

# E-Banking Adoption by Algerian Bank Customers: Towards an Integrated Model

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## ABSTRACT

This study aimed to identify the factors affecting customers' adoption and use of e-banking services in Algeria. For this purpose, a theoretical model—based on the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT)—was developed. To test the hypotheses, a survey was conducted on 326 Algerian bank customers, and the data were analyzed using structural equation modeling. At the end, the results indicate that perceived usefulness and perceived ease of use significantly positively influence attitudes toward e-banking. In turn, attitudes toward e-banking influence behavioral intention and behavioral intention, facilitating conditions each influence significantly and positively actual e-banking use. The results also found that the relationship between perceived usefulness and attitude toward e-banking use was stronger for women, and the relationship between facilitating conditions and actual e-banking use was significantly stronger for older end-users.

## KEYWORDS

Algeria, Customers, E-Banking Adoption, Emerging Economy, TAM, UTAUT

## INTRODUCTION

In recent decades, information and communication technologies have broken geographical, regulatory, and industrial barriers, generating new products, services, and market opportunities (Liao & Cheung, 2002). In the financial services industry, different technologies such as automatic teller machines (ATMs), electronic transfers, electronic cash cards, the Internet, and mobile phones have radically changed the delivery channels used to provide the elaborated services to existing or potential customers.

Known as e-banking, the use of bank websites and other electronic means through which customers access their banking accounts and conduct financial transactions has great value for both banks and consumers (Yu et al., 2015). On the one hand, e-banking facilitates the e-commerce and e-government activities of customers (Garín-Muñoz et al., 2017) and allows them to complete their banking operations with speed and convenience at the time and place of their choosing (Anouze & Alamro, 2019; Siadat et al., 2019). On the other hand, e-banking offers precious opportunities to banks to attain competitive advantage and reach higher levels of efficiency, especially by saving costs, fulfilling customers' expectations, and attracting new prospective customers (Poon, 2008; Salimon et al., 2017; Takiédine & Sun, 2015).

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In developing countries, these benefits are all the more important, as access to banks and banking services is unequal and internet and smartphones have reached high penetration rates among populations. Nevertheless, as an information system project, e-banking development is characterized by a high risk of failure (Pan et al., 2008; Bellahcene et al., 2020). Indeed, the success of this kind of project is influenced by different organizational, technological, and environmental factors, of which consumer response is crucial (Ray et al., 2005; Strassmann, 1997; Wang et al., 2008).

Despite these different advantages, experience has shown that the e-banking adoption rate is very low in developing countries when compared with that of developed nations (Salimon et al., 2017). In Algeria, even with the huge projects initiated to implement e-banking systems, currency in circulation continues to increase, and most commercial bank consumers continue to conduct banking transactions using traditional channels. Thus, it seems necessary to understand the essential factors influencing consumers' adoption and use of e-banking services provided by Algerian commercial banks (as a case of developing countries).

Prior studies on e-banking adoption have mobilized the dominant theories of innovation adoption, such as the technology acceptance model (TAM) (Kurnia et al., 2010; Lee, 2009; Rawashdeh, 2015; Roy et al., 2017) and the unified theory of acceptance and use of technology (UTAUT) (Alalwan et al., 2017; Merhi et al., 2019; Rahi et al., 2019). Their results point out several factors causing the low rate of e-banking adoption. However, there is no universal agreement on the variables influencing e-banking adoption, and the results differ depending on place, context, and time (Cruz et al., 2010). Furthermore, the question has not been extensively examined in the context of developing countries in general and, more specifically, for the Algerian case (Bellahcene & Khedim, 2016).

Therefore, the purpose of this study is to investigate the key factors affecting Algerian bank customers' adoption and use of e-banking services. Specifically, this research proposes and tests an integrated model for customer adoption of e-banking based on TAM and UTAUT.

The remainder of this paper is presented as follows: Section two reviews the literature. Section three proposes the conceptual framework. Section four explains the research methodology of the study. Section five presents the results. Finally, section six concludes our work and proposes future research directions.

## **LITERATURE REVIEW**

Prior the past decades, researchers have proposed many theories to explain and predict technology adoption. The most well-known theoretical models are the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), the theory of planned behavior (TPB) (Ajzen, 1991), the technology acceptance model (TAM) (Davis et al., 1989), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003).

More recently, various researchers have investigated the adoption of e-banking. For instance, Zhou (2012) estimates that e-banking use is affected by trust, and flow experience wishes are in turn influenced by structural assurance, ubiquity, and perceived ease of use. Furthermore, Bellahcene & Khedim (2016) examine the acceptance of e-banking by Algerian bank consumers using the technology-personal-environment model (TPE). Their results indicate that age, profession, income, and perceived security are the main factors affecting e-banking system adoption in Algeria. Moreover, Masoud & Abutaqa (2017) found that E-Service Quality, E-Perceived Usefulness, E-Security, and E-Reliability have a significant effect on E-Banking adoption. In other studies, Mwiya et al. (2017) estimate that perceptions of trust, usefulness, and ease of use have a significant impact on e-banking adoption by Zambian customers. Roy et al. (2017) integrate the TAM and perceived risk theory to understand Internet banking acceptance among Indian bank account holders. Their results show that the intention to use Internet banking in India is influenced by external and internal risk, perceived ease of use, and perceived usefulness. Alalwan et al. (2017, 2018) found that effort expectancy, performance expectancy, perceived risk, price value, hedonic motivation, and trust have a significant effect on Jordanian customers' intentions and adoption of e-banking. Rahi et al. (2019) validate the UTAUT in the Pakistani context and detect a significant effect of assurance and reliability on the

intention to adopt internet banking. Baabdullah et al. (2019) indicate that performance expectancy, facilitating conditions, price value, hedonic motivation, habit, service quality, and system quality have a significant impact on e-banking services use by Saudi bank customers. More recently, several studies have validated these results in different national contexts, such as Vietnam (Thich, 2021), Turkey (Khan et al., 2021) and Indonesia (Firmansyah et al., 2022), and have added perceived credibility as a latest antecedent of e-banking acceptance.

Beyond the progress, there is still some knowledge gap about e-banking adoption and use in developing countries. Indeed, developing countries still lag behind developed economies in the e-banking usages (Kurnia et al., 2010). Furthermore, there is a lack of published studies addressing the factors affecting e-banking adoption in developing countries (Riyadh et al., 2009; Lin et al., 2015). Therefore, further research is still required to understand the relevance of e-banking.

## CONCEPTUAL MODEL

To identify the factors affecting Algerian customers' use of e-banking, an integrated model using the TAM and the UTAUT was constructed.

The Technology Acceptance Model was proposed by Davis (1989). According to this model, information systems adoption and use depend on perceived ease of use and perceived usefulness (Mwiya et al., 2017). In the last 20 years, the TAM has been most widely used by information system researchers and has accumulated large empirical support (Lai & Li, 2005; Lin, 2013; Prasanna & Huggins, 2016; Roy et al., 2017). Therefore, the conceptual model proposed in this study includes all factors adopted by TAM.

Nevertheless, even if the TAM is now well recognized as a parsimonious, robust, and powerful model for predicting users' adoption of new technologies (Venkatesh & Davis, 2000; Yousafzai et al., 2010), this framework omits many crucial theoretical constructs, and it does not reflect the variety of user constraints (Olushola & Abiola, 2017). Then, and in addition to the TAM, our model was based on UTAUT.

Proposed by Venkatesh et al. (2003), the UTAUT incorporates four core determinants of IS adoption and use: performance expectancy, effort expectancy, social influence, and facilitating conditions. Furthermore, the key relationships in the theory are moderated by gender, age, experience, and voluntariness of use (Olushola & Abiola, 2017).

In the UTAUT, effort and performance expectancy were used to incorporate perceived usefulness and ease of use (Marchewka & Kostiwa, 2007). Consequently, the current research model adopts two independent variables from the UTAUT model, social influence and facilitating conditions, and two demographic moderators, age and gender.

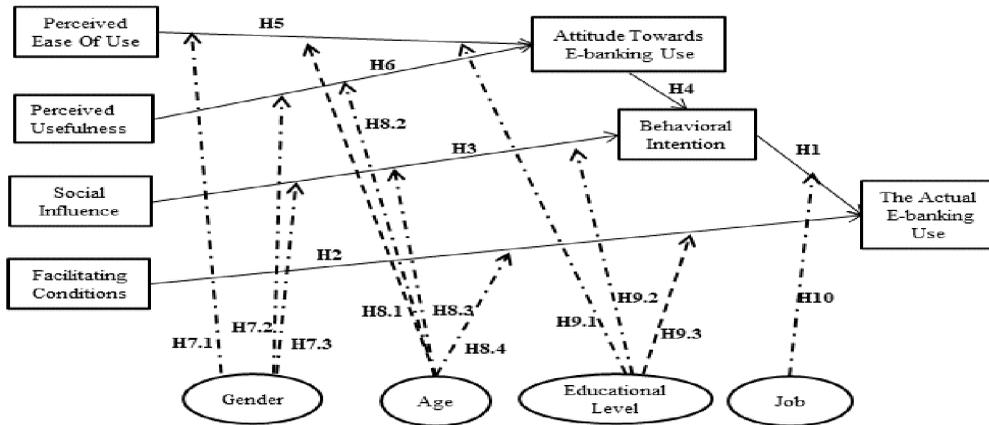
In addition, the proposed framework also examines the influences of education level and job on the relationships between variables. According to Al Soumali et al. (2009) and Choudrie & Dwivedi (2005), these latest (education and job) have a significant impact on the adoption and use of new systems such as e-banking. Accordingly, the research model contains six main factors affecting e-banking use (Figure 1):

### Behavioral Intention

Behavioral intention refers to the degree to which the bank consumer has formulated a conscious plan to adopt and use an information system (Furneaux & Wade, 2009). It is heavily indicated in Technology Acceptance Theories that the strongest influential factor in the actual use of technology is intention (Ajzen, 1991; Davis et al., 1989; Fishbein & Ajzen, 1975; Venkatesh et al., 2003). More specifically, extensive research presents behavioral intention as one of the major antecedents of e-banking use (Afshan et al., 2018; Alalwan et al., 2018; Al Soumali et al., 2009; Mwiya et al., 2017). Consequently, this study proposes the following hypothesis:

**H1.** Behavioral intention will positively influence Algerian customers' use of e-banking.

Figure 1. Research model



## Facilitating Conditions

Facilitating conditions refer to the degree to which a person believes that the technical and organizational infrastructure exists to support a new technology’s usage (Venkatesh et al., 2003). According to previous studies, facilitating conditions play an important role in e-banking use (Alalwan et al., 2017; Baabdullah et al., 2019; Firmansyah et al., 2022; Khan et al., 2021; Sharma et al., 2020). Therefore, the second hypothesis is formulated as follows:

**H2.** Facilitating conditions will positively influence Algerian customers’ e-banking use.

## Social Influence

Social influence is defined as the degree to which an individual perceives that important others believe he or she should use a new technology (Venkatesh et al., 2003). Social influence reflects the effects of the opinions of users’ friends, family, work superiors, and colleagues on user behavior. In a society where sociability and strong contact between citizens is a fundamental cultural characteristic, the majority of persons seem to be sensitive and easily influenced by what the environment recommends to them in general and family relatives and friends in particular. In view of this, prior studies have suggested that social influence has a significant positive effect on the intent to use e-banking (Khan, 2022; Patel and Patel, 2018; Rahi et al., 2019; Sharma et al., 2020; Tarhini et al., 2016). Accordingly, we assume the following hypothesis:

**H3.** Social influence will positively influence Algerian customers’ intention to use e-banking.

## Attitude Toward E-Banking Use

Attitude toward e-banking use is the degree to which an individual positively or negatively evaluates technology use performance (Ajzen, 1991). Research suggests that attitude toward use is the most powerful influencing factor on behavioral intention to use technology (Teo and Noyes, 2011; Zhou, 2016). In the context of e-banking or mobile banking, researches support that attitude toward e-banking has positive effects on behavioral intention (Al-Somali et al., 2009; Chauhan et al., 2019; Chavali & Kumar, 2018; Munoz-Leiva et al., 2017; Rawashdeh, 2015). Thus, the following hypothesis is suggested:

**H4:** Attitude toward e-banking use positively influences intention to use e-banking.

### **Perceived Usefulness**

Perceived usefulness is defined as the degree to which a person believes that using a new technology will increase his performance (Carr et al., 2013). According to Pupion & Leroux (2006), individuals only use technology if they perceive that it is useful for them. So, when a consumer considers that the use of e-banking systems would give him precious opportunities, he will be more inclined to accept this new system and to optimize its usage. In this sense, several studies have underlined that perceived usefulness plays a determining role throughout the usage stage of information systems (Thich, 2021; Lin et al., 2014; Salimon et al., 2017). Moreover, many studies (Ahmad et al., 2019; Anouze and Alamro, 2019, Mwiya et al., 2017; Rawashdeh, 2015; Roy et al., 2017) have proven that perceived usefulness influences attitudes toward e-banking use. Therefore, the fifth hypothesis is formulated as follows:

**H5:** Perceived ease of use positively influences attitude toward e-banking use.

### **Perceived Ease of Use**

Perceived ease of use refers to the degree to which an individual believes that a new technology use would be free of effort (Davis et al., 1989). Perceived ease of use represents postadoption expectation. According to the TAM, this variable has an important effect on information system adoption and use (Ramdani & Kawalek, 2007). Prior studies on e-banking adoption have found that perceived ease of use has a significant impact on consumers' attitudes toward e-banking adoption (Al-Somali et al., 2009; Chawla and Joshi, 2018; Munoz-Leiva et al., 2017; Teka, 2020; Yiu et al., 2007). Consequently, the sixth hypothesis is as follows:

**H6:** Perceived usefulness positively influences attitude toward e-banking use.

### **Gender**

Turning to the moderators, the conclusions reached by prior studies have raised several concerns about the importance of gender in regard to the e-banking usages (Borraz-Mora et al., 2017). Some studies have found that men are more likely to use both e-banking and mobile banking than women (Gerrard et al., 2006; Laukkanen 2016; Kalinić et al., 2019). Furthermore, it appears that gender has a significant moderating effect on perceived ease of use and perceived usefulness (Sahni & Singh Mann, 2018) and that perceived usefulness is more salient for men, while ease of use and subjective norms are more salient for women (Venkatesh et al., 2000; Morris & Venkatesh, 2000). Therefore, the following hypotheses are suggested:

**H7.1:** The influence of perceived ease of use on attitude toward e-banking will be moderated by gender such that the effect will be stronger for women.

**H7.2:** The influence of perceived usefulness on attitude toward e-banking use will be moderated by gender such that the effect will be stronger for men.

**H7.3:** The effect of social influence on intention to use e-banking will be moderated by gender such that the effect will be stronger for women.

### **Age**

In addition to gender, it is commonly accepted that young people have a stronger predisposition to use new technologies. Studies on information systems adoption demonstrate that younger users behave differently compared to their counterparts (Rose & Fogarty, 2010; Wang et al, 2009). Older users

tend to be relatively laid back in terms of using technology for conducting transactions, as they are relying more on face-to-face transactions; they need to keep greater control over their situation and perceive a higher level of use complexity and difficulty (Chawla & Joshi, 2018). A study conducted by Gan et al. (2006) found that senior consumers, being more risk averse, prefer a personal banking relationship. Wan et al. (2005) indicated that internet banking adoption was highest among middle adulthood customers and lower for younger and older customers. In a more recent study, Ghalandari (2012) found that the age variable can play a moderating role between social influence and users' behavioral intention and between facilitating conditions and e-banking use. In a more recent study, Zhao et al. (2018) found that the age of the user has a significant moderating impact on perceived ease of use and that perceived ease of use is a more important factor for middle-aged and older users to use information systems. Furthermore, Tarhini et al. (2014) found that age moderates the effect of perceived usefulness and that perceived usefulness has a stronger effect on younger users than on older users. Therefore, the following hypotheses are suggested:

- H8.1:** The influence of perceived ease of use on attitude toward e-banking use will be moderated by age such that the effect will be stronger for middle-aged and older users.
- H8.2:** The effect of perceived usefulness on attitude toward e-banking will be moderated by age such that the effect will be stronger for younger users.
- H8.3:** The effect of social influence on intention to use e-banking will be moderated by age such that the effect will be stronger for older users.
- H8.4:** The influence of facilitating conditions on actual e-banking use will be moderated by age such that the effect will be stronger for older users.

### **Educational Level**

Compared with other potential demographic moderators, education level has received less attention in previous studies. Nevertheless, increased educational levels lead to increased e-banking adoption. In contrast, less-educated consumers may not be too eager to use sophisticated e-banking, such as account opening, as they may believe that these are complex and not useful (Gan et al., 2006; Sánchez-Torres et al., 2017). In this line of idea, Sánchez-Torres et al. (2017) found that educational level has a moderating effect on the variables of facilitating conditions and social influence. Additionally, Binyamin et al. (2019) found that education level has a significant moderating effect on perceived ease of use. Thus, this study proposes the following hypotheses:

- H9.1:** The influence of perceived ease of use on attitude toward e-banking use will be moderated by educational level such that the effect will be stronger for users with a high educational level.
- H9.2:** The effect of social influence on intention to use e-banking will be moderated by educational level such that the effect will be stronger for users with a high educational level.
- H9.3:** The influence of facilitating conditions on actual e-banking will be moderated by educational level such that the effect will be stronger for users with a high educational level.

### **Job**

The results from previous studies underlined that demographic characteristics such as job influence e-banking use in many American, Asian, and European countries (Onyia & Tagg, 2011). Chawla and Joshi (2018) revealed that job is the salient demographic variable that moderates the impact of independent factors (ease of use, trust, lifestyle, convenience, and efficiency) on user attitude toward mobile banking. Indeed, people with higher levels of occupations are more likely to use e-banking than those with lower levels of employment (Wan et al., 2005). Therefore, this study proposes the following hypothesis:

**H10:** The effect of intention to use e-banking on actual e-banking use will be moderated by job such that the effect will be stronger for users in higher levels of occupations.

## METHODOLOGY

The empirical study was conducted in Northwest of Algeria between January and April 2019. As it is the most dominant technique for data collection about the constructs associated with behavioral theories (Hassan et al., 2018), the survey method was adopted to test the hypotheses proposed in the conceptual model. The following section details the research method used to test the hypotheses, including measurement and sampling.

### Measurement

As shown in Table 1, the measures (items) were originally derived from previous researches, and their validity and reliability have been demonstrated. A 5-point Likert-type scale was utilized for most items in this study (5=strongly agreed; 1=strongly disagreed). Before undertaking an industry-wide survey and to validate items, a pilot study was conducted among four experts (university researchers) and three Algerian bank customers explaining the research intent and the questions. Based on the feedback received, the questionnaire was refined.

Table 1. Measurement scales

Factor	Number of questions	Literature sources
e-banking use	3 items	Venkatesh & Bala (2008)
Behavioral intention	3 items	Venkatesh & Bala (2008)
Attitude toward e-banking use	3 items	Davis et al (1989) Venkatesh et al (2003)
Perceived ease of use	5 items	Davis et al (1989) Venkatesh & Bala (2008)
Perceived usefulness	3 items	Davis et al (1989) Venkatesh & Bala (2008)
Social influence	3 items	Thompson et al (1991) Venkatesh & Bala (2008)
Facilitating conditions	3 items	Thompson et al (1991) Venkatesh et al (2003)

### Sample Characteristics

This study used direct interviews to collect information from Algerian bank consumers. Although interviewer-administered surveys are expensive and time-consuming, they were preferred because they allowed us to gain a fairly good response rate. A total of three hundred twenty-six (326) valid questionnaires were collected. Table 2 shows that the respondents consisted of 189 males (58%) and 137 females (42%). Their ages ranged from 18 to more than 61 years, with 45.7% being 29-39 years, 23.9 being 40-50 years, and 18.1% being 18-28 years old. Furthermore, the respondents had various jobs; they were the clients of different banks, and the vast majority of them had a university degree.

Covariance-based structural equation modeling (CB-SEM) was used to test the hypotheses of this study. The data analysis was performed in two stages. In the first stage, reliability and validity analysis was conducted using SPSS (ver. 22) to evaluate the stability and consistency of the measured items. In the second stage, the main research hypotheses were tested using AMOS (ver22).

Table 2. Demographic analysis

Variable	Response's choice	Frequency	Percent
<b>Gender</b>	Male	189	58
	Female	137	42
<b>Age</b>	18-28 years	59	18.1
	29-39 years	149	45.7
	40-50 years	78	23.9
	51-61 years	29	8.9
	61+ years	11	3.4
<b>Education level</b>	No studies	1	0.3
	Primary	7	2.1
	Secondary school	25	7.7
	High school	85	26.1
	University	208	63.8
<b>Job</b>	Employees	28	8.6
	Technician	32	9.8
	Senior technician	31	9.5
	Managers	102	31.3
	Senior managers	30	9.2
	Other	103	31.6
<b>Bank</b>	National bank of Algeria	86	26.4
	Algerian Popular Loan	65	19.9
	External Bank of Algeria	13	4
	National Savings and Reserve Fund	20	6.1
	Local development bank	40	12.3
	Bank for Agriculture and Rural Development	68	20.9
	BNP Paribas bank	4	1.2
	Gulf Bank Algeria	2	0.6
	Natixis Bank	1	0.3
	Algeria Post	27	8.3

## RESULTS

### Normality

A skewness-kurtosis approach was adopted to test univariate normality for each variable. When the acceptable values for skewness and kurtosis are between  $\pm 2$  and  $\pm 7$ , respectively (Hair et al., 2010), we can see in Table 3 that all variables' values support the normality of univariate distribution.

Table 3. Assessment of Normality

Variable	skewness	Kurtosis
e-banking use	0.09-	0.94-
Behavioral intention	0.77-	0.74-
Attitude toward e-banking use	0.87-	0.17-
Perceived ease of use	0.64-	0.22-
Perceived usefulness	0.76-	0.13
Social influence	0.09-	0.85-
Facilitating conditions	0.30-	1.12-

### Reliability and Validity Test

To check for consistency and stability of items, all constructs were tested using Cronbach’s alpha. The results shown in Table 4 indicate that all of the variables have values greater than the cutoff point of 0.70 (Nunnally, 1978; Kline, 2011). This suggests that the measurement model has adequate internal consistency.

We performed a confirmatory factor analysis (CFA) to ensure adequate levels of model fitness as well as construct validity and reliability. As shown in Table 4, all standardized factor loading values ( $\lambda$ ) are significant and greater than the recommended level of 0.50 (Hair et al. 2010), as they ranged between 0.70 and 0.98.

Table 4. Reliability and validity test

Variable	Notation	Items	$\lambda_i$	( $\alpha$ ) Cronbach
e-banking use	USE	USE1 USE2 USE3	0.94 0.97 0.87	0.94
Behavioral intention	BI	BI1 BI2 BI3	0.98 0.96 0.86	0.95
Attitude toward e-banking use	ATB	ATB1 ATB2 ATB3	0.93 0.97 0.88	0.94
Perceived ease of use	PEU	PEU1 PEU2 PEU3 PEU4 PEU5	0.76 0.79 0.90 0.78 0.70	0.88
Perceived usefulness	PU	PU1 PU2 PU3	0.86 0.91 0.91	0.92
Social influence	IS	IS1 IS2 IS3	0.77 0.91 0.83	0.87
Facilitating conditions	FC	FC1 FC2 FC3	0.84 0.90 0.86	0.89

**Goodness-Of-Fit Indicators:**

As seen in Table 5, the values of the goodness-of-fit indexes indicate that the structural model is a good fit to the data. Indeed, a root mean square error of approximation (RMSEA) value below 0.08 indicates a reasonable error of approximation (Browne & Cudeck, 1993). Furthermore, the chi-square divided by the degree of freedom value (CMIN/DF) is less than 2.00 (Bryne, 1989), and the other fit measures, such as the incremental fit index (IFI), relative fit index (RFI), comparative fit index (CFI), Tucker–Lewis index (TLI) or normed fit index (NFI), are greater than 0.9, which shows a well-fitting model (Kline, 2011).

**Table 5. Goodness-of-fit indicators**

Indicator	Value
RMSEA	0.05
IFI	0.97
RFI	0.93
CFI	0.97
TLI	0.96
NFI	0.94
CMIN/DF	1.98

**Coefficient of Determination (R<sup>2</sup>):**

R<sup>2</sup> determines the predictive accuracy, and its magnitude describes the combined effect of exogenous latent variables on each endogenous variable (Hair et al., 2010). Values of R<sup>2</sup> are interpreted as 0.25=weak, 0.50 = moderate and 0.75 = substantial (Hassan et al., 2018). In this study, the R<sup>2</sup> values extracted in the endogenous factors reached a highly acceptable level. Indeed, this coefficient was estimated as follows: 69% for behavioral intention; 60% for attitude toward e-banking use; and 55% for e-banking use (Table 6).

**Table 6. Coefficient of determination (R<sup>2</sup>)**

Construct	R square
BI	0.69
ATB	0.59
USE	0.55

**Hypothesis Test:**

*Testing The Structural Model And The Main Hypothesis*

Table 7 and Figure 2 show the results of the applied structural equation analysis. On the one hand, H1 and H2 were confirmed; accordingly, behavioral intentions ( $\beta=0.40, p<0.001$ ) and facilitating conditions ( $\beta=0.39, p<0.001$ ) have both a positive and significant impact on e-banking use. On the other hand, H3 was rejected ( $\beta=0.06, p=0.3$ ), which suggests that social influence was not approved

to have a significant path with behavioral intention. Additionally, H4 was confirmed ( $\beta=1, p<0.001$ ). Thus, we can confirm the importance of attitude toward e-banking use to behavioral intention. Finally, there was a significant and positive relationship between perceived ease of use and attitude toward e-banking use ( $\beta=0.49, p<0.001$ ) and between perceived usefulness and attitude toward e-banking use ( $\beta=0.49, p<0.001$ ), which supports H5 and H6.

Figure 2. Structural model

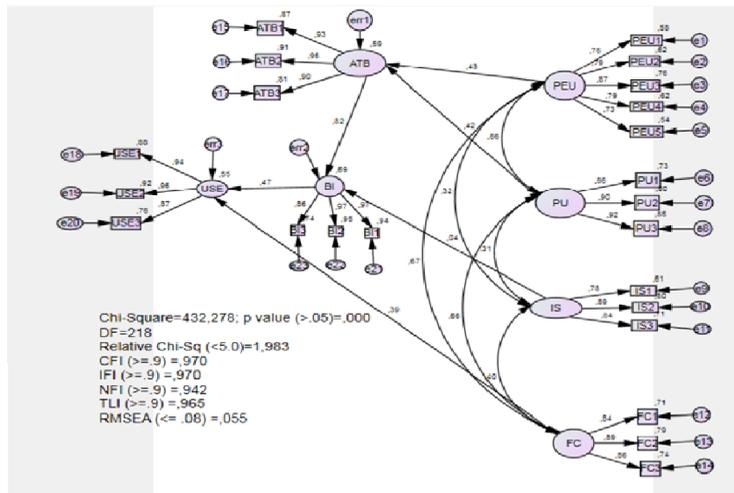


Table 7. Structural model results and main hypothesis testing

Hypothesis	Estimate	SE	CR	P value	Inference
H1: BI @ USE	0.40	0.04	9.45	<0.001	Supported
H2: FC @ USE	0.39	0.05	7.61	<0.001	Supported
H3: SI @ BI	0.06	0.06	1.03	0.3	No supported
H4: ATB @ BI	1	0.05	19.15	<0.001	Supported
H5: PEU @ ATB	0.49	0.07	6.85	<0.001	Supported
H6: PU @ ATB	0.49	0.07	6.96	<0.001	Supported

### Test Hypotheses Related to Moderator Variables

To assess the effect of moderator variables in the model, we performed a multigroup analysis CFA using the critical ratio difference test.

To examine the moderating effect of the demographic variables (Gender, Age, Educational level, Job) on the relationship path between exogenous and endogenous constructs, each of these variables was divided into two groups. The first group comprises male, younger respondents (18-39 years), high education category, and senior manager’s category. The second comprises female, older respondents (>40 years), low education category, and working as employees, technicians, senior technicians, and others (Table 8).

Among the eleven hypotheses related to the moderating effect of demographic variables, the results supported only H8.4 and the opposite of H7.2 (the critical ratios are over |1.96|). Therefore, relationships between perceived usefulness and attitude toward e-banking use were significantly

Table 8. Results of hypothesis testing related to moderator variables

Moderating effect of gender						
	Men Group		Women group			
Hypotheses	Estimate	p	Estimate	p	critical ratio	Inference
H 7.1	0.56	<0.001	0.43	<0.001	1.21	No supported
H 7.2	0.39	<0.001	0.67	<0.001	2.49-	Supported
H 7.3	0.05	0.422	0.09	0.375	0.28-	No supported
Moderating effect of age						
	Younger (18-39 year)		Older (+40 years)			
Hypotheses	Estimate	p	Estimate	p	critical ratio	Inference
H 8.1	0.41	<0.001	0.56	<0.001	1.33	No supported
H 8.2	0.54	<0.001	0.49	<0.001	0.48-	No supported
H 8.3	0.05	0.476	0.06	0.502	0.13	No supported
H 8.4	0.30	<0.001	0.51	<0.001	2.29	Supported
Moderating effect of education level						
	high education group		low education group			
Hypotheses	Estimate	p	Estimate	p	critical ratio	Inference
H 9.1	0.46	<0.001	0.47	<0.001	0.08-	No supported
H 9.2	0.03-	0.7	0.11	0.179	1.24-	No supported
H 9.3	0.45	<0.001	0.29	<0.001	1.75	No supported
Moderating effect of job						
	First group		Second group			
Hypotheses	Estimate	p	Estimate	p	critical ratio	Inference
H 10	0.42	<0.001	0.40	<0.001	0.14	No supported

stronger for women, and relationships between facilitating conditions and actual e-banking use were significantly stronger for older users. In return, it seems that the educational level did not moderate the effect of any independent variables on dependent variables and that job did not moderate the relationship between intention to use e-banking and actual e-banking use.

## DISCUSSION AND IMPLICATIONS

### Discussion

Beyond their phenomenal evolution and their wide diffusion across the world, e-banking services still achieve low levels of adoption and use in several developing countries. By integrating TAM and UTAUT, this research aimed to identify and analyze factors affecting customers' use and adoption of e-banking services in Algeria.

When the R square of 55% exceeded the recommended values of 40% (Straub et al., 2004), the findings show major support for our model. This indicates that the model has a high predictive value. Therefore, by integrating TAM and UTAUT, we have been able to improve the predictive ability of the TAM model.

In addition, the results showed that behavioral intention and facilitating conditions determine actual e-banking use. This indicates that customers will adopt e-banking if they intend to use these

services and if they think that the necessary resources and support services are available. These results are consistent with the technology adoption literature in general (Davis et al., 1989; Venkatesh et al., 2003), where behavioral intention and facilitating conditions have always been decisive factors in the adoption of technological innovations. This result is also consistent with previous studies on e-banking (Afshan et al., 2018; Alalwan et al., 2018; Alalwan et al., 2017; Baabdullah et al., 2019; Firmansyah et al., 2022; Khan et al., 2021; Sharma et al., 2020).

The findings also revealed that attitudes toward e-banking use influence e-banking intention. This means that the intention of customers to use e-banking will be raised if their attitude toward the use of e-banking is increased. This is in accordance with previous studies (Al-Somali et al., 2009; Chauhan et al., 2019; Chavali & Kumar, 2018; Munoz-Leiva et al., 2017; Rawashdeh, 2015). In contrast, social influence does not seem to have a significant effect on intention to use e-banking. This indicates that bank customers in Algeria do not seem to care as much about what their friends, family, colleagues, and superiors think about their use of e-banking. This result is consistent with previous findings of Alalwan et al. (2017, 2018) and Baabdullah et al. (2019) and differs from the results of Khan (2022), Patel and Patel (2018), Rahi et al. (2019), and Tarhini et al. (2016).

Furthermore, the study findings show that perceived ease of use and perceived usefulness play a major role in shaping customer attitudes toward e-banking adoption. Indeed, respondents seem more likely to have a positive attitude toward e-banking use if they perceive that the use of these technologies is valuable and convenient. The higher the perceived usefulness and ease of use of e-banking, the higher the attitudes toward its adoption. Confirming the importance of perceived ease of use and perceived usefulness in explaining the use or adoption of new technology, these results are usually in line with the basic concept of TAM and the findings of Mwiya et al. (2017), Munoz-Leiva et al. (2017), Rawashdeh (2015), Roy et al. (2017), etc.

Regarding moderators, whereas the relationship between perceived usefulness and attitude toward e-banking use was significantly stronger for women, as in the studies of Venkatesh et al. (2000), Morris & Venkatesh (2000) and Sahni & Singh Mann (2018), the gender of users did not introduce significant differences in the proposed relationships between perceived ease of use and attitude toward e-banking use or between social influence and behavioral intention (which is in contrast with the same studies). This is consistent with prior studies on e-banking adoption (Al-Somali et al., 2009).

In addition, this study finds that age did not affect relationships between perceived ease of use and attitude toward e-banking use, between social influence and behavioral intention, as well as between perceived usefulness and attitude toward e-banking use. These results differ from those of Zhao et al. (2017) and Tarhini et al. (2014). However, the relationship between facilitating conditions and actual e-banking use is significantly stronger for older end users. This suggests that old Algerian customers need more help and support and require better conditions to address barriers to e-banking use, which supports the previous results of Ghalandari (2012).

Finally, education level and job did not moderate any of the relationships proposed in our theoretical model. These results diverge from those reported by Sánchez-Torres et al. (2017), Binyamin et al. (2019), and Onyia & Tagg (2011)

## Academic Implications

This study offers important academic contributions to the technology adoption and acceptance literature. First, the study validates the TAM and the UTAUT variables scales in Algeria as a case of developing countries and for a specific technological innovation, namely, e-banking. Hence, our findings extend the TAM and the UTAUT to other contexts, in a way to provide sufficient advice about how to deal with customer adaptation and to push e-banking adoption. Second, this research investigated the moderating effect of demographic variables (gender, age, education level, and job) on TAM-UTAUT relationships in a way that confirms and extends the results of Sánchez-Torres et al. (2017) and Venkatesh et al. (2000) to the case of e-banking. Third, the study applied models that were developed in an organizational context to a form of user behavior that was voluntary (customer

e-banking adoption). Finally, the empirical analysis of this research contributed to the knowledge of using the multigroup structural equation, which is a crucial advanced tool for addressing questions about group comparison and demographics such as gender and age.

## **Managerial Implications**

There are various managerial implications of this study in building a powerful relationship between banks and potential e-banking users. First, this study explores customers' e-banking adoption and use. Understanding customer behavior could aid banks in designing strategies to encourage their e-banking use. Managers and organizations of Algerian banks can exploit the findings of this research to inform their strategies for promoting e-banking services. The results found that perceived ease of use and perceived usefulness are important factors in the adoption of e-banking services in Algeria. Therefore, if banks want to increase the adoption of e-banking services among consumers, they should design e-banking accounts that are straightforward to open and manage, and they could offer a clear user manual for using these services. Additionally, they need to create appealing advertising that highlights the advantages and opportunities that e-banking offers to customers so that customers get encouraged to discover the services and their benefits. In other terms, we can underline that it is necessary to convince potential customers that e-banking services are easy and useful.

Second, the findings found that facilitating conditions affect the adoption of e-banking, which emphasizes the importance of support resources and services in e-banking investment success. Thus, Algerian banks need to improve the facilities required to use e-banking and consider the factors regarding infrastructure (e.g., improve internet access or speed access to the use of e-banking services) to attract more customers.

Third, this study found that the relationship between perceived usefulness and attitude toward e-banking use is significantly stronger for women. This means that women customers are more perceptive of the usefulness of e-banking services. Therefore, Algerian banks should explain and convince their female customers about the usefulness of e-banking. Finally, in terms of age, older customers tend to pay attention to facilitating conditions. Hence, banks should develop strategies to provide more support to older customers and simplify their access to e-banking services.

## **CONCLUSION AND LIMITATIONS**

Based on the TAM and the UTAUT, this study investigates the factors affecting customers' adoption and use of e-banking services in Algeria. To test the related hypotheses, a survey (n=326) was conducted on Algerian bank customers, and the data were analyzed using structural equation modeling. The findings reveal that perceived usefulness and perceived ease of use have positive and significant effects on attitudes toward e-banking use. They also highlight that attitude toward e-banking use influences behavioral intention. Moreover, facilitating conditions and behavioral intention significantly influence e-banking adoption and use. Finally, the relationship between perceived usefulness and attitude toward e-banking use was stronger for women, and the relationship between facilitating conditions and actual e-banking use was significantly stronger for older end-users.

At the end, and even if it represents a fruitful attempt at the e-banking adoption area, this study stands on some limitations. First, this study is limited to investigating two theoretical models for information systems adoption and few variables that affect e-banking adoption. Future studies could examine other variables, such as individual information technology culture or technology infrastructures., our results contradict several previous studies that have used social influence as a variable. Further studies are needed to explain this difference. Third, the study also adopts convenience sampling of the Northwest of Algeria, and the majority of respondents are youths and educated, which may negatively reflect on generalizability to the whole population. Future studies should extend to the whole geography of Algeria. Finally, only a quantitative analysis was undertaken in this research. For future studies, a mixed method using both quantitative and qualitative techniques could be used to test whether the supported hypotheses are still valid.

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## **COMPETING INTERESTS**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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