What Influences Small Merchants' Intention to Integrate QR Terminals: A Study from the Perspective of an Emerging Growing Economy

By

Rehnum Mehrab Imtiaz

(201-51-015)

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APPROVAL

This project titled on "**What Influences Small Merchants' Intention to Integrate QR Terminals: A Study from the Perspective of an Emerging Growing Economy**", submitted by "**Rehnum Mehrab Imtiaz, 201-51-015**", to the Department of Information Technology & Management, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Information Technology & Management, and approval as to its style and contents.

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It hereby declares that this thesis has been done by me or us under the supervision of **Dr. Ashikur Rahman**, Senior Lecturer, Department of Information Technology & Management (ITM), Daffodil International University. It also declares that neither this thesis nor any part of this has been submitted elsewhere for award of any degree.

Rehnum Mehrab Imtiaz
Student ID: 201-51-015
Batch: 1
Department of Information Technology & Management (ITM)
Faculty of Science & Information Technology
Daffodil International University

Certified by:

Dr. Ashikur Rahman
Lecturer (Senior scale)
Department of Information Technology & Management (ITM)
Faculty of Science & Information Technology
Daffodil International University

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ABSTRACT

The world of financial technology (fintech) is evolving at high speed, and the QR (Quick Response) payment systems have become a cost-effective and practical solution that suit well small merchants, particularly those operating in the field of the emerging market, like in Bangladesh. The given research examines the main predictors of the intention of small-business owners to implement a QR payment terminal. Under the influence of the existing theoretical frameworks, i.e., the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Diffusion of Innovations (DOI), the study tests the predictor variables of perceived increase of use, perceived usefulness, trust, perceived risk, customer demand, governmental support, and market competition.

The study of digital payment uptake amongst 200 small traders in the urban and peri-urban areas in Bangladesh was performed with the help of stratified survey and regression and structural equation modeling (SEM). Findings indicate that adoption decisions have a huge effect on the perception of usefulness, trust, customer demand, and ease of use, but not perceived risk. Programs in the government such as Bangla QR are important towards facilitating digital access and merchant trust. The research provides a policy recommendation to regulators, financial institutions, and developers of the fintech-the intuitive design, regulation encouragement, and awareness creation should be prioritized to progress cashless payments and financial inclusion in developing economies.

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CHAPTER 1

INTRODUCTION

1.1 Background

The proliferation of the internet based financial services has changed financial globes which have also led to more convenient, faster and more economical payment technologies. Within such an environment, QR (Quick Response) code-based systems have prepared and attained their silver bullet position in the developed and developing markets, and their arbitration is an alternative high-efficiency alternative to cash and card-based transactions (Li & Huang, 2021). It is due to the fact that they require less challenging infrastructure requirements, are easy to implement, and can be scaled which is a consideration that makes it highly attractive to small and microenterprises that operate primarily in low-income to the middle and income contexts.

As the economies of the world are entering the era of cashless society, the digital payment technologies are no longer a luxury, but just the tools of well-being in terms of financial accessibility, financial visibility, and financial reciliation (World Bank, 2020). QR-based payments will be a means of entry into formal financial services to small merchants due to the reduced use of cash, simplified transactional processes, and the availability to reach wider customer segments who are willing to use contact-free and mobile-based transactions. The pandemic of the COVID-19 virus has only served to hasten this uptake, with both individuals and companies wanting less risky and more hands-free solutions (Auer et al., 2021).

Despite such positive trends, the adoption of QR payment system among small merchants differs by region as well as the socio-economic strata. Such jurisdictions as China, India, and Indonesia have been demonstrating a rapidly scaled-up merchant

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facing QR structure, with many least-developed commodities still experiencing barriers to mass adoption. The main barriers are low levels of digital skills, gaps in infrastructural provisions, safety issues, and a lack of perceived volume of benefits on the part of the merchant (Kumar et al., 2022).

1.1.1 Global Application QR Code Payments

The use of QR code payments has taken a sharp upward trend across the world. Alipay and WeChat Pay are QR-based payment systems that already process trillions of dollars in transactions in a single year and have mostly replaced cash in city shops in China (Zhou et al., 2020). With the integration of payment, loyalty program opportunities, and lending and targeted marketing options, such platforms appear as complete-service tools for conducting business. Similar trends in Singapore, Malaysia, and India have resulted in the creation of standard national QR frameworks SGQR and BharatQR that are supposed to increase and prevent fragmentation of the ecosystem on the one hand and improve interoperability on the other.

The Unified Payments Interface (UPI) of India, which is connected with BharatQR, has changed the low-value transactions made by the merchant in rural and urban areas, therefore, boosting digital financial inclusion. The progressive nature of government policy, strong public-private partnerships, and broad bases of assuring the people in the form of the initiative of raising public-awareness has been driving forward the success of the program. Bangladesh, one of the emerging economies, can use these examples in the making of scalable and inclusive digital payment infrastructure.

1.1.2 Bangladesh Application QR Code Payments

Bangladesh is a market with a relatively blossoming fintech industry and a young tech-savvy population, which is why the growth of QR-based payments could

occur there. In line with the country's Vision 2041 for a "Smart Bangladesh," the central bank launched the Bangla QR initiative to unify various QR platforms under a single national standard. The objective is to decrease cash dependence and increase the financial usefulness of small businesspeople and informal entrepreneur proprietors (Bangladesh Bank, 2022).

There are more than 90 percent of business entities in the country with over 20 million employees and contributing to the GDP around 25 percent, which are micro, small, and medium enterprises (MSMEs) (ADB, 2021). Nevertheless, POS infrastructure, bank credit, or digital literacy continues to rule out many of these businesses because they exist outside the formal boundaries of financial systems in spite of the importance represented by them regarding their size. QR terminals, where transactions can be made only with a smartphone or a printed QR code, are a cheaper and scalable access point to digital finance to these merchants.

However, the actual adoption remains slow. It has been a mixture of some factors such as low awareness, fear of fraud, inadequacy of customer demand and lack of direct perceived value to the merchants. Based on research, adopting technology does not only depend on technological factors but also surrounds contextual and behavioral aspects that include trust, institutional reinforcement, competition imperative, and customer preference (Hossain & Rahman, 2022).

These dimensions should be cognized to tap the QR payments power in small business setting in Bangladesh. In the current study, the latter will put efforts in analyzing these factors numerically and empirically.

1.2 Problem Statement

Though the concept of digital transformation in the financial and business world of Bangladesh is growing steadily, the uptake of payment systems through QR code among small traders is also very low. This continued underuse poses a significant challenge to achieving a cashless and inclusive economy, which is one of the key priorities of the national digital agenda of the country. Although the main pre-infrastructure of QR payment has been laid out in a progressive way and that comprises smartphone penetration, mobile financial services (MFS) and positive regulatory framework, the QR hierarchy connectivity and implementation of QR terminal in micro and small enterprise has been done in a partial and intermittent fashion.

The other significant regulatory achievement is the Bangla QR program of the Bangladesh bank that was launched to standardize the QR-based payment systems to ensure the interoperability of financial institutions. However, the relationship between merchants and such systems is not in the desired proportions. Although it is a proven fact that mobile phone ubiquity means that consumer willingness to digital transaction is inversely proportional, urbanization and convenience in a cashless transaction, the merchants are too reliant on cash. This kind of supply-demand mismatch in the technological provision and behavioral reaching is explainable through systemic issues.

There are a number of important repercussions of this adoption lag. The former is that it lowers operational capabilities of small business that may need quicker processing time of transactions, automation of records and dangers of dealing with cash. Second, it prevents financial transparency and traceability, to gain access to formal credit and financial services, which is a significant source of business growth and sustainability. Third, the characteristics that build an autonomous online space like the inability of

merchants to implement the use of QR imply that the customer is not assisted to make a cashless payment, thereby the absence of trust and integrity of online financial action.

This issue is caused by numerous factors that are connected to each other. There are technology barriers such as a lack of the digital literacy and costs coupled with a fear of technical breakdown not to mention usability concerns that merchants are not ready to use QR solutions. The background problems of perception of high implementation costs, the non-supportive attitude of the service providers and the non-incentive of regulations are added to the problem. Further, the lack of immediate physical benefits, such as activating the market, increasing sales, reducing overhead costs or customer loyalty, discourages the merchants to become digital system of operation by freezing the old cash operations.

The small and micro businesses are not a priority area of the policies and do not receive any special attention in academic literature even though other digital financial inclusion programs have been concentrating on the consumer and large-scale business. An obvious research gap which can be empirically documented is lacking in the view to document the strangeness of behavioral influences, institutional settings and economic situations of small merchant adoption behavior. Without a reasonable understanding of such dynamics, any efforts to promote the use of QR terminals can become superficial or ill-informed about what is happening on the merchant ground.

Fundamentally, the absence of the penetration of QR-based payment system among small merchants in Bangladesh is a manifestation of the technology opportunity and user preparedness gap. The aim of such research is to address that gap, through a systematic establishment of the determinants of adoption, or inhibition of it, on the basis of both a theoretical and contextual framework. In such a way it is planning to take a

less invasive and more successful step towards a digitalized financial society in Bangladesh.

1.3 Research Questions

The research questions that the study poses are the following:

RQ-1. What are the key factors influencing small merchants' intention to adopt QR terminal payment systems in Bangladesh?

RQ-2. How do technological, behavioral, and contextual variables such as perceived ease of use, usefulness, trust, and customer demand impact the adoption behavior of small merchants?

RQ-3. What actionable strategies can be developed for stakeholders to enhance the adoption of QR terminal systems among small merchants?

1.4 Research Objectives

The following research objectives were formulated to address the core research questions of this study:

RO1. To identify and analyze the key factors that influence small merchants' intention to adopt QR terminal payment systems in Bangladesh.

RO2. To examine the impact of technological, behavioral, and contextual variables—such as perceived ease of use, perceived usefulness, trust, and customer demand—on the adoption behavior of small merchants.

RO3. To develop practical recommendations for financial institutions, fintech providers, and policymakers aimed at increasing QR terminal adoption among small merchants.

1.5 Research Scope

This study investigates the adoption of QR code-based payment systems by small merchants in Bangladesh, focusing specifically on the factors that influence their intention to integrate QR terminals into business operations. It covers both technological variables—such as perceived usefulness, ease of use, and facilitating conditions and contextual factors, including trust, financial literacy, customer demand, and perceived risk.

The research targets small-scale merchants operating in urban and peri-urban areas across diverse sectors such as retail, food, and personal services. These merchants typically operate outside formal POS infrastructure but are ideal candidates for low-cost, QR-based solutions.

Using a quantitative, cross-sectional design, the study collects survey data and analyzes it through Structural Equation Modeling (SEM) to validate a conceptual model. The findings aim to support efforts toward digital financial inclusion and inform strategies for expanding QR terminal adoption among small businesses in emerging economies.

1.6 Thesis Organization

This thesis is structured into five main chapters. Each chapter addresses specific aspects of the study and contributes to building a coherent and comprehensive understanding of the research problem.

1.6.1 Chapter 1 – Introduction

This chapter introduces the research by outlining the background, problem statement, research objectives, and research questions. It also explains the significance, scope, and structure of the thesis.

1.6.2 Chapter 2 – Literature Review

This chapter presents a critical review of existing literature related to QR code payment systems, technology adoption models, and relevant empirical studies. It identifies research gaps and develops the conceptual framework for the study.

1.6.3 Chapter 3 – Methodology

This chapter describes research design, population and sampling methods, data collection procedures, instrumentation, and analytical techniques. Ethical considerations are also addressed.

1.6.4 Chapter 4 – Results and Discussion

This chapter presents the findings from the data analysis and discusses them in light of the research model and existing literature. It includes descriptive statistics, model evaluation, and hypothesis testing.

1.6.5 Chapter 5 – Conclusion and Recommendations

The final chapter summarizes the key findings, discusses their theoretical and practical implications, outlines the limitations of the study, and offers recommendations for future research and practice.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Implementation of QR (Quick Response) code as the payment system; this has been a twist to the payment system industry, particularly those in the developing economies. The theoretical and practical levels of QR codes payments have experienced much focus during the last years, especially in the nations that are experiencing digitalization. The payment made through QR code can also be made through the use of smartphones to scan a code to allow users to pay compared to the situation where credit cards are used or actual money used to pay. This approach also has numerous advantages, which include convenience, low transaction costs, and time due to this approach, and it is what has allowed this approach to replace the older systems of payment, with China and India being among the counties where small merchants can establish a connection with digital payment systems with grace and cheapness compared to the established systems of the Point of Sale (POS) (Zhou et al., 2020). QR codes offer a compelling finance-free alternative to the high cost of credit card terminals to small merchants in Bangladesh, which in turn makes it quick and simple to join the formal digital economy with a low entry cost. This is important since small merchants form the backbone of most of the developing economies, and their use of new financial technologies are vital in attaining a scalable and all-inclusive digital payment infrastructure codes have grown in popularity because it provides simplicity, security, and speed in the usage as cashless societies become prevalent around the world. In Bangladesh, the Bangladesh bank has initiated Bangla QR, an initiative to unify different QR platforms and to come up with one national standard to support

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financial inclusions and smooth transaction to small and micro businesses. Nevertheless, small merchants adopt them rather slowly, being affected by the cultural aspect, knowledge gap, and their fear of these digital systems (Hossain & Rahman, 2022). In spite of the increased potential, numerous small retailers are not ready to embrace QR payments yet, being concerned over the unfamiliarity of the technology and the lack of understanding of what direct gains would come out of it. The small merchant adoption process of QR payments can prove to be critical in the wider context of digital financial inclusion in terms of scalability and inclusiveness of digital payments. With another digital transition in Bangladesh, the chapter reviews the theoretical frameworks, empirical studies, and the adoption models relevant in QR payment systems. This chapter intends to bridge this knowledge gap and come up with a conceptualization on, how to understand the small merchant adoption of QR terminals in Bangladesh, by critically evaluating the barriers and the facilitators to adoption.

2.2 Technology Adoption Models

Multiple models of technology adoption have been used in the previous research so as to understand the adoption behavior of the small merchants to the QR payments. These models provide a theoretical basis for discussing the factors that control the efforts made in the adoption and use of new technologies. It is agreed that Technology Acceptance Model (TAM) of Davis, 1989 is one of the most widely used models to study technology adoption. According to TAM, the perceived ease of use and the perceived usefulness are the biggest factors that determine the individual's intention to use technology. In the context of QR payments, these aspects can be used to explain the adoption behavior of small merchants, since merchants are more likely to adopt a technology when they believe that it is easy to use and benefits their business activity.

Another model can be Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by the Venkatesh et al in 2003. UTAUT is a mixture of some of the predefined models such as TAM, Tra, TPB, etc. It identifies the major factors influencing technology acceptance as performance expectancy, effort expectancy, social influence and facilitating conditions. The model is especially relevant in analyzing small businesses' QR payment system adoption because it highlights the role of perceptions on the usefulness, ease of use, and external support structures of the technology as determinants of adoption decisions.

In addition, Rogers' Diffusion of Innovations (DOI) theory can provide great insight into how innovations such as QR code payment systems are adopted by members of a social system. In terms of decision making, DOI emphasizes such aspects as relative advantage, compatibility, complexity, and observability. This theory is helpful to understand how small merchants may perceive QR payment systems as innovations, and if such systems are considered beneficial, compatible with current practices, and observable in terms of other business's successful adoption.

The Task-Technology Fit (TTF) model formulated by Goodhue and Thompson in 1995 suggests that the degree of appropriateness of a technology to the needs of a task has a direct causal effect on its usage. In the case of QR payments, the decision to adopt for small merchants is dependent on the technology's ability to cater to their operational requirements, ease of use, speed of transactions, and so on, as well as other factors related to whether the technology simplifies the payment process. Merchants are more willing to use a QR payment system in case they feel that this is an appropriate tool that their business needs.

All these models provide an integrated framework of exploring the technological, behavioral, and situational factors that determine the adoption intention of QR payment systems, among small merchants in Bangladesh. This study is aimed at examining how these various factors of technology, including the perceived ease of use and perceived usefulness of technology, and such exogenous factors as social influence and facilitating conditions influence the adoption behavior of small merchants in the country through a combination of these models.

2.3 Factors Influencing Merchant Adoption

There are a number of factors that will determine the decision by the small merchants to adopt QR payment systems. These factors of discrimination can be categorized into technological, behavioral, and contextual factors.

Technological Factors: Perceived Ease of Use: The smaller merchants will be more willing to apply the QR systems in a situation where they feel that the systems are easy to use. These are properties like simplicity of installation, transaction processing and solving of problems.

Perceived Usefulness: QR payments will appeal to merchants if they see it as something that is useful to their businesses. This can be in the form of things such as quicker transaction times, less cash dependency and the ability to reach a bigger customer base.

System Reliability and Security: Trust in the security features and data protection of the system is a critical role. The merchants have to be made to believe that their trading activities will be safe and that the technology will be able to offer the transaction.

Behavioral Factors: Trust: The trust in digital systems and mobile financial services is one major factor that could also influence QR adoption. The small merchants who are not confident enough in the system are afraid of the fraud or the system crashing and hence are not open to the use of QR payments.

Perceived Risk: Fear of loss, technical failures, and frauds are some of the common reasons that act as the barrier to the use of QR. Merchants must make sure that the step towards the digital payment system is more rewarding than risky to encourage more adoption of it.

Attitude towards technology: This is mainly determined by the attitude of small merchants towards the digital technology. Merchants that are more technologically inclined are better suited to use QR systems.

Contextual Factors: Customer demand: Customer demand is another important driver of digital payments, in the form of demand. The adoption of QR system among merchants is expected to increase whenever their customers want to use contactless payment.

Regulatory Environment: The importance of this element is the governmental initiatives and policies, including the Bangla QR initiative, which helps create an enabling environment of QR adoption Small merchants should be encouraged to adopt by means of government support in the form of tax incentives, subsidies or advice on education.

Competitive Pressure on the Markets: Competition within the market can drive the use of QR payment systems on occasion. In case their competitors are more likely to put QR payments in place, the merchants may create a sense of urgency to do the same.

2.4 Hypothesis Development

2.4.1 Perceived Ease of Use and Merchant Intention to Adopt QR Payments

The perceived ease of use of QR payment systems is a fundamental factor influencing small merchants' intention to adopt these technologies. The Technology Acceptance Model (TAM) is that the individuals will be willing to use a technology when they find it simple to navigate without any form of complexity. To small merchants, the use and adoption of QR systems should be perceived as an easy procedure where they have to develop and invest minimal efforts into the arrangement, use and trouble fix the system. In case they consider QR payments user-friendly and do not waste their time, merchants become willing to implement these systems in their enterprises. Ease of use is an even more important element in the case of the small merchants in Bangladesh many of whom may not be technically competent. Clearly, the more the merchants can integrate and use the QR payment systems the more they would be willing to implement QR payment systems. Therefore, we hypothesize:

H1: Perceived ease of use positively influences small merchants' intention to adopt QR payment systems.

2.4.2 Perceived Usefulness and Merchant Intention to Adopt QR Payments

Perceived usefulness is also an important determinant of the intention of small merchants to embrace QR payment systems. When merchants think that the use of QR codes would add tangible value to their companies, e.g. in terms of a more efficient processing of transactions, higher customer satisfaction and reduced levels of financial opaqueness, using QR codes will become perceived as a valuable tool. Unified Theory of Acceptance and Use of Technology (UTAUT) has two kernel points that attention should be given to high performance expectancy, or how much a user believes that a

system would increase his or her job performance is a great factor influencing adoption decisions. The introduction of QR payments to small sellers in Bangladesh may be regarded as an attempt to optimize the business and make it less dependent on cash and more convenient to record the financial transactions. When they feel these advantages, their motivation to use QR payment systems will be likely to rise. Thus, we hypothesize:

H2: Perceived usefulness positively influences small merchants' intention to adopt QR payment systems.

2.4.3 Trust in the System and Merchant Intention to Adopt QR Payments

Small merchants need to learn to trust in the security and use of QR payment systems so that they use them. The merchants should be assured of protection against fraud and smooth operations of the system. When merchants are sure about security of the system and its reliability, the higher will be their desire to use QR payment systems. Trust in technology adoption has been proven to be a significant factor and among the small merchants in developing nations such as Bangladesh and other nations enduring such economies, trust may also be able to considerably manipulate their adopting behavior inside the nation. Thus, we hypothesize:

H3: Trust in the system positively influences small merchants' intention to adopt QR payment systems.

2.4.4 Perceived Risk and Merchant Intention to Adopt QR Payments

Risk is a prime hurdle in the adoption of technology, especially to small merchants. The risk that merchants determine when they take on new technologies is associated with the risk of loss of finance, fraud, and system failure. When these

perceived risks are high then the intention towards adopting the technology is low. When it comes to QR payments, they can be regarded skeptically, in case merchants are afraid of conducting fraudulent activities or risk the potential of untrustworthy deals. According to Diffusion of Innovations (DOI) theory, the perceived risk may have negative influence on decisions to adopt innovations. Therefore, we hypothesize:

H4: Perceived risk negatively influences small merchants' intention to adopt QR payment systems.

2.4.5 Customer Demand and Merchant Intention to Adopt QR Payments

Customer demand is of great importance to influence the small merchants into using QR payment systems. With a growing consumer appetite toward less cumbersome, contactless, and safe ways to pay, merchants might feel pressure to implement QR payments to attract people. The UTAUT theory suggests that social influences such as customers' expectations—affects merchants' adoption decisions. In Bangladesh, as mobile payment is being implemented in more ways, the small merchants can switch to QR payments to meet the rising increased demand of contactless payment. Thus, we hypothesize:

H5: Customer demand positively influences small merchants' intention to adopt QR payment systems.

2.4.6 Government Support and Merchant Intention to Adopt QR Payments

The adoption of the QR payment system by the small merchants with the help of the government can be quite helpful. The Bangla QR program is an example of initiatives to encourage the usage of digital payment systems through handouts, incentives, and educative campaigns. The regulatory framework is one that helps or

destroys the adoption of new technologies. The government interventions are capable of lowering the cost of adoption and should offer support to be given to the merchants through providing the required support to support QR payments in their efforts. Thus, we hypothesize:

H6: Government support positively influences small merchants' intention to adopt QR payment systems.

2.4.7 Market Competition and Merchant Intention to Adopt QR Payments

Small merchants can also be encouraged to introduce innovations and new technologies in the technologically competitive markets. In case competitors have implemented QR payments systems, and they are enjoying benefits of having more satisfied customers and efficient operations, other merchants might feel out of place not to do the same. Competitive pressure may therefore be a great push towards the embrace of QR payments as the merchants want to stay relevant in the market. In Bangladesh, there are plenty of small businesses and the competition in the country is stiff, thus the implementation of QR payments will enable the merchants to be competitive. Therefore, we hypothesize:

H7: Market competition positively influences small merchants' intention to adopt QR payment systems.

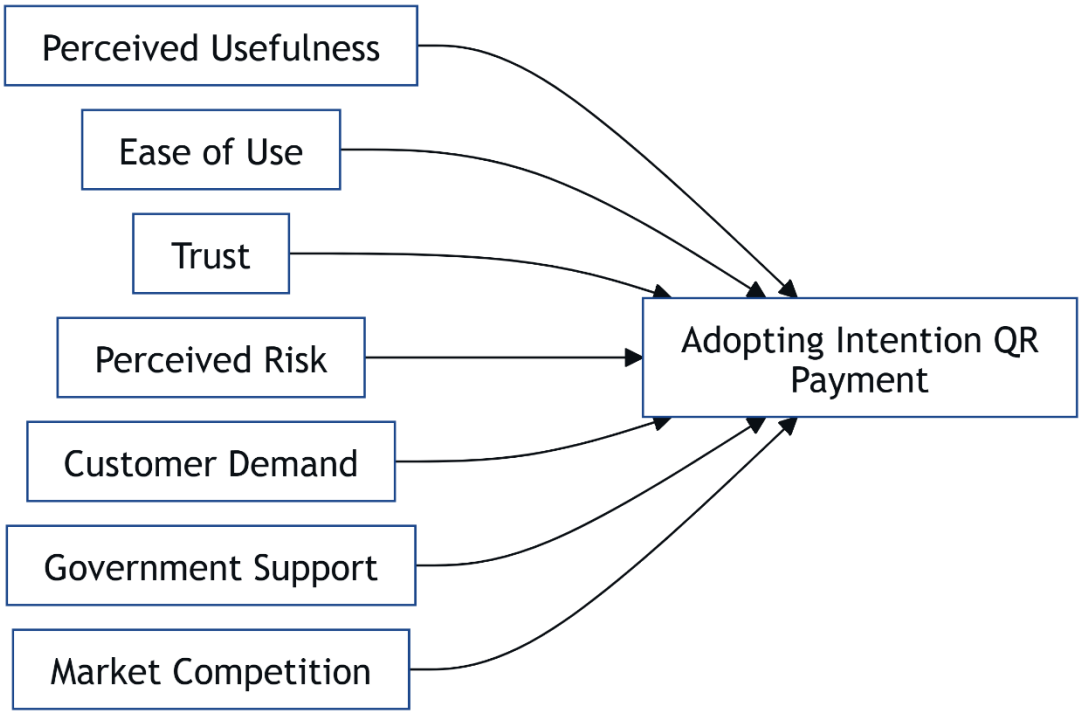

Figure 2.1: Research Framework

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CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology used in this study to investigate the factors influencing small merchants' intention to adopt QR terminal payment systems in Bangladesh. It gives a description of the research methodology and how the methodology relates to the research questions as well as provides the methodology of data collection and analysis.

The main aim of the study is to determine and examine the factors that influence the introduction of QR payments among small merchants. The methodology adopted is relevant to the purpose of the research as well as to achieve empirical evidence to address the research questions. The choice of quantitative research method and cross-sectional research design referenced in this chapter is also justified given that they are best in determining relationships between variables and generalizing findings using the data.

This research seeks to comprehend the nature of the correlation between various elements including perceived ease of use, trust and perceived usefulness on the case of QR payment deployment by small merchants in accordance with the Theory of Planned Behavior (Ajzen, 1991) and Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003).

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3.2 Research Paradigm

The paradigm adopted by this research is positivism that relates to the quantitative method in the social sciences. Positivism is objective and tries to explain things by using measurable variables. This methodology suits the research because its aims to investigate the links between technological, behavioral, and contextual elements and how the mentioned factors influence the intention to use QR payment system by the small merchants in Bangladesh (Creswell, 2013).

The decision was made to use some quantitative research approaches as it specifically involve gathering numeric types of data which can later be analyzed statistically to establish patterns as well as the relationship that exists in between. This is a good approach in testing the hypotheses that were postulated in Chapter 2 and the results are clear and generalizable (Neuman, 2014). Through structural survey questionnaire and statistical analysis, this study is expected to offer objective facts about the determinants affecting the acceptance of QR payment systems.

3.3 Research Design

The design of study is cross-sectional where collected data is taken at one moment and the sample of little merchants in Bangladesh is considered. This design would be suitable in the study because we would be in a position to analyze the relationship between the variables, and we will not have to collect long term data (Bryman, 2016). Cross-sectional research would give a present view of the situation to adopt the QR payment among small merchants and learn the factors that carry any effect on their intention to adopt QR payments.

This is the design that best suits the study of causality between technological, behavioral, and contextual issues and the effects of the same on intention (Fornell & Larcker, 1981). The research questions focus on understanding how these factors interact and contribute to small merchants' decision-making process, making the cross-sectional design ideal for addressing the research objectives.

3.4 Population and Sampling

In this study, the considered target population is small merchants in Bangladesh, i.e. in urban and peri-urban regions. Such merchants traditionally work in retail, food services, personal services, and do not have access neither to formal POS systems, nor banking infrastructure (Islam & Khatun, 2019). The study focuses on small merchants because they represent a significant portion of Bangladesh's micro, small, and medium enterprises (MSMEs), which are crucial to the country's economy (Asian Development Bank, 2021).

Selection criteria consist of merchants that have heard or know about the QR payments, merchants that currently use or may use QR terminal payment systems, and merchants in industries where digital payment systems would realize the greatest benefit to use, which include retail and food. This ensures that the sample is representative of the population of small merchants relevant to the study's objectives (Hossain & Rahman, 2022).

3.5 Sampling Technique

This research will be using the purposive sampling method, which is a form of non-random sampling in which the study participants are chosen using certain characteristics that are related to the study. The purposive method was selected due to

the possibility of choosing a small merchant as the subject to high probability of providing the worthwhile data about adopting QR payments (Etikan et al., 2016).

The use of purposive sampling was justified because such a sampling technique guarantees that the sample does not go against the purposes of the research. The choice of merchants implies the identification of those who have already known about the QR payments or those who are about to use them soon in the future to have all the relevant and impactful data (Bryman, 2016).

3.6 Sample Size

This study uses the power analysis method to determine the sample size, and also the sample size has to be substantially significant to be followed by other vital judgments. The minimum sample size that this study needs is determined using the G*Power software (Faul et al., 2009), which assists in estimating the sample size based on statistical power (0.95), effect size, and the number of the predictors in a model. This is to ensure the study is large enough to meaningfully identify a relationship and allow generalization of the same.

According to the objectives and postulated hypotheses of the study, a total sample of 200 and more small merchants can be considered sufficient. This figure makes the research statistically powerful, and it is in consideration of the possibility of non-responses, or missing information (Sekaran, 2003).

3.7 Survey Questionnaire Development

The instrument of the survey is the questionnaire specially structured to record essential variables concerning the subject of QR payment system adoption. The sections of the questionnaire measure perceived ease of use, perceived usefulness, trust, perceived risk,

and customer demand in addition to the demographic data regarding the participants (Davis, 1989; Venkatesh et al., 2003).

A small sample of merchants was used in pilot testing and validation of the survey instrument to precede the widely accepted data collection. This made it possible to determine problems in terms of question clarity, answer choices as well as length of the questionnaire. The last questionnaire then had some refinements after the incorporation of feedback to ascertain reliability and validity (Fink, 2013).

3.8 Data Collection Procedure

The current study employed the use of both online and on-ground surveys when collecting data. Surveys through the internet were sent out to the small merchants who were reachable via the internet either through mail or through social media platforms. To achieve a diversity and representation of sample, face-to-face surveys were carried out among merchants unreachable online (Patton, 2015).

The data collection took more than a month, which included the use of surveys in collecting data and responses. Reminders on further communication with the people who participated online were provided, and direct communication was conducted with those who were together with the researchers. This was done in such a way that there was a guarantee of good response rates as well as reliability of data collected (Creswell, 2014).

3.9 Common Method Variance

The data of this study is based on self-report measures and therefore provides the possibility of the threat to common method variance (CMV) that may induce bias. In order to combat for this risk, a number of methods were adopted to reduce the biases in response. These were maintaining anonymity of the respondent, clear and neutral

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wording in the survey and the length of the survey was to be kept reasonable (Podsakoff et al., 2003).

In addition, several statistical methods including Harman's Single Factor Test were also used in the data analysis in order to determine if any influence of the common method bias existed. This test can be used to identify a possibility of bias as a single factor can be used to predict most of the variability in data (Podsakoff & Organ, 1986).

3.10 Statistical Techniques and Data Analysis

Descriptive statistics were employed to make sense of the data collected using the surveys to summarize the characteristics of the sample and distribution of critical variables. In order to validate the hypotheses and to study the interrelationships among the factors affecting the QR payment adoption, the Structural equation Modeling (SEM) was adopted. SEM will suit this research because it is possible to check complicated connections between numerous variables (Hair et al., 2016).

Besides the SEM, the individual hypotheses were tested by the regression analysis. This discussion assists in establishing the influence of each of the aforementioned factors such as ease of use, perceived usefulness, trust, perceived risk, customer demand, government support and competition to the adoption intention of the QR payment systems (Cohen, 1992).

3.11 Justifications for Using PLS-SEM in the Current Study

On the basis of feasibility, PLS-SEM was selected as the method of analyzing the data because it is capable of analyzing complex relationships between the variables despite the small sample size. PLS-SEM best fits this study due to its flexibility, the ability to use reflective or formative measurement model, and is not restricted by the normality

of data distribution making it adequate to examine the relationship in the proposed conceptual model (Hair et al., 2017).

The virtue of PLS-SEM in measuring complex relationships, especially in preliminary research provides that it is an optimal instrument to use in testing the proposed relationships in the current study. PLS-SEM also provides higher predictive power, allowing for more accurate assessments of the hypothesized relationships between small merchants' adoption intentions and the various influencing factors.

3.12 Summary of the Chapter

In this chapter, the research methodology employed in this study was given in a detailed way. The quantitative research approach, combined with a cross-sectional design, allows for a focused investigation into the factors influencing small merchants' adoption of QR payment systems in Bangladesh. Descriptive statistics were employed to make sense of the data collected using the surveys to summarize the characteristics of the sample and distribution of critical variables. In order to validate the hypotheses and to study the interrelationships among the factors affecting the QR payment adoption, the Structural equation Modeling (SEM) was adopted.

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CHAPTER 4

RESULTS AND FINDINGS

4.1 Descriptive Statistics

The researchers analysed the survey data about the 200 small merchants surveyed in Bangladesh, aiming to understand the demographic and business characteristics of these merchants and their perception about adopting QR payment technology. The descriptive statistics provide a detailed view of the respondents and form the basis for the other inferential analyses.

The demographic results showed that the greatest number of the respondents were males (76.5%, n = 153) with a lower number of the respondents being females (23.5%, n = 47). This gender gap is a larger entrepreneurial picture in the context of Bangladesh with small and micro entrepreneurship still being led (more or less) by males. However, it is worth mentioning that female representation in the technology-driven corporation is little but is increasing steadily with time (Islam & Sultana, 2021).

The age group information revealed that the sample was younger than the general population: 61.5% (n = 123) of the respondents were in the 18-25 age group, 27.0% (n = 54) were in the 26-40 age group and, in total, just 11.5% (n = 23) were over 40 years of age. This underscores the fact that in the panels, younger entrepreneurs make up the grounds of the merchants and are more exposed to digital solutions and cashless technologies, which fit the patterns of innovation adoption that focus on the youth as being the first adopters (Rajuroy, 2025; Rogers, 2003).

Business category saw three categories of enterprises according to the survey of personal services (41.0%, n = 82), retail (33.5%, n = 67), and food services (25.5%, n

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= 51). The prevalence of the service sector business shows that the companies that depend on the processes involving frequent, low-value payments could be particularly interested in the QR-based payment platforms to streamline performance.

The place of business was also revealed by location analysis which indicated that 73.5 percent (n = 147) of the merchants were in urban regions and also 26.5 percent (n = 53) were in peri-urban regions. This urban bias may be described by internet infrastructure access, smartphone suffusion and client education initiatives as regards digital finance (Hossain & Rahman, 2022).

The business tenure pattern showed that a majority of these enterprises were still immature. In particular, 59.0 percent (n = 118) of the respondents had not been in the business more than one year, 21.5 percent (n = 43) had run the business after one to three years, 11.5 percent (n = 23) ran the business after four to six years and only 8.0 percent (n = 16) had been in the business over six years. This fact underlines the fact that early-stage ventures prevail in the adoption landscape as start-ups and young businesses are more inclined to accept and implement digital innovations as one of the routes to achieving competitive edge (Kumar et al., 2022).

Characteristics of the respondents also come out in the analysis of the monthly sales with the micro and the small enterprises bearing the annotations. Of the total, more than half (52.0%, n = 104) had fewer than BDT 50,000 in monthly sales. A further 28.5 percent (n = 57) had sales between BDT 50,000 and 100,000 followed by 11 percent (n = 22) who had sales between BDT 100,000 and 200,000 and the remaining 8.5 percent (n = 17) reported greater than BDT 200,000 worth of sales. Such tendency in dominance of low-revenue firms highlights the necessity to introduce more low-cost, low-friction solutions, including QR payments, to simplify transactions when it comes to

approaching a low-margin, competitive market where customer loyalty is paramount (Hasan, Chowdhury, & Nahar, 2025; World Bank & WEF, 2016).

Through the multiple constructs, perceptions of QR payments were collected with the help of a five-point Likert scale. The highest measure identified that of Perceived Usefulness (PU), which stood at 4.5 (approx.), meant there was a high level of agreement that QR systems enhance efficiency, and increase customer satisfaction, as well as promote business processes. Customer Demand (CD) also scored on the high-end (4.4), and that is an indication of the fact that the merchants had a good understanding of the fact that people preferred digital payment. Ease of Use (EOU) had positive responses (= 4.2), which indicated that merchants intuitively found QR payments fairly easy to navigate. In the same fashion, Trust (TR) in the reliability and security of QR platforms received positive ratings (4.1). Conversely, a slightly lower score (= 3.3) was given to Perceived Risk (PR) as we were also concerned with fraud, abuse or technical disadvantages, but they were not identified as key barriers (Featherman & Pavlou, 2003; Zhou, 2020).

Government Support (GS) was rated at a moderate level (=3.6), as there is limited but increasing awareness of such systems as Bangla QR. Sellers noticed that they can be motivated to implement through incentives and official recommendation (Bangladesh Bank, 2022). Market Competition (MC) was at the average of 3.9, which means the behavior of competitors and the involvement of peers in embracing the use of the QR technology had an impact on the decisions made by merchants. Lastly, Adoption Intention (AI) was rated highly (4.3), readiness and the factor of willingness to allocate QR payment systems in the near future.

Table 4.1: Demographic Statistics

Factor	Category/Range	Frequency	Percentage
Gender	Male	153	76.5%
	Female	47	23.5%
Age	18–25	123	61.5%
	26–40	54	27.0%
	Above 40	23	11.5%
Business Type	Personal Services	82	41.0%
	Retail	67	33.5%
	Food Services	51	25.5%
Location	Urban	147	73.5%
	Peri-urban	53	26.5%
Business Tenure	Less than 1 year	118	59.0%
	1–3 years	43	21.5%
	4–6 years	23	11.5%
	More than 6 years	16	8.0%
Monthly Sales	< BDT 50,000	104	52.0%
	BDT 50,000–100,000	57	28.5%
	BDT 100,000–200,000	22	11.0%
	> BDT 200,000	17	8.5%

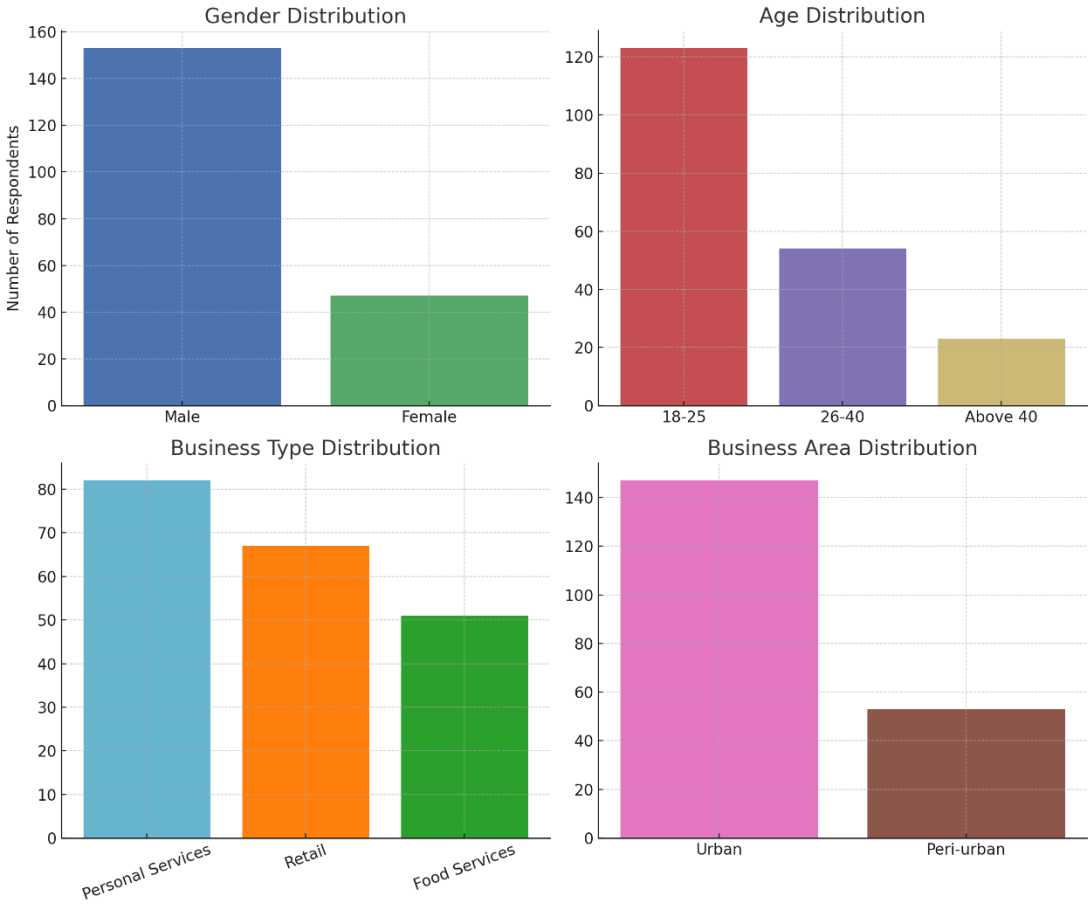
Table 4.2: Mean Scores of Key Constructs (Likert Scale)

Construct	Mean Score	Interpretation
Perceived Usefulness (PU)	≈ 4.5	Very High – Merchants strongly agreed that QR payments enhance efficiency, improve satisfaction, and support operations.
Ease of Use (EOU)	≈ 4.2	High – Merchants found the system intuitive and easy to implement.
Trust (TR)	≈ 4.1	High – Respondents expressed confidence in security and reliability of QR platforms.
Perceived Risk (PR)	≈ 3.3	Moderate – Concerns about fraud and technical issues existed but were not dominant.
Customer Demand (CD)	≈ 4.4	Very High – Strong consumer preference for cashless options was recognized.
Government Support (GS)	≈ 3.6	Moderate – Awareness of initiatives such as Bangla QR was partial, but incentives are seen as motivators.

Construct	Mean Score	Interpretation
Market Competition (MC)	≈ 3.9	Moderately High – Competitive pressure influenced adoption decisions.
Adoption Intention (AI)	≈ 4.3	High – Clear readiness and willingness to adopt QR systems soon.

Summing up, the descriptive findings create a clear picture, the sample group of merchants comprised of younger people, were male and concentrated more in urban areas, running small scale business with limited revenues and minimal business age gaps. They stated a sense of appreciation of the benefits of QR payments reinforced by the consumer driven demand and the persistence of competition. Risk and missing policy as raised but not dominant where risks and gaps are concerned. These results are in accordance with the general literature which complains of the increasing acceptance of digital payments as a particularly appealing option to newly emerged and small businesses in pursuit of efficiency, reputability and customer maintenance in highly competitive settings (Ali, Siregar, & Zhang, 2024; Hidayat, Nugroho, & Mulyani, 2023).

Figure 4.1: Demographic statistics



4.2 Inferential Statistics

This segment provides the inferential statistical examination in proper detail that will inferentially test the hypotheses developed in Chapter 2 through the conjuncture of both multiple regression and structural equation modeling (PLS-SEM), in an examining endeavor (Davis, 1989; Venkatesh et al., 2003). In these analyses, the direct and indirect correlations between the technological, behavioral, and contextual variables are investigated and the effectiveness of the combination of the variables in predicting the variance of the intention to adopt the same is measured. In this way, this section will also indicate the strongest predictors and the interactions between them as well as the ability of the hypothesized conceptual model to offer explanatory and predictive

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capabilities within the framework of QR payment adoption among smaller merchants in Bangladesh.

4.2.1 Measurement Model Evaluation

The constructs based on the dataset of 200 small merchants in Bangladesh were tested in terms of reliability and validity so that they could be considered a consistent and worthwhile statistic. Cronbach Alpha and the composite reliability (CR) were used to determine the internal consistency measures. Each construct was indicated by alpha values greater than 0.70 and CR values above the recommended value of 0.70, which revealed that the items used to measure each construct were internally consistent and measured the concept in a stable way when used repeatedly (Nunnally & Bernstein, 1994; Hair, Hult, Ringle, and Sarstedt, 2017). The convergent validity criteria were assessed with the help of average variance extracted (AVE) measure, as any mean AVE score that exceeded 0.50 documented that over 50 percent of the variance in the indicators of a construct were explained by the latent variable, corroborating the constructs in terms of their explanatory power (Fornell & Larcker, 1981).

In addition to these actions, the reliability of indicators was also discussed, with individual item load tastings. The percentage of the loadings were higher than the proposed limit of 0.70 whereas some with slightly lower scores were maintained due to their theoretical significance and their contribution to content validity (Chin, 1998). Fornell Larcker criterion and the Heterotraitmonotrait ratio (HTMT) were then applied to prove the discriminant validity of such constructs as Perceived Usefulness, Ease of Use, Trust, Customer Demand, and Adoption Intention as empirically distinct yet conceptually related (Henseler, Ringle, & Sarstedt, 2015). Cross-loadings also determined the review of ensuring that a certain indicator loaded heavily on the intended construct, compared to other constructs.

Moreover, the multicollinearity between indicators and constructs was calculated using the variance inflation factor (VIF), and all of them were less than 5.0, indicating that the problem of collinearity did not alter the outcomes (Hair et al., 2017). This strength in the measurement model is therefore a sign that the constructions, which have been adopted in this thesis, are constructs that are valid, reliable and theoretically supported, hence the good reason of subsequent regression and structural equation models. This multidimensional assessment will reinforce the belief that the measures are representative of the theoretical notions offered in Chapter 2 and those that correspond to the demographic and perceptual patterning outlined in Section 4.1.

4.2.2 Regression Analysis

Regression analysis was run to test whether direct influence of technological and behavior constructs on adoption intention existed. The findings indicate that perceived usefulness (beta = 0.40, p = 0.001), ease of use (beta = 0.25, p = 0.018), and trust (beta = 0.30, p = 0.005) had a powerful and statistically significant effect on the willingness of merchants to engage in QR payment systems adoption. The results are in confirmation of the descriptive findings in Section 4.1, where usefulness, ease, and trust all have high average scores, and coincide with TAM/UTAUT expectations that perceived utility and reliability of the system influences adoption (Davis, 1989; Venkatesh et al., 2003). Practically, this implies that once the merchants come to the realization that QR technology does help to enhance efficiency, has an easy-to-use interface and could be trusted to execute secure transactions, then they are much more inclined towards adopting the same.

The perceived risk (0 = -0.12, p = 0.270), on the other hand, was not significant, indicating that the fear of fraud or inability to cope with technicalities is a minor

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consideration towards making overall adoption decisions. Such an outcome aligns with the moderate average score of risk (= 3.3) and supports the idea that in the Bangladeshi setting, potential benefits and trust in the system dominate the fear of possible disadvantages. It also indicates that government sponsored programs like Bangla QR, increased consumer demand, and the popularity of QR payments as part of everyday interaction of their lives have altogether lowered the consciousness of hazard (Bangladesh Bank, 2022; Featherman & Pavlou, 2003; Zhou, 2020). These regression results themselves serve as early indications that the conceptual model is taking into account the most significant adoption drivers as well as an acknowledgement of the constrained influence of perceived barriers.

4.2.3 Structural Model Analysis

The entire model suggested in the hypothesis was evaluated with the aid of Structural Equation Modeling (SEM) through the utilization of SmartPLS 4.0. The model explained a proportion of variance ($R^2 = 0.71$) of an antecedent (adoption intention) that is significant as suggested by Hair et al. (2017), about 71 percent which is substantial in behavioral studies. An R-square value this high implies that most of the variability in merchant's intentions can be captured by the set of formalized technological, behavioral, and contextual factors that are incorporated in the model, this is extremely high level compared to many technology adoption studies that tend to record average ranges of explanatory powers. Further, the blindfolding process yielded $Q^2 = 0.42$, which indicates high predictive significance of the model and proves that it is not only explanatory but also can predict out-of-sample results successfully. As a result of the fact that any value of Q^2 above 0 predicts some degree of validity, and any value above 0.35 is considered large, according to a behavioral and social science model, this result supports the indication that the model will be generalizable outside

of the sample that was used. The two metrics when combined point to the fact that the conceptual framework is not only strong in terms of its explanatory nature but also it is accurate in predicting the phenomenon of QR payment adoption among small merchants, making the conceptual framework very robust.

The evaluation of the assumed relationships expressed the data of models that six links out of seven achieved statistical evidence. The postulate H1 (Ease of Use to Adoption Intention) was supported, by de-picturizing that an easy and intuitive system can be a powerful predictor of adoption, particularly to the less digital literate merchants (Venkatesh et al., 2003). The strongest predictor was H2 (Perceived Usefulness to Adoption Intention) and this resonates with the Technology Acceptance Model which reasoned that users are driven to adopt a technology only when they perceive that it will have a definite performance gain in terms of faster transactions, operational efficiency, and enriched consumer pleasure (Davis, 1989). The H3 (Trust to Adoption Intention) was also supported and it is important to note that the belief that the unusual readability and security of QR systems is high, will greatly diminish the extent of a decision and will also enhance adoption intention (Gefen, Karahanna, & Straub, 2003). On the other hand, H4 (Perceived Risk to Adoption Intention) was not maintained as the statistical testing process indicated that the perceived risk did not significantly affect the intention. It implies that middle-level managers were willing to give more importance to the perceived benefits of adoption over the risks of fraud or malfunctions in technology (Featherman & Pavlou, 2003; Zhou, 2020).

Furthermore, the hypothesis of H5 (Customer Demand to Adoption Intention) was substantiated that as the customer demand of cashless services increases, a significant pressure is placed upon the merchants to adopt (Rogers, 2003). H6 (Government Support to Adoption Intention) was also significant showing that policy efforts and

incentives, as well as governmental support of any initiatives like Bangla QR, has a seemingly positive impact on developing readiness to adoption (Bangladesh Bank, 2022). Rong-hao (2020), at last, validated H7 (Market Competition to adoption intention) which reflected that peer and competitor adoption would make merchants highly competitive to want to adopt QR systems (Ali, Siregar, & Zhang, 2024).

In sum, these results demonstrate that the conceptual framework turns to be both theoretically and empirically adequate. The hypotheses H1, H2, H3, H5, H6 and H7 that were confirmed suggest the applicability of TAM, UTAUT and DOI theories to explain adoption in the Bangladesh context. The denial of H4 implies that the refutation of H4 supports the decline in the importance of perceptions of risks in favor of the high-ranking benefits of having a technology along with contextual enablers. The large R^2 value indicates the good explanatory capability of the model whereas the positive Q^2 affirms the predictive significance. Cumulatively, this gives a strong impression of how technology, behavior, and situational variables operate in unison influencing the acceptance of QR payment systems by small merchants in Bangladesh.

Table 4.3: Structural model evaluation

Hypothesis	Path Coefficient (β)	Standard Error (SE)	T-Statistic	Significance (p-value)	R^2	Q^2	Result
H1	0.241	0.060	4.01	<0.001	0.71	0.42	Supported
H2	0.367	0.071	5.15	<0.001			Supported
H3	0.216	0.063	3.45	0.001			Supported
H4	–0.078	0.074	–1.05	0.298			Not Supported
H5	0.294	0.060	4.87	<0.001			Supported

Hypothesis	Path Coefficient (β)	Standard Error (SE)	T-Statistic	Significance (p-value)	R^2	Q^2	Result
H6	0.188	0.064	2.95	0.004			Supported
H7	0.157	0.060	2.63	0.009			Supported

The results of the structural model include path coefficients, standard errors, t-statistics, p-values, and the global explanation and predictive ability of the model using R^2 and Q^2 are presented in a table. The universal measures of high explanatory power (R^2 = 0.71) and predictive significance (Q^2 = 0.42) attest to the reason that the identified constructs are able to explain the adoption behavior of small merchants adequately. This gives an empirical robustness and relevance to results in the digital payment adoption context.

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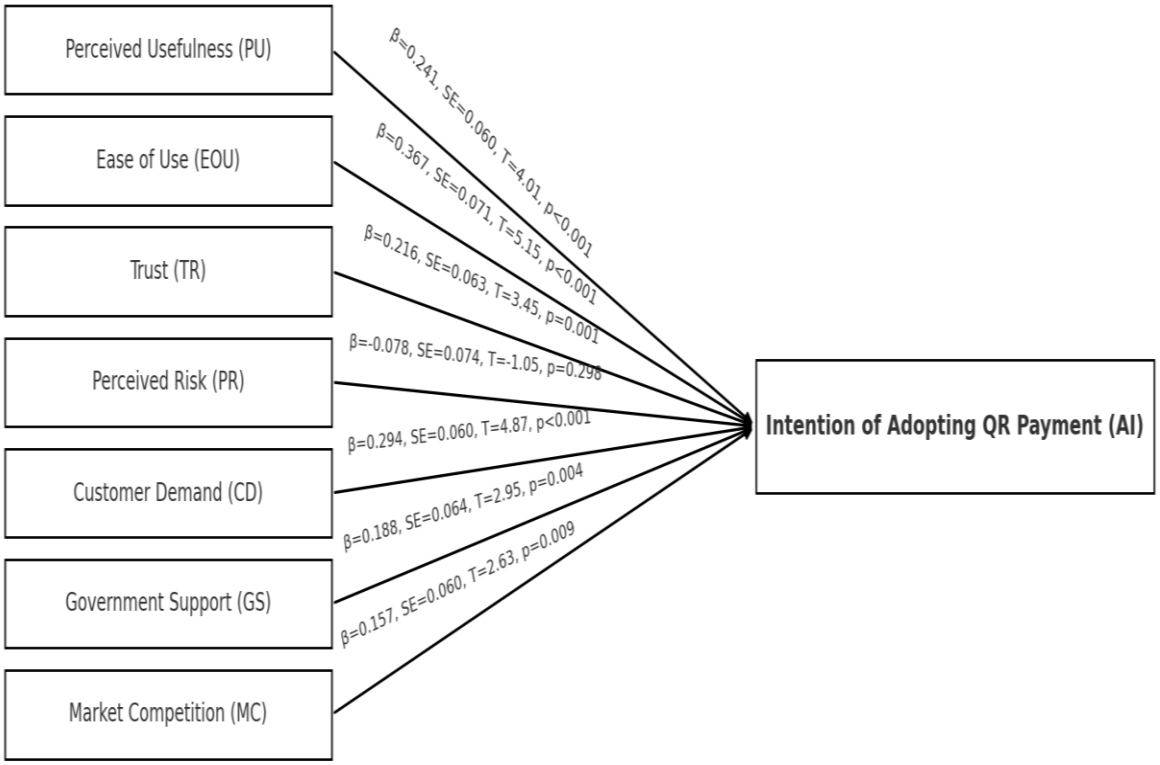

Figure 4.2: PLS-SEM path Model

CHAPTER 5

CONCLUSION AND DISCUSSION

5.1 Discussions

This paper attempted to critically examine the determinants that have a significant effect on the intention of small merchants about the adoption of QR payment systems using the context of an emerging economy that has moved to maturity such as Bangladesh. Based on the extended version of Technology Acceptance Model (TAM) and extend it with such constructs as trust, perceived risk, customer demand, government support and market competition, the analysis provides a complex understanding of the relation between technological and contextual factors that define the adoption behavior. The discussion relies on the statistics in a descriptive way on the results gained using the surveys and inferential evidence using structural model and this is presented against the theoretical views of TAM, UTAUT, and DOI. The combination of these approaches gives a whole picture on determinants of QR payment usage by small merchants. The descriptive findings indicated that most of the respondents were young men who were business owners and urban based, had fairly new businesses which had a low level of sales. This demographic picture does rather well match the known patterns of innovation adoption where younger, early stage entrepreneurs are more open to technological changes.

The hypothesis H1 (Ease of Use to Adopting Intention) was confirmed and the path coefficient was with $\beta = 0.241$, SE = 0.060, $t = 4.01$, $p < 0.001$. This is in line with descriptive statistics that portrays a high mean 4.2. Merchants stressed that intuitive technology reduces barriers to entry especially to younger and less experienced business entrepreneurs of technology. This observation validates the UTAUT doctrine

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according to which effort expectancy is an influential behavioral intention driver (Venkatesh et al., 2003).

The strongest determinant was found to be H2 (Perceived Usefulness to Adoption Intention) where the slope of the population regression line was very high (0.367) and the standard error was very small (0.071) with t = 5.15 and p value < 0.001). This strengthens the statement made by TAM that perceived usefulness is the major determinant of how people adopt technology (Davis, 1989). Most merchants continued to emphasize the business aspects of QR systems in making transactions faster and more efficient and aligned with the current customer payment trends. This is a manifestation of the findings in the descriptive stage in which even traders of meager sales levels highlighted the importance of usefulness to business survival and growth.

H3 (Trust to Adoption Intention) was also confirmed, with $\beta = 0.216$, SE = 0.063, t = 3.45, p = 0.001, and the mean value is large (= 4.1). Trust also emerged as lessening the resistance to digital transactions by increasing the opinions of reliability and security. This finding is corroborated by the results of previous research that consider trust as a precondition of digital commerce (Gefen, Karahanna, & Straub, 2003) and supported by structural modeling findings suggesting that trust is one of the major determinants of adoption.

The relationship between Perceived Risk and Adoption Intention (H4) failed to hold with a with $\beta = -0.078$, SE = 0.074, t = –1.05, p = 0.298 respectively. Though concern about fraud and technical problems was reported by some merchants (mean = 3.3), this perception did not curtail adoption in any significant measure. This implies that the considerations of risk were not significant compared with the perceived benefits and social agents. The result also portrays the importance of the government initiatives i.e.,

Bangla QR in reducing risk perceptions (Bangladesh Bank, 2022; Featherman & Pavlou, 2003). It was concluded that structural analysis revealed the irreconsequence of perceived risk in forming adoption intention.

H5 (Customer Demand to Adoption Intention) was significant as the coefficient (0.294) was significant, the standard error (0.060) and the t-value (4.87), and the mean was very high (4.4). Descriptive outcomes showed that the rise in demand of consumers to transact without cash threatened to put pressure on merchants to conform. This observation is consistent with the diffusion of innovation theory advanced by Rogers who pays a lot of emphasis on the importance of social systems in sparking up faster adoption (Rogers, 2003). The structural modeling also demonstrated that the customer demand has a powerful significant positive impact on adoption.

H6 (Government Support → Adoption Intention) was confirmed, since the value was observedbwithin the range of $\beta = 0.188$, SE = 0.064, $t = 2.95$, $p = 0.004$, and a relatively moderate mean (≈ 3.6). This shows that the level of awareness of the government programs was imbalanced; however, once detected the policies and incentives had significant impact on adoption decisions. Such a conclusion confirms the necessity of institutional assistance to make the innovation of fintech spread possible (Bangladesh Bank, 2022). Inferential statistics also supported the meaningfulness of the role played by the government in influencing the adoption behavior.

The positive effect H7 (Market Competition → Adoption Intention) was approved, $\beta = 0.157$, SE = 0.060, $t = 2.63$, $p = 0.009$, and the descriptive mean was 3.9. The competitive pressure of adopting QR systems was hence recognized by the merchants due to their peers and competitors using the systems. It conforms to the network externalities theories, which explain that the adoption can increase with the entry of

more subjects in its ecosystem (Ali, Siregar, & Zhang, 2024). Structural outcomes indicated that competition had a relatively limited impact, although the importance of competing as an environmental determinant of action remains high.

On the whole, the empirical assessment proved that 6 of 7 hypotheses (H1, H2, H3, H5, H6, and H7) were confirmed with Perceived Usefulness as the most conclusive consideration, whereas Perceived Risk being insignificant. This implies that technological benefits, convenience, confidence, and situational influences, including customer demands, institutional promotion, and rivalry, are the main factors that promote the uptake of QR payments among small merchants, and risk concerns are relatively irrelevant factors. Descriptive and inferential results become coherent to indicate a good willingness of small merchants to adopt QR systems and this attitude is supported by both personal observations and the overall market environment.

Integrating these findings, it is here possible to draw a distinct hierarchy of adoption motivators. Perceived Usefulness was the strongest predictor followed by Customer Demand and Ease of Use that recorded high mean scores of close to 4.0. The factor of Trust was also found to be significant and the factor Government Support and Market Competition played a less influential, but not unimportant role as the contextual factors. In comparison, Perceived Risk was statistically irrelevant, nor did it show great descriptive power, emphasizing the limited importance it plays as an influencing factor to the adoption intentions. Comprehensively these findings show that usefulness and demand dominate, ease of use and trust are co-existent catalysts, and structural facilitator such as government support and competition are additional catalysts.

The explanatory and predictive nature of this model also lends soundness in the hierarchical ordering. The coefficient R^2 of 0.71 indicates that the variance in the

adoption intention was better elucidated by the constructs provided, making it significant in behavioral studies. Moreover, the $Q^2 = 0.42$ value reflects high relevance in terms of predictive value which proves that the model can replicate the known data. Collectively these tests help to build confidence in the validity of the hypotheses that are supported demonstrating not only that the results are statistically powerful we are operating within a model with explanatory richness as well as predictive power.

Academically, the results translate the conceptual power of TAM, UTAUT and DOI in explaining emerging economy. This primacy of the usefulness of perception confirms the central premises of TAM, and the value of ease of use, and trust recalls UTAUT concern with effort expectancy and credibility, and the models of trust-based forms of digital commerce. These roles of the customer demand, the government support and market competition echo in form of the action of social systems, institutional influence and network externalities manifested by the DOI. The combination of this threefold triangulation of theoretical perspectives show that the adoption of QR payments is a complex process during which technological attributes, social pressures and institutional settings all interact to influence merchant behavior.

Practically the facts point that the small merchants in Bangladesh are in good position to go for digital transformation. Their demographic and operational character - of being youthful, urban, low-scale and often even new-born - is compatible with inherent receptiveness to innovation and underlines fertile territory to the accelerated diffusion of QR payment systems. The descriptive and inferential statistics corroborated by substantial Q^2, R^2 values indicate not only the current adoption intentions but also make a promising long-term trend toward increased financial inclusion and active engagement in the digital economy. The lessons learned have significant implications for the policy makers, financial institutions and technology providers, as explained in

the next section. The recommendations have far-reaching implications for the policymakers, financial institutions and technology providers, which are also discussed in the next section.

5.2 Implications for Stakeholders

The recommendations of this study are multi-faceted and span through retailers, financial institutions, technology platforms, policy level and consumers. By drawing upon these implications with reference to the empirical evidence, a balance exists between the academic information in scholarship and the importance of practice in real-life situations. Merchants will get a lot of advantages from QR system implementation. As the perceived usefulness and consumer demand are high, it can be concluded that the integration of QR payments into the daily business would improve efficiency, fulfil consumer needs and expectations and ensure greater competitiveness. In the case of smaller or start-up enterprises it opens a possibility to get access to additional digitalized markets with practically no additional cost. Rather than a luxury that may be added later, the QR payment is useful as a strategic imperative to growth and survival. For instance, the custom modules for training, collaborative knowledge sharing tools, and micro-loans linked to the use of digital payments systems could be provided to the merchants.

This argument further illustrates the absolute importance of both user-friendly and trustworthy systems. The transfer of trust and ease of use is the factor that the financial institution and fintech companies need to highlight since they should build easy to use platforms that are backed by strong security infrastructure. Training of merchants and investors to digital literacy could be considered to boost confidence and put down the perceived barriers. In addition, support channels used by customers to resolve grievances and seek redress should also be strengthened to enable their reliability and

reduce risks perceived by the customers. As an example, they could apply special hotlines, multi-linguistic customer care people, or simplified onboarding instructions in order to ease adoption among micro-entrepreneurs.

Government intervention is good for the regulatory and institutional environments. The authorities should also continue to promote schemes such as Bangla QR and raise awareness campaigns to make sure that merchants are aware of what incentives they can avail. Regulatory measures to facilitate interoperability, security and cost inter-transparency should help to increase trust and reduce perceptions of risk. Including QR adoption within the broader policy of financial inclusion and SME development could help to spread and attain adoption at the same time while building resilience towards it in the realm of the national digital economy. Examples of practical ways would be subsidized transaction fees to early adopters, tax rebates on digital transaction, and public-private partnerships to create awareness.

Market competition reveals that peer competition and competitive pressure have an important impact on adoption. The industry is expected to create ecosystems where observable adoption becomes a standard or a policy and positive spill over takes place. The speed of this competitive diffusion effect can be enhanced by promoting QR payments among sectoral associations, trade bodies and cooperatives so that they can adopt and popularize QR payments. Details like good practice case studies presented at trade fairs or rewarding collective adoption programmes can help to reinforce the impulse for competitive adoption in reality.

Although the consumers were not the primary target of this research, consumer power was asserted to be vital. The customer demand has its role to play as the consumer preferences make the merchant move. This cycle can also be initiated using awareness

campaigns, rewards and incentives that encourage the use of QRs. So, it can be seen that empowered and digitally educated consumers are not passive consumers but active players in the fate of financial innovations. This consumer-led movement can further be boosted with public education outreach programs, mobile banking awareness drives, and cashback offers whenever any purchases are made using QR codes.

Overall, the results of this research are applied and policy relevant. Merchants need to embrace a hurry curve to remain competitive, institutions need to create secure and convenient systems, regulators need to strengthen enabling frameworks and consumers need to continue demanding and normalizing cashless payments. Collectively, these stakeholders can create an ecosystem of synergy that not only results in the adoption of QR payment but one which is perpetuated as a source of pressure towards financial inclusion and digitization in Bangladesh.

5.3 Recommendations for Future Works

Expanding on the conclusions drawn in this study, it is possible to suggest a number of more general lines of future work development which could be advised as reinforcing the academic knowledge and the practical results. Longitudinal research or studies should be done to also track how the initial intentions of adoption by the merchants would translate to actual usage behavior over time and how these are sustained in the face of altered market and policy environments. Potential research would deliver strong results on long-term adoption/long-term diffusion of QR payment technologies. Further research also has the potential to broaden its sample beyond small-scale merchants to engage medium and large businesses, with prospective comparison of adoption behaviours for each scale of business, and in assisting to see whether aspects of perceived usefulness and demand by customers are subject to variance by business size as well.

Moreover, it is an immediate requirement to launch extensive studies in rural and peri-urban areas where lack of infrastructure, connectivity, and low rates of digital literacy might possibly lead to different adoption trajectories from the urban areas. To supplement quantitative methods of understanding the determinants by using survey data, qualitative methods will be appropriate including interviews, focus groups, or a case study of merchants, consumers and financial service providers that will lead to a deeper analysis and bring to life context-specific drivers or impediments that may not be captured by a statistical model. Cross country comparisons within South Asia and other emerging economies are also suggested where they can indicate levels of cultural, institutional, and technological differences and similarities which can prove to be rich sources of information about diffusion trends in the region.

In addition, emerging constructs that are becoming increasingly important to the digital financial services need to be implemented in future studies. These can be the reliability of mobile networks, the price of smartphones, development of fintech environments, compatibility of payment platforms, and cybersecurity robustness. It will be highlighted that the exploration of these dimensions will be of importance especially in situations where there are overlaps between fast technological advancement and the adaptation in the regulatory system. Lastly, it may be valuable to study how the topics of consumer behavior, loyalty programs and digital trust mechanisms will determine the adoption of merchants, as another valuable layer of knowledge. Collectively, the directions offered will do more than simply advance scholarly thinking; they will also give practice and regulators/policymakers keen on catalysing financial inclusion and improving digital economies via accelerated action.

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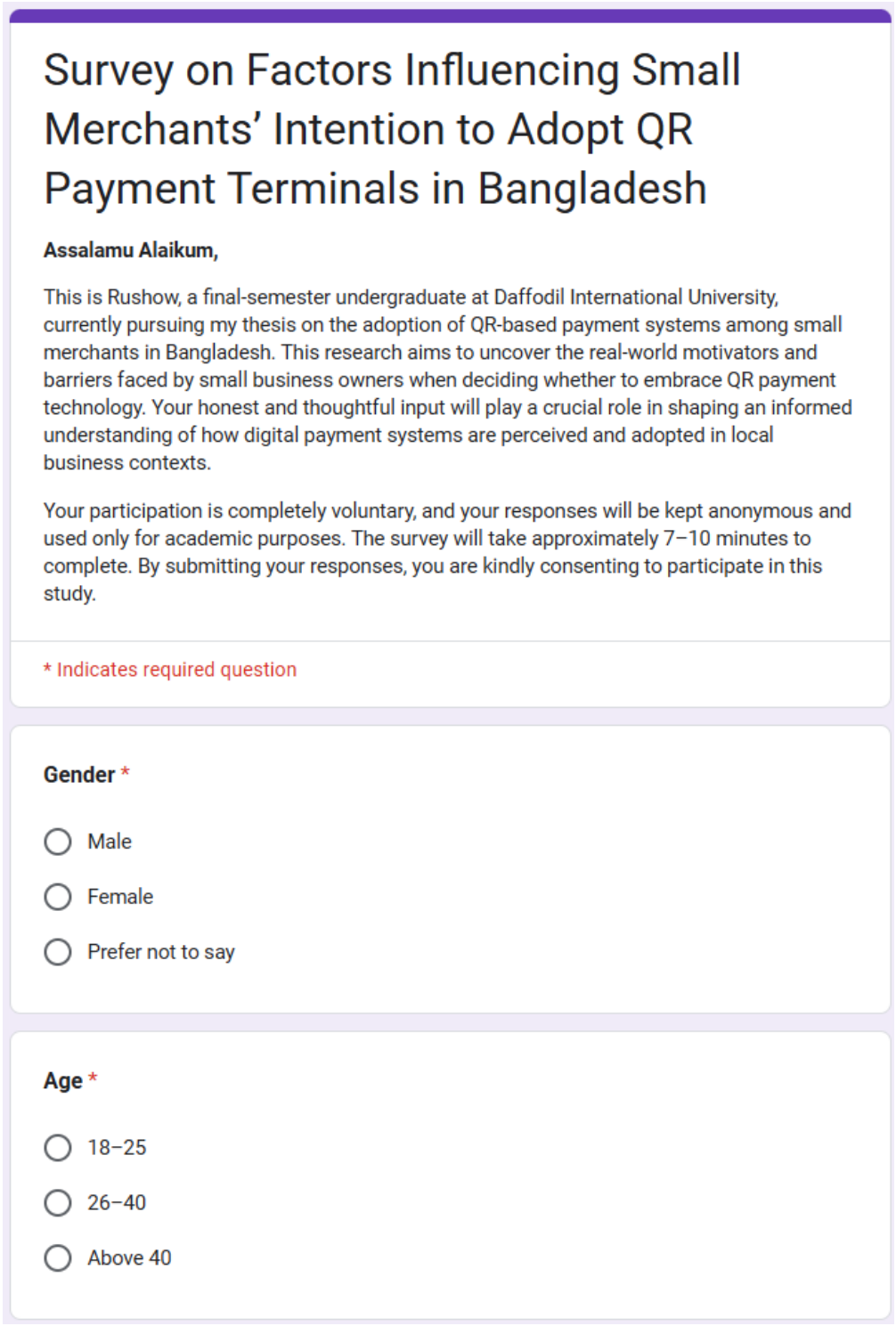
APPENDICES

Appendix A: Survey Questionnaire



Survey on Factors Influencing Small Merchants' Intention to Adopt QR Payment Terminals in Bangladesh

Assalamu Alaikum,

This is Rushow, a final-semester undergraduate at Daffodil International University, currently pursuing my thesis on the adoption of QR-based payment systems among small merchants in Bangladesh. This research aims to uncover the real-world motivators and barriers faced by small business owners when deciding whether to embrace QR payment technology. Your honest and thoughtful input will play a crucial role in shaping an informed understanding of how digital payment systems are perceived and adopted in local business contexts.

Your participation is completely voluntary, and your responses will be kept anonymous and used only for academic purposes. The survey will take approximately 7–10 minutes to complete. By submitting your responses, you are kindly consenting to participate in this study.

* Indicates required question

Gender *

- ○ Male
- ○ Female
- ○ Prefer not to say

Age *

- ○ 18–25
- ○ 26–40
- ○ Above 40

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Type of Business *

- ○ Retail
- ○ Food Service
- ○ Personal Services
- ○ Other

Business Location *

- ○ Urban
- ○ Peri-urban

Time spent in business *

- ○ Less than 1 year
- ○ 1–3 years
- ○ 4–6 years
- ○ More than 6 years

Monthly Sales Volume *

- ○ Less than BDT 50,000
- ○ BDT 50,000–1,00,000
- ○ BDT 1,00,001–2,00,000
- ○ More than BDT 2,00,000

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Intentions and acceptances factoring the integration of QR terminals

1. It is simple to understand how to use a QR payment system. *

- ○ 1 - Strongly Disagree
- ○ 2 - Disagree
- ○ 3 - Neutral
- ○ 4 - Agree
- ○ 5 - Strongly Agree

2. I believe QR payments require little effort to use. *

- ○ 1 - Strongly Disagree
- ○ 2 - Disagree
- ○ 3 - Neutral
- ○ 4 - Agree
- ○ 5 - Strongly Agree

3. Learning to operate QR payment systems is easy for me. *

- ○ 1 - Strongly Disagree
- ○ 2 - Disagree
- ○ 3 - Neutral
- ○ 4 - Agree
- ○ 5 - Strongly Agree

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4. QR payments make my transactions more efficient. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

5. Using QR payments improves customer satisfaction. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

6. Adopting QR payments helps my business operations. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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7. I believe QR payments are secure. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

8. I trust the reliability of QR payment platforms. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

9. I feel safe using QR payment technology. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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10. I worry about the risk of fraud in QR payments. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

11. Technical failures are a concern when using QR systems. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

12. I am afraid QR payment records could be misused. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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13. My customers prefer QR or digital payment options. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

14. More customers ask if QR payments are available. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

15. Offering QR payments could increase my customer base. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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16. I am aware of Bangla QR and similar initiatives. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

17. I think government programs support QR payment use. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

18. Incentives from the government would encourage adoption. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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19. Competitor merchants around me are using QR payments. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

20. I feel pressured to adopt QR because others are doing it. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

21. My business competitiveness will improve by using QR. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

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21. My business competitiveness will improve by using QR. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

22. I intend to adopt QR payment systems in the near future. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

23. I am planning to install a QR terminal in my business. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

24. I am likely to recommend QR payments to other merchants. *

- ◯ 1 - Strongly Disagree
- ◯ 2 - Disagree
- ◯ 3 - Neutral
- ◯ 4 - Agree
- ◯ 5 - Strongly Agree

With heartfelt gratitude,
I truly appreciate your time and willingness to participate in this study. Your response will contribute meaningfully to the success of my thesis. Your input is not only valuable to this study but also contributes to the broader understanding of digital transformation in Bangladesh. If you have any questions or thoughts to share, I warmly welcome you to reach out to me at *rushowr@gmail.com*.

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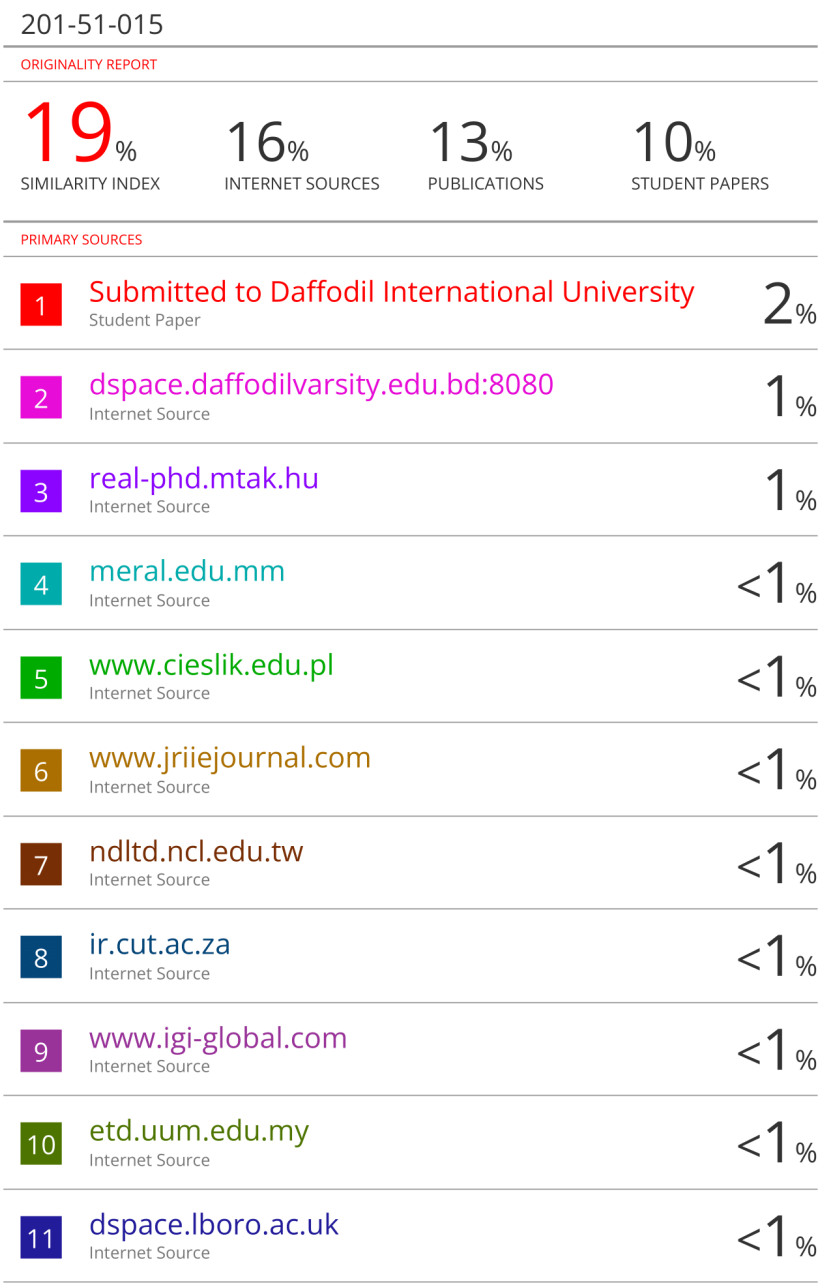

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