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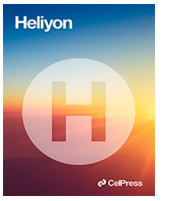

Research article

The path to cashless transaction: A study of user intention and attitudes towards quick response mobile payments

Muhaiminul Islam [a], Ashia Khatun Tamanna [b], Saiful Islam [b,*]

[a] Department of Organization Strategy and Leadership, University of Dhaka, Bangladesh
[b] Department of International Business, University of Dhaka, Bangladesh

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ABSTRACT

This study explores the factors influencing users' behavioral intentions, attitudes and actual adoption of quick response (QR) mobile payment in the least developed country (LDC) of Bangladesh, by extending the original unified theory of acceptance and use of technology (UTAUT) model. The study conducts a mixed-methods investigation by combining the partial least squares (PLS) and focus group discussion (FGD) methods to empirically evaluate the research model and cross-validate the findings. Using purposive sampling, data were gathered from 412 respondents, followed by 10 respondents who took part in the FGD, who all met the sample criteria. The study findings indicate that performance expectancy, effort expectancy, and social influence significantly positively influence users' behavioral intention, while self-concept, perceived self-efficacy, and habit substantially influence their attitudes towards using QR mobile payments. The findings also confirm a positive effect of users' attitudes toward using QR mobile payment on both behavioral intention and actual use, and a positive effect of behavioral intention on the actual use of QR mobile payments. These findings offer several important theoretical and managerial implications.

1. Introduction

Due to the proliferation of smartphones and mobile applications (hereinafter, apps) that enable cashless banking and payments [1,2], consumers have shown a growing preference for cashless payment methods in recent years [3]. Digital payments such as SMS payments, cards such as debit, credit and ATM cards, electronic transfers, online banking, virtual wallets, QR code payments, and other mobile payment services are the foundation of the idea of a cashless society [4]. Compared to other digital payment mechanisms, QR payment has grown more strongly in popularity in recent years [5–7] because it requires only a smartphone [5]. The number of smartphone users is predicted to reach 18.22 billion globally by 2025 [5,8].

QR mobile payment enables customers to make purchases by scanning a merchant-displayed QR code [5,9] connected to a bank account, debit card, credit card, prepaid card, or mobile financial service (MFS) account. Users can benefit from QR mobile payments in several ways, including the elimination of inconveniences associated with carrying cash, the lack of change, the simplicity of tracking small transactions, counterfeit currency, and, most significantly, improved health and cleanliness [10]. In addition, QR mobile payment helps businesses to attract more clients, cut point-of-sale (POS) terminal expenses, free up important time, increase front-line staff productivity, and enhance the customer experience [6].

* Corresponding author.
E-mail addresses: muhaiminul@du.ac.bd (M. Islam), ashia-2017112114@ib.du.ac.bd (A.K. Tamanna), saifulib@du.ac.bd (S. Islam).

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With the increasing benefits and the prevalence of smartphones, more and more individuals are opting for the convenient and speedy experience that QR payment provides. According to Bluebite, the reach of QR payments increased by 96 % between 2018 and 2020. In addition, Statista [8] states that 70 % of China's population and 40 % of the Indian population regularly used QR payment in 2018, with the number growing dramatically; by 2020, 90 % of smartphone users in China were predicted to use QR mobile payments [11]. In 2020, Statista surveyed people in the United States and the United Kingdom to estimate the incremental adoption rate of QR mobile payment, and 45.6 % of those polled confirmed their use of the method. According to a survey by Kleiner Perkins Caufield & Byers, Visa Inc. and GfK, 4 % of all consumer transactions take place via QR payment [8].

As a result of this growth, researchers around the world have studied the acceptance of QR mobile payment in different countries where smartphone and mobile payments have significantly penetrated users' daily lives, such as China [5,6,11,12], Malaysia [9], Spain [13] Indonesia [14], Thailand [14], Turkey [3]. However, these previous studies addressed users' intention towards QR mobile payment in several selected developed and developing economies, leaving the least developed countries (LDCs) unexplored.[1] Therefore, further research on users' attitudes and intentions towards the acceptance of QR mobile payments in LDCs needs to be initiated to enhance the current literature [15]. Additionally, in Bangladesh, as a representative of an LDC, no research has yet been conducted on QR mobile payments (see Table A1 in the Appendix), which creates an interesting avenue for further research on QR adoption in LDCs.

Bangladesh has reason to be optimistic about the future of QR mobile payments: a successful rollout of QR transactions could add 1.7 % to the country's GDP [16]. Many businesses in the country, from major chains to supermarkets, together with small street vendors, have begun accepting QR mobile payments following promotional efforts by banks and MFS providers [17]. In addition, the government is actively supporting QR mobile payment as a means to achieving a cashless economy. On January 18, 2023, Bangladesh Bank, the country's central bank, introduced "Bangla QR" transactions in a lavish ceremony attended by ten banks and mobile financial services (MFS).

Moreover, Bangladesh has sufficient potential to digitalize its payment systems with QR mobile payment, as it is the ninth-largest country globally and the fifth-largest smartphone market in the Asia Pacific region [18]. According to the Bangladesh Telecommunication Regulatory Commission (BTRC), as of February 2020, there were over 99.984 million internet users, 94.236 million of whom used mobile internet, and the same number having access to the MFS app. According to Bangladesh Bank, there were 181 million MFS users as of July 2022. In Bangladesh, financial inclusion has advanced significantly over the past eight years, with as many as 48 % of the adult population being covered by the banking system, although the majority of them are not directly connected to the formal banking system [19]. The efforts of MFS and its banking agents have brought the nation's unbanked population into the banking system and made it possible for even rural people to use digital payment systems, including QR mobile payment [20]. Consequently, there is an acknowledged need for a context-specific empirical prediction of users' attitudes and intentions to use this payment method.

In addition, it has been observed that the majority of previous studies on users' attitudes and behavior towards using QR mobile payment are either fully qualitative [21] or purely quantitative [5,13,14] in nature, whereas research applying mixed methodologies is rare. Therefore, employing a mixed research methodology is crucial, since it will permit the researchers to reconcile the contradictory findings of previous studies on consumers' attitudes and behaviors in relation to QR mobile payments.

In order to fill these gaps, this study aims to explore the factors that influence users' behavioral intentions, attitudes and actual adoption of QR mobile payment in Bangladesh. Based on this aim, this study seeks to answer the following two research questions.

1. What are the antecedents that affect users' intentions and attitudes to adopt QR mobile payment?
2. What is the relationship between behavioral intention, attitude and the actual use of QR mobile payment?

The study findings will contribute both theoretically and practically. In terms of theory, the study extends the unified theory of acceptance and use of technology (UTAUT) model by including the most frequently used factors in technology adoption, perceived security, perceived self-efficacy, perceived trust, habit, and self-concept, in a new setting and LDC-context. Moreover, the theoretical model of the study considers the role of users' attitudes toward using QR mobile payments in their behavioral intentions and actual use. The study employed a mixed research approach (quantitative and qualitative) to cross-validate the hypothesized results, an approach which is missing in previous studies. Combining the empirical findings, the proposed theoretical model indicates its effectiveness in explaining users' intentions, attitudes and actual use of QR mobile payment in emerging economies such as Bangladesh. In addition, the study provides several practical and managerial implications; for example, insights for service providers for understanding the role of different factors in offering better QR payment services; branding efforts; building trust and security among users; and developing user-friendly apps. Finally, the study urges a holistic approach by combining service providers, merchants, financial institutions and policymakers in the development of enabling factors for a smooth QR mobile payment system in LDCs, including digital infrastructure, institutional framework, safety and security.

The remainder of the paper is organized as follows. Section 2 presents the theoretical framework and hypothesis development. The data and methods are described in Section 3, Section 4 presents the results and discussion. Finally, Section 5 concludes the paper.

[1] A representative sample of studies on QR mobile payment is presented in Table A1, including ones on different payment services in Bangladesh (see the appendix).

2. Theoretical background and study hypotheses

A number of studies are evident that investigate the factors, progress, and patterns of different technologies as part of digitalization in developing nations, especially in the context of Bangladesh, which include but are not limited to Ullah et al. [22], Kabir et al. [23] and Nath et al. [24] in block chain adoptions; Shi et al. [25], Yawised et al. [26] and Nikbin and Abushakra [27]in internet of things (IoT) adoptions; and Fianu et al. [28], Khan et al. [29] and Gupta [30] in massive open online courses (MOOC) adoptions. However, mobile payment is a relatively new area of research that has recently been gaining popularity [31]. Even though related studies are burgeoning, there is little research on QR mobile payments. The first study on the QR mobile payment method was conducted using a video demonstration to potential users of the new payment method in Spain [13]. This research revealed that attitude, subjective norms, and personal innovation significantly influenced users' intentions to adopt the payment system. Most previous studies have also revealed that QR payments are becoming a dominant form of mobile payment in countries such as China, Malaysia, Turkey, Saudi Arabia, Thailand and Indonesia (see Table A1 in the appendix). These studies were based on different contexts, such as retail payment or pandemics such as Covid-19. Studies were conducted in relation to Covid-19 as more users started using QR mobile payments during the epidemic [14,32]; however, investigation into the behavioral intention to use QR mobile payments in the post-pandemic period should be continued [11].

Several theories have been developed to explain the phenomena related to technological adoption and their specific use [33]. Various studies have shown that by taking a multi-theoretical approach, one can build a more comprehensive model and improve its explanatory ability [34]. However, the findings of these previous studies also revealed that integrating different theories has been unsuccessful due to the diverse assumptions and beliefs of the theories involved [35]. Therefore, Venkatesh et al. [36] created a new approach, UTAUT, to characterize both the intent to use and the actual usage of technology. UTAUT's strength lies in its ability to explain variance in both intentions to use (70 % variance) and actual usage (50 % variance) [36]. In addition, its generalizability has been confirmed by numerous other studies [33,37].

For studying behavioral intentions and actual usage, related to technologies, previous studies have extensively utilized the Technology Acceptance Model (TAM) developed by Fred Davis in 1986, which proposes that perceived usefulness and perceived ease

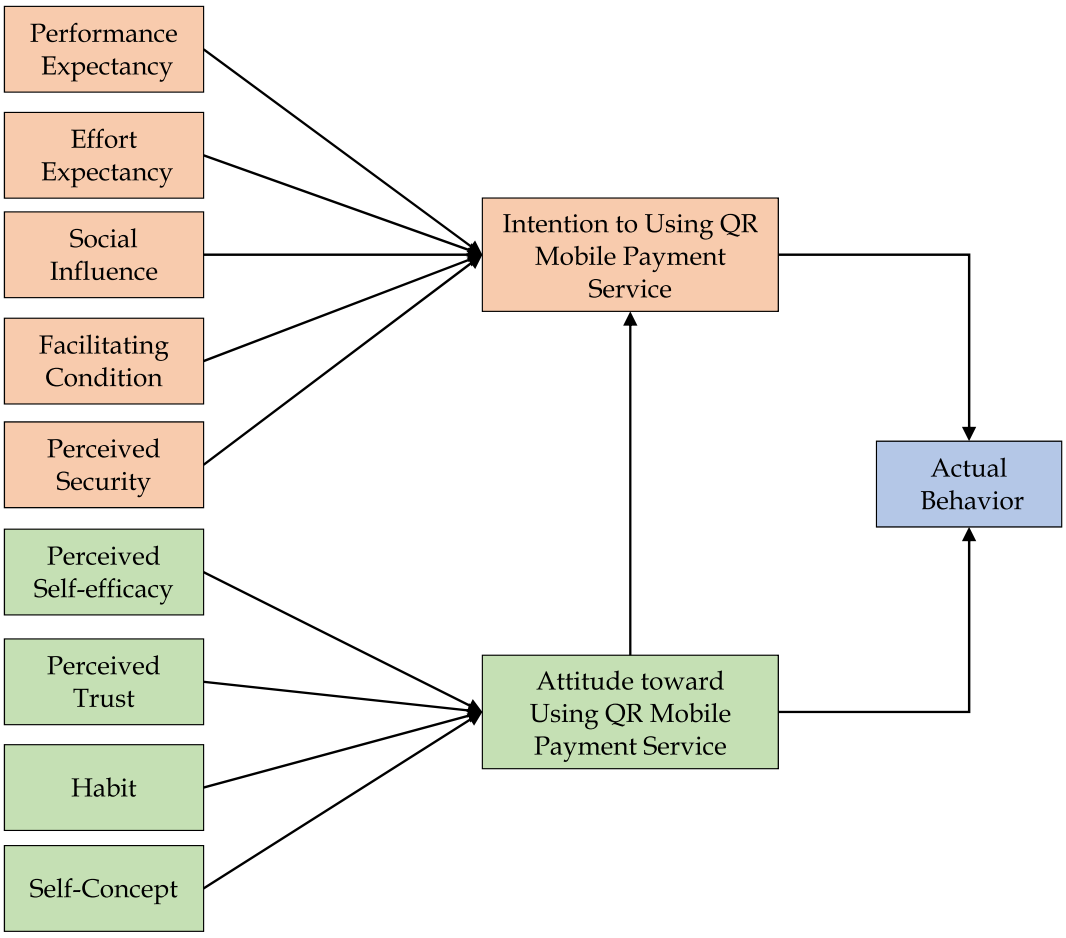

Fig. 1. Conceptual framework of the Study.

of use are the key determinants of behavioral intention [38,39] Similarly, the Theory of Planned Behavior (TPB), proposed by Ajzen [40] has also been extensively utilized to investigate phenomena connected to the acceptance and usage of technology [41], suggesting that an individual's inclination to use technology is affected by their attitudes towards the behavior, subjective norms, and perceived behavioral control. Nevertheless, the review of the sample literature (See Table A1 in the appendix) undertaken for this study reveals that no prior scientific studies have exclusively utilized either TAM or TPB to examine the combined factors of attitude, intention, and actual usage behavior. It is worth noting that the TAM and TPB models may not fully capture the complexities of mobile payment acceptance. The UTAUT framework, on the other hand serves as an extension of the TAM and provides a more thorough understanding of the adoption of mobile payment [42]. Furthermore, the examination of contemporary studies reveals that the Theory of Reasoned Action (TRA), Theory of Interpersonal Behavior (TIB), Social Cognitive Theory (SCT), and Diffusion of Innovations Theory (DOI) have not been used to comprehend similar phenomena. However, the majority of studies have utilized the UTAUT framework to explain behavioral intentions and actual usage behavior related to QR mobile payment or other similar disruptive technologies [43–45]. This motivated the current research to assess the suitability of the UTAUT framework.

UTAUT is considered one of the models most utilized in studies on technology adoption, including QR mobile payment in different countries (see Table A2 in the appendix). Moreover, Patil et al. [37] suggested the inclusion of certain context-specific external constructs that could more appropriately capture all the possible aspects of mobile payment. UTAUT has also been identified in previous studies as the best method for predicting technology adoption in LDCs [46,47]. Due to the novelty of QR mobile payment in the setting of LDCs, as well as its generalizability and strengths in comparison to other theories, this study employed the original UTAUT approach to investigate users' intention to use and actual use of QR mobile payment.

UTAUT includes performance expectancy, effort expectancy, facilitating conditions, and social influence as direct predictors of users' intention to use, which eventually predict actual use behavior [37]. In addition to the six variables in the original UTAUT, this study extends the original model by adding six other variables, namely perceived security, perceived trust, perceived self-efficacy, self-concept, habit and attitude (See Fig. 1). Concern about safety is a major factor in the intention to embrace mobile payment systems [48], hence perceived security is incorporated in the model as a predictor of the intention to use QR mobile payment. Previous studies of mobile payment have also used perceived security as a predictor of behavioral intention [48–50]. Furthermore, the majority of studies based on the application of UTAUT have employed variables outside of the four core model ones as independent variables, with self-efficacy being the most frequently used external variable, followed by attitude and trust. Attitude is incorporated into the model because previous research demonstrates that this increases the exploratory capacity of behavioral intention [51]. Individuals' attitudes drive their evaluations of the technology as a whole, with a favorable opinion having a significant impact on whether or not they intend to embrace it and how they intend to use it.

To provide a comprehensive understanding of QR mobile payment, this study emphasizes how internal psychological factors affect attitude. Perceived trust, perceived self-efficacy, self-concept and habit are all internal psychological factors of the respondents and are therefore regarded in this study to be predictors of attitude. All these factors influence how people feel about using QR mobile payment technology [37,52–55] and ultimately how likely they are to make the switch. When users perceive alignment with their self-concept, trust in security, confidence in their abilities, and comfort with habituation, they are more likely to develop a positive attitude and employ a new technology.

Therefore, we incorporated perceived trust, perceived self-efficacy, self-concept and habit as predictors of attitude, concentrating on the internal psychological factors of users. Additionally, the selection was founded on the available literature. Perceived trust addresses the most important aspect of security concerns in financial services, such as mobile payments [3]. In previous research, self-efficacy and habit have been recommended due to their potential influence on user adoption behavior [14]. Self-concept has been incorporated as it has become a frequently researched variable in evaluating the adoption of new technologies, thus highlighting its importance.

This research deliberately excluded certain moderating variables, such as age, gender, experience and voluntariness of use, from the study model (see Fig. 1). This decision was made to ensure both generalizability and to address concerns related to asymmetrical distribution, aligning with the approach taken in previous research [56] The rationale behind omitting these moderating variables was to prevent potential biases or limitations from arising in the study findings [56].

Moreover, with regard to the adoption of technology among Bangladeshi respondents, a consistent and uniform trend is observed. Previous studies utilizing the UTAUT model for various technology adoption cases have indicated that factors such as gender [33,57], age [33,57], and voluntariness [58] have insignificant effects. Interestingly, this pattern holds true among Bangladeshi respondents due to their homogeneity. Several other technology adoption studies conducted in Bangladesh have also excluded moderating variables [59–62] as respondents in the country exhibit remarkable uniformity. The exclusion of the moderating variables in this study aimed to craft a more universally applicable model, suitable for a diverse range of QR mobile payment users across various contexts.

2.1. Performance expectancy and behavioral intention

Performance expectancy is the degree to which technology will help users complete a particular activity [36]. Perceived usefulness, job fit, extrinsic motivation, relative advantage, and outcome expectations are the five constructs of related theories that seek to standardize performance expectancy. In this study, performance expectancy is defined as the degree of user assurance that using QR mobile payments is a solution that can boost their performance [63]. Previous research has also argued that performance expectations drives users towards using a new technology [36,54,63,64]. Significant positive relationships between performance expectancy and the intention to use QR mobile payment have also been verified in previous studies [5,63]. Therefore, this study proposes that.

H_1: Performance expectancy positively and significantly affects the intention to use QR mobile payments.

2.2. Effort expectancy and behavioral intention

Effort expectancy measures how simple it is for people to use the technology. It derives from three constructs in existing models: perceived ease of use, complexity and actual ease of use [36]. In this study, effort expectancy refers to the minimal effort needed to complete payment using a QR code [63]. Previous research has contended that users adopt a technology when they find it useful and less difficult to use [49,51,54,65]. In mobile payments, effort expectancy has been found to be a significant indicator of the intention to use a new technology [49,64,66]. In an LDC environment such as Bangladesh, where mobile payments, especially QR ones, are still in their infancy, the ease of use of the technology for the user can be crucial. Therefore, it is proposed that.

H_2: Effort expectancy positively and significantly affects the intention to use QR mobile payments.

2.3. Social influence and behavior intention

The extent to which individuals believe influential people (such as family, friends or superiors) think they should use the new technology is known as social influence [36]. In this study, this is described as the extent to which people are positively influenced towards using QR mobile payment by those close to them. Social influence is a subjective measure that directly predicts use intention [36,51,54,64,65]. It has also been confirmed as one of the best predictors of influencing users' intention to use QR mobile payment [5, 12]. Therefore, this study assumes that when family, friends or superiors have a favorable opinion of QR payment, users' intention to adopt the technology will increase. Therefore, the study posits that.

H_3: Social influence positively affects the intention to use QR mobile payments.

2.4. Facilitating conditions and behavioral intention

Facilitating conditions are the degree to which a person thinks that the existence of a technological and organizational infrastructure facilitates the use of the technology [36]. This study defines these conditions as the degree to which a person thinks that a technological and organizational infrastructure system and ongoing available support facilitate the use of QR mobile payment. Previous studies on technology adoption have obtained mixed findings on the role of facilitating conditions. While some have found that they are significant in the intention to use new technology [55,65], others have concluded them to be insignificant [9,43,55,67]. Previous research on mobile payment has found that facilitating conditions are significant in India [10,66], Oman [49] and Brazil [68]. Similarly, this study anticipates that the actual usage rate of the system will increase as operational infrastructure and facilities for using QR mobile payments become available. Therefore, it is hypothesized that.

H_4: Facilitating conditions positively and significantly affect the intention to use QR mobile payments.

2.5. Perceived security and behavioral intention

Perceived security is the perception of safety concerning mobile payment threats, specifically the fear of losing personal data, which could result in a financial loss [69]. In this study, it is defined as the extent to which users think a transaction on a QR mobile payment platform is secure in terms of both financial and personal aspects [70]. Previous studies have found that perceived security significantly affects the intention to use different mobile payment technologies [43,48–50,71]. Therefore, the study proposes that.

H_5: Perceived security affects the intention to use QR mobile payments.

2.6. Self-concept and attitude

Self-concept refers to users' personalities and internal self-perceptions regarding the importance of technology, with a particular appeal in conceiving other users' preferences [55]. In this study, self-concept concerns how closely a user's preference matches the QR mobile payment impression when viewed in the context of a self-intrinsic assessment of their personality-related traits. Self-concept significantly impacted actual behavior in a cross-country comparison of mobile health adoption [55]. It has also been found to be one of the best predictors of users' attitudes [72]. Therefore, this study assumes a similar relationship between self-concept and attitude, and argues that what users think about themselves concerning the use of QR mobile payments often affects how they accept and use the method. Therefore, the study hypothesizes that.

H_6: Self-concept affects attitudes towards using QR mobile payments.

2.7. Perceived self-efficacy and attitude

Perceived self-efficacy assesses how successfully one can follow the steps necessary to deal with potential problems [73]. It refers to the evaluation of a person's technological proficiency to complete a transaction with QR payment [36]. The relationship between perceived self-efficacy and attitude in the context of mobile payments has not been extensively examined, but perceived self-efficacy significantly affects the intention to use technology [54]. Rahman et al. [74] found a significant positive relationship between self-efficacy and attitude toward using healthcare technology. Another study on online learning acceptance confirmed that attitude and self-efficacy were connected [75]. Based on previous studies, this study assumes that perceived self-efficacy can affect attitudes towards using QR mobile payment. Therefore, it is proposed that.

H_7: Perceived self-efficacy affects attitudes towards using QR mobile payment services.

2.8. Habit and attitude

Habit is a natural behavior characterized by the strong association between specific environmental cues and the corresponding actions, regardless of people's intentions and goals. Individuals develop habits as they act consistently in predictable situations, creating a strong linkage in their memories between their reaction and cues from the performance context [76]. Venkatesh et al. [77] defined habit as the degree to which individuals tend to perform behaviors automatically due to learning. The relationship between habit and attitude has not been explored in previous research, but in studies of technology adoption, habit has been shown to be a significant predictor of the intention to use [77]. Research in the mobile payment environment has reaffirmed this relationship [44, 52]. However, since habit indicates the frequency with which a behavior is repeated, it can influence the attitude toward using QR mobile payments. Given the argument in previous research, this study is interested in investigating the connection between habit and the attitude towards using QR mobile payments. Therefore, the following hypothesis is posited:

H_8: Habit affects attitudes towards using QR mobile payments.

2.9. Perceive trust and attitude

Perceived trust refers to the inclination of users to feel that the technology can provide superior services and would not compromise their personal information in any way [78]. It is defined in this study as the user's confidence that QR mobile payment would adhere to given standards or guidelines and play a crucial role in financial transactions [79]. Previous studies on technology adoption have found perceived trust to be a significant indicator of attitude [80,81] and behavioral intention [54,64,65]. In a study of mobile payment adoption, Patil et al. [37] found a significant association between attitude and perceived trust. This study assumes that trust will make people more likely to use QR mobile payments if the technology is able to protect sensitive data and keep transaction information safe. Consequently, it is hypothesized that.

H_9: Perceived trust affects attitudes towards using QR mobile payments.

2.10. Attitude, behavioral intention and actual use

Attitude is a person's positive or negative evaluation of how they feel about displaying a certain behavior [82]. Attitudes towards using QR mobile payments refer to a person's overall emotional reaction to a system and significantly influences their behavioral intention and actual use [36]. Many studies in the mobile payment context have confirmed the significant positive relationship between attitude and intention to use [37,50,71,83,84]. Previous research on the adoption of QR mobile payment in China, Thailand and Spain have also demonstrated that attitude is one of the main predictors of the intention to use a technology [13,14,85]. Studies have also found a significant relationship between attitude and actual use [45]. Therefore, this study assumes that attitudes significantly impact a person's intention to use technology and its actual adoption. Therefore, the following hypotheses are proposed:

H_{10}: Attitudes towards using QR mobile payments affect users' intention to use them.

H_{11}: Attitudes towards using QR mobile payments affects their actual adoption.

2.11. Behavioral intention and actual use

The intention to use refers to a user's mental state before they use the technology [86]. The majority of earlier studies in the field of mobile payments merely evaluated behavioral intentions as an end outcome, claiming that behavioral intention was a good substitute for actual behavior [13,43,49,68,71]. On the other hand, it has been advised that actual behavior should be evaluated, and cautioned that behavioral intention might not necessarily reflect actual use [87]. In the technology acceptance literature and relevant fields, the importance of behavioral intention as a predictor of actual behavior has been well validated [36,67,88]. In studies of mobile payment adoption, a significant association between behavioral intention and actual use has been confirmed [66,89]. Therefore, it can be assumed that the likelihood of using QR mobile payment will grow with the increased intention to use it. It is therefore posited that.

H_{12}: The intention to use positively and significantly affects the actual use of QR.

3. Methods

3.1. Population and sample

Mixed-methods research was employed to compensate for the shortcomings of any one methodology over another, thus providing the best outcomes and supporting validity proof [90]. Consequently, the research uses a focus group discussion (FGD) to verify the findings obtained through the quantitative analysis using partial least squares (PLS). PLS structural equation modeling (PLS-SEM) was used to examine the link between the research model variables (Fig. 1). The FGD was then used to explain the findings. In this way, the study attempted to deepen our understanding of the participants' intent and attitudes towards QR mobile payments.

The study participants were individuals who had used QR mobile payments regularly. More precisely, regular users in the study refer to shoppers who had used QR mobile payments in the weeks preceding the data collection (October and November 2022). In terms of inclusion criteria, users were included who were at least 18 years old, as at this age they would be eligible to register for a mobile phone payments application. Users who had employed other forms of MFS services apart from QR payments were excluded. Therefore, those who had used QR mobile payments were exclusively considered for the study sample.

Due to the challenging nature of ascertaining the exact number of shoppers who used QR mobile payment, a non-probability sample method was utilized. In particular, we used the mall-intercept purposive sampling technique, whereby we purposefully approached individuals in a shopping mall who met specific criteria. Previous studies on QR mobile payment, such as the study conducted by Türker et al. [3], has also utilized a similar sampling method.

In terms of sample size, we aimed for more than 384 samples, as suggested by Krejcie and Morgan [91] for surveys of populations larger than one million. Besides, According to Comrey and Lee [92], a sample size of 300 is sufficient. Ultimately, we obtained a total of 412 responses. To collect these, we used both paper-based and online questionnaires through Qualtrics. Two cities, Dhaka, the country's capital, and Chittagong, its commercial hub, were selected for the paper-based survey. These two cities were chosen because of their substantial populations, openness to new payment methods, and digital economy growth plans. The shopping mall is widely used as a favored location for financial transactions, so was chosen for the study [93].

Later, ten individuals with diverse origins, ages, educational qualifications, and occupations were selected from the 412 respondents for the FGD to cross-validate the findings. A focus group with ten members from a wide range of demographics would be ideal for the analysis [94].

The sample size in this investigation was sufficient because PLS-SEM was employed, a robust multivariate analysis technique renowned for its statistical power with small sample sizes. According to Nitzl [95], a sample size of at least 100 responses is adequate for obtaining reliable results in PLS-SEM path modeling. Nevertheless, the authors referred to Hair et al. [96], who suggest that the sample size should be modified in accordance with the power analysis. Consequently, G*power software was employed to determine

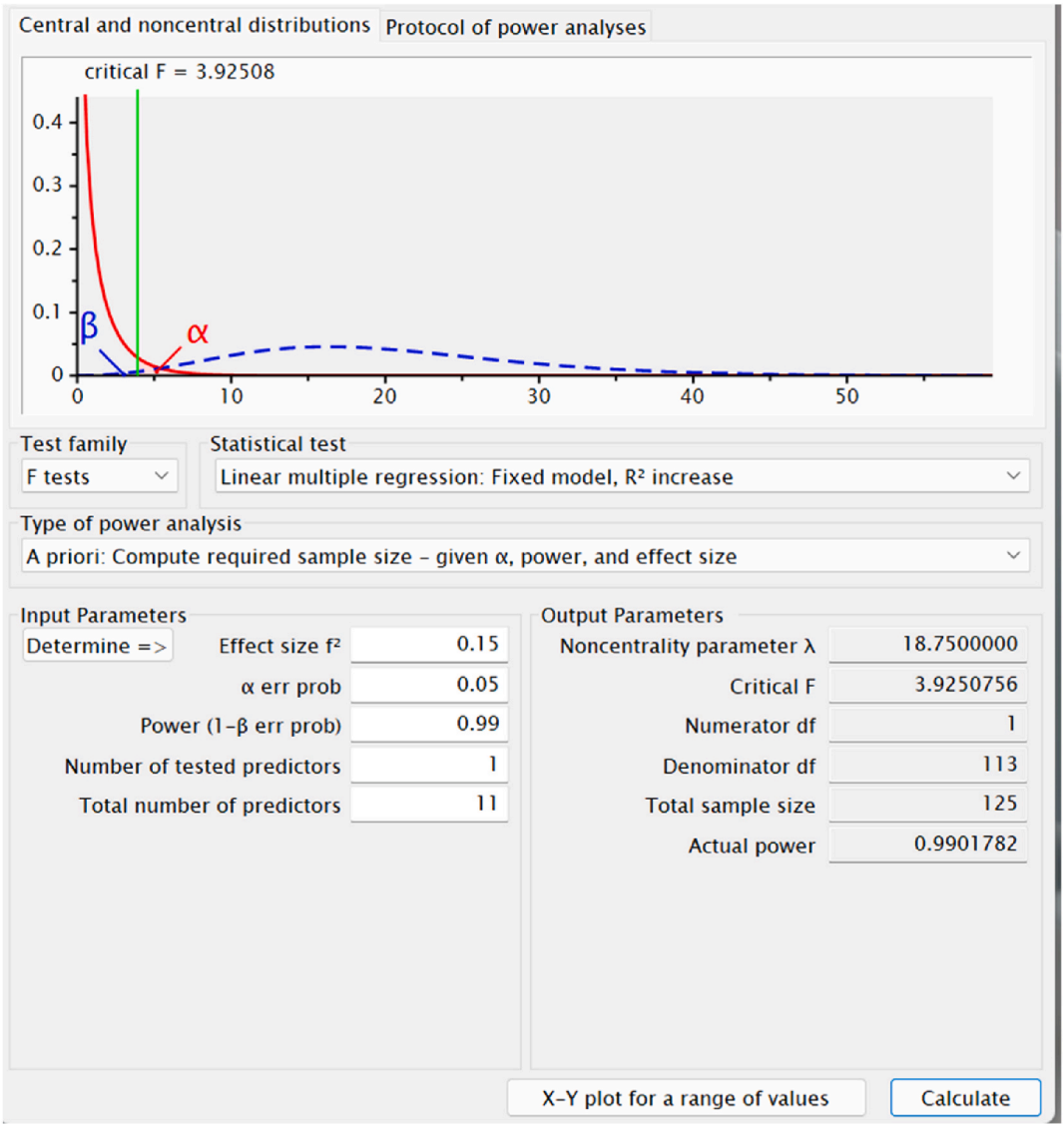

Fig. 2. Power result of required sample size.

the number of acceptable samples for the power analysis [97].

As suggested in previous research [96–98], this study considered effect size (f^2) as medium as 0.15 on average, α err prob as 0.05, and power (1-β err prob) as 0.99, while the number of predictors was 11. The calculated sample size, as demonstrated in Fig. 2, was 125, which guaranteed acceptable statistical power with sufficient samples.

3.2. Instruments

The items used to measure the latent variable were taken from validated scales and then adapted to fit the research context, as shown in Table 1. Some modifications were made to assure face validity and better comprehension. We formed an expert group consisting of a diverse panel of esteemed academics and sought their critical evaluation, focusing on the clarity and face validity of the scale. Based on their recommendations, we made informed decisions about modifications.

Moreover, according to Brislin's [99] advice, the survey instrument was back-translated into native Bangla for the respondents' comfort [100]. Furthermore, we conducted a comprehensive pilot study (See results in Table A3 in the appendix). Apart from the quantitative feedback, we also encouraged the qualitative feedback of the participants and paid close attention to their perception. We analyzed the pilot study results, interpreted the items, and ensured face validity. Therefore, we refined the measurement scales before the actual data collection.

The final form of the survey instrument was split into two sections, the first of which contained demographic questions, such as ones on gender, age, level of education, monthly income, and frequency of QR mobile payment usage. The other section contained the items for measuring performance expectancy, effort expectancy, facilitating conditions, social influence, perceived security, perceived credibility, perceived self-efficacy, perceived trust, habit, self-concept, attitude, behavioral intention, and actual use. All the items were scored using a 5-point Likert scale, with 5 indicating 'strongly agree' and 1 'strongly disagree'.

3.3. Data collection

Using Qualtrics and an in-person approach, a total of 750 self-administered questionnaires were distributed to the regular users of QR mobile payments. Each questionnaire was accompanied by a cover letter detailing the study objectives, outlining the survey instructions, and inviting the users to participate. During October and November 2022, 454 completed questionnaires were returned, with a response rate of 61 percent. However, 42 questionnaires are discarded due to incomplete responses and extreme values. Finally, 412 responses were considered for further analysis. The descriptive statistics are presented in Table 2. 48.80 % of the respondents were male (N = 201) and 51.80 % female (N = 211). 48.3 % are doing their undergraduate education, with the remainder, 51.60 %, having completed graduation and post-graduation degrees. The younger generation is more likely to use QR mobile payment, as 74.9 % of the respondents were between the ages of 20–30 (N = 313), 21.6 % were between 30 and 40 (21.6 %), and the remainder, 2.4 %, over 40. Concerning monthly income, 26.4 % of the respondents reported monthly incomes of BDT 50,000 or more, while 20.6 % percent reported a monthly income of BDT 20,000 or less. Although the respondent pool consisted of frequent users of the QR mobile payment method, only 36.8 % of the respondents had made a QR mobile payment more than 15 times in October 2022, while 9.9 % had made one 11–15 times, 15.2 % 6–10 times, and the remaining 37.8 % had made such a payment 1–5 times.

Table 1
Study measures.

Constructs	Details	Sample Items
Performance Expectancy	Venkatesh (2012) 4 Items	Using QR Mobile payment services makes my life more convenient
Effort Expectancy	Venkatesh (2012) 4 Items	Becoming skillful at QR mobile payment services is easy for me
Social Influence	Venkatesh (2012) 4 Items	People who are important to me think that I should use QR mobile payment services
Facilitating Condition	Venkatesh (2012) 4 Items	I have the resources necessary to use QR mobile payment service
Perceived Security	Schierz et al. (2010) 4 Items	The risk of an unauthorized party intervening in the payment process is low
Perceived Self-efficacy	Nisha et al. (2019) 3 Items	I have the capability to use QR mobile payment services
Perceived Trust	Nisha et al. (2019) 2 Items	I believe QR mobile payment services to be trustworthy
Habit	Venkatesh et al. (2012) 3 Items	I am habituated to using QR mobile payment services
Self-concept	Dwivedi et al. (2016) 4 Items	I prefer QR mobile payment services
Attitude	Hu et al. (1999) 3 Items	I Believe QR mobile payment service is beneficial to monetary transactions
Intention to Use	Venkatesh (2012) 4 Items	I will strongly recommend to others to use QR mobile payment service
Actual Use	Sharma & Sharma (2019) 3 Items	I am using QR mobile payment services regularly now

Table 2
Respondent's demographic profile.

Variable	Category	Frequency	Percentage
Gender	Male	201	48.8 %
	Female	211	51.2 %
Age	20–30	313	75.9 %
	30–40	89	21.6 %
	Above 40	10	2.4 %
Education Level	Undergraduate	199	48.3 %
	Graduate	118	28.6 %
	Post-graduate	95	23.0 %
Monthly income	Under 20000	85	20.6 %
	21000–30000	85	20.6 %
	31000–40000	80	19.4 %
	41000–50000	53	12.8 %
	Above 50000	109	26.4 %
Frequency of using in last month	1 - 5 times	156	37.8 %
	6 - 10 times	63	15.2 %
	11 - 15 times	41	9.9 %
	More than 15 times	152	36.8 %

3.4. Data analysis

SPSS software (SPSS 26.0) was used to analyze the respondents' profiles (Table 2), descriptive statistics and inter-construct correlations (Table 3), and Smart PLS 4 to validate and test the hypotheses of the research model. Although in the past covariance-based structural equation modeling (CB-SEM) was the preferred method for studying complicated interrelationships between observed and latent variables, recent years have seen a dramatic rise in the use of PLS-SEM [96].

PLS-SEM, widely applied in many social science disciplines, is a well-established method for evaluating complicated cause-effect-relationship models [101]. Besides, it is a robust statistical technique that can work with small sample sizes and is able to minimize unexplained variance and maximize explained variance in the endogenous variable(s) accounted for exogenous variables [102,103]. Moreover, many researchers prefer PLS-SEM because it allows them to estimate complex models with several constructs, indicators and structural paths without forcing distributional assumptions on the data [102]. PLS-SEM was also chosen for this study because the data used were not normally distributed, as the researchers examined the multivariate skewness and kurtosis determined by Mardia's multivariate skewness ($\beta = 398.50$, $p < 0.01$) and kurtosis ($\beta = 2274.34$, $p < 0.01$) [96].

3.5. Bias issue

Despite the utilization of both pen-and-paper surveys and online surveys to gather responses, the research remains unaffected by common method bias. We ran a thorough collinearity test, and our meticulous examination revealed VIF values ranging from 1.544 to 3.330, much below the recommended threshold of 5 [101]. Additionally, we employed the correlation matrix method [104], and Table 3 displays that the strongest correlation between constructs was 0.719, which fell below the threshold value of 0.90 [104]. Therefore, these analyses conclude that common method bias was not an issue.

Table 3
Descriptive statistics and correlations of latent constructs.

Latent Variable	Mean	SD	PE	EE	SI	FC	PS	SC	PSE	HT	PT	AT	BI	AB
PE	4.182	0.753	1											
EE	3.161	0.914	0.338	1										
SI	3.667	0.863	0.399	0.42	1									
FC	3.971	0.816	0.559	0.309	0.405	1								
PS	3.75	0.897	0.348	0.32	0.369	0.334	1							
SC	3.788	0.88	0.588	0.561	0.473	0.477	0.601	1						
PSE	4.319	0.693	0.528	0.254	0.346	0.68	0.42	0.51	1					
HT	4.282	0.721	0.648	0.251	0.321	0.649	0.349	0.497	0.651	1				
PT	3.901	0.837	0.414	0.296	0.289	0.392	0.586	0.575	0.483	0.41	1			
AT	4.079	0.713	0.567	0.362	0.437	0.507	0.56	0.665	0.594	0.529	0.496	1		
BI	3.773	0.866	0.511	0.561	0.474	0.416	0.481	0.719	0.425	0.44	0.422	0.677	1	
AB	3.525	0.909	0.427	0.588	0.478	0.389	0.406	0.593	0.372	0.375	0.309	0.494	0.635	1

Note: *PE = Performance Expectancy, EE = Effort Expectancy, SI = Social Influence, FC = Facilitating Condition, PSE = Perceived Self Efficacy, HT = Habit, PT= Perceived Trust, AT= Attitude, BI = Behavioral Intention, AB = Actual Behavior.*

4. Results

4.1. Measurement model

The measurement model assesses the reliability and validity of the constructs with their corresponding items. Acceptance of the model is dependent on three criteria: its internal consistency reliability, its convergent validity, and its discriminant validity [98].

Internal consistency reliability, a form of reliability, examines the consistency between the observed variables in a test. Cronbach's alpha and composite reliability are the traditional criteria for determining this; nevertheless, composite reliability is preferable because it prioritizes the indicators based on their individual reliability [96]. Composite reliability and Cronbach's alpha values range from 0 to 1, and both must exceed the 0.6 thresholds to be considered acceptable [96,98]. As shown in Table 4, the value of both composite reliability and Cronbach's alpha surpasses 0.6, thus demonstrating internal consistency reliability.

Convergent validity appears when different measures of the same construct exhibit a positive correlation with one another. Measures of convergent validity include factor loadings and average variance extracted (AVE), which must be greater than 0.5 [96]. As shown in Table 4, all the constructs displayed satisfactory convergent validity, with loadings and AVE values exceeding 0.5.

The final aspect is discriminant validity, the extent to which a construct is empirically different from other constructs. The cross-loadings and Fornell-Larcker criterion are commonly used to evaluate discriminant validity. However, compared to conventional methods (i.e., the Fornell–Larcker criterion and cross-loadings), HTMT is superior for discriminant validity [105]. As indicated in Table 5, all the constructs exhibit discriminant validity except for PSE as their HTMT scores are below the 0.85 criterion [106]. Gold et al. [107] state that any HTMT value below 0.90 demonstrates discriminant validity. Therefore, PSE has no validity concerns.

Following the guidelines of Hair et al. [96], the bootstrapping of 5000 sub-samples was applied. The measurement model failed to meet the requirements in the initial analysis due to its low AVE value. Consequently, some indicators were discarded, including EE4, SI4 and FC4, before running the measurement model once.

Table 4
Item loadings, alpha value, CR & AVE.

Constructs	Items	Loading	Alpha	CR	AVE
Performance Expectancy	PE 1	0.767	0.778	0.857	0.601
	PE 2	0.830			
	PE 3	0.703			
	PE 4	0.794			
Effort Expectancy	EE 1	0.836	0.797	0.881	0.711
	EE 2	0.858			
	EE 3	0.835			
Social Influence	SI 1	0.873	0.863	0.916	0.785
	SI 2	0.908			
	SI 3	0.876			
Facilitating Condition	FC 1	0.746	0.712	0.837	0.631
	FC 2	0.794			
	FC 3	0.840			
Perceived Security	PS 1	0.825	0.866	0.908	0.713
	PS 2	0.887			
	PS 3	0.885			
	PS 4	0.777			
Self-Concept	SC1	0.826	0.796	0.866	0.62
	SC2	0.806			
	SC3	0.818			
	SC4	0.691			
Perceived Self Efficacy	PSE 1	0.855	0.823	0.894	0.739
	PSE 2	0.867			
	PSE 3	0.857			
Habit	HT1	0.851	0.863	0.907	0.709
	HT 2	0.865			
	HT 3	0.824			
	HT 4	0.826			
Perceived Trust	PT 1	0.949	0.886	0.946	0.898
	PT 2	0.946			
Attitude	AT 1	0.887	0.829	0.897	0.745
	AT 2	0.853			
	AT 3	0.848			
Behavioral Intention	BI 1	0.843	0.865	0.908	0.712
	BI 2	0.826			
	BI 3	0.844			
	BI 4	0.862			
Actual Behavior	AB 1	0.821	0.789	0.877	0.705
	AB 2	0.904			
	AB 3	0.791			

*EE4, SI4 & FC4 are deleted.

Table 5
Discriminant validity (HTMT).

	PE	EE	SI	FC	PS	SC	PSE	HT	PT	AT	BI	AB
PE												
EE	0.428											
SI	0.482	0.502										
FC	0.737	0.391	0.500									
PS	0.409	0.383	0.427	0.423								
SC	0.726	0.721	0.579	0.619	0.707							
PSE	0.652	0.307	0.407	0.895	0.492	0.607						
HT	0.778	0.300	0.368	0.838	0.398	0.591	0.769					
PT	0.493	0.352	0.329	0.495	0.663	0.673	0.565	0.466				
AT	0.701	0.444	0.517	0.654	0.653	0.805	0.716	0.623	0.576			
BI	0.617	0.674	0.547	0.517	0.548	0.871	0.501	0.507	0.480	0.797		
AB	0.540	0.737	0.573	0.507	0.488	0.749	0.457	0.453	0.370	0.608	0.767	

Note: *PE = Performance Expectancy, EE = Effort Expectancy, SI = Social Influence, FC = Facilitating Condition, PSE = Perceived Self Efficacy, HT = Habit, PT= Perceived Trust, AT= Attitude, BI = Behavioral Intention, AB = Actual Behavior.*

4.2. Structural model

Examining the structural model is the second step in evaluating PLS-SEM results [108]. When examining a structural model, it is essential to consider its path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and collinearity assessment [96,102].

The researchers assessed the path coefficients of the structured model in line with Hair et al. [96] using bootstrapping with 5000 subsamples, a two-tailed test, and a significance level of 0.05, as shown in Table 6. The results demonstrate that apart from H4, H5 and H9, all the hypothesized relationships are observed to be statistically significant.

In particular, performance expectancy ($\beta = 0.111$, $t = 2.755$, $P = <0.05$); effort expectancy ($\beta = 0.311$, $t = 8.025$, $P = <0.05$); and social influence ($\beta = 0.093$, $t = 2.266$, $P = <0.05$) are positively associated with behavioral intention, except for the facilitating condition ($\beta = -0.023$, $t = 0.570$, $P > 0.05$) and perceived security ($\beta = 0.075$, $t = 0.056$, $P > 0.05$). Similarly, self-concept ($\beta = 0.432$, $t = 6.964$, $P = <0.05$); perceived self-efficacy ($\beta = 0.265$, $t = 5.254$, $P < 0.05$); and habit ($\beta = 0.112$, $t = 2.066$, $P < 0.05$) are positively associated with attitude, apart from perceived trust ($\beta = 0.074$, $t = 1.442$, $P > 0.05$). In addition, attitude is favorably associated with both actual behavior ($\beta = 0.119$, $t = 2.308$, $P < 0.05$) and behavioral intention ($\beta = 0.431$, $t = 8.062$, $P < 0.05$), which is again positively linked with actual behavior ($\beta = 0.554$, $t = 10.893$, $P < 0.05$).

The coefficient of determination, also termed R^2, of the endogenous component (s) is used to evaluate the explanatory power of the model. In terms of such power, endogenous constructs with R^2 values of 0.25, 0.50 and 0.75 are defined as weak, moderate and substantial respectively [96]. The R^2 values for attitude, behavioral intention and actual behavior are 0.540, 0.593 and 0.410 respectively (Table 6), indicating that the models have a moderate level of explanatory power.

Effect size, often known as f^2, is a statistical measure used to evaluate the relative influence of exogenous constructs on endogenous ones. An exogenous construct's effect on an endogenous one is deemed to be minor, medium or large when the f^2 value is 0.02, 0.15 or 0.35 respectively [96]. Table 6 shows that PE and SI have a minor effect on BI, whereas EE has a medium effect. Likewise, habit and PSE have a minor effect on AT, whereas SC has a medium effect. In turn, AT has a minor effect on AB and a medium one on BI, which itself has a medium effect on AB.

The researchers also assessed predictive relevance (Q^2) by applying PLS predict (setup: No. of folds: 10, No. of repetitions: 10,

Table 6
Outcomes of structural model.

Hs	Paths	B	SE	T Values	R^2	Q^2	F^2	Decision	95 % Confidence Interval	
									LLCI	ULCI
H1	PE - > BI	0.111	0.040	2.755	0.540(AT)	0.526 (AT)	0.017	Supported	0.045	0.177
H2	EE - > BI	0.311	0.039	8.025	0.593 (BI)	0.532 (BI)	0.182	Supported	0.247	0.374
H3	SI - > BI	0.093	0.041	2.266	0.41 (AB)	0.405 (AB)	0.015	Supported	0.025	0.161
H4	FC - > BI	−0.023	0.041	0.570			0.001	Not Supported	−0.091	0.043
H5	PS - > BI	0.075	0.056	1.329			0.009	Not Supported	−0.014	0.169
H6	SC - > AT	0.432	0.062	6.964			0.233	Supported	0.329	0.533
H7	PSE - > AT	0.265	0.05	5.254			0.077	Supported	0.18	0.345
H8	HT - > AT	0.112	0.054	2.066			0.015	Supported	0.023	0.201
H9	PT - > AT	0.074	0.051	1.442			0.007	Not Supported	−0.008	0.161
H10	AT - > BI	0.431	0.053	8.062			0.224	Supported	0.345	0.521
H11	AT - > AB	0.119	0.052	2.308			0.013	Supported	0.033	0.205
H12	BI - > AB	0.554	0.051	10.893			0.281	Supported	0.464	0.631

Note: *PE = Performance Expectancy, EE = Effort Expectancy, SI = Social Influence, FC = Facilitating Condition, PSE = Perceived Self Efficacy, HT = Habit, PT= Perceived Trust, AT= Attitude, BI = Behavioral Intention, AB = Actual Behavior.*

Random Number Generator: Random Seeds) to obtain cross-validated redundancy measures for each endogenous construct. Ali et al. [101] suggest that the value of Q^2 should be higher than zero. As shown in Table 6, the Q^2 values of AT, BI and AB are 0.526, 0.532, and 0.405 respectively, and the predictive relevance of each construct is significant. Furthermore, we conducted a more comprehensive evaluation of predictive significance using tenfold cross-validation, performing seven repetitions with the PLS predict method (Table 7). The majority of the prediction errors show substantial dispersion. Therefore, we chose to use the RMSE value for the PLS prediction. In accordance with the suggestion made by Shmueli et al. (2019), it is notable that for the majority of indicators the RMSE of PLS-SEM is less than that of LM. This indicates that the model possesses a moderate level of predictive significance.

The variance inflation factor (VIF) score is used to report collinearity, which must be analyzed to ensure that collinearity concerns do not distort the structural model results [96]. The VIF values for the study range from 1.544 to 3.330, all of which are lower than the cut-off of 5, indicating no issue with collinearity [101].

4.3. Insights from the focus group discussion

Participants were asked several open-ended questions regarding the three primary constructs of the theoretical model - behavioral intention, attitudes and actual use of QR mobile payment. Listed below are some of the main questions asked to the FGD participants; in response to these questions, the major extracts are in the following sections.

1. Do QR mobile payments need minimal effort from you, but increase your performance? Do the current technology and infrastructure, perceived security and influence of those close to you motivate you to employ QR mobile payments?
2. Do your technological proficiency and preferences influence your attitudes towards QR mobile payment? How do you evaluate the trust in the QR mobile payment system in shaping your attitude? Will you repeat QR mobile payment if you are repeatedly placed in similar situations?
3. Do you think you are most likely to use QR mobile payments on different occasions if this payment service positively influences your perception?

4.3.1. Performance expectancy, effort expectancy, social influence and behavior intention

Most participants agreed that QR mobile payment required minimum effort to operate and complete a transaction, while increasing their convenience and productivity. In this regard, one participant reasoned:

> Participant 6# "QR mobile payment is very easy to operate. It requires a smartphone, which I have used for last couple of years, an active internet connection, which usually I have for my different activities, and a mobile banking app, of which I have a couple because I use several mobile banking accounts with different institutions such as bKash, Nagad, and Cellfin. I don't need to think about the amount of cash I have in my wallet. I can scan the code and make the payment after purchasing a product or receiving a service. To me, QR payment reduced my hassle."

Another participant responded similarly and added:

> Participant 3# "QR mobile payment is as easy as operating other apps on my cellphone. I don't even have to press the number of the merchant. I only open the app, scan the QR code, enter the desired amount, and then tap to complete the transaction. It saves me time and effort."

The participants also acknowledged the importance of social influence in shaping their intention to use QR mobile payment. One participant explained how his viewpoints had changed after recommendations from friends and family about QR mobile payment:

> Participant 4# "Initially I was reluctant to use QR payment. I rather preferred swiping my credit card when shopping. However, when I broke my card for the first time by keeping it in my wallet and lost it on another occasion, I became very stressed about carrying a credit card. I shared my situation with some of my friends in a get-together, several of whom recommended I added the credit card to the mobile app and tried QR payment. They also demonstrated the process of how easily I could add a card to

Table 7
PLS predict.

Endogenous Construct	Items	Q^2predict	PLS-SEM_RMSE	LM_RMSE	Difference
Attitude	AT 1	0.446	0.527	0.518	−0.009
	AT 2	0.358	0.534	0.555	0.021
	AT 3	0.363	0.611	0.623	0.012
Behavioral	BI 1	0.439	0.604	0.599	−0.005
Intention	BI 2	0.348	0.703	0.698	−0.005
	BI 3	0.363	0.760	0.787	0.027
	BI 4	0.363	0.674	0.692	0.018
Actual	AB 1	0.245	1.004	1.031	0.027
Behavior	AB 2	0.349	0.854	0.810	−0.044
	AB 3	0.262	0.896	0.897	0.001

the app. Then I started using QR mobile payment instead of carrying the credit card, and I assure you, life became very easy now for me."

4.3.2. Facilitating conditions, perceived security and behavioral intention

However, participants in the FDG showed concern over the current technological and organizational infrastructure and perceived security of QR mobile payment in Bangladesh. Concerning the former, one participant expressed his frustration:

> Participant 10# "In most of the cases when I want to make a payment using QR code, I find the internet connection unstable, especially, if the outlet of the merchant is not adjacent to the main road of the locality, the internet connection became unstable and I cannot either open the app or complete the steps required for successful completion of the transactions. I think the apps are designed in such way that they cannot operate with slow internet connections."

4.3.2.1. Concerning security, one participant argued that

> Participant 8# "I heard and also experienced that many apps downloaded from the apps store steal valuable information from the mobile phone. Sometimes, they can access photos, contact numbers, and messaging apps. I am reluctant to accept a technology like QR mobile payment, which will be operated based on a mobile app, as I am not sure whether it will steal my personal and financial information."

This opinion was echoed by a young female participant, who added:

> Participant 2# "When I installed a QR mobile payment app, it accessed my contact lists, photos, location details, and messaging app. I had to grant access to complete the installation, but I am unhappy with this process. I keep myself safe and avoid sharing my personal stuff.

4.3.3. Perceived trust and attitude

Participants also expressed similar concerns when asked to evaluate perceived trust in the QR mobile payment system in shaping their attitudes. Most contended that they would not use QR mobile payment until it had satisfactorily built confidence in users' minds about its security and functionality. In this regard, a businessman with a small poetry shop in Dhaka city argued:

> Participant 5# "I am used to transacting with cash. In most cases, the counterparties to my transactions keep their records manually. They maintain their own ledger and collect my signature on their documents for future reference. I don't see any scope for QR payments in such situations and agree with their process as I also prefer physical documents for transactions to avoid future misunderstanding."

Another participant showed a similar concern, adding:

> Participant 2# "The QR mobile payment service providers, along with different merchants, should initiate different campaigns and promotional activities so that we get more trust in this payment option. The service providers should also assure us how promptly they can solve problems regarding a QR payment."

4.3.4. Self-concept, perceived self-efficacy, habit and attitude

Participants agreed that self-concept and self-efficacy positively shaped users' attitudes toward QR mobile payments. One participant reasoned that

> Participant 1# "I like the QR mobile payment services. The process of using this service is as easy and fast as I thought and I don't see any issue to continue use it on all possible occasions."

However, another female participant argued:

> Participant 7# "I am not much used to different technologies, especially those which emerged in recent times. I still prefer the traditional methods of payment. I might use QR mobile payment only when I have better expertise of digital financial services and I have no way of conducting a traditional payment."

Similarly, participants agreed they would use QR mobile payment in different situations if it became their habit. To support this notion, one housewife shared her experience:

> Participant 9# "I have been using a mobile banking app for a while and I am very used to it now. At present, whenever I think of paying my monthly bills, the mobile banking app pops up in my mind spontaneously. As a female I always felt awkward, standing in long queues with other males, to pay my electricity, water and gas bills. Now, I can pay these bills without standing in queues, and I don't even think of other payment alternatives. Based on this experience, I am pretty sure that I will use QR mobile payment in every possible instance since I started using the service. I want a hassle-free life and QR mobile payment is such a blessing, like other mobile payment solutions."

4.3.5. Attitude, behavioral intention and actual use

The participants confirmed the role of their perception of QR mobile payment in the actual use of this service on different occasions. Except for those who were reluctant to adopt new technology such as QR mobile payments, and those who were still skeptical about the trust and security of the service, all the other participants agreed that they had a positive perception of QR mobile payment and will apparently use this service in every possible instance. In this regard, one participant stated:

> Participant 1# "I am very adaptive to new technologies and found QR mobile payment very handy and useful. It made my life easy and hassle-free. I can also make payments and track my expenditures smartly. Such advantages create a positive viewpoint about this payment method in my mind. So, I will use this service further and I will also recommend it to others, like my friends, peers and family members."

This opinion was echoed by other participants, with both participants #3 and #7 simultaneously adding that they *"found QR mobile payment to be very promising and I will use it at all possible future events."* Participant #9 also stated that *"When I have to pay for something, I look for the QR mobile payment option first. It is more convenient for me."*

5. Discussion

This study explores the factors affecting the behavioral intention, attitudes, and actual use of QR mobile payment in an LDC, Bangladesh, using an extended version of the UTAUT model which includes perceived security, perceived self-efficacy, perceived trust, habit, and self-concept. The proposed theoretical model explains 54 % of the variance in attitudes toward using QR mobile payment, 59.30 % in behavioral intention (BI), and 41 % in the actual use of QR mobile payment.

With a t value of 2.775 and β value of 0.111, H_1 is supported, indicating that performance expectancy has a significant positive impact on users' intention to use QR mobile payment. This prediction is in agreement with previous studies on such payment [5,49,66,68]. Users are expected to embrace QR mobile payments in their regular transactions if it reduces the costs and difficulties usually associated with traditional transactions. The Effort Expectancy confirms that more people will be interested in using the QR payment if service providers initiate further education and usage opportunities. Therefore, they should develop easy-to-use and user-friendly QR payment solutions to strengthen users' behavioral intentions. Moreover, with a t value of 8.025 and β value of 0.311, the study confirms a positive significant impact of effort expectancy on users' behavioral intention to use QR mobile payments. Therefore, H_2 is supported and matches the predictions of previous studies regarding technology adoptions [49,51,54,65]. This study argues that in the environment of LDCs, where QR payments are still in their infancy, the ease of use of the technology for users will be crucial. They will expect minimal effort needed to complete a QR mobile payment, with improved ease of use. Moreover, with a t value of 2.266 and β value of 0.093, H_3, that social influence positively affects users' intention to make QR mobile payments, is also supported. The findings coincide with those of previous studies [5,10,12,49,66], implying that social pressure and the favorable opinions of family, friends or superiors positively influences users' behavioral intention to use the QR payment method. Users who receive positive reviews from their family members and friends are more inclined to use QR mobile payments, and vice versa.

However, the study finds no significant effect of facilitating conditions on the behavioral intention to adopt QR mobile payments. Hence, H_4 is not supported. This finding matches several previous studies focused on the adoption of new technologies [43,64,67], which is not very surprising for LDCs. Bangladesh, like other LDCs, is positioned far behind the global standard in technological readiness, ICT infrastructure, innovation, and industrial advancement [109]. Therefore, people are not enthusiastic about adopting new mobile payment technologies such as QR payments. A holistic approach is required, including service providers and policymakers, to ensure a better technological and organizational infrastructure for facilitating the use of QR payments. This study also finds no significant support for H_5, that perceived security has a direct positive effect on the intention to use QR mobile payments, which is in line with Gupta et al. [64], but contradicts several previous studies [48–50]. Security is one of the most significant concerns in users' behavioral intention [48], but is less potent in countries with low individualism, such as Bangladesh [110]. People in low individualist societies rely more on long-term relationships and consider technology only when it is mature and has positive feedback from most of society. In adopting financial technologies like QR mobile payments, users in LDCs showed preference to be listed in the categories of 'late majority' and 'laggards', classified under Roger's diffusion of innovations theory [111].

Furthermore, with a t value of 6.964 and β value of 0.432, H_6 is supported, indicating that self-concept significantly influences users' attitude towards using QR mobile payments. This prediction is in agreement with previous studies [72,112] and implies that what users think about themselves concerning the use of QR payment often affects their attitude towards such payment technology. If users believe that QR mobile payment is beneficial and will improve performance, they perceive a positive attitude, which in turn influences their behavioral intention toward the technology. The study also supports H_7, that self-efficacy positively affects users' intention to use QR payment. This finding coincides with those of previous studies [74,75] and implies that self-efficacy assesses how successfully a user can carry out the steps required, which positively influences both behavioral intention and users' attitudes to adopting a new technology [32,36,49]. Users show no reluctance to start using QR payments if they believe that they can successfully complete all the steps of a QR transaction. Additionally, with a t value of 2.066 and β value of 0.112, H_8 is supported, indicating that habit significantly influences users' attitude toward using QR payments. This finding also matches those of previous studies [44,52] and assumes that users are most likely to develop a habit of using a technology in future predictable situations, which is an outcome of their strong association between cues and reactions in their memory [76]. Therefore, marketing managers should focus on branding efforts to build brand equity for QR mobile payments [113].

However, the study finds no significant relationship between perceived trust and users' attitudes toward QR mobile payment. With a t value of 1.442 and β value of 0.074, H_9 is rejected. Zhang et al. [110] contended that cultural features such as high-power distance,

low individualism, and high uncertainty avoidance significantly shape intentions and attitudes towards using technology. Mobile payments are still in their infancy in LDCs, and technological readiness needs to mature. Consequently, users are concerned about sharing their sensitive data and are not interested in making QR payments rather than conventional ones. These findings are evident in both the quantitative and qualitative results of the study. Building trust among users and a wider acceptance of QR payments in the country can trigger more adoption of QR payments.

Finally, the study finds a positive effect of users' attitudes toward QR mobile payment on behavioral intention and actual use; thus supporting both H_{10} and H_{11}. These findings coincide with previous studies on the adoption of QR mobile payment in different countries, for example China, Thailand and Spain [13,14,85], implying that a positive attitude towards QR payment is a significant predictor of behavioral intention and actual use of the technology [45,84]. Therefore, it can be concluded that users' attitude towards QR payment is a significant predictor of QR adoption in LDCs, as it is in developed and developing countries. Moreover, with a t value of 10.893 and β value of 0.554, this study supports H_{12}, indicating that behavioral intention to use QR payment positively affects its actual usage. While the majority of previous studies on mobile payments have considered behavioral intention as a good substitute for actual use [43,49,114], this study considers both behavioral intention and actual use in the theoretical model and concludes that the former positively affects the latter in QR mobile payments. These findings coincide with previous studies on mobile payments [37,89].

The qualitative results obtained from the FGD also coincide with the quantitative study results. The participants in the FGD agreed that QR mobile payment requires minimum effort to operate and complete a transaction, thus increasing their convenience and productivity. Participants were also significantly influenced by their family, friends and peers in adopting QR payment. However, they expressed concern about the current technological and organizational infrastructure, as well as the perceived security of the QR payment system in LDCs. They were also concerned about perceived trust in shaping their attitude. On the other hand, the participants agreed that self-concept and self-efficacy positively shaped their attitudes towards QR mobile payments. They also agreed that they would use QR mobile payment in different instances if it became their habit. Apart from those who were hesitant to adopt QR mobile payment, and those who were still skeptical about the trust and security of the payment service, the participants agreed that they had a positive perception of QR mobile payment and would apparently use the service on all possible future occasions.

6. Implications

6.1. Theoretical implications

The study makes several noteworthy contributions. First, it provides an understanding of QR mobile payment through the lens of the UTAUT framework. This framework has been utilized in research on earlier MFS adoptions and some cases of QR adoption, mostly in developed nations. Therefore, this study is novel in that it examines QR mobile usage for monetary transactions from the perspective of LDCs, which will surely help to expand existing understanding of the topic.

Second, this study extends the original UTAUT model by incorporating attitude as a predictor variable for both intention and actual QR mobile payment usage. In addition, the unique focus of the study is on how internal psychological factors influence the formation of attitude towards QR mobile payment. In particular, the study sheds light on the critical role played by a number of predictors (perceived trust, perceived self-efficacy, self-concept, and habit) in the process of developing attitudes towards QR mobile payment. Third, while focusing on internal psychological factors as predictors of attitude, the study considers previous research suggestions and examines the impact of self-efficacy and habit on QR mobile payment users' adoption [14]. Therefore, a new perspective is added to the minds of those who create and promote mobile payment services, by demonstrating the impact of attitude on the rate of adoption and frequency of use. Attitudes towards using QR mobile payment and its associated factors open up a new avenue for further research in adopting similar or newer technologies in the same or similar field.

Fourth, theoretical backing is provided for the role of performance expectancy, effort expectancy, social influence, and attitude in developing QR mobile payment intention and the roles of self-concept, perceived self-efficacy and habit in forming attitudes towards QR mobile payment. Likewise, the study strengthens theoretical support for the role of attitude and usage intention in actual QR mobile payment usage.

Fifth, the study offers a methodological novelty as a mixed research approach (quantitative and qualitative) was employed, which helped cross-validate the hypothesized results. To the best of the researchers' knowledge, no study has used a mixed approach to examine QR mobile payment adoption. Finally, the study employed mall intercept purposive sampling, specifically considering users who frequently used QR mobile payment, which helped to capture usage intention more precisely. Consumers at a shopping mall usually have access to a wide variety of payment options, including QR mobile payment. Therefore, shopping malls, as a flexible payment environment, allowed the study to capture users' QR mobile payment usage intention and frequency more accurately.

6.2. Practical implications

In terms of practical implications, first, this research is a pioneering study in that it explores the factors influencing the adoption of QR mobile payment in Bangladesh. A few previous studies based in Bangladesh have considered users' intention to adopt digital financial services, but none has explored QR mobile payment. Concentration on QR mobile payment adoption as part of the country's overall drive toward digitalization of financial services will be helpful to both service providers and respective authorities. Second, the study provides important insights for service providers in offering better QR mobile payment services, and for marketing managers to build brand equity through branding efforts, as users showed concern over trust and security in their intentions and attitudes towards using QR mobile payments, which in turn will affect their actual use.

Third, it is suggested that app developers design QR payment apps in a more user-friendly way, so that users can open the app quickly, operate it on different devices, and handle it easily. Fourth, as QR payment is emerging in Bangladesh, marketing campaigns need to highlight the users' benefits, positive experience, and prospects of QR payment. Such marketing efforts may include the ability for potential users to experience the QR payment on a trial basis. Such steps will attract more users, reduce their inertia, and improve the pace of QR adoption in Bangladesh. Finally, the study suggests a holistic approach from service providers, merchants, financial institutions, and policymakers in developing enabling factors for smooth QR mobile payment in Bangladesh, including digital infrastructure, institutional framework, safety and security. With a supportive regulatory framework and incentives from the government, coupled with customer-centric service design from QR service providers, it is expected that users' attitudes, behavioral intentions, and actual use of QR mobile payments will be accelerated in LDCs.

7. Conclusion

The world is progressively moving towards a cashless society, as governments of various countries and their citizens are rapidly moving towards cashless transactions. These prevent fraudulent activities such as money theft and loss, and reduce the hassle of carrying wallets. Since the outbreak of Covid-19, more people have started making digital cashless transactions to protect themselves against infection through human contact. One of the prominent cashless payment transaction mechanisms is QR mobile payment, which is gaining popularity globally. While studies on digital payment services are proliferating, no previous studies have focused on behavioral intention, attitudes and actual use of QR mobile payment in LDCs. Interestingly, Bangladesh's government aims to build a cashless society within the next four years. However, the country's poor performance in technological readiness, ICT infrastructure, innovation, and industrial advancement make this dream a challenge. Therefore, this study aimed to explore the factors influencing users' behavioral intentions, attitudes and actual adoption of QR mobile payment in Bangladesh, as a representative LDC.

The study adopted an extended version of the UTAUT model which formed a relationship between three primary factors: behavioral intention, users' attitudes and actual use. The findings indicate that performance expectancy, effort expectancy and social influence significantly influence users' behavioral intention towards QR mobile payment, while self-concept, perceived self-efficacy and habit significantly influenced their attitudes toward using such a payment method in Bangladesh. A positive effect of users' attitudes towards using QR mobile payment on both behavioral intention and actual use, and a similar effect of behavioral intention on the actual use of QR mobile payment, is also evident in LDCs.

8. Limitations and future study scope

Despite offering some new contributions to the body of knowledge, this study is not without its limits. In this study, researchers used a self-reporting survey approach in conjunction with nonprobability sampling. Therefore, the results may not be applicable to a broader population because of selection bias and a non-representative sample that may have affected data collecting. In addition, the use of self-reporting questionnaires may introduce several biases, including interpretation bias and social desirability bias. Moreover, the study does not consider the moderating variables of the original UTAUT model due to the notable consistency across Bangladeshi respondents in their adoption of new technologies. These moderating variables (such as age, gender and voluntariness) can be explored in future research, if the users in a particular location show heterogeneity in their decision making.

Beyond that, the constraints of this study present opportunities for further research. The theoretical model developed and validated in this investigation could be studied in other country settings, for example in other LDCs or in developed and developing countries, to observe whether the theoretical proposition suggested in this study is equally applicable elsewhere. As QR mobile payment is intricate and diverse in nature, it is plausible that additional factors might contribute to fostering the intention to embrace the technology. In future studies, QR mobile payment could be compared with other contactless payment systems. Moreover, further research could be initiated to compare the QR mobile payment adoption rate of Bangladesh and other LDCs in a cross-country analysis. This study has examined the actual use of QR mobile payment. Therefore, future studies could also focus on users' continued use of the QR mobile payment method.

Data availability statement

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CRediT authorship contribution statement

Muhaiminul Islam: Writing – review & editing, Writing – original draft, Validation, Methodology, Data curation,

Conceptualization. **Ashia Khatun Tamanna:** Writing – review & editing, Writing – original draft, Visualization, Resources, Investigation, Data curation, Conceptualization. **Saiful Islam:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Resources, Project administration, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e35302.

References

[1] M. Al-Okaily, H. Alqudah, A.A. Al-Qudah, N.S. Al-Qadi, H. Elrehail, A. Al-Okaily, Does financial awareness increase the acceptance rate for financial inclusion? An empirical examination in the era of digital transformation, Kybernetes 52 (2022) 4876–4896.
[2] T.-M. Choi, Mobile-app-online-website dual channel strategies: privacy concerns, e-payment convenience, channel relationship, and coordination, IEEE Trans. Syst. Man, Cybern. Syst 51 (2020) 7008–7016.
[3] C. Türker, B.C. Altay, A. Okumuş, Understanding user acceptance of QR code mobile payment systems in Turkey: an extended TAM, Technol. Forecast. Soc. Change 184 (2022) 121968.
[4] O.S. Akinola, Cashless society, problems and prospects, data mining research potentials, Int. J. Comput. Sci. Telecommun. 49–55 (2012).
[5] S. Gao, X. Yang, H. Guo, J. Jing, An empirical study on users' continuous usage intention of QR code mobile payment services in China, Int. J. E-Adoption (IJEA) 10 (2018) 18–33, https://doi.org/10.4018/ijea.2018010102.
[6] L. Lou, Z. Tian, J. Koh, Tourist satisfaction enhancement using mobile QR code payment: an empirical investigation, Sustain. Times 9 (2017), https://doi.org/10.3390/su9071186.
[7] X. Zhu, Case II: micro platform, major innovation—WeChat-based ecosystem of innovation, China's Technol. Innov. Sel. Cases Creat. Stay. Ahead Bus. Trends (2018) 33–52.
[8] Statista: • Number of Mobile Devices Worldwide 2020-2025 | Statista, 2022. https://www.statista.com/statistics/245501/multiple-mobile-device-ownership-worldwide/.
[9] M.H. Ibrahim, R. Hussin, H. Hussin, Factors influencing Malaysian consumers' intention to use quick response (QR) mobile payment, J. Pengur 57 (2019) 1–16.
[10] N. Sobti, Impact of demonetization on diffusion of mobile payment service in India: antecedents of behavioral intention and adoption using extended UTAUT model, J. Adv. Manag. Res. 16 (2019) 472–497, https://doi.org/10.1108/JAMR-09-2018-0086.
[11] Y. Zhong, H.-C. Moon, Investigating customer behavior of using contactless payment in China: a comparative study of facial recognition payment and mobile QR-code payment, Sustainability 14 (2022) 7150.
[12] M. Tu, L. Wu, H. Wan, Z. Ding, Z. Guo, J. Chen, The adoption of QR code mobile payment technology during COVID-19: a social learning perspective, Front. Psychol. 12 (2022) 6586.
[13] F. Liébana-Cabanillas, I. Ramos de Luna, F.J. Montoro-Ríos, User behaviour in QR mobile payment system: the QR Payment Acceptance Model, Technol. Anal. Strateg. Manag. 27 (2015) 1031–1049, https://doi.org/10.1080/09537325.2015.1047757.
[14] P. Suebtimrat, R. Vonguai, An investigation of behavioral intention towards QR code payment in bangkok, Thailand, J. Asian Financ. Econ. Bus. 8 (2021) 939–950, https://doi.org/10.13106/jafeb.2021.vol8.no1.939.
[15] D. Almajali, M. Al-Okaily, K. Al-Daoud, S. Weshah, A.A. Shaikh, Go cashless! Mobile payment apps acceptance in developing countries: the Jordanian context perspective, Sustainability 14 (2022) 13524.
[16] A.F. Talukder, QR-based transaction_ A big move towards Smart Bangladesh _ online version. https://www.daily-sun.com/post/670622/QRbased-Transaction:-A-Big-Move-towards-Smart-Bangladesh, 2023.
[17] Uddin, Digital Payment Takes a Giant Leap _ the Daily Star, 2022.
[18] GSMA: The Mobile Economy 2022, GSMA Association, vols. 1–56, 2022.
[19] S. Khan, Rural people must be brought under financial inclusion. https://thefinancialexpress.com.bd/views/rural-people-must-be-brought-under-financial-inclusion-1597850266, 2020.
[20] A. Chowdhury, Digital financial inclusion of the rural poor in Bangladesh. http://a2i.pmo.gov.bd/blog/digital-financial-inclusion-of-the-rural-poor-in-bangladesh/, 2017.
[21] N.P.A. Karniawati, G.S. Darma, L.P. Mahyuni, I.G. Sanica, Community Perception of Using QR Code Payment in Era New Normal, vol. 18, PalArch's J. Archaeol. Egypt/Egyptology., 2021, pp. 3986–3999.
[22] N. Ullah, W. Mugahed Al-Rahmi, A.I. Alzahrani, O. Alfarraj, F.M. Alblehai, Blockchain technology adoption in Smart learning environments, Sustainability 13 (2021) 1801, https://doi.org/10.3390/su13041801.
[23] M.R. Kabir, M.A. Islam, Behavioural intention to adopt blockchain technology in Bangladeshi banking companies, in: AIP Conference Proceedings, 2021.
[24] S.D. Nath, A. Khayer, J. Majumder, S. Barua, Factors affecting blockchain adoption in apparel supply chains: does sustainability-oriented supplier development play a moderating role? Ind. Manag. Data Syst. 122 (2022) 1183–1214.
[25] Y. Shi, A.B. Siddik, M. Masukujjaman, G. Zheng, M. Hamayun, A.M. Ibrahim, The antecedents of willingness to adopt and pay for the IoT in the agricultural industry: an application of the UTAUT 2 theory, Sustainability 14 (2022) 6640.
[26] K. Yawised, D. Apasrawirote, M. Chatrangsan, P. Muneesawang, Travelling in the digital world: exploring the adoption of augmented reality (AR) through mobile application in hospitality business sector, J. Adv. Manag. Res. 20 (2023) 599–622.
[27] D. Nikbin, A. Abushakra, Internet of things adoption: empirical evidence from an emerging country, in: Knowledge Management in Organizations: 14th International Conference, KMO 2019, 2019, pp. 348–352. Zamora, Spain, July 15–18, 2019, Proceedings 14.
[28] E. Fianu, C. Blewett, G.O.A. Ampong, K.S. Ofori, Factors affecting MOOC usage by students in selected Ghanaian universities, Educ. Sci. 8 (2018) 70.
[29] I.U. Khan, Z. Hameed, Y. Yu, T. Islam, Z. Sheikh, S.U. Khan, Predicting the acceptance of MOOCs in a developing country: application of task-technology fit model, social motivation, and self-determination theory, Telematics Inf. 35 (2018) 964–978, https://doi.org/10.1016/j.tele.2017.09.009.
[30] K.P. Gupta, Investigating the adoption of MOOCs in a developing country: application of technology-user-environment framework and self-determination theory, Interact. Technol. Smart Educ. 17 (2020) 355–375, https://doi.org/10.1108/ITSE-06-2019-0033.
[31] T. Dahlberg, N. Mallat, J. Ondrus, A. Zmijewska, Past, present and future of mobile payments research: a literature review, Electron. Commer. Res. Appl. 7 (2008) 165–181, https://doi.org/10.1016/j.elerap.2007.02.001.

[32] X.C. Le, The diffusion of mobile QR-code payment: an empirical evaluation for a pandemic, Asia-Pac. J. Bus. Adm. 14 (2022) 617–636.
[33] M. Islam, A. Al Mamun, S. Afrin, G.M.A. Ali Quaosar, M.A. Uddin, Technology adoption and human resource management practices: the use of artificial intelligence for recruitment in Bangladesh, South Asian J. Hum. Resour. Manag. 9 (2022) 324–349.
[34] F.Z. Barrane, G.E. Karuranga, D. Poulin, Technology adoption and diffusion: a new application of the UTAUT model, Int. J. Innovat. Technol. Manag. 15 (2018) 1950004.
[35] V. Bhatiasevi, An extended UTAUT model to explain the adoption of mobile banking, Inf. Dev. 32 (2016) 799–814.
[36] V. Venkatesh, G. B, F.D. Davis, User acceptance of information technology: toward a unified view, MIS Q. 425–478 (2003).
[37] P. Patil, K. Tamilmani, N.P. Rana, V. Raghavan, Understanding consumer adoption of mobile payment in India: extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal, Int. J. Inf. Manag. 54 (2020) 102144.
[38] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, MIS Q. 319–340 (1989).
[39] F.D. Davis, A. Granić, N. Marangunić, The technology acceptance model 30 years of TAM, Technology 1 (2023) 1–150.
[40] I. Ajzen, The theory of planned behavior, Organ. Behav. Hum. Decis. Process. 50 (1991) 179–211.
[41] G.A. Abbasi, J. Kumaravelu, Y.-N. Goh, K.S.D. Singh, Understanding the intention to revisit a destination by expanding the theory of planned behaviour (TPB), Spanish J. Mark. 25 (2021) 282–311.
[42] C.-C. Yang, S.-Y. Yang, Y.-C. Chang, Predicting older adults' mobile payment adoption: an extended TAM model, Int. J. Environ. Res. Publ. Health 20 (2023) 1391.
[43] T. Oliveira, M. Thomas, G. Baptista, F. Campos, Computers in Human Behavior Mobile payment : understanding the determinants of customer adoption and intention to recommend the technology, Comput. Hum. Behav. 61 (2017) 404–414, https://doi.org/10.1016/j.chb.2016.03.030.
[44] H. Karjaluoto, A.A. Shaikh, M. Leppäniemi, R. Luomala, Examining consumers' usage intention of contactless payment systems, Int. J. Bank Mark. 38 (2020) 332–351.
[45] K.-Y. Chen, M.-L. Chang, User acceptance of 'near field communication'mobile phone service: an investigation based on the 'unified theory of acceptance and use of technology'model, Serv. Ind. J. 33 (2013) 609–623.
[46] K.O. Kwateng, K.A.O. Atiemo, C. Appiah, Acceptance and use of mobile banking: an application of UTAUT2, J. Enterp. Inf. Manag. 32 (2018) 118–151.
[47] J.T. Ami-Narh, P.A.H. Williams, A revised UTAUT model to investigate E-health acceptance of health professionals in Africa, J. Emerg. Trends Comput. Inf. Sci. 3 (2012) 1383–1391.
[48] F. Liébana-Cabanillas, V. Marinkovic, I.R. de Luna, Z. Kalinic, Predicting the determinants of mobile payment acceptance: a hybrid SEM-neural network approach, Technol. Forecast. Soc. Change 129 (2018) 117–130.
[49] K. Al-Saedi, M. Al-Emran, T. Ramayah, E. Abusham, Developing a general extended UTAUT model for M-payment adoption, Technol. Soc. 62 (2020) 101293, https://doi.org/10.1016/j.techsoc.2020.101293.
[50] J. Khalilzadeh, A.B. Ozturk, A. Bilgihan, Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry, Comput. Hum. Behav. 70 (2017) 460–474.
[51] Y.K. Dwivedi, N.P. Rana, A. Jeyaraj, M. Clement, M.D. Williams, Re-examining the unified theory of acceptance and use of technology (UTAUT): towards a revised theoretical model, Inf. Syst. Front 21 (2019) 719–734.
[52] N.H.M. Ariffin, F. Ahmad, U.M. Haneef, Acceptance of mobile payments by retailers using UTAUT model, Indones. J. Electr. Eng. Comput. Sci. 19 (2020) 149–155.
[53] H. Karjaluoto, A.A. Shaikh, M. Leppäniemi, R. Luomala, Examining consumers' usage intention of contactless payment systems, Int. J. Bank Mark. 38 (2020) 332–351, https://doi.org/10.1108/IJBM-04-2019-0155.
[54] C.-M. Chao, Factors determining the behavioral intention to use mobile learning: an application and extension of the UTAUT model, Front. Psychol. 10 (2019) 1652.
[55] Y.K. Dwivedi, M.A. Shareef, A.C. Simintiras, B. Lal, V. Weerakkody, A generalised adoption model for services: a cross-country comparison of mobile health (m-health), Gov. Inf. Q. 33 (2016) 174–187.
[56] M.T. Islam, M.T.A. Khan, Factors influencing the adoption of crowdfunding in Bangladesh: a study of start-up entrepreneurs, Inf. Dev. 37 (2021) 72–89.
[57] P.K. Chopdar, Adoption of Covid-19 contact tracing app by extending UTAUT theory: perceived disease threat as moderator, Heal. Policy Technol. 11 (2022) 100651.
[58] M.S. Miah, J.S.K. Singh, M.A. Rahman, Factors influencing technology adoption in online learning among private university students in Bangladesh post COVID-19 pandemic, Sustainability 15 (2023) 3543.
[59] A. Al Mamun, Human resource professionals' intention to use and actual use of human resource information systems, Int. J. Technol. Hum. Interact. 18 (2022) 1–18.
[60] M.S. Hassan, M.A. Islam, F.A. Sobhani, H. Nasir, I. Mahmud, F.T. Zahra, Drivers influencing the adoption intention towards mobile fintech services: a study on the emerging Bangladesh market, Information 13 (2022) 349.
[61] K. Maisha, S.N. Shetu, Influencing factors of e-learning adoption amongst students in a developing country: the post-pandemic scenario in Bangladesh, Futur. Bus. J. 9 (2023) 37.
[62] J.U. Palas, G. Sorwar, M.R. Hoque, A. Sivabalan, Factors influencing the elderly's adoption of mHealth: an empirical study using extended UTAUT2 model, BMC Med. Inform. Decis. Mak. 22 (2022) 1–21.
[63] A.M. Musyaffi, R.J. Johari, I. Rosnidah, D.A.P. Sari, M.I. Amal, I. Tasyrifania, S.A. Pertiwia, F.D. Sutanti, Digital payment during pandemic: an extension of the unified model of QR code, Acad. J. Interdiscip. Stud. 10 (2021) 213.
[64] A. Gupta, N. Dogra, B. George, What determines tourist adoption of smartphone apps? An analysis based on the UTAUT-2 framework, J. Hosp. Tour. Technol. 9 (2018) 50–64.
[65] Y.S. Foon, B.C.Y. Fah, Internet banking adoption in Kuala Lumpur: an application of UTAUT model, Int. J. Bus. Manag. 6 (2011) 161.
[66] P. Patil, K. Tamilmani, N.P. Rana, V. Raghavan, Understanding consumer adoption of mobile payment in India: extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal, Int. J. Inf. Manag. 54 (2020) 102144, https://doi.org/10.1016/j.ijinfomgt.2020.102144.
[67] G.M.A.A. Quaosar, M.R. Hoque, Y. Bao, Investigating factors affecting elderly's intention to use m-health services: an empirical study, Telemed. e-Health. 24 (2018) 309–314.
[68] R. de S. Abrahão, S.N. Moriguchi, D.F. Andrade, Intention of adoption of mobile payment: an analysis in the light of the unified theory of acceptance and use of technology (UTAUT), RAI Rev. Adm. e Inovação. 13 (2016) 221–230, https://doi.org/10.1016/j.rai.2016.06.003.
[69] K.-B. Ooi, G.W.-H. Tan, Mobile technology acceptance model: an investigation using mobile users to explore smartphone credit card, Expert Syst. Appl. 59 (2016) 33–46.
[70] J. Zhang, Y. Luximon, Y. Song, The role of consumers' perceived security, perceived control, interface design features, and conscientiousness in continuous use of mobile payment services, Sustainability 11 (2019) 6843.
[71] I. Ramos-de-Luna, F. Montoro-Ríos, F. Liébana-Cabanillas, Determinants of the intention to use NFC technology as a payment system: an acceptance model approach, Inf. Syst. E-bus. Manag. 14 (2016) 293–314, https://doi.org/10.1007/s10257-015-0284-5.
[72] A. Agbatogun, Self-concept, computer anxiety, gender and attitude towards interactive computer technologies: a predictive study among Nigerian teachers, Int. J. Educ. Dev. using ICT. 6 (2010) 55–68.
[73] A. Bandura, Self-efficacy mechanism in human agency, Am. Psychol. 37 (1982) 122.
[74] M.S. Rahman, M. Ko, J. Warren, D. Carpenter, Healthcare Technology Self-Efficacy (HTSE) and its influence on individual attitude: an empirical study, Comput. Hum. Behav. 58 (2016) 12–24.
[75] D.D. Prior, J. Mazanov, D. Meacheam, G. Heaslip, J. Hanson, Attitude, digital literacy and self efficacy: flow-on effects for online learning behavior, Internet High Educ. 29 (2016) 91–97.
[76] W. Wood, D.T. Neal, The habitual consumer, J. Consum. Psychol. 19 (2009) 579–592.

[77] V. Venkatesh, J.Y.L. Thong, X. Xu, Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology, MIS Q. 157–178 (2012).
[78] C.-K. Pai, T.-W. Wang, S.-H. Chen, K.-Y. Cai, Empirical study on Chinese tourists' perceived trust and intention to use biometric technology, Asia Pacific J. Tour. Res. 23 (2018) 880–895.
[79] T. Zhou, An empirical examination of continuance intention of mobile payment services, Decis. Support Syst. 54 (2013) 1085–1091, https://doi.org/10.1016/j.dss.2012.10.034.
[80] S. Guritno, H. Siringoringo, others: perceived usefulness, ease of use, and attitude towards online shopping usefulness towards online airlines ticket purchase, Saudi J. Bus. Manag. Stud. –2 (2017) 212–216.
[81] T. Indarsin, H. Ali, Attitude toward Using m-commerce: the analysis of perceived usefulness perceived ease of use, and perceived trust: case study in Ikens Wholesale Trade, Jakarta–Indonesia, Saudi J. Bus. Manag. Stud. –2 (2017) Iss.
[82] I. Ajzen, M. Fishbein, A Bayesian analysis of attribution processes, Psychol. Bull. 82 (1975) 261.
[83] M.K. Amin, A. Azhar, A. Amin, A. Akter, Applying the technology acceptance model in examining Bangladeshi consumers' behavioral intention to use mobile wallet: PLS-SEM approach, in: 2015 18th International Conference on Computer and Information Technology (ICCIT), 2015, pp. 93–98.
[84] M.T.A. Himel, S. Ashraf, T.A. Bappy, M.T. Abir, M.K. Morshed, M.N. Hossain, Users' attitude and intention to use mobile financial services in Bangladesh: an empirical study, South Asian J. Mark. 2 (2021) 72–96.
[85] V. Chang, W. Chen, Q.A. Xu, C. Xiong, Towards the customers' intention to use QR codes in mobile payments, J. Glob. Inf. Manag. 29 (2021) 1–21.
[86] F.D. Davis, R.P. Bagozzi, P.R. Warshaw, Extrinsic and intrinsic motivation to use computers in the workplace 1, J. Appl. Soc. Psychol. 22 (1992) 1111–1132.
[87] J. Wu, H. Du, Toward a better understanding of behavioral intention and system usage constructs, Eur. J. Inf. Syst. 21 (2012) 680–698, https://doi.org/10.1057/ejis.2012.15.
[88] S.G. Yaseen, I.A. El Qirem, Intention to use e-banking services in the Jordanian commercial banks, Int. J. Bank Mark. 36 (2018) 557–571.
[89] B. Sivathanu, Adoption of digital payment systems in the era of demonetization in India: an empirical study, J. Sci. Technol. Policy Manag. 10 (2019) 143–171.
[90] J.W. Creswell, V.L.P. Clark, Designing and Conducting Mixed Methods Research, Sage publications, 2017.
[91] R.V. Krejcie, D.W. Morgan, Determining sample size for research activities, Educ. Psychol. Meas. 30 (1970) 607–610.
[92] A.L. Comrey, H.B. Lee, A First Course in Factor Analysis, Psychology press, 2013.
[93] D. Balachandran, G.-W.-H. Tan, Regression modelling of predicting NFC mobile payment adoption in Malaysia, Int. J. Model. Oper. Manag. 5 (2015) 100–116.
[94] R.A. Krueger, Focus Groups: A Practical Guide for Applied Research, Sage publications, 2014.
[95] C. Nitzl, Management accounting and partial least squares-structural equation modelling (PLS-SEM): some illustrative examples, Partial least squares Struct. Equ. Model. Recent Adv. Bank. Financ. (2018) 211–229.
[96] J.F. Hair, G.T.M. Hult, C.M. Ringle, M. Sarstedt, N.P. Danks, S. Ray, Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook, Springer Nature, 2021.
[97] F. Faul, E. Erdfelder, A.-G. Lang, A. Buchner, G* Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences, Behav. Res. Methods 39 (2007) 175–191.
[98] K.F. Ferine, R. Aditia, M.F. Rahmadana, others: an empirical study of leadership, organizational culture, conflict, and work ethic in determining work performance in Indonesia's education authority, Heliyon 7 (2021) e07698.
[99] R.W. Brislin, Back-translation for cross-cultural research, J. Cross Cult. Psychol. 1 (1970) 185–216.
[100] M.A. Uddin, H.P.R. Priyankara, M. Mahmood, Does a creative identity encourage innovative behaviour? Evidence from knowledge-intensive IT service firms, Eur. J. Innov. Manag. 23 (2019) 877–894.
[101] F. Ali, S.M. Rasoolimanesh, M. Sarstedt, C.M. Ringle, K. Ryu, An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research, Int. J. Contemp. Hosp. Manag. 30 (2018) 514–538, https://doi.org/10.1108/IJCHM-10-2016-0568.
[102] J.F. Hair, J.J. Risher, M. Sarstedt, C.M. Ringle, When to use and how to report the results of PLS-SEM, Eur. Bus. Rev. 31 (2019) 2–24.
[103] L. Wu, C.A. King, L. Lu, P. Guchait, Hospitality aesthetic labor management: consumers' and prospective employees' perspectives of hospitality brands, Int. J. Hosp. Manag. 87 (2020) 102373.
[104] R.P. Bagozzi, Y. Yi, L.W. Phillips, Assessing construct validity in organizational research, Adm. Sci. Q. 421–458 (1991).
[105] C.M. Ringle, M. Sarstedt, R. Mitchell, S.P. Gudergan, Partial least squares structural equation modeling in HRM research, Int. J. Hum. Resour. Manag. 31 (2020) 1617–1643.
[106] J. Henseler, C.M. Ringle, M. Sarstedt, A new criterion for assessing discriminant validity in variance-based structural equation modeling, J. Acad. Mark. Sci. 43 (2015) 115–135.
[107] A.H. Gold, A. Malhotra, A.H. Segars, Knowledge management: an organizational capabilities perspective, J. Manag. Inf. Syst. 18 (2001) 185–214.
[108] C. Fornell, D.F. Larcker, Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics, 1981.
[109] H. Fan, H.M. Ismail, S.M. Reza, Technological innovation, infrastructure and industrial growth in Bangladesh: empirical evidence from ardl and granger causality approach, Asian Econ. Financ. Rev. 8 (2018) 964–985, https://doi.org/10.18488/journal.aefr.2018.87.964.985.
[110] Y. Zhang, Q. Weng, N. Zhu, The relationships between electronic banking adoption and its antecedents: a meta-analytic study of the role of national culture, Int. J. Inf. Manag. 40 (2018) 76–87.
[111] E.M. Rogers, A. Singhal, M.M. Quinlan, Diffusion of innovations, in: An Integrated Approach to Communication Theory and Research, Routledge, 2014, pp. 432–448.
[112] S.I. Wu, H.J. Chan, Perceived service quality and self-concept influences on consumer attitude and purchase process: a comparison between physical and internet channels, Total Qual. Manag. & Bus. Exc. 22 (2011) 43–62.
[113] R. Sankaran, S. Chakraborty, Measuring consumer perception of overall brand equity drivers for m-payments, Int. J. Bank Mark. 41 (2023) 130–157, https://doi.org/10.1108/IJBM-03-2022-0113.
[114] R. de Sena Abrahão, S.N. Moriguchi, D.F. Andrade, Intention of adoption of mobile payment: an analysis in the light of the unified theory of acceptance and use of technology (UTAUT), RAI Rev. Adm. e Inovação. 13 (2016) 221–230.