizes resource allocation for campus merchants. Consequently, stakeholders should prioritize merchant training, service innovation, infrastructure investment, and policy frameworks to amplify efficiency gains. Strategic adoption of mobile payment technologies emerged as a critical lever for enhancing competitiveness in academic commercial environments.

Keywords: popularization of mobile payment,operational efficiency, university merchants,Wuhan University Town

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QIN CHANGHAO

DECLARATION

I, Qin Changhao, hereby declare that this Independent Study entitled “The Impact of the Popularization of Mobile Payment on the Operational Efficiency of University Merchants: A Case Study of Wuhan University Town in China” is an original work and has never been submitted to any academic institution for a degree.

(QIN CHANGHAO)
MAR 1, 2025

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Chapter 1 Introduction

1.1 Research Background

The rapid advancement of financial technology has driven the widespread integration of mobile payment into daily economic activities, fundamentally reshaping transaction behaviors and commercial interactions across various sectors (Zhou & Zhang, 2021). Mobile payment has increasingly substituted the traditional cash or card method as an existing transactional tool (Liu et al., 2020). This shift is even more extreme in college towns, where a savvy student population has become the local economy's backbone and these communities act as canaries in the mine for mobile payments' rise.

The university merchant exists in a special community with heavy foot traffic which is only operative during certain times of day, depends highly on the buying patterns of students and fluctuates greatly with academic cycles (Liu, 2020). The usage of mobile payment systems poses some opportunities and challenges for these traders. On the one hand, it improves trade efficiency and reduces cash handling costs for transactions (Chen, 2022; Huang et al., 2022); on the one hand, it is good for inventory management and marketing strategies as it can obtain data of consumer behaviors with the quick transaction settlement rates. On the other hand, it relies on investments in complementary infrastructures, staff development and cybersecurity that may be costly for small-campus businesses (Gomber et al., 2018; Wang & He, 2023).

Research has indicated mobile payment influences merchant operability efficiency. Studies have shown that more frequent use, higher degrees of satisfaction and deeper usage with functionalities lead to increased throughput and decreased operational frictions (Hasan et al., 2021; Yang & Lin, 2022). Nevertheless, empirical studies that concentrate on the environment of university towns are few lacking and in particular, filial students' mobile payment behavior and merchant operation are faced with complex interactions. Huang et al. (2023) reported on efficiency improvements in campus retail ecosystems charged of high mobile payment adoption, the specific workings of how factors including awareness, frequency and satisfaction & depth affect operation efficiency still need further elucidation.

Against this backdrop, this study focuses on Wuhan University Town to explore how the popularization of mobile payment impacts the operational efficiency of local university merchants. This research not only contributes to enriching the theoretical framework linking FinTech and merchant operations but also provides practical

insights for campus merchants to optimize their strategies, thereby promoting sustainable development in the unique university commercial environment.

1.2 Research Questions

With the explosive development and popularization of mobile payment, particularly its popularity among merchants around university campuses, the impact of mobile payment popularization on the operational efficiency of university merchants has attracted much attention from both scholars and practitioners. Mobile payment doesn't just provide convenient payment methods for merchants, but has the potential to revolutionize their operation productivity. How the popularization of mobile payment affects university merchants' operating efficiency has emerged as a current research hotspot. The purpose of this study is to investigate the effect of popularization of mobile payment (awareness, frequency, satisfaction and depth) of the operational efficiency from the merchant perspective in Wuhan University Town. In addition, this research investigates the impact of different aspects of mobile payment popularization and operational efficiency of college merchants on one another, proving that some determinants are imperative for the acceptance to operate successfully. Based on these objectives, this study raises the following four research questions:

1. How does the awareness of mobile payment affect the operational efficiency of university merchants?

2. How does the frequency of mobile payment usage influence the operational efficiency of university merchants?

3. How does the satisfaction with mobile payment impact the operational efficiency of university merchants?

4. How does the depth of mobile payment usage affect the operational efficiency of university merchants?

1.3 Research Objectives

With the popularization of digital payment, mobile payment has been widely used in daily life and it is especially common in densely populated university areas such as Wuhan University Town. This study seeks to analyze how awareness of mobile payment, frequency of mobile payment usage, satisfaction with mobile payment, and depth of mobile payment usage affect the operational efficiency of

these merchants. Through this research, new insights and empirical support are provided for university merchants to optimize their operational practices and for the further integration of mobile payment into their daily operations. Based on the above research focus, the following four research objectives are proposed:

Objective 1: To explore the effect of awareness of mobile payment on the operational efficiency of university merchants.

Objective 2: To explore the effect of frequency of mobile payment usage on the operational efficiency of university merchants.

Objective 3: To explore the effect of satisfaction with mobile payment on the operational efficiency of university merchants.

Objective 4: To explore the effect of depth of mobile payment usage on the operational efficiency of university merchants.

1.4 Research Scope

Population and Sample: The research subjects comprised merchants operating within university commercial districts of Wuhan University Town in China. To ensure sample representativeness and data reliability, this study adopted a random sampling method by selecting representative samples from the operating merchants in Wuhan University Town, China. A total of 420 questionnaires were distributed for data collection.

Independent Variable: Popularization of Mobile Payment. The dimensions of Popularization of Mobile Payment include: Awareness of Mobile Payment, Frequency of Mobile Payment Usage, Satisfaction with Mobile Payment and Depth of Mobile Payment Usage. Dependent Variable: Operational Efficiency of University Merchants

Data Collection: From May 1, 2025 to June 1, 2025, during which the questionnaire surveys were conducted in batches. The scientific and effective nature of the data collection was ensured, with strict control over data quality and the authenticity and completeness of questionnaire responses. The data were collected online and quantitative analysis methods, including descriptive statistical analysis, reliability and validity analysis, and correlation analysis were used.

1.5 Research Significance

This study contributes to the existing literature by examining the nuanced relationship between mobile payment popularization and operational efficiency within the unique context of university town merchants, a domain underexplored in prior research. While extant studies have acknowledged mobile payment's role in enhancing merchant efficiency, they often overlook the synergistic effects of its multi-dimensional components (awareness, frequency, satisfaction, depth). By integrating Transaction Cost Economics and the Unified Theory of Acceptance and Use of Technology, this research clarifies how distinct dimensions of mobile payment adoption collectively reduce transaction frictions and optimize resource allocation for campus merchants. This model complements FinTech literature by localizing macro-level theorizations into micro context as highlighted by Gomber et al. (2018) highlights the importance of granular studies on FinTech's effect to particular merchant segments. Moreover, it is a continuous approach of Huang et al.'s (2023) identification of factors influencing the cashless campus were analysed to measure the relative importance of each factor on mobile payment, and a more comprehensive theory for future research was established.

The practical implications derived from the empirical findings provide recommendations for university town ecosystem stakeholders. For retailers, knowing that the frequency of awareness and use of mobile payment among shoppers corresponds to operational efficiency can shape policies designed to simplify checkout procedures and trim costs related to cash handling. For example, satisfaction rates can be used to inform investments in user-friendly payment interfaces to improve customer retention. Banks can leverage records of depth-of-use to create customized products and services, such as integrated reward programs or alerts on inventory in real time, that reflect campus economies used these findings of demand cycles. Local governments, university authorities may make use of the findings to rank infrastructure enhancements including secure payment terminals in light of cyber-risks observed by Wang & He (2023). Finally, this study further helps moving decision-making towards an evidence-based approach allowing a leaner student-centered commercial scheme where mobile payments are leveraged to achieve the right trade-offs between profitability and service levels for in-university merchants.

1.6 Key Terms Definition

Popularization of mobile payment refers to the proliferation and use of the smartphone technology for transactions that can be performed as part of everyday

economic life. It is of theoretical significance to this field and would contribute to how this trend changes university merchants' way of operating, offer advice for using digital financial tools to improve campus commercial ecosystem, and provide a theoretical basis for sustainable development in native shops.

Awareness of mobile payment refers to the perception and understanding of consumers of mobile payments for transactions. Its investigation has an important implication since it will be a base of user acceptance, the relationship between how students' perceive on mobile payment and then their transaction behavior as well as influencing mechanism for merchants' operation which bridge perception and actual efficiency enhancement.

Frequency of mobile payment usage refers to frequency of the use of a mobile payment system in a given period. Drilling down into this metric, it makes it much easier to see the relationship between intensity of usage and operational efficiency because more frequent use reduces cash handling costs and speeds up checkouts, so managing inventory is a quicker process resulting in merchants being able to staff based on demand and restock according to usage with better margin for resource allocation.

Satisfaction with mobile payment refers to the long-term overall evaluation of customers on the basis of expected performance comparison with all kinds of mobile transaction platform. Its research value is to the extent that ultimate satisfaction results in persisting usage, which has a direct bearing on transaction volume and merchant income. The exploration of it can help merchants to maximize quality of service, and hence achieve great efficiency through user retention.

Depth of mobile payment usage refers to the advanced level and degree of using mobile payment applications beyond fundamental payment transfer services, such as those including a variety of services and features. Studying it is worthwhile, because deeper applications create valuable transaction data which will ultimately support personalized marketing and accurate inventory control, key to boosting merchants' operational efficiency in a data-driven era.

Operational efficiency of university merchants refers to the effective use of resources for university businesses to produce at its best possible ratio of output to input costs. Analyzing the popularization of mobile payment, the study offers specific business management ideas for guiding businesses adjusting to digitization trends, enhancing digital ability in the specialized university context, and guaranteeing long-term sustainability.

Chapter 2 Literature Review

2.1 Introduction

The rapid advancement of financial technology has integrated mobile payment as a core component into daily economic activities, fundamentally transforming payment behaviors and commercial interactions. This transformation is especially evident in university towns, where the widespread adoption of mobile payment significantly influences the operational dynamics of local merchants. Focusing on Wuhan University Town, this study examines how the popularization of mobile payment encompassing awareness, usage frequency, satisfaction, and usage depth affects the operational efficiency of university merchants. Investigating this relationship offers substantial theoretical value by enriching FinTech and merchant operation research, along with practical significance for optimizing operational strategies among campus merchants. This chapter reviews relevant concepts and theories to establish a foundational framework for the subsequent empirical analysis.

2.2 Popularization of Mobile Payment

Popularization of mobile payment stands for smartphone transaction technologies that are widely used and combine into the daily economic activities, changing the payment habits and commercial interaction at root (Zhou & Zhang, 2021). It is an elemental direction in FinTech industry, to enable instant secure money transfer without physical cash and credit card-like instruments by building around enabling technologies such as near field communication (NFC), QR codes, digital wallets (Liu et al., 2020). The latter is beyond mere availability of technology, but also about the wider spread of mobile payments as an accepted mode of payment among various user profiles and merchant categories, which hinders it becoming a dominant way to pay as being normalized (Huang et al., 2022). Crucial signs of its popularization include increased consumer awareness of mobile payment platforms and their services, more frequent usage for micro and macro transportations, high levels of user satisfaction with respect to convenient usage experience, an in-depth scope for use in terms of a variety of applications other than shopping itself via the use case such as paying bills, transferring funds peer-to-peer, managing personal finance (Gomber et al., 2018; Zhou & Zhang, 2021).

The diffusion of mobile payment systems greatly disrupts conventional cash-based economies since transaction transactions can be simplified and friction costs in currency management (Chen, 2022). For retailers, especially those which trade in high-footfall areas such as university towns, this ‘ rise of the cashless ’

equates to a change in the transactional landscape. Frequent consumers' use of the card reduces the physical transaction costs related to cash management, security, and reconciliation minimizes the time required for checkouts, and accelerates throughput in peak periods as well (Liu et al., 2020; Wang & He, 2023). Furthermore, the combination of mobile payment data offers merchants insights into their consumers' purchasing patterns that can be used for better inventory management and marketing campaign strategies (Huang et al., 2022). In turn, popularization becomes the driving force to optimize the operation process and resource allocation of merchant operations (Chen, 2022). Yet, rapid adoption also calls for investment by merchants in the infrastructures that are compatible with cryptocurrencies, as well as staff training, and security investment with opportunities and challenges for operational efficiency improvements (Gomber et al., 2018; Wang & He, 2023). The path of mobile payment diffusion therefore is a core principle in perceiving the dynamics of service efficiency at modern retail and service settings, such as digitally-rich environments.

2.3 Awareness of Mobile Payment

Awareness of mobile payment refers to the awareness and knowledge of mobile payment for performing financial transactions. It includes knowledge about the existence of particular mobile payment platforms, their basic components and the pros and cons they may bring to the financial sector (Zhou & Lu, 2017). This kind of awareness is not limited to simply knowing that mobile payment tools exist; it also involves understanding how these tools fit into the specific business scenarios of university town merchants. For example, in the catering and retail stores that dominate Wuhan University Town, awareness of mobile payment means recognizing how to adapt these tools to the high-frequency, small-value transactions typical of student consumers, such as setting up quick scan codes at checkout counters or integrating mobile payment with student discount programs to streamline the payment experience. For university town merchants, comprehensive mobile payment awareness covers multiple practical dimensions. It includes familiarity with the basic operations of different platforms, such as distinguishing between the refund processes of WeChat Pay and Alipay, which helps merchants resolve customer payment issues quickly and avoid delays that might affect customer satisfaction. It also involves grasping security knowledge, such as understanding the encryption mechanisms of transaction data or how to verify the authenticity of payment receipts. This security awareness is particularly important in campus environments where students may have concerns about the safety of their funds; merchants who can clearly explain these

security measures to students can alleviate such worries and encourage more frequent use of mobile payment.

Venkatesh et al. (2016) noted that user awareness shapes perceptions of a technology ' s ease of use and usefulness, and this applies equally to merchants. Merchants with strong mobile payment awareness are more likely to perceive these tools as practical and easy to integrate into daily operations. They can proactively adjust their workflows, for instance, training employees to handle mobile payment devices proficiently or arranging checkout areas to accommodate both mobile and traditional payment methods without causing congestion. This proactive adaptation directly reduces transaction errors, such as incorrect amount entries due to unfamiliarity with the system, and shortens the time spent on each transaction. Li et al. (2020) emphasized that awareness is a key predictor of intention to use mobile payment services. For university town merchants, this means that higher awareness translates to a greater willingness to adopt and promote mobile payment. Merchants who are aware of the latest mobile payment technologies, such as near-field communication (NFC) or integrated loyalty program features, can leverage these tools to enhance their services, offering instant points via mobile payment to retain student customers. Additionally, awareness of relevant policies and regulations ensures that merchants operate within legal frameworks, avoiding penalties or service disruptions that could harm operational efficiency. In sum, strong mobile payment awareness lays the groundwork for merchants to fully leverage these tools, creating a smoother payment experience for students while optimizing their own operational processes.

2.4 Frequency of Mobile Payment Usage

Frequency of mobile payment usage measures how frequently people use mobile payment service to make transaction over a period of time. It is an important signal that applies to indicate user adoption intensity and habitual dependence on digital payment methods. This dimension is operationally defined in terms of the transaction volume weekly or monthly and payment frequency in different consumption contexts. In university town settings, this frequency is often amplified by the unique consumption patterns of student populations who engage in frequent small-value transactions such as purchasing daily meals snacks stationery or printing services. These repeated interactions mean that university merchants face a steady stream of mobile payment requests which in turn elevates their own usage frequency of such systems.

High-frequency use indicates that mobile payments have been more deeply embedded in daily financial practices and directly reduces the cash processing burden for merchants while speeding up the transaction cycle Kim et al. (2020). For instance merchants in Wuhan University Town who process dozens of mobile payments daily no longer need to spend hours counting cash at the end of each business day or make frequent trips to banks to deposit funds. This not only saves valuable time but also minimizes the risks associated with cash storage such as theft or human error in counting. Empirical research consistently finds that high usage frequency is a precursor to increased merchant operational efficiency largely through streamlining transaction processes and reducing customer wait times Hasan et al. (2021). During peak hours such as lunch breaks or weekends when student foot traffic surges merchants with high mobile payment usage frequency can serve more customers in a shorter period. A restaurant that handles most orders via mobile payment for example can cut down the time spent on each transaction by 30 to 40 percent compared to cash-only operations as staff do not need to handle change or verify bill amounts manually. Studies also show that users with high levels of transaction frequency are disproportionately associated with revenue stability and data-driven inventory management especially for small business users since repeated use leads to predictable cash flow patterns and granular consumption insights Yang & Lin (2022). A convenience store in a university town for example might notice through high-frequency transaction data that students buy more energy drinks during exam weeks. This insight allows the store to adjust inventory in advance ensuring sufficient stock without overordering.

For this reason frequency should not be viewed merely as a metric for technology adoption but rather as a demonstration of behavioral commitment that streamlines merchant processes by reducing manual reconciliation work and accelerating service delivery (Gomber et al., 2018). As mobile payment usage becomes more frequent merchants gradually develop standardized operational routines around it further enhancing efficiency and creating a more seamless experience for both staff and customers.

2.5 Satisfaction with Mobile Payment

Satisfaction with mobile payment is an essential level of consumer perception construct, depending on consumers' feelings of satisfaction when making mobile transaction. This concept represents the cumulative assessment of the user regarding how their expectations and actual performance of a service compare in regards to their perception of ease-of-use, speed of transaction, reliability system, security

assurance and perceived value (Venkatesh et al., 2012). High satisfaction scores indicate that the mobile payment method well fulfills user's demand of convenient, efficient and reliable financial transactions, which is particularly critical in university town contexts where student users dominate the consumer base. Students in these areas often engage in frequent, small-value transactions, such as purchasing meals, stationery, or printing services, and their satisfaction with mobile payment directly shapes their choice of payment method for subsequent transactions. For instance, a student who finds a mobile payment platform easy to operate and fast in processing transactions during a lunchtime rush is more likely to prioritize that platform for future purchases, creating a consistent flow of digital transactions for local merchants.

Empirical work by Oliveira et al. (2016) shows that satisfaction serves as the antecedent of continued usage intention and loyalty to mobile payment systems, which in turn directly affect usage frequency and depth. In university towns, this loyalty translates to sustained demand for mobile payment options among merchants; those who adopt platforms favored by satisfied students are better positioned to reduce checkout wait times and avoid lost sales from customers unwilling to use less preferred payment methods. For example, a convenience store that uses a mobile payment platform with high student satisfaction may see fewer instances of customers abandoning purchases due to slow transaction processing, thereby improving overall service throughput. Yet satisfaction is not only shaped by positive experiences; perceived risks, like concerns over account security or financial loss, also strongly moderate levels of satisfaction. Users engage in an ongoing balancing act, weighing the benefits of mobile payment against potential risks (Chawla & Joshi, 2019). In campus settings, where students may have limited disposable income and heightened sensitivity to financial security, even minor issues, a temporary delay in fund confirmation or a lack of clear fraud protection measures, can significantly erode satisfaction. Merchants who recognize this dynamic and proactively address risk-related concerns, such as displaying security certifications of their chosen mobile payment platforms or guiding students through dispute resolution processes, can help maintain high satisfaction levels. Ultimately, continuous satisfaction acts as a foundational driver for the successful integration of mobile payment into routine campus financial activities, linking positive user experiences to improved operational efficiency for university merchants.

2.6 Depth of Mobile Payment Usage

Depth of mobile payment usage denotes consumer's usage experience on mobile payment applications such as the other types of services accessed, how financial transactions are integrated into daily life and how higher value-added services potentially provided by mobile payments are utilized, credit service, wealth management tools, loyalty programme or cross-platform integration (Zhou, 2013). This dimension goes beyond mere transaction frequency, which focuses primarily on the number of payments made, and instead emphasizes the breadth of functional adoption and the degree to which mobile payment systems are woven into both consumer daily routines and merchant operational processes. For instance, a student in Wuhan University Town might not only use mobile payment to buy meals or stationery but also to pay for campus library fines, book laundry services in nearby shops, or even participate in merchant-run loyalty programs where points accumulated via mobile transactions can be redeemed for discounts, all of which reflect a deeper level of usage than basic payment alone.

Venkatesh et al. (2012) noted that depth represents behavioral embeddedness, in which users develop new more sophisticated behaviors and turn these transactional interactions into maintenance of ongoing financial behavior. This embeddedness is particularly evident in university town contexts, where both students and merchants rely on interconnected services. Merchants, for example, can leverage the depth of mobile payment usage to go beyond processing payments: they can use built-in data analytics tools to track which products sell best during exam weeks versus regular semesters, or use member management features to send personalized promotions to students who frequently make purchases, a discount on coffee for a student who buys breakfast at their shop three times a week. These actions transform mobile payment from a simple transaction tool into a strategic resource for optimizing business operations. Moreover, deeper usage often involves cross-platform integration that streamlines both consumer and merchant experiences. A print shop in Wuhan University Town, for instance, might integrate mobile payment with its order system: students submit print requests online, pay via mobile payment, and receive a notification once their order is ready, eliminating the need for in-person payment delays and reducing the risk of order mix-ups. For merchants, this kind of integration cuts down on administrative work, speeds up service delivery, and minimizes errors, all of which directly contribute to better operational efficiency. In essence, the depth of mobile payment usage creates a symbiotic relationship: consumers gain greater convenience and personalized services, while merchants access actionable data and streamlined processes that enhance their ability to adapt to the unique demands of the university town market.

2.7 Operational Efficiency of University Merchants

Operational efficiency of university merchants refers to the efficient return on investments for businesses within or near campus locations to result in the highest level of goods and services in comparison with input costs. At its core, this notion is composed of how well a business process operates how well one controls inventory turnover or the speed of processing transactions, optimizes labor allocation management, and manages overhead costs, adapted to the distinctive environment of a university setting (Chen et al., 2018). In this regard, efficiency is also significantly concerned with aspects such as service throughput in periods of peak academic activity, minimising wait times for students, limiting transaction errors and flexibility to the fluctuating demand cycles that a campus experiences end-of-terms and exams (Liu, 2020). The business context of these merchants is different: high foot traffic limited to certain hours, reliance on student-buying habits and the spatial constraints often experienced by campus commercial districts. Recent empirical work underscores that technological integration, particularly digital payment systems, significantly enhances this efficiency by streamlining payment verification, reducing cash-handling costs, accelerating checkout processes, and improving sales data accuracy for inventory forecasting (Zhou & Li, 2023). Achieving high operational efficiency is thus paramount for campus merchants to maintain competitiveness, ensure customer satisfaction amidst a transient student population, and sustainably manage operational costs within a geographically concentrated market.

2.8 Transaction Cost Economics

Transaction Cost Economics, pioneered by Williamson (1981), analyzes the costs associated with making economic exchanges. Mobile payment systems significantly reduce transaction costs for both consumers and merchants compared to traditional cash or card payments. Reduced search costs, bargaining costs, and especially the costs of policing and enforcing transactions (e.g., faster checkout, lower fraud risk, automated reconciliation) contribute directly to enhanced operational efficiency for university merchants. The depth and frequency of mobile payment usage among students directly lower these transaction frictions.

2.9 Unified Theory of Acceptance and Use of Technology

Venkatesh et al. (2012) extended the UTAUT to consumer contexts, introducing key constructs like hedonic motivation, price value, and habit. The frequency and satisfaction dimensions of mobile payment usage among students are heavily

influenced by factors like habit (automaticity of use), price value (perceived cost-effectiveness), and hedonic motivation (enjoyment). High frequency and satisfaction levels drive consistent customer adoption. This predictable, high-volume digital transaction flow allows merchants to optimize staffing, inventory management, and cash handling processes, thereby improving operational efficiency.

2.10 Relevant Research

The commoditization of mobile transactions has profound implications on the business operations of sellers in online academic environments. Mobile payment use promotes efficiency in transaction processes, minimizes the associated cost of cash handling and sales cycle elongation, thus improving operational efficiency for campus businesses. Chen et al. (2021) factually proved that when merchants adopt mobile payment systems, their inventory turnover can be effectively increased and the queue times minimized due to faster processing of payment as well as an automatic process of reconciling transactions. Such efficiency is enhanced by increased user visiting frequency, which lead to a decline in the per-transaction operating costs (Li & Zhang, 2022).

Users attitudes towards mobile payment interfaces also play a key role in determining merchant results. By making payments fast and secure, students make more transactions which mean direct revenue streams for merchant in the university. Li and Zhang (2022) also discovered that higher service satisfaction can associates with more customer visiting frequency, average spend per visit and customer retention etc., could help merchants reasonably allocate their resources. Further, the advanced use of mobile payments, the use of data and integrating loyalty programs, also gives merchants a better predictability and a possibility to enabling personalisation services in terms of demand in order to avoid wastage but as well, throioughput -minimising (Huang et al., 2023).

On campus-specific research emphasizes specific influence of mobile payment penetration in academic commercial settings. Huang et al. (2023) found the daily transaction efficiency for university merchants in high-adoption districts to be 19–27 percent higher than cash-only operations, attributed to lower payment frictions, and improved data-based decisions. But to access these advantages, strong digital foundations and steady rates of pupil take-up are necessary. Taken together, extant literature supports the proposition that mobile payment constructs—awareness, usage frequency, satisfaction, and depth—constitute working gears for university merchants to improve operational efficiency by speeding up transaction speed facilitation effect,

enhancing data richness scenario enrichment and broadening income sources diversifying.

2.11 Conceptual Framework

This study aims to explore the relationship between the popularization of mobile payment and the operational efficiency of university merchants. The variables and dimensions are defined as follows:

Independent Variable: Popularization of Mobile Payment, with key dimensions including:

Awareness of Mobile Payment

Frequency of Mobile Payment Usage

Satisfaction with Mobile Payment

Depth of mobile Payment Usage

Dependent Variable: Operational Efficiency of University Merchants

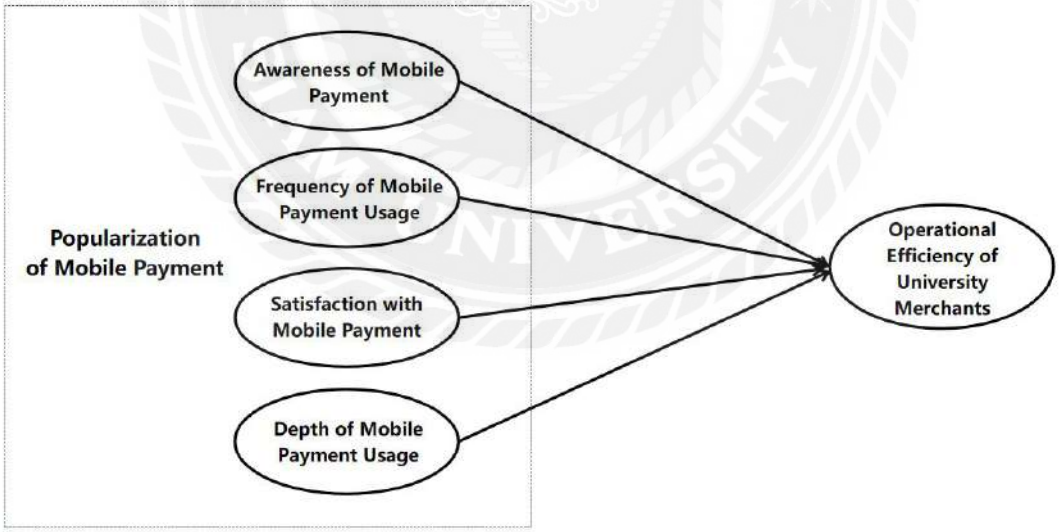

Figure 1 Conceptual Framework

Chapter 3 Research Methods

3.1 Research Design

This chapter outlines the quantitative research methodology employed to investigate the impact of the popularization of mobile payment on the operational efficiency of university merchants in Wuhan University Town China. The study utilized a questionnaire as the primary data collection tool distributed to a randomly selected sample of 400 university merchants from Wuhan University Town. Data analysis involved descriptive statistics to summarize demographic profile and variable distributions, reliability and validity tests (Cronbach ' s alpha, KMO, and Bartlett's test) to ensure measurement consistency and correlation analysis to explore associations between dimensions of mobile payment popularization and operational efficiency of university merchants.

3.2 Questionnaire Design

The questionnaire incorporates 5-point Likert scales to measure variables. By analyzing the awareness of mobile payment, the frequency of mobile payment usage, the satisfaction with mobile payment, and the depth of mobile payment usage, this research reveals how these dimensions contribute to the operational efficiency of university merchants, providing a theoretical basis for optimizing the integration of mobile payment into the operations of campus merchants and offering practical insights for enhancing their operational practices.

Table 3. 1 Measurement Items

Variable	Measurement item	NO.
Awareness of mobile payment	1.I am familiar with the basic functions of mobile payment.	Q1
	2.I know the security knowledge related to mobile payment very well.	Q2
	3.I have a clear understanding of the latest technologies in mobile payment.	Q3
	4.I am aware of the relevant policies and regulations on mobile payment.	Q4
	5.I can distinguish the characteristics of different mobile payment platforms.	Q5

Frequency of mobile payment usage	6.Our store uses mobile payment for transactions very frequently every day.	Q6
	7.When customers use mobile payment, we can handle it quickly most of the time.	Q7
	8.Mobile payment is used in most of the transactions in our store every week.	Q8
	9.We use mobile payment almost every day to complete business transactions.	Q9
	10.The number of transactions completed by mobile payment in our store is large every month.	Q10
Satisfaction with mobile payment	11.I am satisfied with the convenience of operating mobile payment.	Q11
	12.I am satisfied with the speed of mobile payment arrival.	Q12
	13.I am satisfied with the stability of the mobile payment system.	Q13
	14.I am satisfied with the reasonableness of mobile payment service fees.	Q14
	15.I am satisfied with the customer service provided by mobile payment platforms.	Q15
Depth of mobile payment usage	16.We use mobile payment to complete not only transactions but also account checking.	Q16
	17.Our store uses mobile payment functions to manage member information.	Q17
	18.We have used mobile payment platforms to carry out marketing activities.	Q18
	19.We can use mobile payment data to analyze customer consumption habits.	Q19
	20.We use mobile payment to manage store inventory and purchase.	Q20
Operational efficiency of university merchants	21.The time taken to process each transaction in our store is short.	Q21
	22.Our store can reduce operational costs effectively through efficient management.	Q22
	23.The speed of serving customers in our store is fast.	Q23
	24.The inventory turnover rate in our store is high.	Q24

3.3 Hypotheses

In this study, the independent variable is popularization of mobile payment, with key dimensions including: awareness of mobile payment, frequency of mobile payment usage, satisfaction with mobile payment, and depth of mobile payment usage. The dependent variable is the operational efficiency of university merchants. The model of this study is built on an in-depth analysis of the relationships between these independent and dependent variables. These relationships are set through a series of hypotheses. Based on the analysis above, this study proposes the theoretical hypothesis model of the impact of popularization of mobile payment on the operational efficiency of university merchants in Wuhan University Town, China, as well as the interrelationships between independent and dependent variables. Therefore, the following hypotheses are proposed:

H1: There is a significant positive correlation between the awareness of mobile payment and the operational efficiency of university merchants.

H2: There is a significant positive correlation between the frequency of mobile payment usage and the operational efficiency of university merchants.

H3: There is a significant positive correlation between the satisfaction with mobile payment and the operational efficiency of university merchants.

H4: There is a significant positive correlation between the depth of mobile payment usage and the operational efficiency of university merchants.

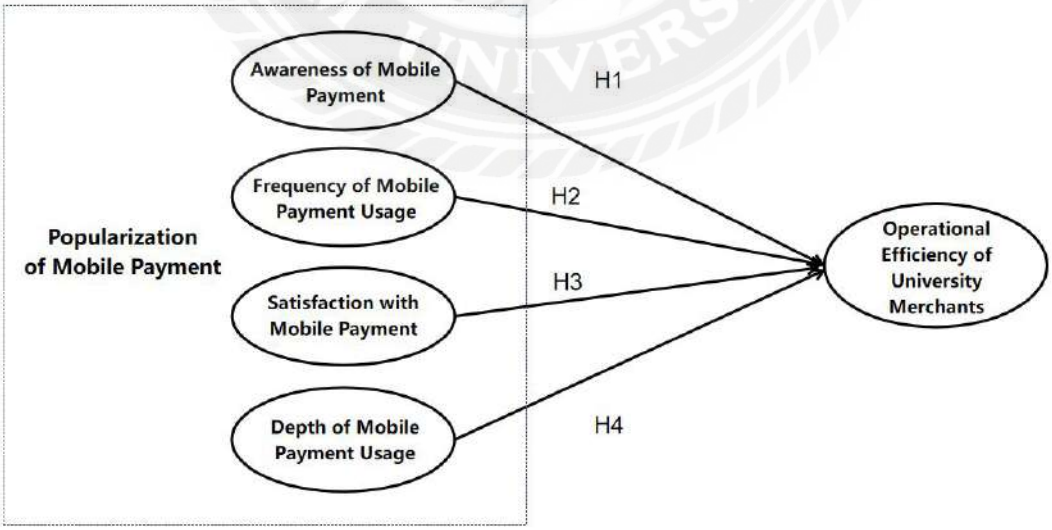

Figure 2 Hypotheses

3.4 Population and Sampling

To achieve the objective of this study, which is to explore the impact of the popularization of mobile payment on the operational efficiency of university merchants, a questionnaire survey was selected as the primary data collection method. The study population consisted of university merchants in Wuhan University Town, China. Due to the large number of participants in this study, the sample size calculation formula by Venkatesh et al. (2016) was used to determine the sample size.

$$n = \frac{z^2 p(1-p)}{e^2}$$

When the confidence level was set at 95%, the margin of error e was 0.05. Thus, the following values were applied:

p = 0.5

z = 1.96

e = 0.05

Substituting the values of the above variables into the formula:

Sample size (n) = $(1.96^2 \times 0.5 \times (1 - 0.5)) / (0.05^2) = 384.16$

Rounded up to 400, the total number of samples was 400.

3.5 Data Collection

The survey questionnaire was distributed and collected through "Wenjuanxing", a prominent digital survey platform in China. From May 1, 2025 to June 1, 2025, a total of 420 questionnaires were distributed during the survey period, with 400 valid responses received, resulting in an effective response rate of 95.2%.

3.6 Data Analysis

3.6.1 Reliability

Methodological soundness formed the cornerstone of this research investigation. To ensure the collected data possessed the necessary credibility and contextual validity for drawing meaningful conclusions about variable linkages, a

comprehensive validation of the measurement instrument was undertaken before substantive analysis commenced. The scales employed were carefully adapted and refined from established measures to suit the specific research context, with all core constructs undergoing thorough scrutiny to verify their measurement characteristics. This process established a foundation of methodological integrity critical for robust hypothesis evaluation and model confirmation. Reliability, representing the consistency and stability of measurement outcomes over time and across different potential instrument applications, is fundamental for minimizing distortions in the data.

Since all empirical measurements inherently contain both substantive information and error components, enhancing reliability serves to reduce the proportion of error variance. This strengthens result stability and mitigates the influence of inconsistencies inherent in the measurement process. The internal coherence of the scales, a key aspect of reliability, was rigorously assessed using Cronbach's alpha coefficients. This reinforces the psychometric strength of the research instrument, providing confidence in its suitability for the subsequent analytical procedures required to explore the relationships under investigation.

Table 3. 2 Reliability Test

Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Q1	0.714	0.828	
Q2	0.656	0.842	
Q3	0.7	0.831	0.863
Q4	0.682	0.835	
Q5	0.666	0.839	
Q6	0.723	0.826	
Q7	0.683	0.836	
Q8	0.718	0.826	0.864
Q9	0.665	0.84	
Q10	0.631	0.848	
Q11	0.655	0.848	
Q12	0.724	0.83	
Q13	0.655	0.847	0.867
Q14	0.717	0.832	
Q15	0.696	0.837	
Q16	0.655	0.831	
Q17	0.629	0.838	0.857
Q18	0.702	0.819	

Q19	0.665	0.829	
Q20	0.706	0.818	
Q21	0.6	0.748	0.796
Q22	0.635	0.731	
Q23	0.62	0.738	
Q24	0.57	0.762	

3.6.2 Validity

Validity analysis evaluates the relationship between measurement and external standards. Validity is typically divided into content validity and construct validity. Construct validity is further subdivided into convergent validity and discriminant validity, both of which must be proven for a measurement to be considered as having construct validity. Content validity refers to the ability of a measurement tool to cover all items related to the concept it is intended to measure. If a measurement tool covers representative items of the concept being measured, it is considered to have content validity. The measurement variables in this study came from a well-established scale, which was revised and designed according to the actual research situation, with new items added and further adjustments made in a pre-survey. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were used to assess the association between research questions. The KMO value is an important indicator of whether the data meet the conditions for factor analysis. A KMO value higher than 0.9 is considered excellent, 0.8-0.9 is good, 0.7-0.8 is fair, 0.6-0.7 is poor, 0.5-0.6 is very poor, and below 0.5 is unsuitable. Bartlett's test of sphericity determines whether the correlation matrix is an identity matrix. A significant p-value (usually less than 0.05) indicates that there is substantial correlation between the features of the scale, making it suitable for factor analysis. Table 3.3: KMO and Bartlett Test shows that the KMO value for this study is 0.978, and Bartlett's test indicates a significant correlation between indicators ($p = 0.000$), confirming that the data meet the conditions for factor analysis. Factor loadings greater than 0.5 indicate stronger convergent validity, and the greater the number of items with factor loadings greater than 0.5, the stronger the discriminant validity.

Table 3. 3 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.978
Bartlett's Test of Sphericity	Approx. Chi-Square	6672.844
	df	276
	Sig.	0

3.6.3 Descriptive Statistics

Descriptive statistical analysis is a statistical analysis method that classifies, depicts and describes the basic situation of sample data, and converts raw data into information and statistical data that can be analyzed. The analysis mainly includes the frequency, mean, standard deviation and variance of the data. This study analyzed the relevant data of the respondents to lay the foundation for subsequent verification of the hypothesis.

3.6.4 Correlation Analysis

Correlation analysis was used in this study. It is a representative method for describing the strength and direction of the relationship between multiple variables, as measured by the correlation coefficient. In the existing literature, the Pearson coefficient (usually denoted by R) is often used to indicate the correlation between variables, i.e., whether it is positive or negative. The value reflects the strength of the relationship. When the R value is below 0.3, it indicates a low correlation between the two variables; when the R value is between 0.3 and 0.7, it indicates a moderate correlation between the two variables; and when the R value is above 0.7, it indicates a high correlation between the two variables. Possible reasons for this are either common linear problems or poor surface quantities.

Chapter 4 Research Findings

4.1 Introduction

Quantitative research methods were used to analyze the data collected through the questionnaires. A total of 420 questionnaires were distributed during the survey period, with 400 valid responses received, resulting in an effective response rate of 95.2%. The collected data were analyzed using descriptive statistics, and Pearson's correlation analysis was used to determine the relationships and significance between the variables. Finally, the research results were derived from the analysis.

4.2 Descriptive Statistics of Sample

The main demographic parameters include business type, approximate size of business, and years of operation, as shown in Table 4.1. Overall, the sample meets the statistical requirements.

Among the 400 surveyed university merchants, the distribution of business types was as follows: 219 in Food & Beverage (54.8%), 123 in Retail (30.7%), and 58 in Services (14.5%). This indicates a dominant representation of Food & Beverage merchants in the sample, reflecting the typical business composition in university town areas where catering services are in high demand among students.

The distribution of the approximate size of businesses was divided into four groups: 11 merchants with only the owner-operator (2.75%), 205 with 2-5 employees (51.25%), 106 with 6-10 employees (26.5%), and 78 with 11+ employees (19.5%). Merchants with 2-5 employees constituted the main respondent group, indicating that small-scale operations are prevalent among university merchants in the studied area.

The distribution of the number of years the businesses have operated within Wuhan University Town was as follows: 107 merchants with less than 1 year of operation (26.75%), 186 with 1-3 years (46.5%), 92 with 4-6 years (23%), and 15 with 7 years or more (3.75%). Merchants operating for 1-3 years are the primary group, reflecting a relatively high turnover rate and a dynamic business environment in Wuhan University Town.

Table 4. 1 Demographic Data

Basic Information	Count	Percentage
1. Business Type		
Food & Beverage	219	54.8
Retail	123	30.7
Services	58	14.5
2. Approximate size of business		
1 (Owner-Operator)	11	2.75
2-5 Employees	205	51.25
6-10 Employees	106	26.5
11+ Employees	78	19.5
3. Years of Operation		
Less than 1 year	107	26.75
1-3 years	186	46.5
4-6 years	92	23
7 years or more	15	3.75

4.3 Descriptive Statistics of Variables

Descriptive statistical analysis focuses on screening, analyzing and summarizing a large amount of data obtained from a survey, and it summarizes the concentration trends and the degree of dispersion of these data. The centralized trends of the analyzed data include the mean and median, and the descriptive data deviations include the maximum, minimum, variance, and standard deviation. These descriptive statistics synthesize and analyze the characteristics of the variables.

In this study, a 5-level Likert scale questionnaire (level of agreement) was used to collect the responses of the sample towards each of the measured variables. In order to interpret the data obtained, the following arbitrary levels were used to interpret the mean value of each variable.

Table 4. 2 Arbitrary Levels of Interpretation of Questionnaire Data

Arbitrary level	**Account for**
1.00 - 1.79	disagree
1.80 - 2.59	slightly disagree
2.60 - 3.39	neutral
3.40 - 4.19	agree slightly
4.20 - 5.00	agree

As shown in Table 4.3, each item is scored on a scale of 1 to 5, representing the popularization of mobile payment.

Table 4. 3 Descriptive Statistics of Popularization of Mobile Payment

Items	N	Minimum	Maximum	Mean	Std. Deviation
Q1	400	1	5	3.23	1.305
Q2	400	1	5	3.24	1.373
Q3	400	1	5	3.18	1.364
Q4	400	1	5	3.37	1.421
Q5	400	1	5	3.29	1.329
Q6	400	1	5	3.25	1.326
Q7	400	1	5	3.27	1.375
Q8	400	1	5	3.13	1.436
Q9	400	1	5	3.22	1.359
Q10	400	1	5	3.13	1.349
Q11	400	1	5	3.29	1.382
Q12	400	1	5	3.26	1.407
Q13	400	1	5	3.27	1.301
Q14	400	1	5	3.32	1.377
Q15	400	1	5	3.33	1.391
Q16	400	1	5	3.22	1.349
Q17	400	1	5	3.24	1.342
Q18	400	1	5	3.37	1.333
Q19	400	1	5	3.36	1.349
Q20	400	1	5	3.16	1.371

Most items have a mean above 3 (e.g., Q1: 3.23, Q2: 3.24, Q3: 3.18). This indicates that the merchant groups in Wuhan University Town, in aspects of awareness, frequency of usage, satisfaction, and depth of usage regarding mobile payment, exhibit a moderate to high level of performance related to the popularization of mobile payment. While the median is not explicitly provided, based on the mean values, it is likely that the majority of responses tend to fall in the middle

to upper range. This suggests a relatively frequent engagement with mobile payment-related behaviors, though there remains room for improvement.

The standard deviation mostly ranges between 1.301 and 1.436 (e.g., Q4: 1.421, Q5: 1.329, Q6: 1.326). This indicates some variability in the behaviors and attitudes related to mobile payment among the respondents. It means that despite the overall moderate to high mean scores, the levels of awareness, frequency of usage, satisfaction, and depth of usage of mobile payment are not entirely uniform across individuals, with some showing higher engagement and others lower.

From the descriptive statistics, it can be observed that the merchant groups in Wuhan University Town display an overall moderate to high level of performance across various aspects (Q1-Q20) related to the popularization of mobile payment. They also show a certain degree of positive attitude and engagement frequency. However, the standard deviation in the data indicates that there are still significant differences among individuals in their behaviors and attitudes concerning mobile payment.

As shown in Table 4.4, each item is scored on a scale of 1 to 5, representing operational efficiency of university merchants.

Table 4. 4 Descriptive Statistics of Operational Efficiency of University Merchants

Items	N	Minimum	Maximum	Mean	Std. Deviation
Q21	400	1	5	3.25	1.368
Q22	400	1	5	3.32	1.377
Q23	400	1	5	3.3	1.392
Q24	400	1	5	3.41	1.348

The mean values of Q21 to Q24 range from 3.25 to 3.41, close to the "neutral" or "slightly agree" level. This suggests most respondents evaluate the relevant dimensions of the popularization of mobile payment at a moderate level with a slight positive inclination, indicating some degree of recognition. The standard deviations of Q21 to Q24 are between 1.348 and 1.392, showing there are differences in respondents' evaluation of these dimensions. While overall evaluations are moderate, some respondents rate the dimensions lower, and others rate them higher. From the analysis of the four questions related to the popularization of mobile payment, the respondents generally evaluate these dimensions at a moderate to slightly above level, with differences among individuals. Most respondents' self-evaluations fall into the "neutral" or "slightly agree" range, showing a balanced view on the popularization of mobile payment, neither pessimistic nor overly optimistic.

4.4 Correlation Analysis

Correlation analysis requires establishing a relationship or probability between the related elements. Using correlation analysis has undoubtedly become the most effective method for studying the relationships between multiple groups.

Table 4. 5 Correlations between Variables (Pearson Correlation Matrix)

Variable	Awareness of mobile payment	Frequency of mobile payment usage	Satisfaction with mobile payment	Depth of mobile payment usage	Operational efficiency of university merchants
Awareness of mobile payment	1				
Frequency of mobile payment usage	.847**	1			
Satisfaction with mobile payment	.864**	.887**	1		
Depth of mobile payment usage	.854**	.875**	.884**	1	
Operational efficiency of university merchants	.839**	.828**	.873**	.840**	1

Note: *Correlation is significant at the 0.05 level (two-tailed). *Correlation is significant at the 0.01 level (two-tailed).

The closer the correlation coefficient (r) is to 1 or -1, the stronger the correlation; the closer it is to 0, the weaker the correlation. This study used the Pearson correlation coefficient to analyze the correlation between the popularization of mobile payment and operational efficiency of university merchants based on data from 400 questionnaires. As shown in Table 4.5, the correlation coefficients (r values) range from 0 to 1, with a high degree of correlation at the 0.01 level. There is a significant correlation between the factors ($P<0.01$).

All dimensions of the popularization of mobile payment show significant positive correlations with the four dimensions of operational efficiency of university merchants ($p<0.01$). This suggests that a higher level of popularization of mobile payment, including greater awareness, more frequent usage, higher satisfaction, and deeper usage, is associated with higher operational efficiency among university merchants.

4.5 Hypothesis Test Results

H1: There is a significant positive correlation between the awareness of mobile payment and the operational efficiency of university merchants. The Pearson correlation coefficient between awareness of mobile payment and operational efficiency of university merchants is 0.839 ($P<0.01$), indicating a significant positive correlation. Therefore, Hypothesis 1 is supported.

H2: There is a significant positive correlation between the frequency of mobile payment usage and the operational efficiency of university merchants. The Pearson correlation coefficient between frequency of mobile payment usage and operational efficiency of university merchants is 0.828 ($P<0.01$), indicating a significant positive correlation. Therefore, Hypothesis 2 is supported.

H3: There is a significant positive correlation between the satisfaction with mobile payment and the operational efficiency of university merchants. The Pearson correlation coefficient between satisfaction with mobile payment and operational efficiency of university merchants is 0.873 ($P<0.01$), indicating a significant positive correlation. Therefore, Hypothesis 3 is supported.

H4: There is a significant positive correlation between the depth of mobile payment usage and the operational efficiency of university merchants. The Pearson correlation coefficient between depth of mobile payment usage and operational efficiency of university merchants is 0.840 ($P<0.01$), indicating a significant positive correlation. Therefore, Hypothesis 4 is supported.

Table 4. 6 Hypothesis Test Results

No.	Hypothesis	Result
H1	There is a significant positive correlation between the awareness of mobile payment and the operational efficiency of university merchants.	Supported
H2	There is a significant positive correlation between the frequency of mobile payment usage and the operational efficiency of university merchants.	Supported
H3	There is a significant positive correlation between the satisfaction with mobile payment and the operational efficiency of university merchants.	Supported
H4	There is a significant positive correlation between the depth of mobile payment usage and the operational efficiency of university merchants.	Supported

Chapter 5 Conclusion and Recommendation

5.1 Conclusion

This study focused on university merchants in Wuhan University Town, China, and explored the impact of the popularization of mobile payment on their operational efficiency. Four hypotheses were tested. Through the analysis of 400 valid questionnaires, using descriptive statistics and correlation analysis, the following key conclusions were drawn.

5.1.1 Awareness of Mobile Payment has a positive effect on Operational Efficiency of University Merchants

The study found a significant positive correlation between awareness of mobile payment and operational efficiency of university merchants, with a Pearson correlation coefficient of 0.839 and a significance level of $P<0.01$. This indicates that as the awareness of mobile payment among university merchants increases, their operational efficiency improves. Specifically, a higher level of awareness, including familiarity with basic functions, security knowledge, latest technologies, relevant policies and regulations, and the ability to distinguish characteristics of different mobile payment platforms, enables merchants to handle mobile payment-related transactions more smoothly, reduce errors in the transaction process, and thus optimize the efficiency of daily operations. Descriptive statistics show that most items related to awareness have a mean above 3, reflecting a moderate to high level of awareness, which further supports the positive impact of awareness on operational efficiency.

5.1.2 Frequency of Mobile Payment Usage has a positive effect on Operational Efficiency of University Merchants

The study found a Pearson correlation coefficient of 0.828 between frequency of mobile payment usage and operational efficiency of university merchants, with a significance level of $P<0.01$. This shows that the frequency of mobile payment usage significantly enhances the operational efficiency of university merchants. Frequent use of mobile payment for transactions, quick handling of customer mobile payment requests, and a large number of mobile payment transactions per month contribute to shortening transaction processing time, accelerating customer service speed, and reducing the time and labor costs associated with traditional payment methods. The descriptive statistical results, where relevant items have a mean above 3, indicate a relatively frequent engagement with mobile payment, which aligns with the positive

correlation observed, as higher frequency leads to more proficient operation and thus higher efficiency.

5.1.3 Satisfaction with Mobile Payment has a positive effect on Operational Efficiency of University Merchants

Satisfaction with mobile payment has a strong positive correlation with operational efficiency of university merchants, with a Pearson correlation coefficient of 0.873 and a significance level of $P<0.01$. This indicates that higher satisfaction with mobile payment significantly improves the operational efficiency of university merchants. Satisfaction with aspects such as convenience of operation, speed of arrival, system stability, reasonableness of service fees, and quality of customer service promotes more active and effective use of mobile payment by merchants. This positive attitude drives merchants to integrate mobile payment more deeply into their daily operations, thereby enhancing transaction efficiency, reducing operational costs, and improving overall service quality. The moderate to high mean values of satisfaction-related items in descriptive statistics further confirm that higher satisfaction is associated with better operational performance.

5.1.4 Depth of Mobile Payment Usage has a positive effect on Operational Efficiency of University Merchants

Depth of mobile payment usage has a significant positive correlation with operational efficiency of university merchants, with a Pearson correlation coefficient of 0.840 and a significance level of $P<0.01$. This indicates that a deeper level of mobile payment usage significantly improves the operational efficiency of university merchants. Using mobile payment beyond simple transactions, such as for account checking, member information management, marketing activities, customer consumption habit analysis, and inventory and purchase management, enables merchants to optimize management processes, reduce operational costs, and improve inventory turnover rates. The multi-scenario and in-depth application of mobile payment broadens the ways merchants manage their businesses, enhances the precision of operation and management, and thus significantly boosts operational efficiency. The descriptive statistics showing moderate to high engagement in depth-related behaviors further support that deeper usage contributes to higher efficiency.

5.2 Recommendation

University merchants should take the initiative to enhance their awareness of mobile payment, as the study confirms that higher awareness directly reduces transaction errors and optimizes operational workflows. To achieve this, merchants can participate in training programs organized by local industry associations or mobile payment platforms. These programs should focus on practical content such as identifying security risks in mobile transactions, understanding updates to payment-related policies, and comparing the functional advantages of different payment platforms. Merchants can also establish regular internal learning mechanisms. For example, they can hold weekly short meetings where employees share problems encountered during mobile payment operations and discuss solutions collectively. This continuous learning process helps merchants stay informed about the latest developments in mobile payment technology and policies, ensuring that every employee can handle mobile payment-related tasks proficiently. By strengthening awareness, merchants can avoid operational disruptions caused by insufficient knowledge of mobile payment functions or policies, thereby laying a solid foundation for improving operational efficiency.

Increasing the frequency of mobile payment usage is another key measure for university merchants to boost operational efficiency. The study shows that frequent use of mobile payment shortens transaction processing time and reduces costs associated with cash handling. Merchants can adopt targeted strategies to encourage customers to use mobile payment. They can offer small incentives for mobile payment transactions, such as a small discount on purchases or a free small product with a certain spending amount. This approach is particularly effective during peak hours, as it not only speeds up checkout but also reduces customer waiting times, improving overall service satisfaction. Merchants should also ensure that their mobile payment terminals are always in good working condition. They can assign a dedicated employee to check the terminals daily, ensuring that QR codes are clear and payment systems are connected to a stable network. For customers who are not familiar with mobile payment, employees should provide patient guidance to help them complete transactions smoothly. Over time, these efforts will increase the proportion of mobile payment transactions, making the checkout process more efficient.

Improving satisfaction with mobile payment is essential for merchants to sustain the adoption of this tool and further enhance operational efficiency. The study highlights that satisfaction with aspects such as operational convenience, fund arrival speed, system stability, service fee reasonableness, and customer service quality has a

strong positive impact on operational efficiency. Merchants should first carefully select mobile payment platforms based on their business needs. They can compare the performance of different platforms in terms of system downtime, fund settlement speed, and service fee rates, and choose the one that best fits their business scale and type. If merchants encounter problems such as delayed fund arrival or system failures, they should actively communicate with the platform's customer service team to seek timely solutions. Additionally, merchants can optimize their internal operational processes related to mobile payment. For example, they can train employees to proficiently operate payment devices, reducing transaction delays caused by human error. By ensuring a smooth and reliable mobile payment experience, merchants can maintain high satisfaction levels, which in turn encourages continued use of mobile payment and supports long-term operational efficiency improvements.

University merchants should deepen the usage of mobile payment beyond basic transaction functions, as the study indicates that deeper usage significantly improves operational efficiency. Merchants can start by using mobile payment platforms for account checking and financial management. This allows them to track daily transaction volumes and revenue in real time, simplifying the process of financial reconciliation and reducing the time spent on manual bookkeeping. Merchants can also leverage mobile payment platforms to manage member information. They can link customer mobile payment accounts to membership systems, enabling customers to accumulate points or enjoy exclusive discounts directly through mobile payments. This not only improves customer retention but also helps merchants build a stable customer base. Furthermore, merchants can use the transaction data provided by mobile payment platforms to analyze customer consumption habits. For example, they can identify peak consumption periods and popular products, and adjust their inventory levels and product assortments accordingly. They can also launch targeted marketing campaigns based on this data, such as promoting relevant products to customers who have purchased similar items in the past. By fully utilizing the advanced functions of mobile payment, merchants can transform their operations from traditional experience-based management to data-driven management, thereby optimizing resource allocation and improving operational efficiency.

Mobile payment platforms have a crucial role to play in supporting university merchants. These platforms should prioritize optimizing their services to meet the specific needs of campus merchants. First, they should invest in technology to improve system stability and reduce downtime. System failures can cause transaction disruptions, leading to customer dissatisfaction and operational losses for merchants. Platforms can also accelerate fund settlement speed. Many university merchants are small-scale operations with limited working capital, so faster fund settlement helps

them improve cash flow and maintain normal business operations. Second, platforms should set reasonable service fee rates for campus merchants. Considering the relatively small transaction volumes and tight profit margins of many campus merchants, platforms can offer preferential fee packages, such as lower rates for merchants with a certain number of monthly transactions. Third, platforms should strengthen customer service support. They can establish a dedicated customer service channel for campus merchants, ensuring that merchants can receive timely assistance when encountering problems. Additionally, platforms can develop industry-specific functions for different types of campus merchants. For example, they can provide inventory management modules for retail stores and order management functions for food and beverage shops, helping merchants better integrate mobile payment into their daily operations.

University administrative departments should provide necessary support to facilitate the integration of mobile payment among campus merchants. They can act as a bridge between merchants and mobile payment platforms by organizing regular communication meetings. These meetings allow merchants to share their needs and challenges, and platforms to introduce new services and solutions. Administrative departments can also collaborate with mobile payment platforms to organize free training workshops for merchants. These workshops can cover topics such as mobile payment security, data analysis for business optimization, and the use of advanced payment functions. Furthermore, administrative departments should optimize the infrastructure in university commercial areas. They can work with network service providers to ensure stable and high-speed network coverage, which is essential for smooth mobile payment transactions. They can also install additional power outlets near payment terminals to prevent device shutdowns due to low battery. Additionally, administrative departments can establish a supervision mechanism to protect the legitimate rights and interests of both merchants and students. For example, they can investigate complaints about unfair service fees or transaction fraud, and work with relevant authorities to address such issues promptly.

Local governments should formulate policies to promote the popularization of mobile payment in university towns and support the development of campus merchants. First, they can provide financial subsidies for small and medium-sized campus merchants to purchase mobile payment terminals or upgrade existing equipment. This reduces the initial investment cost for merchants, encouraging more of them to adopt mobile payment. Second, governments can strengthen the construction of digital infrastructure in university towns. They can expand 5G network coverage and improve network speed in campus commercial areas, ensuring the reliability of mobile payment services. Third, governments can formulate and

improve relevant policies and regulations to standardize the operation of mobile payment platforms. These regulations should focus on protecting transaction security, preventing data leakage, and regulating service fee rates. Additionally, governments can promote the integration of mobile payment into the local campus economy by supporting "cashless campus" projects. These projects encourage the widespread use of mobile payment in campus shops, cafeterias, and service facilities, creating a convenient payment environment for students and promoting the adoption of mobile payment among merchants.

Improving the impact of mobile payment popularization on the operational efficiency of university merchants requires the joint efforts of multiple stakeholders. University merchants should take targeted measures to enhance awareness, increase usage frequency, improve satisfaction, and deepen usage depth of mobile payment. Mobile payment platforms, university administrative departments, and local governments should provide corresponding support in terms of services, infrastructure, and policies. Through such collaborative efforts, the operational efficiency of university merchants can be significantly improved, and the sustainable development of the university town commercial ecosystem can be achieved.

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Appendix

Questionnaire

THE IMPACT OF THE POPULARIZATION OF MOBILE PAYMENT ON THE OPERATIONAL EFFICIENCY OF UNIVERSITY MERCHANTS: A CASE STUDY OF WUHAN UNIVERSITY TOWN IN CHINA

Dear Merchant,

Thank you for taking the time to participate in our survey despite your busy schedule. The purpose of this survey is to understand your views on the relationship between the popularization of mobile payment and operational efficiency of university merchants. Please note that there are no right or wrong answers, and we value your honest opinions.

This survey is conducted anonymously, and your responses will be used solely for academic research purposes. We assure you that all personal information will be kept strictly confidential.

Part 1

1. Business Type:

□ Food & Beverage (e.g., Cafes, Restaurants, Stalls)

□ Retail (e.g., Bookstores, Convenience Stores, Stationery Shops)

□ Services (e.g., Print Shops, Barbershops, Laundry)

2. Approximate size of business (number of employees, including owner):

□ 1 (Owner-Operator)

□ 2-5 Employees

□ 6-10 Employees

□ 11+ Employees

3.Years of Operation

□ Less than 1 year

□ 1-3 years

□ 4-6 years

□ 7 years or more

Part 2

Please select the most appropriate option and mark "√" on the corresponding number. The questionnaire uses a Likert scale from 1 to 5, where 1 means "disagree," 2 means "slightly disagree," 3 means "neutral," 4 means "agree slightly," and 5 means "agree."

Question	1	2	3	4	5
Awareness of mobile payment					
1.I am familiar with the basic functions of mobile payment.					
2.I know the security knowledge related to mobile payment very well.					
3.I have a clear understanding of the latest technologies in mobile payment.					
4.I am aware of the relevant policies and regulations on mobile payment.					
5.I can distinguish the characteristics of different mobile payment platforms.					
Frequency of mobile payment usage					
1.Our store uses mobile payment for transactions very frequently every day.					
2.When customers use mobile payment, we can handle it quickly most of the time.					
3.Mobile payment is used in most of the transactions in our store every week.					
4.We use mobile payment almost every day to complete business transactions.					
5.The number of transactions completed by mobile payment in our store is large every month.					

Satisfaction with mobile payment					
1.I am satisfied with the convenience of operating mobile payment.					
2.I am satisfied with the speed of mobile payment arrival.					
3.I am satisfied with the stability of the mobile payment system.					
4.I am satisfied with the reasonableness of mobile payment service fees.					
5.I am satisfied with the customer service provided by mobile payment platforms.					
Depth of mobile payment usage					
1.We use mobile payment to complete not only transactions but also account checking.					
2.Our store uses mobile payment functions to manage member information.					
3.We have used mobile payment platforms to carry out marketing activities.					
4.We can use mobile payment data to analyze customer consumption habits.					
5.We use mobile payment to manage store inventory and purchase.					
Operational efficiency of university merchants					
1.The time taken to process each transaction in our store is short.					
2.Our store can reduce operational costs effectively through efficient management.					
3.The speed of serving customers in our store is fast.					
4.The inventory turnover rate in our store is high.					