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Contaduría y Administración
Accounting & Management

Contaduría y Administración 71 (4), 2026, e585

Integration of trust in a TAM/ISS model: A study on the use of mobile banking by Mexican banking customers

Integración de la confianza en un modelo TAM/ISS: un estudio sobre el uso de la banca móvil por los clientes de la banca mexicana

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Received June 8, 2024; accepted April 2, 2025
Available online June 25, 2026

Abstract

This research was based on the technology acceptance model (TAM), the information systems success model (ISSM) and incorporated trust into the theoretical research model. The study focuses on addressing how the factors of application quality, information quality and service quality affect ease of use, perceived usefulness, and trust. And in turn, how these last three incidents in the use of mobile banking by users in the Monterrey Metropolitan Area (MMA), Mexico. A quantitative study was carried out and the structural equation modeling (SEM) technique based on components/variances was applied. Of the variables addressed, it was found that the three quality factors affect the perceived usefulness, which in turn is an important driver of the use of mobile banking. By addressing the factors that are relevant to the user, a more attractive mobile banking can be created, attracting a greater number of users, leaving traditional banking behind and thus increasing the competitiveness of financial institutions.attractive mobile banking system, attracting a higher number of users, leaving traditional banking behind and thus increasing the competitiveness of financial institutions.

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Peer Review under the responsibility of Universidad Nacional Autónoma de México.

https://doi.org/10.22201/fca.24488410e.2026.5599

JEL Code: D12, G21, M15, O32
Keywords: mobile banking; technology adoption; mobile consumer analysis; business strategy

Resumen

Esta investigación tomó como base el modelo de aceptación tecnológica (TAM), el modelo de éxito de sistemas de información (ISSM) e incorporó la confianza al modelo teórico de investigación. El estudio se centró en abordar cómo los factores de calidad de la aplicación, calidad de la información y calidad del servicio inciden en la facilidad de uso, la utilidad percibida y la confianza. Y a su vez cómo estos tres últimos inciden en el uso de la banca móvil por usuarios del Área Metropolitana de Monterrey (AMM), México. Se hizo un estudio cuantitativo y se aplicó la técnica de modelado de ecuaciones estructurales (SEM) basadas en componentes/varianzas. De las variables abordadas se encontró que los tres factores de calidad inciden en la utilidad percibida que a su vez es un importante impulsor del uso de la banca móvil. De atender los factores que para el usuario resultan relevantes se puede crear una banca móvil más atractiva, atrayendo a un mayor número de usuarios dejando atrás la banca tradicional e incrementando así la competitividad de las instituciones financieras.

Código JEL: D12, G21, M15, O32
Palabras clave: banca móvil; adopción de tecnología; análisis de consumidor móvil; estrategia de negocio

Introduction

Currently, access to high-speed connectivity and a progressive mobile technology (Balapour, Nikkhah, and Sabherwal, 2020) has triggered over-use of mobile devices (Reychav et al., 2019). Thus, customers prefer technologies that provide convenience, agility, and usefulness in a single platform (Singh, Sinha, and Liébana, 2020) such as those related to mobile banking.

Mobile banking consists of using mobile devices to manage financial transactions remotely, allowing full access to customer information and performing actions such as checking balances, reviewing recent transactions, paying bills, depositing checks, making payments, and transferring money between users (Abu-Taieh et al., 2022). Mobile banking has great potential in developing countries as it offers its users freedom in both time and space (Kumar et al., 2020). In addition, it has helped banks to reduce their operational costs and expand their reach to customers (Durkin et al., 2007).

Mexico possesses favorable conditions for mobile banking. Firstly, 78.6% of its population are internet users, while 97% connect through a smartphone (IFT, 2022). Secondly, 78% of the adult population has or used to have a financial instrument (savings account, credit, or insurance) (CNBV, 2021). In that sense, 2022 presented a steady growth rate of 6% in new banking accounts, while 13% in domestic credits (CNBV, 2023). Nevertheless, 24% of Mexico's internet population use online banking

(IFT, 2022). Therefore, this research aims to explore the factors that influence the use of mobile banking with the intention of improving the quality of life of citizens and the performance of financial institutions.

Literature on technology adoption and usage has shown diverse perspectives (Kumar et al., 2020). In one hand, the use of a certain technology has been subdued by its perceived ease of use (Kasilingam, 2020; Muhaimin et al., 2019). In the other hand, perceived usefulness has been a critical factor for the use of a certain technology (Chawla & Joshi, 2019; Saroia & Gao, 2019). Moreover, users' trust has been a significant driver for technology adoption (Cha, 2020; Sharma & Sharma, 2019; Tam, Lourero, and Oliveira, 2020). Similarly, perceived quality has been a relevant factor impacting on ease of use (Fitria et al., 2024; Salloum et al., 2019; Chi , 2018), perceived usefulness (Fitria et al., 2024; Alshurideh et al., 2019; Yang et al., 2017) and trust (Uzir et al., 2021; Sarkar, Chauhan, and Khare, 2020).

The factors that affect the use of mobile banking remain diverse in literature. Thus, a research question related to factors that have a direct and indirect impact on mobile banking is relevant. In that sense, this study aims to analyze the effect of the following factors (app quality, information quality, and quality in service/support) on perceived ease of use, perceived usefulness, and trust as mediators of mobile banking usage in Monterrey city and its metropolitan area.

This paper is structured as follows. Initially, theoretical models, subjacent factors, research hypotheses and the conceptual model are introduced. Secondly, the applied methodology using structural equation modelling (SEM) based on components/variances is presented. Next, statistical results are analyzed and discussed. Finally, concluding remarks and future research lines are addressed.

Literature review

Technology Acceptance Model (TAM)

One of the main theoretical models focused on technology usage is the Technology Acceptance Model (TAM). Such model developed by Davis (1985), was intended to determine factors that influence technology acceptance or rejection based on social psychology (Yang et al., 2017). In the aim of a deeper understanding of users' intentions and behavior, an extended TAM included social, organizational, and individual factors (Yang et al., 2017). Such version implies 5 variables (compatibility, resistance to change, perceived usefulness, perceived ease of use and behavioral attitude) (Venkatesh & Davis, 2000).

The TAM model has been used in several studies that aim to measure users' perceptions. Thus, inferences about factors that affect technology usage have resulted from its application (Abu-Taieh et al.,

2022; To & Trinh, 2021; Zhou et al., 2019; Chi, 2018). Although such model has been widely accepted in literature, results are limited if mobile banking is analyzed, given its original premises based on computer usage (To & Trinh, 2021).

Information Systems Success Model (ISSM)

TAM's limitations on the measurement of usage, acceptance, and success of a given technology led to the development of the Information Systems Success Model (ISSM) (DeLone & McLean, 2016). Such model initially included six factors (system's quality, information quality, usage, user satisfaction, individual impact, and organizational impact) (DeLone & McLean, 1992). Later, service quality was added as the seventh factor (Pitt et al., 1995). Such modification led to the definite set of factors: systems' quality, information quality, service quality, usage and usage intention, user satisfaction and net benefits (DeLone & McLean, 2003).

The ISSM model has been applied in different technologies such as e-commerce sites, and information systems for hospitals, with positive results in terms of analyzing usage drivers (Salim et al., 2021; Shim & Jo, 2020). Thus, its applicability could be limited for explaining mobile banking usage (Salim et al., 2021).

Combining perspectives

TAM and ISSM models have been combined in recent studies, resulting in positive outcomes that compensate its specific limitations with a larger number of factors that aim to explain technology usage (Hawash, Mokhtar, and Yusof, 2021; Martono et al., 2020; Zhang, Chen, & Chen, 2019). Moreover, such combination could be used to study mobile usage (Chen & Tsai, 2019). Thus, this study combines TAM and ISSM models to provide an integral model about users' perceptions on mobile banking.

The theoretical model includes two variables derived from TAM (perceived ease of use and perceived usefulness), while four variables were taken from ISSM (app quality, information quality, service quality and usage). Moreover, trust is suggested by literature as a trigger for technology usage (Li & Li, 2023; Mishra et al., 2023; Siagian et al., 2022; Abu-Taieh, et al., 2022). Similarly, trust has been driven by app quality (Sarkar et al. 2020; Silic & Ruf, 2018; Gao & Waechter, 2017), information quality (Sarkar et al., 2020; Silic & Ruf, 2018), and service quality (Sarkar et al., 2020; Ofori, Boakye, and Narteh,

2018; Silic & Ruf, 2018). Thus, trust is included in the theoretical model as an additional variable to those mentioned from TAM and ISSM models.

App Quality (AQ)

Derived from ISSM, app quality is defined by literature as the set of features expected by users when a new technology is available (DeLone & McLean, 2016) in terms of reliability effective web surfing and design (Chi , 2018). Moreover, app quality has been related with trust and TAM's factors included in this study (perceived ease of use and perceived usefulness). Alyouseff (2023) analyzed usage of an online learning app at Saudi Arabia, while Dokhanian et al., (2022) studied a mobile app for a library at Iran. In both studies, app quality had a significant positive effect on perceived ease of use and perceived usefulness. Similarly, app quality resulted as a significant driver of trust for a financial mobile service at Switzerland (Silic & Ruf, 2018) and an e-government service at Jordan (Kanaan et al., 2023). Thus, the following hypotheses were used for this study on mobile banking in Mexico.

H1: App quality has a positive effect on perceived ease of use.

H2: App quality has a positive effect on perceived usefulness.

H3: App quality has a positive effect on trust.

Information Quality (IQ)

Information quality, as taken from ISSM, has been defined as the degree in which app users consider that received information fulfills their expectations in terms of precision, integrity, coherence, comprehension, customization, relevance, safety, and punctuality (Petter, DeLone, & McLean, (2012). Information quality has been studied in literature, with positive results in relation to perceived ease of use and perceived usefulness (Alyoussef, 2023; Salloum, et al, 2019; Alshurideh et al., 2019). Similarly, such variable has been linked with users' trust (Silic & Ruf, 2018; Gao et al., 2015; Zhou, 2014). Thus, the following hypotheses were used for this study on mobile banking in Mexico.

H4: Information quality has a positive effect on perceived ease of use.

H5: Information quality has a positive effect on perceived usefulness.

H6: Information quality has a positive effect on trust.

Service Quality (SQ)

Service quality, as taken from ISSM, has been defined as the capability of the information technology area to assist users (DeLone & McLean, 2016). Such variable has been studied by Xu and Du (2018), implying the demonstration of perceived ease of use and perceived usefulness as factors that affect satisfaction and fidelity of library users in China. Similarly, other studies have shown the effect of service quality on users' trust (Sarkar et al., 2020; Uzir et al., 2021). Thus, the following hypotheses were used for this study on mobile banking in Mexico.

H7: Service quality has a positive effect on perceived ease of use.

H8: Service quality has a positive effect on perceived usefulness.

H9: Service quality has a positive effect on trust.

Perceived Ease of use (PE)

Perceived ease of use, taken from the TAM model, is defined as the degree in which a given technology is easy in terms of use (Davis, 1985). The mentioned variable has been a trend in literature as a driver of the use of technology (Alyoussef, 2023; Siagian et al., 2022; Dokhanian et al., 2022). Thus, the following hypothesis was used for this study.

H10: Perceived ease of use has a positive effect on the use of mobile banking.

Perceived Usefulness (PU)

Perceived usefulness, taken from the TAM model (Davis, 1985), is defined as the degree in which and individual considers that the use of technology enhances or improves performance. Such variable has been studied in literature, resulting in a positive impact on the use of technology (Alyoussef, 2023; Mishra et al., 2023; Siagian et al., 2022; Nguyen et al., 2022; Dokhanian et al., 2022). Thus, the following hypothesis was used for this study.

H11: Perceived usefulness has a positive effect on mobile banking usage.

Trust (TR)

Although trust is a variable not related to the TAM or ISSM models, it was included in this study. Such variable is defined as the degree in which a user perceives that a given technology offers a safe service

that complies with its intended features and functionalities (Cha, 2020). Trust has resulted as a critical factor for the use of mobile banking (Li & Yeh, 2010) and other fintech services (Hu et al., 2019). Moreover, the influence of trust on users of a certain technology has been studied in literature (Li & Li, 2023; Mishra et al., 2023; Siagian et al., 2022; Abu-Taieh et al., 2022). Thus, the following hypothesis was used for this study.

H12: Trust has a positive effect on mobile banking usage.

Previous research has identified and analyzed ease of use (Alyoussef., 2023; Nguyen et al., 2022; To & Trinh., 2021), perceived usefulness (Mishra et al., 2023; To & Trinh., 2021; Widiar, Yuniarinto, & Yulianti, 2023) and trust (Sun, Zhang, Liao, & Chang, 2021; Widiar er al., 2023; Wilson et al., 2021) as mediating variables. In those investigations, ease of use, perceived usefulness and trust were placed in the corresponding theoretical models as mediating variables between an independent variable and a dependent variable. Following this line and with what has been presented so far, the model of the present research was formulated (Figure 1).

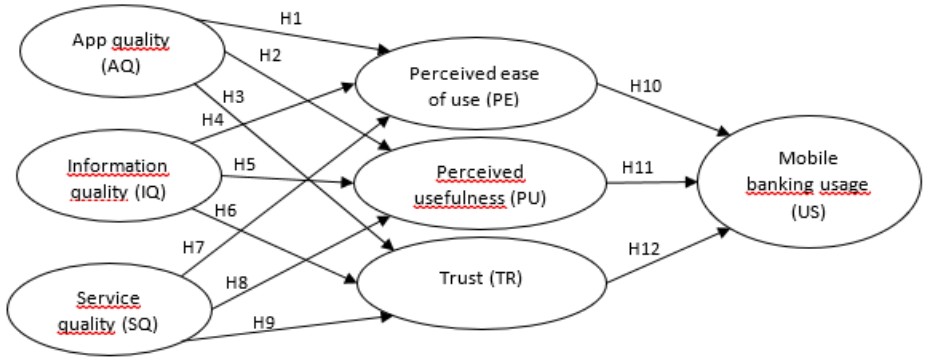

Figure 1. Conceptual Model
Source: Authors' own creation (2024).

Method

In line with other studies (Alyoussef, 2023; Li & Li, 2023; Salameh et al., 2022) this study was conducted with a quantitative approach, as well as a transversal and non-experimental design. Moreover, a validated survey was used to quantify users' perceptions on technology. The survey includes items that have been adapted from previous empirical studies (Table 1). Thus, the survey used in this study, revised by experts, consists of 8 items related to the respondent's profile, while 39 items are based on a 7-point Liker scale,

which is a widely used scale within the social sciences with higher reliability and validity indices due to a greater number of response categories, as compared to smaller scales (Preston & Colman, 2000).

Table 1
Items and sources

Variable	Ïtem	Description	Adapted from
AQ	AQ1	Images and information load quickly	(Martins et al., 2019a; Chi, 2018)
	AQ2	The application responds quickly	
	AQ3	The application works quickly	
	AQ4	The interface design is pleasant	
	AQ5	The layout of the functions on the screen is adequate	
IQ	IQ1	Information is always up to date	(Albashrawi & Motiwalla, 2020; Martins et al., 2019a; Chi, 2018)
	IQ2	The information is relevant	
	IQ3	The information is accurate	
	IQ4	The information is complete	
	IQ5	The information is displayed in an easy to understand way	
	IQ6	The information is provided in useful formats	
SQ	SQ1	Support staff provides individual and personalized help	(Albashrawi & Motiwalla, 2020; Martins et al., 2019ª.)
	SQ2	Support staff has the knowledge necessary for their work	
	SQ3	Support staff is always available	
	SQ4	Support staff are qualified to do their job	
	SQ5	I can contact the support staff by various means	
	SQ6	The services provided by the support staff are helpful	
	SQ7	The support staff resolves problems quickly	
PE	PE1	A person with little computer and/or technology knowledge can use the application.	(Chi, 2018; Wang & Song, 2017; Moslehpour, Pham, Wong, and Bilgiçli, 2018)
	PE2	A person with little computer and/or technology knowledge can learn how to use and operate the application.	
	PE3	The mobile banking application is easy to control	
	PE4	Overall the mobile banking application is easy to use.	
	PE5	In general it is easy to learn how to use the mobile banking application.	
PU	PU1	The application allows me to perform transactions quickly	(Kumar et al., 2020; Mariani et al., 2021; Wang & Song, 2017)
	PU2	Performing transactions on the app is easier compared to traditional banking	
	PU3	The app enhances my ability to keep up to date with my financial products	
	PU4	The functions of the application are useful to me	
	PU5	The application is useful in my daily life	
CF	CF1	It is safe to make transactions through the application	(Cha, 2020; Kumar et al., 2020; Mariani, et al., 2021)
	CF2	I trust the application to make transactions	
	CF3	Adequate measures are implemented to protect my personal data	
	CF4	The application protects my personal data	
	CF5	In general, the application is secure	
	CF6	In general, the application is reliable	
US	US1	I will continue to use the application frequently	

US2	I will continue to use the application as long as I have access to it.	(Cha, 2020; Chawla & Joshi, 2019; Kasilingam, 2020; To & Trinh, 2021).
US3	I intend to continue using the application in the future	
US4	I will continue to use the application for future transactions	
US5	I plan to use the application on a regular basis in my daily life	

Source: Authors' own creation (2024).

The target population was mobile banking users that reside in Monterrey Metropolitan Area, Mexico (MMA). Data collection was performed by following a simple-probability sample during the first semester of 2023. Sample size, with a 95% confidence interval, resulted in 384 users. Once data was obtained, an inferential statistical analysis applying structural equality model (SEM) was conducted. Moreover, such SEM model was based on the partial least squares (PLS) technique in SmartPLS 4.1.0.8 (Ringle, et al., 2024).

SEM was applied in alignment with several studies about users' perceptions on technology usage (Albashrawi & Motiwalla, 2020; Chi, 2018; Moslehpour et al., 2018; Wang & Song, 2017). In addition to the fit with the design of the conceptual model, SEM is appropriate when data is related to mobile banking users' perception. Specifically, Partial Least Squares (PLS) technique was applied given a lack of normality in the data collected (Hair, Ringle, and Sarstedt, 2011). Moreover, such technique could be applied with robust models without considering consistency or convergence issues (López & González, 2014). In addition, Salameh et al. (2022), Nguyen et al. (2022) and Uzir et al. (2021) have used PLS in their studies related to technology adoption.

Results

Data from 384 mobile banking users at the MMA was analyzed. The sample was gender-balanced (53% female, 47% male) and primarily composed of young adults (21–40 years old), individuals with higher education, and employed participants. Most respondents use BBVA's mobile banking application and have over a year of experience with mobile banking. Additionally, 86% use it frequently, adding relevance to the responses. The majority also reside in the most populated cities within the MMA. A selection of descriptive statistics is shown in Table 2.

Table 2
Descriptive Statistics

Gender	Male 47%				Female 53%		
Age (years)	Up to 20 3%	21 a 30 37%	31 a 40 49%	41 a 50 8%	51 o más 3%		
Education	High school 15%		University 63%		Postgraduate 22%		
Occupation	Student 8%	Employee 71%	Self-employed 8%	Another 13%			
Bank	BBVA 54%	Banorte 23%	Santander 11%	Banamex 4%	Others 8%		
Seniority	Less than 1 month 3%	1 to 6 months 3%	6 months to 1 year 8%	More than 1 year 87%			
Frequency	High (Daily or several times a week) 86%		Low (Sometimes a month or occasionally) 14%				
City	Monterrey 45%	Guadalupe 13%	Apodaca 11%	Juárez 8%	Escobedo 7%	García 6%	Otras 10%

Fuente: Authors' own creation (2024).

Concerning inferential statistics, the partial least squares technique (PLS) from SEM required validation of the measurement model and validation of the structural model to confirm validity of the proposed model (Ringle et al., 2024).

Measurement model validation

As a first step towards the validation of the measurement model, the reliability of the indicators was analyzed, for this purpose a minimum factor load of 0.7 was established (Field, 2024), those items that did not reach this value were eliminated (IQ1, IQ6, PE1 and US5). Table 3 shows the results.

Table 3
Individual item reliability

Variable	Item	Load	Variable	Item	Load	Variable	Item	Load	Variable	Item	Load
IQ	IQ2	0.727	PE	PE2	0.707	US	US1	0.894	SQ	SQ1	0.812
	IQ3	0.868		PE3	0.892		US2	0.925		SQ2	0.922
	IQ4	0.881		PE4	0.854		US3	0.913		SQ3	0.919
	IQ5	0.781		PE5	0.886		US4	0.715		SQ4	0.923
AQ	AQ1	0.853	PU	PU1	0.818	TR	TR1	0.812		SQ5	0.701
	AQ2	0.915		PU2	0.792		TR2	0.783		SQ6	0.927
	AQ3	0.900		PU3	0.832		TR3	0.876		SQ7	0.891
	AQ4	0.799		PU4	0.867		TR4	0.845			
	AQ5	0.856		PU5	0.798		TR5	0.939			
							TR6	0.892			

Fuente: Authors' own creation (2024).

For internal reliability of constructs three internal consistency measures were obtained: Cronbach Alpha, the composed reliability coefficient and rho_A. Concerning the first one, Hair et al., (2014) suggests that values over 0.70 could be considered satisfactory. For the second and latter, Hair et al., (2014) state that values over 0.80 are significant. Table 4 shows viability of each construct implied in this study.

Table 4
Construct validity

Variables	Cronbach Alpha	Criteria compliance (>0.7)	rho_A	Criteria compliance (>0.8)	Composed reliability	Criteria compliance (>0.8)
AQ	0.916	✔	0.922	✔	0.937	✔
IQ	0.832	✔	0.844	✔	0.889	✔
SQ	0.947	✔	0.963	✔	0.957	✔
PE	0.858	✔	0.881	✔	0.904	✔
PU	0.880	✔	0.882	✔	0.912	✔
TR	0.929	✔	0.932	✔	0.944	✔
US	0.887	✔	0.913	✔	0.922	✔

Fuente: Authors' own creation (2024).

Next, convergent validity and discriminant validity were calculated. The former refers to the case where items from a construct that measure similar concepts, show a significant fit and high correlation among each of them (Figueroa, Vázquez, and Lira, 2020). The evaluation of convergent validity implies the calculation of the average variance extracted (AVE), related to a construct's variance derived from its indicators versus variance related to an error in measurement (Figueroa et al., 2020). Given that an AVE value must show an amount greater than 0.50 (Fornell & Larcker, 1981), table 5 shows the results implying convergent validity.

Tabla 5
Convergent validity AVE

Variables	AVE	Fornell and Larcker (1981)	Criteria compliance
AQ	0.749	>0.5	✔
IQ	0.667	>0.5	✔
SQ	0.764	>0.5	✔
PE	0.703	>0.5	✔
PU	0.675	>0.5	✔
TR	0.738	>0.5	✔
US	0.750	>0.5	✔

Fuente: Authors' own creation (2024).

The complementing indicator in the validation process is discriminant validity. It is used to measure if one construct is different from others in a certain model. Thus, two methods were used to measure such indicator: Heterotrait Monotrait Ratio (HTMT) and Fornell and Larcker. Table 6 shows HTMT results within the threshold of 0.90 (Henseler, Ringle & Sarstedt, 2015), indicating that all constructs are empirically different from each other.

Table 6
Discriminant Validity HTMT.

	AQ	TR	IQ	SQ	PE	US	PU
AQ							
TR	0.449						
IQ	0.651	0.698					
SQ	0.335	0.523	0.466				
PE	0.578	0.490	0.719	0.359			
US	0.447	0.589	0.664	0.242	0.417		
PU	0.600	0.714	0.762	0.478	0.633	0.721	

Fuente: Authors' own creation (2024).

The Fornell and Larcker (1981) method evaluates if AVE's square root is higher than all high correlations among the rest of the variables. Table 7 shows the upper value in each column as higher than the values below, indicating that Fornell and Larcker's criteria is met.

Table 7
Discriminant Validity Fornell and Larcker.

	AQ	TR	IQ	SQ	PE	US	PU
AQ	0.866						
TR	0.424	0.859					
IQ	0.579	0.625	0.817				
SQ	0.319	0.499	0.415	0.874			
PE	0.521	0.456	0.625	0.340	0.838		
US	0.412	0.554	0.576	0.233	0.376	0.866	
PU	0.546	0.657	0.656	0.438	0.559	0.646	0.822

Fuente: Authors' own creation (2024).

Structural model validation

Once the measurement model was validated, the analysis of the structural model was conducted. It implied the strength and measurement of the relation among variables by using two indexes: explained variance (R^2) and standardized path coefficients (β). The first index explains the predictive power of the

model; while the second one indicates the strength of the relations among dependent and independent variables (Johnson et al., 2006).

When analyzing R^2 on dependent or exogenous variables, explained variance must be equal or greater than 0.1 (Falk & Miller, 1992). Moreover, R^2 values of 0.25, 0.50, y 0.75 are considered weak, medium, and strong respectively (Hair et al., 2014). Table 8 shows R^2 values that meet explained variance criteria, and thus, model´s constructs contribute on the predictive power of the model.

Table 8
Explained variance (R^2).

Variable	R^2	Criteria Falk y Miller (1992)	Criteria compliance
FU	0.429	>0.1	✔
UT	0.494	>0.1	✔
CF	0.458	>0.1	✔
US	0.442	>0.1	✔

Fuente: Authors' own creation (2024).

When analyzing the influence of independent variables on dependent variables, path coefficients (β) were calculated (β). Thus, the bootstrap technique was applied using 384 cases from 10,000 subsamples, as the final result computations should be based on 10,000 subsamples (Streukens & Leroi-Werelds, 2016). Table 9 shows Smart PLS results.

Table 9
Smart PLS results (structural equation modeling)

	Hipothesis	Standardized Path coefficients (β)	p Values	Comment
H1	App quality➔ Perceived ease of use	0.236	0.000***	Not rejected
H2	App quality ➔ Perceived usefulness	0.239	0.000***	Not rejected
H3	App quality ➔ Trust	0.065	0.139	Rejected
H4	Information quality➔ Perceived ease of use	0.457	0.000***	Not rejected
H5	Information quality➔ Perceived usefulness	0.443	0.000***	Not rejected
H6	Information quality ➔ Trust	0.471	0.000***	Not rejected
H7	Service quality➔ Perceived ease of use	0.077	0.063	Rejected
H8	Service quality➔ Perceived usefulness	0.173	0.000***	Not rejected
H9	Service quality➔ Trust	0.283	0.000***	Not rejected
H10	Perceived ease of use➔ Usage	-0.011	0.445	Rejected
H11	Perceived usefulness➔ Usage	0.503	0.000***	Not rejected
H12	Trust➔ Usage	0.230	0.000***	Not rejected

Note: p<0.05*, P<0.005**, P<0.001***
Fuente: Authors' own creation (2024).

Conclusion and discussion

This study intended to answer the research question related to the factors that impact on mobile banking usage. A literature review derived in the determination of the conceptual model implying factors (app quality, information quality, and service quality) that impact on perceived ease of use, perceived usefulness, and trust. Additionally, the conceptual model includes the relation between the last three factors and mobile banking usage at the MMA, México.

The main objective was fulfilled through a statistical analysis using data from 384 mobile banking users. Specifically, SEM analysis by applying PLS helped to determine the positive effect of app quality on perceived ease of use and perceived usefulness. H1 was not rejected in this study, due to the positive effect of app quality on perceived ease of use (β =.236 p<.001). It is aligned with Alyoussef (2023) on a learning system at Saudi Arabia. H2 was not rejected in this study, due to the positive effect of app quality on perceived usefulness (β =.239 p<.001). It is aligned with Dokhanian et al. (2022) on a mobile application at a library in Iran. H3 was rejected due to the lack of significance in the relation between app quality and trust (β =.065 p=.139). This differs from Kanaan et al. (2023) on the use of e-government services at Jordania. However, the type of technology analyzed could explain such contrasting results. In Sarkar et al., (2020), app quality has resulted as a trigger of trust in e-commerce. When analyzing mobile banking and banking service suppliers which are heavily regulated, factors such as app design, response time or interphases could be less relevant for users that trust in the app. In turn, information quality and quality service could be factors of greater value for users.

Similarly, such analysis led to determine the positive effect of information quality on perceived ease of use, perceived usefulness, and trust. H4 and H5 were not rejected, due to the positive effect of information quality and perceived ease of use (β =.457 p<.001); as well as on perceived usefulness (β =.443 p<.001). Results are aligned with Alshurideh et al. (2019) who studied user perceptions on an e-learning system at United Arab Emirates. H6 was not rejected, due to the positive effect of information quality and trust (β =.471 p<.001). Results are aligned with Sarkar et al. (2020) and could be explained in terms of the degree in which banking institutions are providing updated, relevant, precise, complete and comprehensible information that increases trust with its mobile banking users.

Additionally, it led to determine the positive effect of service quality on perceived usefulness and trust. H7 was rejected, implying that quality in service is not a factor that has a positive impact on perceived ease of use (β =.077 p=.063). Such result differs from Xu and Du (2018), who studied factors that affect satisfaction on Chinese digital libraries. However, cultural differences in terms of context, as

well as the type of technology analyzed could explain the lack of alignment. In Mexico, mobile banking support is perceived as more effective and trustable by recurring to other users or visiting bank offices.

Nevertheless, H8 consisting of service quality and perceived usefulness, was not rejected (β =.173 p<.001). Such result is aligned with Chi (2018) on an e-commerce system in China. Thus, if mobile banking issues are solved by support personnel, perceived usefulness increases. In the opposite scenario, users could opt for traditional banking. H9 was not rejected (β =.283 p<.001) due to the positive effect of service quality on trust. Such result is aligned with Uzir et al. (2021), who studied trust on a delivery app in Bangladesh. Thus, if support personnel are available with professionalism, users' trust will increase.

Finally, it led to determine the positive effect of perceived usefulness and trust on mobile banking usage. H10 was rejected (β =-.011 p=445) implying that perceived ease of use is not a factor that has a positive effect on mobile banking usage. Such result differs from studies such as Siagian et al. (2022), who studied digital payment acceptance of streaming services in Indonesia. Differences could be due to the characteristics of each mobile app. Moreover, literatire suggests that with a library mobile app (Dokhanian et al., 2022), or an e-learning system (Alyoussef, 2023), there must be a greater perceived ease of use Vs. other similar services. With respect to mobile banking in Mexico, user could be prompt to learn regardless of a perceived ease of use if the app is useful and trustworthy.

H11 was not rejected (β =.503 p<.001) due to the positive effect of perceived usefulness on mobile banking usage. Such result is aligned with Mishra et al. (2023), who published a metanalysis of 214 studies worldwide, and concluded that perceived usefulness is a trigger for the use of technology. Thus, mobile banking in Mexico could increase its use if financial institutions assist customers in their capability to adopt convenient and agile financial services or products through their applications.

The last hypothesis was not rejected (β =.230 p<.001) due to the positive effect of trust on mobile banking usage. Such result is aligned with Li and Li (2023) who analyzed the use of facial recognition technology in China. Thus, if financial institutions promote mobile app-transactions in a safe and trustworthy environment, mobile banking usage will increase. In addition, the protection of sensitive personal information is critical in the financial sector. If mobile apps provide mechanisms to assure such data protection, usage will be triggered due to an increased trustworthiness.

Implying practical implications, results could be used by financial institutions with mobile apps. According to the explained variance, perceived ease of use and perceived usefulness account for 44% of mobile banking usage. Thus, customer growth could be driven by identifying specific requirements (i.e.: balance inquiry, loan request, investment vehicles, bill payments) that could be managed thru an app. Additionally, trustworthiness on the app is a critical driver for its usage.

Similarly, app quality, information quality, and service quality are factors that influence mobile banking usage, The mentioned factors accounted for 49% of perceived usefulness's behavior in the model, while information quality and service quality accounted for 46% of trust's behavior in the model. Thus, if a mobile banking app shows quality in terms of design and response time; as information quality in terms of efficiency, precision, and ease of use; as well as service quality in terms of customer support, perceived usefulness and trust on the app will be increased.

Addressing relevant user factors is crucial, as digital services, especially mobile banking, enhance well-being and convenience by providing greater accessibility and financial autonomy anytime, anywhere, eliminating the need for physical branch visits. These services facilitate money management, offering users more control and financial security. Additionally, they promote financial inclusion by expanding access to banking products in rural areas and for individuals with limited mobility, contributing to greater social equity.

Decision makers in financial institutions could consider the mentioned findings to generate a more attractive app with more usage. Thus, by reaching a greater number of mobile banking customers, such institutions could reduce their operating costs and provide better services. In the opposite side, customers could be benefitted by receiving a mobile banking service of enhanced quality to fulfil or exceed their expectations.

However, further research is needed to better understand mobile banking adoption. It would be beneficial to consider models focused on e-commerce and social commerce, incorporating variables such as compatibility, change management, and user satisfaction. These factors help assess how technology aligns with users' lifestyles, how transitions to new technologies are managed, and whether users are likely to continue using these services in the long term. Additionally, social influence plays a crucial role, as it examines how recommendations and the behavior of others impact technology adoption. Integrating these aspects into future research would complement the findings of this study and provide a clearer picture of how mobile banking is perceived and used.

On the other hand, analyzing and identifying the most frequently used functions in mobile banking would be beneficial. Understanding the features most demanded by users allows developers and financial institutions to refine these functions, ensuring they better meet customer needs.

Additionally, stratified sampling could enhance the representation of users from different financial institutions, enriching the results by capturing variations in mobile banking usage based on the number of customers per institution and the quality of services offered. This methodology enables comparative studies to identify differences in mobile banking applications, not only across financial

institutions but also across regional and national contexts. This helps in understanding user preferences and challenges in mobile banking adoption more effectively.

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