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Modelling the Intention and Adoption of Cashless Transactions through the Lens of Developing Nations

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Abstract

This study examined the influence of perceived ease of use, perceived usefulness, social influence, perceived trust, perceived convenience, and emotional experience on intention to use and adoption of cashless transactions in Bangladesh. The present study used convenience sampling to collect quantitative data from 324 individuals in Bangladesh using structured interviews. Data was analyzed using PLS-SEM. Results revealed that perceived usefulness, perceived trust, perceived convenience, and emotional experience significantly and positively affect the intention to use cashless transactions. Intentions to use cashless transactions have a significant positive effect on adoption of cashless transactions. Finally, intention to use cashless transactions mediated the effect of per-ceived usefulness, perceived trust, perceived trust, perceived trust, perceived trust, perceived trust the effect of per-ceived usefulness, perceived trust, perceived trust, perceived the effect of per-ceived usefulness, perceived trust, perceived convenience, and emotional experience on adoption of cashless transactions in Bangladesh. This study contributes to empirical literature on digital transactions, particularly adding the developing countries' perspective. The findings further contribute by applying the extended TAM in an under-researched developing nations' perspective. Our findings have greater significance for policy makers and management of financial institutions to pursue strategies that can expand the adoption of cashless transactions. Several other implications for diverse stakeholders have also been narrated.

Keywords: Cashless transactions; emotional experience; intention and adoption; perceived convenience; perceived trust; TAM.

Introduction

Financial institutions in general play an important role in economic progress of every country by facilitating financial services, such as collecting savings from groups and individuals and turning them into investment (Al-Smadi, 2012). Globalization and financial liberalization along with technological advancement in the past decades left the banks with no choice but to increase the range of services to their customers which relies heavily on technology (Al-Smadi, 2012). Technological advancement led the traditional banking system to heavily depend on electronic banking services for better distribution channels and e-commerce (Soeng, et al., 2019). Moreover, the recent outbreak of COVID-19 has forced businesses and individuals to continue

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their daily tasks from home, therefore, enforcing the banks to depend on technology more than ever before (Sepasgozar, et al., 2020). Digital banking represents reliable and faster services that empower financial institutions and their cus-tomers to execute transactions, access accounts, gather information related to financial services and products through private or public networks (Mwiya et al., 2017; Karim & Gide, 2019).

Research suggests that digital banking makes it possible to design and cater services that require fewer internal resources, thereby increasing the cost efficiency of the bank and facilitating them to reach out to wider ranges of customers with the availability of diverse banking services (Aduda & Kingoo, 2012; Karahoca, et al., 2017). According to Moudud-Ul-Huq and Hossain (2020), use of cashless transactions represents the most ob-vious remedy to save time, reduce transaction costs, offer efficient and easy integrated services, and enhance interactive marketing capabilities, which could increase customer numbers and leverage profitability. Thus, cashless services can develop competitive advantages for banks and make their customers happy (Carranza et al., 2021; Karim & Gide, 2019). Undoubtedly, cashless transactions could emerge as one of the most effective fi-nancial tools with the potential for significant expansion in its adoption and usage in recent years, even in Bangladesh (Siddik et al., 2016).

It is well established that the success of technological services, such as cashless transactions heavily depend on the customer's behavioral intention which help them decide to accept and adopting to a new system (Ven-katesh et al., 2003; Rahi, et al., 2017). The significance of behavior intention as an explanatory variable of individual adoption behavior and an indicator of system success has drawn considerable attention by playing a dynamic role in IT literature (Venkatesh et al., 2003). However, Carranza et al. (2021) argued that digital banking is yet new to bank customers. Perhaps this is why, in the context of developing countries, the rate of adoption for cashless transactions still remains poor despite massive investments by banks towards electronic banking systems (Salimon et al., 2020).

Review of relevant literature showed that most of the existing studies on digital banking paradigm are based on western and industrialized nations (Jayawardhena & Foley, 2000; Chan & Lu, 2004; Kolodinsky, et al., 2004; Pikkarainen, et al., 2004; Yiu, et al., 2007). Empirical studies examining the adoption of cashless transactions, particularly from a developing nation's perspective, remain limited. This study sought to bridge this contextual gap in knowledge by examining the technology user behavior in Bangladesh under the premise of an extended TAM. Specifically, the objective of this study was to investigate the role of perceived ease of use, perceived usefulness, social influence, trust, convenience, and emotional experience on forming intention to use and adopt cashless transactions in developing nations.

Literature Review

Digital Transactions and a Cashless Society

A cashless society is described as "a societal context wherein there is a limited presence of physical currency consisting of notes and coins issued by a central bank, and individuals habitually use noncash instruments for all transactions" (Bhuiyan et al., 2024; Olusola et al., 2013). However, it should be noted that the central bank will lose its traditional instruments of monetary policy under the cashless economy concept (Storti & Grauwe, 2001). Moreover, the strategies that are effective in one nation may not be applicable to another due to variations in infrastructure, technology and culture (Bhuiyan et al., 2024) Ward (2017) opined that digital illiteracy, cyber security, digital division and infrastructural problem are challenges that can be

addressed by properly planning and implementing a policy toward the transition to a cashless society. Nakayama et al. (1997) identified some re-quirements for a cashless economy that included prevention of invalid use and identifying malicious users, direct transferability between individuals, off-line capability and portability, and unique convenience. It is important for Third World countries to ensure that some minimum requirements are fulfilled in case of launching and using e-money in a laxer regulatory framework and without possible use for illegal purposes (European Central Bank, 1998). A cashless society may easily allow small payments using relevant technologies such as Near Field Communication (NFC), thus reducing queueing and the need to carry cash for high-volume and low-value transactions (Kulkarni, 2021). Digital payments utilize electronic payment methods using the internet, encom-passing various channels and electronic devices for conducting online transactions (Bhuiyan et al., 2024; Pizzol et al., 2018). According to Laudon & Traver (2023), e-payment systems encompass many methods including online credit card transactions, electronic currency, e-wallets, digital check payment systems, online stored value sys-tems, digital balance accumulation systems and wireless payment systems. Najib & Fahma (2020) opined that "trust in the security of technological procedures and infrastructure will increase interest in adopting digital payment".

The Context of Bangladesh

Despite related concerns (e.g., cybercrime, phishing, hacking, sniffing spoofing, and others) digital banking created revolution in the Bangladeshi banking sector and plays a key role in improving both the banking industry and the overall economy of the South Asian nation (Karim & Gide (2019). As a result, the financial sector in Bangladesh is keen to employ cashless transactions (i.e., ATM, POS, internet banking, E-wallets, etc). at an in-creasing rate (Moudud-Ul-Huq & Hossain, 2020). According to Md, Anton, and Sanjida (2010), Bangladesh is far from achieving the expected level in international banking systems, thanks to the inadequate knowledge of Bangladeshi customers regarding digital banking services. It is evident that understanding the potential customers' motives in adopting cashless service is crucial, particularly for the banks in developing nations (Al-Smadi, 2012). Nevertheless, the complete advantages of a cashless economy cannot be fully realized until a substantial pro-portion of the populace consistently participates in cashless transactional activities (Raj L. et al., 2023). To promote the development of a technologically advanced Bangladesh, the Access to Information (a2i, 2024) program introduced "Ekpay" in 2022, a user-friendly and comprehensive platform for the payment of various bills such as gas bills, electricity bills, school fees, traffic prosecution bills, insurance bills and other related expenses, streamlining the payment process and reducing transaction costs for individuals and businesses. According to Alam et al. (2010) and Bhuiyan et al. (2024), there are several e-wallets used in Bangladesh such as iPay, Ekpay, Rocket, bKash, SureCash Nagad, NexusPay, Upay, GPAY, Easy.com.bd and Dmoney.

Theoretical Foundation

The premise of TAM is used as the theoretical base in several studies across the world to capture intention and adoption of new technology (Davis, et al., 1989; Venkatesh, et al., 2007; El-Qirem, 2013), including electronic commerce, electronic learning, internet banking, mobile financial services, as well as e-health and e-government (Al Sukkar & Hasan, 2005; Arbaugh, 2000; Lee, et al., 2012; Gefen, et al., 2003; Al-Ajam & Nor, 2013; Dünnebeil, et al., 2012; Al-Smadi, 2012). TAM communicates that individuals' behavioral intention to adopt an innovative technology is determined by their attitude and belief that is made up of perceived usefulness and perceived ease of use of that technology (Davis, 1989; Gao & Bai, 2014). Hence, in general, all TAMs rely

primarily on three constructs, i.e., determinants of individuals' intention, behavioural intention to use, and adoption behavior (Zhang & Prybutok, 2005). Although TAM was initially developed to predict IT system use, it can also be extended to foresee customer acceptance in a magnitude of technological settings, such as the present case of cashless transactions.

To enhance the predictive power of the original framework, researchers integrated additional relevant variables to TAM over time. In an earlier study Venkatesh and Davis (2000) developed TAM 2 by removing attitude and adding the subjective norm to the original model. To accommodate e-commerce, Venkatesh and Bala (2008) proposed TAM 3 by including trust and perceived risk into the original model. In related context, Yousafzai, Foxall, and Pallister (2010) highlighted the importance of trust for exploring e-banking end user be-haviour and adoption. Additionally, Venkatesh et al. (2003) included the constructs of social influence, gender, age, and effort expectancy to TAM, proposing a unified view of users' acceptance of IT. In a separate study, Massilamany and Nadarajan (2017) used self-efficacy and knowledge, security, trust, as well as convenience to determine adoption of internet banking. It is evident that TAM could be extended to accommodate technological evolution and technology specific factors which might have an impact on the user's acceptance of cashless transactions in Bangladesh (Gao & Bai, 2014). Based on the above, this study used TAM as a theoretical foundation and integrated both functional and emotional constructs, such as social influence, trust, convenience, and emotional experience into it to broaden understanding of consumers' acceptance of cashless transactions in the context of developing nations. It is expected that the used extended TAM will extend the lens of theory in developing countries' perspective, which have been tested inadequately, limiting generalisability of existing lit-erature because of contextual differences in terms of education level, culture, access to banking services, as well as internet services across nations (Mwiya et al., 2017).

Perceived Ease of Use (PE)

PE denotes the extent to which an individual perceives that adopting an innovative technology would need minimum effort (Al-Smadi, 2012; Mwiya et al., 2017). Logically, if an innovative system is user-friendly, it will require less effort from the user, which could create a positive intention towards adopting the new technology. The TAM perspective denotes that easy-to-use technologies are more attractive to users (Venkatesh & Davis, 2000). Hence, this study argues that if cashless transactions are difficult to adopt, individuals would find alternative ways to conduct their financial activities. Empirically, Firdaus et al. (2023), PE have a strong influence on behavioural intention. According to Ria (2023), PE portrays a significant relationship with the intention to adopt cloud ac-counting. In a more related study, Mwiya et al. (2017) found that PE significantly and positively affects attitude to electronic banking, which in turn affects the intention and adoption of e-banking services. Several previous studies identified that PE has a significant impact on behavioural intention of the users of digital banking services, which in turn increase users' adaptability to the new system (Rahi, et al., 2017; Bashir & Madhavaiah, 2015; Zandhessami & Geranmayeh, 2014). However, contrary to the above, Apriani et al. (2023) found no significant effect of PE on the intention to use mobile banking. Hence, based on the above the following hypothesis is forwarded:

H1: PE has a significant positive effect on Intention to use Cashless transactions in Bangladesh.

Perceived Usefulness (PU)

PU reflects the extent of individual's perception on enhancing their job performance by adopting

a particular system (Al-Smadi, 2012). PU in present context could be worded as individuals' perceptions regarding the outcome of using cashless transactions (Mwiya et al., 2017). Rationally, if the outcomes are perceived to be beneficial, the user should develop a positive intention towards adoption of any new technology. Empirically, Firdaus et al. (2023), PU have a strong influence on behavioural intention. According to Kesharwani and Bisht (2012), conducting financial activities cashless, such as paying bills, saves time; consequently, increasing effectiveness. Recently, Ria (2023) further extended based on data from the banking industry that PU portrays a significant relationship with intention to adopt cloud accounting. Additionally, with technological advancement the scope of cashless transactions is expected to grow over time, increasing the usefulness of the system further. Research shows increased usefulness has a significant positive influence on individuals' intention to adapt the new technology (Lee, 2009; Kesharwani & Bisht, 2012; Venkatesh & Davis, 2000; Rahi, et al., 2017). In related context, Mwiya et al. (2017) found that PU significantly and positively influences attitude to digital banking, which in turn developed intention and adoption of e-banking services. Hence, the following hypothesis is forwarded:

H2: PU has a significant positive effect on Intention to use Cashless transactions in Bangladesh

Social Influence (SI)

SI refers to the extent of influence by the important individuals on the user of new technology (Venkatesh, et al., 2003). If user believes his/her use of innovative technology is considered important by other people, then individuals are more likely to have positive inclination towards the adoption of the new technology (Farahat, 2012; Thakur, 2013). According to Gao and Bai (2014), in assessing the adoption of innovative technologies, the social context of the use should be considered. Earlier research commented that occasionally peer influence and other people's commands get more priority than the individuals' own feelings and beliefs (Davis, 1989; Dutot, 2015). Separately, Cioc et al. (2023) extended that in general, SI, as a multi-dimensional construct is a determining factor for adopting new technologies, however, the differences in users' perceptions along with the main directions showcasing efforts to promote such innovative technologies need to be focused more intensively. Empirically, Nath et al. (2013) identified that SI impacts the adoption and use of innovative technologies. In a related study, Ghalandari (2012) revealed that SI portrays a significant positive influence on individuals' intention behavior to use digital banking services. In a more recent attempt, Yaseen and El Qirem (2018) noted that SI is a significant determinant of behavioral intention towards adoption of electronic banking. Hence, the following hypothesis is forwarded:

H3: SI has a significant positive effect on Intention to use Cashless transactions in Bangladesh

Perceived Trust (PT)

Trust could be defined as the combination of dependence and confidence towards strength, integrity, surety, and ability of an individual or system (Mwiya et al., 2017). The definition persuades why trust is a logical con-sideration to capture users' acceptance of cashless transactions. Recently, Tamara et al. (2023) found that perceived trust and privacy positively influence re-use intention in digital healthcare applications. Research shows that trust plays a crucial role in developing a sustainable association with customers (Garbarino & Johnson, 1999; Doney & Cannon, 1997; Kim, et al., 2008). Earlier, Yousafzai et al. (2010) highlighted the importance of trust for exploring e-banking end user behaviour and adoption. Moreover, Hasan et al. (2023) found that PT significantly impacts users' intentions to use artificial conversational

assistants for managing their financial transactions with banks and other financial institutions. Therefore, it could be argued that for the case of e-commerce and tech environment, trust represents the cornerstone of successfully implementing new technology (Dutot, 2015). Empirical studies identified trust as one of the most critical factors influencing successful implementations of digital banking services (Gerrard & Cunningham, 2003; El-Qirem, 2013; Massilamany & Nadarajan, 2017). In a sep-arate study, Mwiya et al. (2017) found that trust worthiness significantly and positively influences attitude to e-banking, which in turn facilitates intention and adoption of e-banking services. Hence, the following hypothesis is forwarded:

H4: PT has a significant positive effect on Intention to Cashless transactions in Bangladesh

Perceived Convenience (PC)

Convenience, speedy service, and accessibility are the three major advantages of e-banking compared (Meuter et al., 2000; Karjaluoto et al., 2002; Basheer & Ibrahim, 2010). According to Khandelwal (2013), con-venience in the form of better access plays a crucial role in escalating the adoption of digital banking services among users. It is assumed that convenience, allowing customers to conduct financial activities irrespective of times and places could lead to satisfaction towards cashless transactions among customers and banks (El-Qirem, 2013). Such positive customer experience leads to behavioural intention to adopt new systems (Rahi, et al., 2017; Zhang & Prybutok, 2005). Empirically, Wardana et al. (2022) found that convenience has a positive and sig-nificant effect on intention to use electronic wallet. Moreover, Lai and Liew (2021) showed that perceived con-venience has a strong but indirect effect on the intention to use, wherein convenience is a top priority concern to attract users who are not interested in using mobile payment at first. Earlier, Poon (2008) found convenience is a source of satisfaction for individuals' adoption of digital banking services. In a more recent study, Chaimaa et al. (2021) mentioned that convenience is one of the most important characteristics that encourage individuals to adopt electronic banking services. Hence, the following hypothesis is forwarded:

H5: PC has a significant positive effect on Intention to use Cashless transactions in Bangladesh

Emotional Experience (EE)

Emotions play an influential role in individuals' beliefs and attitudes, which in turn affects the thought process, actions, and decision making. Therefore, the importance of emotions cannot be neglected while con-sidering the factors influencing individual intention to accept or reject a new technology (Gratch & Marsella, 2004). Consumer emotions, appraising the consumption experience are crucial to develop willingness to interact with and accept artificially intelligent services (Huang et al., 2023). According to Beaudry and Pinsonneault (2010), emotions triggered in the anticipation of an innovative IT adoption are key precursors to eventual IT use. Earlier, Venkatesh (2000) revealed that individuals' perception regarding PE of a new system is determined by their emotions, which further affects the intention to accept or reject any new system (Ovčjak, et al., 2016). In a recent study, Shanshan and Wenfei (2022) revealed that emotions mediate the effect of psychological stimuli on continuance intention. Moreover, Nyagadza et al. (2022) found that emotions have a direct positive influence on individuals' e-banking satisfaction. Additionally, in several existing studies, the impact of emotion on technology acceptance was integrated in extending the TAM (Venkatesh & Bala, 2008; Ovčjak, et al., 2016). Hence, the following hypothesis is forwarded:

H6: EE has a significant positive effect on Intention to use Cashless Transactions in Bangladesh

Intention to use Cashless transactions (IC)

Intentions could be perceived as the extent to which a potential user has developed conscious plans to ex-ecute or not execute a certain behaviour in the future (Mwiya et al., 2017). According to Yaseen and El Oirem (2018), behavioral intentions could be worded as an indicator of the individuals' potential to perform a specific behavior. Intentions are predicted by the unfavorable or favorable attitude towards the behavior coupled with the perception regarding the usefulness of a certain behaviour. Logically, a higher level of intention should translate into a higher likelihood that such concerned behaviour will be performed by the individual. TAM communicates that technology adoption is predicted by behavioral intention that is formed by combining attitude and perceived usefulness (Davis, 1989). Empirically, Ria (2023) found that the intention to adopt exhibits has a significant effect on the use of cloud accounting in the banking industry. In a related study Mwiya et al. (2017) found that intention significantly determines the actual use of digital banking services. It is thus perceived that an appropriate assessment of intention will capture the adoption behavior most accurately (Yaseen & El Qirem, 2018). Positive customer experience is likely to increase their intention to buy or use a particular product or services, wherein potential customers with higher intention will be more likely to engage in a particular behavior (Rezaei et al., 2016; Kuo & Yen, 2009; Yeo, et al., 2017). Therefore, the hypothesis is proposed, as follows:

H7: IC has a significant positive effect on adoption Cashless transactions in Bangladesh

Mediating Effect of Intention

Generally, intention precedes action. Theoretically, the TAM portrays intention as a mediator between perceived usefulness, perceived ease of use, and adoption of technology (Davis, 1989). Empirically, Mwiya et al. (2017) revealed that PE, PU, along with trust worthiness forms attitude that is positively linked with intention towards e-banking services, which eventually determined e-banking adoption services. This suggests a mediating role of intention between attitude and adoption of digital banking services. Hence, the following hypothesis is proposed:

HM: IC significantly mediates the effect of PE, PU, SI, PT, PC, and EE on adoption of Cashless transactions in Bangladesh.

Methodology

This research used a cross-sectional design and collected quantitative data from individuals to assess the effect of PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Convenience, and EE - Emotional Experience on IC - Intention to use Cashless Transactions and AC - Adoption of Cashless transactions in Bangladesh. The information was gathered using structured interviews between October and November 2019. For the variables of interest, the study collected responses from partici-pants using a 5-point Likert scale. The questionnaire for the study used a set of items validated by different existing studies in the English language. As for the sample size, Hair et al., (2011) suggested that the minimum sample size estimation method in PLS-SEM is the "10-times rule" method. However, adhering to Reinartz et al. (2009), this study collected subjective responses from 324 individuals from 6 major cities in Bangladesh (i.e. Dhaka, Chit-tagong, Khulna, Syllet, Barisal, and Rajshahi) which was statistically adequate.

Research Instrument

The indicators used to measure PE- Perceived Ease of Use, PU- Perceived Usefulness, SI- Social

Influence, PT- Perceived Trust, and IC- Intention to use Cashless Transactions were adopted from Gao and Bai (2014) and Dutot (2015). As for PC - Perceived Convenience and EE, - Emotional Experience, the items were adopted from Pinochet et al. (2018). Finally, items for AC - Adoption of Cashless transactions were adopted from Dutot (2015). A five-point Likert scale (1 = 'strongly disagree', 5 = 'strongly agree') was used for all the variables of the study.

Data Analysis Method

PLS-SEM (Ringle & Hansmann, 2004) was used to analyse the data, following Hulland's (1999) procedure. Results have been reported following recommendations of Hair et al. (2019).

Results

Demographic Analysis

As observed in Table 1, data were gathered from 324 bank customers in Bangladesh (61.7.1% males and 38.3% females). Most of the respondents reported to be between the ages of 20 to 30 years old (65.7%). In terms of educational qualifications, most respondents (58.6%) claimed to have a bachelor's degree. As for employment status, the majority (40.4%) of the respondents were students.

	n	%		n	%
Gender			Age		
Male	200	61.7	20 years old-30 years old	213	65.7
Female	124	38.3	31 years old-40 years old	64	19.8
Total	324	100	41 years old-50 years old	39	12.0
			51 years old-60 years old	5	1.50
Highest Level of Education			Above 60 years old	3	0.90
Secondary School Certificate	8	2.50	Total	324	100
Higher Secondary Certificate	33	10.2			
Bachelor's Degree	190	58.6	Employment Status		
Masters and above	93	28.7	Unemployed	41	12.7
Total	324	100	Employed	118	36.4
			Self-employed	31	9.60
Marital Status			Student	131	40.4
Single	186	57.4	Housewife	3	0.90
Married	134	41.4	Total	324	100
Others	4	1.3			
Total	324	100			

Table 1. Respondents' Profile

Validity and Reliability

Table 2 shows that Cronbach's alpha values for all variables had exceeding 0.7, except "social influence" (0.689) and "perceived trust" (0.684) that reflected values very close to 0.7. According to Chin (2010), Cronbach's alpha values exceeding 0.5 could be considered reliable. Hence, it could be assumed that all items used in this study to be reliable. The composite reliability values of all variables also exceeded 0.8, proving reliability of the items (Hair et al., 2019). Moreover, the Dillon-Goldstein rho values in Table 2 further confirm reliability of the items.

AVE values of all variables exceeded 0.50, portraying convergent validity. The Cross-loading values con-firmed discriminant validity (see Appendix). Moreover, heterotrait–monotrait ratio (HTMT) in Table 3 showed adequate discriminant validity within the dataset. Finally, the VIF values for all

constructs dismissed any mul-ticollinearity in the data (Chin, 2010).

Variables	Items	Cronbach's Alpha	Dillon-Goldstein's Rho	Composite Reliability	Average Variance Extracted	Variance Inflation Factors
PE	5	0.739	0.792	0.827	0.505	1.593
PU	4	0.783	0.791	0.860	0.607	1.954
SI	4	0.689	0.689	0.811	0.518	1.564
PT	4	0.684	0.691	0.806	0.510	1.484
PC	3	0.779	0.798	0.871	0.694	1.650
EE	5	0.806	0.823	0.863	0.561	1.626
IC	4	0.790	0.790	0.864	0.615	1.000
AC	4	0.779	0.790	0.856	0.599	-

Table 2. Validity and Reliability

Note: PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Convenience, EE - Emotional Experience, IC - Intention to use Cashless Transactions, AC - Adoption of Cashless transactions. Source: Author's data analysis

	PE	PU	SI	PT	PC	EE	IB	AB
PE	-							
PU	0.742	-						
SI	0.503	0.637	-					
PT	0.507	0.509	0.656	-				
PC	0.531	0.695	0.541	0.483	-			
EE	0.437	0.457	0.658	0.657	0.570	-		
IC	0.563	0.674	0.541	0.566	0.643	0.569	-	
AC	0.614	0.681	0.676	0.603	0.643	0.627	0.727	-

Table 3. Heterotrait–Monotrait Ratio (HTMT)

Note: PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Con-venience, EE - Emotional Experience, IC - Intention to use Cashless transactions, AC - Adoption of Cashless transactions

Path Analysis

The path coefficients (Table 4 and figure 1) show that the coefficient value for PE on IC (Hypothesis H1) was 0.113 with a p-value of 0.052 (at 5% significance level). Since the p-value is higher than 0.05, Hypothesis H1 is rejected, reflecting that PE does not have a statistically significant effect on IC. The coefficient value for PU on IC (Hypothesis H2) appeared positive (3.333) with a p-value of 0.000. Since the p-value is less than 0.05, Hypothesis H2 is accepted, reflecting that PU implied a significant positive effect on IC. The f2 value of 0.047 indicated that PU had a small effect on IC. Meanwhile, the coefficient for SI on IC had a positive value of 0.510 and a p-value of 0.304 (Hypothesis H3). Since the p-value (0.304) is higher than 0.05, Hypothesis H3 is rejected, reflecting that SI had insignificant effect on IC. The path coefficient value for PT on IC (Hypothesis H4) was 0.136 with a p-value of 0.005, which shows that PT had a significantly positive effect on IC. However, the f2 value of 0.021 reflected a small effect of PT on IC.



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Figure 1: The Structural Model

Furthermore, the coefficient path value for PC on IC (Hypothesis H5) was 0.188 with a p-value of 0.002. As the p-value was less than 0.05 (0.002), Hypothesis H5 was accepted, translating that PC had a significantly positive effect on IC across the sample of the study. The f2 value of 0.037 additionally showed that the effect size of PC on IC was small to medium. As for EE (Hypothesis H6), the coefficient value was 0.179 with a p-value of 0.001. The lower than 0.05 p-value (0.001) allows to accept Hypothesis H6 and indicates a significant positive effect of EE on IC, wherein the f2 value of 0.034 denotes a small effect size. Finally, the path coefficient value for IC on AC (Hypothesis H7) was 0.581 with a p-value of 0.000. The p-value is less than 0.05 (at 5 percent level of significance). Hence this study accepted Hypothesis H7, suggesting a significant positive effect of IC on AC, wherein the f2 value of 0.510 denotes a large effect size of IC on AC across the sample of the study.

Hypothesis	Association	Coefficient	t Value	p Value	Decision	r^2	f^2	Q^2
H_1	$PE \to IC$	0.113	1.628	0.052	Rejected		0.014	
H_2	$PU \to IC$	0.230	3.333	0.000	Supported		0.047	
H_3	$SI \to IC$	0.031	0.512	0.304	Rejected		0.001	
H_4	$PT \rightarrow IC$	0.136	2.611	0.005	Supported	0.424	0.021	0.250
H_5	$PC \to IC$	0.188	2.982	0.002	Supported		0.037	
H ₆	$EE \to IC$	0.179	3.207	0.001	Supported		0.034	
H ₇	$IC \to AC$	0.581	9.304	0.000	Supported	0.338	0.510	0.194

Table 4. Path Analysis

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Note: PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Con-venience, EE - Emotional Experience, IC - Intention to use Cashless transactions, AC - Adoption of Cashless transactions.

The r2 value was 0.424 for IC, indicating that 42.4% of the variance in the construct could be explained by the independent variables of present study. On the other hand, the r2 value of 0.338 for AC translate that 33.8% variance in adoption could be determined by IC. Furthermore, the Q2 values of 0.250 and 0.194 (above 0), show that the respective variables had predictive relevance for IC and AC, accordingly.

Mediating Effects

As observed in Table 5, PE (Hypothesis HM1) had no significant indirect effect on AC (at 5% significance). PU showed significant indirect effect (p-value <0.05) on AC, thus confirming a significant mediating effect of IC on the correlation between PU and AC (Hypothesis HM2). Second to PE, SI showed no significant indirect effect on AC (Hypothesis HM3). In addition, Table 7 revealed significant indirect effects of PT on AC, which suggests that IC mediated the effect of PT on AC (Hypothesis HM4). As for PC, a significant indirect effect is observed on AC. This confirms the mediating effect of IC between PC and AC (Hypothesis HM5). Finally, EE showed significant indirect effect on AC, confirming the mediating role IC between EE and AC across the sample of the study.

Hypothesis	Path	Beta	CI-Min	CI-Max	Sig.	Decision
H _{M1}	$PE \rightarrow IC \rightarrow AC$	0.065	0.005	0.138	0.058	No Mediation
H _{M2}	$PU \rightarrow IC \rightarrow AC$	0.134	0.055	0.209	0.002	Mediation
H _{M3}	$\mathrm{SI} \to \mathrm{IC} \to \mathrm{AC}$	0.018	-0.043	0.078	0.304	No Mediation
H_{M4}	$PT \rightarrow IC \rightarrow AC$	0.079	0.033	0.131	0.005	Mediation
H _{M5}	$PC \rightarrow IC \rightarrow AC$	0.109	0.044	0.173	0.004	Mediation
H _{M6}	$EE \rightarrow IC \rightarrow AC$	0.104	0.050	0.163	0.001	Mediation

Table 5. Mediating Effects

Note. PE, Perceived Ease of Use; PU, Perceived Usefulness; SI, Social Influence; PT, Perceived Trust; PC, Perceived Convenience; EE, Emotional Experience; IC, Intention to Use Cashless transactions; AC, Adoption of Cashless transactions. Source: Author(s) own compilation.

Discussion

This research extended the TAM framework to capture the factors contributing towards adoption of cashless transactions in developing nations. Our model forwards a holistic narration of the major factors af-fecting intention and adoption of cashless transactions, using data from Bangladesh and applying the PLS-SEM approach. Results showed that PE had no significant effect on IC (Hypothesis H1). However, the coefficient value of the path analysis suggested that in case of a correlation, the effect of PE on IC would be positive. The finding contradicts with Mwiya et al. (2017) and several other existing studies. In line with Apriani et al. (2023), results suggest that PE is no longer the most significant factor for technology adoption. One of the reasons for the finding could be the contextual uniqueness of Bangladesh as a developing nation, which is the primary con-tribution of present study. Additionally, it could be the fact that for certain financial transactions there isn't much alternative to digital banking. The condition of minimum effort could play a positive role for the adoption of innovative technology; however, other factors of adoption might be more significant predictors. Moreover, the majority of the study's respondents were young adults belonging to the 20 to 30 years age group. Assumed to

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be tech savvy by default, this group are most likely to effortlessly make more cashes transactions than others, which translate the no substantial impact of PE on IC.

The results further revealed that PU has a significant positive effect on IC, confirming Hypothesis H2. In line with the existing literature (Lee, 2009; Kesharwani & Bisht, 2012; Venkatesh & Davis, 2000; Rahi, et al., 2017; Mwiya et al., 2017), this finding supported that individual's perceptions regarding the benefits of cashless transactions for enhancing their job performance would develop positive intention to use cashless transactions. Unexpectedly, data analysis results could not confirm any significant effect of SI on IC (Hypothesis H3). Interestingly, the coefficient value of the path analysis suggested that in case of a correlation, the effect of SI on IC would be positive. Contradicting with several previous studies, the finding correlates to Daka and Phiri (2019) as well as Naranjo-Zolotov et al. (2018), translating that in the case cashless transactions, the usage is completely voluntary, which may cause SI to be less significant. Moreover, the deviation of our results from existing literature could be because of contextual differences between present study and earlier ones. As the majority of this study's respondents were young adults who are assumed to tech savvy by default, social influence, perhaps is not a compulsory requirement for their adoption of cashless transactions. Finally, this study assumed social influence as a single construct, whereas certain studies establishing a significant effect of social influence showed that the construct could be multi-dimensional (e.g. network of friends, colleagues, or family; public space; etc.) (Cioc et al., 2023). In such case, the differences in users' perceptions matter, but more importantly the main directions in which efforts to promote such innovative are relevant.

The path analysis results further supported the proposition that PT have a significant positive effect on IC, confirming Hypothesis H4. In line with previous studies (Zhang & Tang, 2006; Gerrard & Cunningham, 2003; El-Qirem, 2013; Massilamany & Nadarajan, 2017; Mwiya et al., 2017), this finding signifies that the confidence towards strength, integrity, surety, and ability of cashless systems builds positive intention to use cashless transactions. PC is further found to have a significant positive effect on IC, confirming Hypothesis H5. In agreement with the existing literature (Khandelwal, 2013; El-Qirem, 2013; Poon, 2008; Chaimaa et al., 2021), this highlights that convenience is one of the important factors that encourage individuals' intention to adopt cashless transactions in developing nations.

Moreover, EE showed a significant positive effect on IC, confirming Hypothesis H6. In line with existing studies (Gratch & Marsella, 2004; Beaudry & Pinsonneault, 2010; Venkatesh, 2000; Ovčjak, et al., 2016), this suggest that emotions play an important role in building individuals' beliefs and attitudes and thus is a significant factor to predict intention to adopt cashless transactions. Finally, IC is found to have a significant positive effect on AC, proving Hypothesis H7. This finding is primarily supported by TAM (Davis, 1989). In line with existing empirical evidence (Mwiya et al., 2017; Yaseen & El Qirem, 2018), this finding advocate that individuals' po-tential for action play crucial role in escalating the adoption of cashless transactions in Bangladesh.

As for the mediating effects, the results indicated that IC significantly mediates the effect of PU, PT, PC, and EE on AC across the dataset of the study, confirming Hypothesis HM2, HM4, HM5, and HM6. In line with TAM (Davis, 1989) and existing literature (Mwiya et al., 2017), this finding suggests that intention is an important element for the predecessors of technology adoption to influence actual behavior, i.e., adoption of cashless transactions in Bangladesh. However, since no significant indirect effect was found, concluding that IC failed to mediate the

effect of PE and SI on AC (Hypotheses HM1 and HM3).

Implications and Conclusions

Despite the several outstanding facilities offered by digital banking services, the adoption of cashless transactions among users is yet below expectations (Carranza et al., 2021). Particularly, in context of developing countries, the rate of adoption remains significantly low despite massive investments by banks towards digital banking systems (Salimon et al., 2020). As for Bangladesh, cashless transactions are still very new (Karim & Gide, 2019). Therefore, this study developed an empirical model based on TAM to apply in present context that could broaden our understanding of the users' behavior. The objective of this study was to examine the influence of PE, PU, SI, PT, PC, and EE on IC in Bangladesh. Quantitative data was collected from individuals in Bangladesh using structured interviews. PLS-SEM was used to validate hypothesized relationships between the variables of interest. Results revealed that PU, PT, PC, and EE significantly and positively influence IC. IC has a significant positive effect on AC across the dataset of the study. Finally, IC mediated the effect of PU, PT, PC, and EE on AC in Bangladesh.

This research contributes to the digital banking literature by developing and testing the extended TAM in an under-researched developing nations' perspective, using Bangladesh as a data source. Theoretically, findings confirm the applicability of TAM for adoption of cashless transactions, thus extending the scope of theory. Consequently, the role of SI, PT, PC, and EE along with PE and PU was examined in order to provide a broad understanding of users' consumption of cashless transactions. In its unique approach, our model accommodated both functional and emotional characteristics of technological adoption. Our findings could be beneficial for the developing nations to raise the attention of both policymakers and bank management to formulate and im-plement strategies for expanding adoption of cashless transactions.

As for the practical implications, the findings have several key insights. People increasingly need financial services to be faster with higher quality. For financial institution, this means attracting and retaining customers will require both effective and efficient management of all banking aspects, including digital services (Gha-landari, 2012). For increasing the adoption of cashless transactions, awareness among potential and current bank customers regarding the usefulness of cashlessness is needed. Banks could further address trust issues related to cashless transactions to improve adoption rate. Reflecting that digital banking platforms or E-wallets are safe and secure for cashless transactions could encourage bank customers to adopt such services. Cashless trans-actions should be made convenient. One of the ways could be, through collaboration with Telecom companies to ensure that customers can access the services, anywhere, anytime. Financial institutions could also provide a complimentary data pack for their users to promote convenience, which in turn should result in higher adoption. Finally, it is recommended that banks could design their digital platforms to be interesting and enable them to interact with the users adequately. One of the ways to achieve this could be in the form of mini financial advice that welcomes users to the digital platform. Other strategies could include wishing the user on special occasions and providing customized offers or discounts for the users of such services. Such engagement could develop positive emotions within individuals who would be more likely to use cashless transactions frequently. In terms of limitations, it is noted that the identified factors of cashless transaction adoption is non-exhaustive. Hence future researchers are encouraged to integrate additional relevant variables to the presented model in order to extend

its predictive power and provide a more comprehensive understanding of a cashless economy. Moreover, based on majority of related literature, this study conceptualized variables as single constructs. On the contrary, Cioc et al. (2023) showed that determinants of new technology adoption, such as social influence could be mul-ti-dimensional (e.g. network of friends, colleagues, or family; public space; etc.). In such cases, the differences in users' perceptions matter, but more importantly the main directions in which efforts to promote such innovative technologies should be focused more intensively by future researchers Furthermore, this study used a non-probability-based convenience sampling technique wherein majority respondents were young adults. Hence, future researchers are encouraged to use more diverse and proportionate datasets to forward further generalized findings. It could be fruitful for future researchers to explore and specify that what percentage of the transactions by the respondents are cashless as well as item wise (Mukhopadhyay, 2016), which in turn could enrichen understanding of bottlenecks that prevents cashless transactions.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available upon request from researchers who meet the eligibility criteria. Kindly contact the first author privately through e-mail.

Conflicts of Interest: "The authors declare no conflicts of interest." **Appendix**

Item	PE	PU	SI	PT	PC	EE	IB	AB
PE1	0.801	0.441	0.274	0.201	0.324	0.201	0.364	0.394
PE2	0.771	0.427	0.263	0.286	0.319	0.288	0.318	0.364
PE3	0.332	0.138	0.140	0.235	0.064	0.225	0.114	0.237
PE4	0.744	0.510	0.282	0.316	0.382	0.303	0.344	0.343
PE5	0.790	0.460	0.289	0.213	0.304	0.189	0.356	0.310
PU1	0.390	0.683	0.413	0.300	0.440	0.389	0.354	0.392
PU2	0.484	0.832	0.367	0.320	0.444	0.261	0.429	0.442
PU3	0.437	0.805	0.306	0.243	0.395	0.223	0.440	0.423
PU4	0.510	0.790	0.374	0.290	0.434	0.321	0.426	0.437
SI1	0.223	0.324	0.690	0.401	0.288	0.360	0.291	0.454
SI2	0.112	0.231	0.707	0.283	0.162	0.390	0.272	0.274
SI3	0.351	0.427	0.753	0.322	0.368	0.355	0.276	0.356
SI4	0.336	0.348	0.725	0.289	0.315	0.284	0.310	0.330
PT1	0.263	0.271	0.346	0.661	0.272	0.293	0.300	0.410
PT2	0.198	0.237	0.335	0.762	0.333	0.388	0.365	0.254
PT3	0.246	0.259	0.320	0.689	0.150	0.316	0.209	0.261

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PT4	0.272	0.291	0.292	0.739	0.262	0.393	0.319	0.331
PC1	0.415	0.553	0.323	0.296	0.867	0.348	0.470	0.458
PC2	0.339	0.445	0.344	0.369	0.874	0.471	0.440	0.443
PC3	0.282	0.348	0.330	0.258	0.752	0.362	0.350	0.371
EE1	0.328	0.373	0.347	0.350	0.455	0.746	0.447	0.368
EE2	0.232	0.249	0.344	0.390	0.337	0.820	0.345	0.316
EE3	0.268	0.348	0.374	0.411	0.409	0.825	0.380	0.366
EE4	0.142	0.199	0.346	0.317	0.271	0.640	0.301	0.436
EE5	0.201	0.163	0.417	0.383	0.210	0.696	0.228	0.345
IC1	0.386	0.465	0.306	0.290	0.455	0.352	0.792	0.429
IC2	0.348	0.426	0.323	0.323	0.442	0.337	0.828	0.454
IC3	0.327	0.407	0.313	0.363	0.366	0.407	0.769	0.448
IC4	0.324	0.366	0.313	0.374	0.330	0.387	0.744	0.490
AC1	0.423	0.552	0.403	0.364	0.504	0.381	0.528	0.772
AC2	0.286	0.332	0.424	0.378	0.334	0.462	0.347	0.708
AC3	0.374	0.394	0.376	0.355	0.371	0.368	0.441	0.823
AC4	0.327	0.367	0.335	0.270	0.349	0.317	0.451	0.789

Table I. Table I. Loadings and Cross-Loadings

Note: PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Convenience, EE - Emotional Experience, IC - Intention to use Cashless Transactions, AC - Adoption of Cashless transactions. The italic values in the matrix are the item loadings and others are cross-loadings. Source: Author's data analysis.

Item Code	Questions
PE – Item 1	Learning to use cashless transactions is easy.
PE – Item 2	Using cashless transactions is clear & understandable.
PE – Item 3	Cashless transactions are not much technical for everyday use.
PE – Item 4	It is easy to become skilful at using cashless transactions.
PE – Item 5	Overall, cashless transactions are easy to use.
PU – Item 1	Using cashless transactions can make me more productive.
PU – Item 2	Using cashless transactions can make things easier.
PU – Item 3	Using cashless transactions would enable me to accomplish payments more quickly.
PU – Item 4	Overall, I would find using cashless transactions to be advantageous.
SI – Item1	People who influence my behavior would think that I should use cashless transactions.
SI – Item 2	People who are important to me would think that I should use cashless transactions.
SI – Item 3	People who are important to me would find using cashless transactions beneficial.
SI-Item 4	People who are important to me would find using cashless transactions a good idea.
DT Itam 1	Policy on how it cashless transactions would use any personal information about me makes me feel that the service
PI - Item I	is trustworthy.
PT – Item 2	Policy with respect to how cashless transactions will share my personal information with third parties about me
	makes me feel that the service is trustworthy.
PT – Item 3	The ability to access my personal information to ensure that it is accurate and complete makes me feel that cashless
	transactions are trustworthy.
PT – Item 4	Security rules in shops and stores would help me to be more confident regarding the use of cashless transactions.
PC – Item 1	Cashless transactions make my life easy.
PC – Item 2	Cashless transactions gives me comfort.
PC – Item 3	Cashless transactions increases my efficiency.
EE – Item 1	When I use cashless transactions I feel happy.
EE- Item 2	When I use cashless transactions I feel powerful.
EE – Item 3	Cashless transactions increases my self-esteem.
EE – Item 4	When I use cashless transactions, I feel emotionally satisfied.
EE- Item 5	When I use cashless transactions, I experience strong emotions.
IC – Item 1	Given the chance, I intend to use cashless transactions.
IC – Item 2	I intend to use cashless systems for financial transactions.
IC – Item 3	I intend to use cashless transactions when available in shops or store.
IC- Item 4	I intend to use cashless transactions because I see the benefits of it.
AC – Item 1	I feel able to use cashless transactions.
AC-Item 2	I consider that using cashless transactions rely only on me.

Table II. Research Instrument

Note: PE - Perceived Ease of Use, PU - Perceived Usefulness, SI - Social Influence, PT - Perceived Trust, PC - Perceived Convenience, EE - Emotional Experience, IC - Intention to use Cashless Transactions, AC - Adoption of Cashless transactions.

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