International Journal of Strategic Management and Economic Studies (IJSMES)
ISSN: 2791-299X

EXPLORING THE DETERMINANTS OF M-WALLET ADOPTION: A DELPHI STUDY

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Abstract: The COVID-19 pandemic has accelerated the adoption of mobile wallets globally, especially in Morocco. Amid this digital transformation, our study delves into the challenges and barriers affecting m-wallet adoption, with merchant hesitancy towards electronic payments being a significant obstacle. Several key determinants, including effort expectancy, performance expectancy, social influence, trust, and risk perception, emerged as crucial influencers in this adoption journey.
To comprehensively understand these nuances, we utilized the Delphi method over two rounds, engaging banking application experts. A meticulous literature review led to 39 pivotal criteria from previous research that anchored our expert discussions. Results from these discussions displayed a strengthening consensus on these criteria, emphasizing their significance in the adoption landscape.
These findings are set to inform a detailed questionnaire, tailored for both m-wallet users and non-users, aiming to unearth deeper insights into adoption behaviors. Ultimately, this study provides a holistic view of m-wallet adoption during COVID-19, offering valuable guidance for stakeholders to enhance uptake and bridge adoption gaps in varied user segments.

Keywords: COVID ; Mobile wallets ; Morocco ; UTAUT ; Delphi method; New Technology Adoption; measurement scale.

Digital Object Identifier (DOI): https://doi.org/10.5281/zenodo.10038686

Published in: Volume 2 Issue 5

1. Introduction

The outbreak of COVID-19 has led to significant disruptions affecting individuals and organizations. The uncertainties and unexpected changes brought on by the pandemic have resulted in a noticeable increase in the adoption of banking applications. Various countries, including Morocco, have taken precautionary measures like implementing national lockdowns and social distancing policies to contain the spread and effects of COVID-19 (Hidayat-ur-Rehman, et al (2022), Silanoi et al., 2023).
These measures have had economic repercussions in Morocco, leading to a short-term negative growth rate. However, it is worth noting that the pandemic occurred during a time of heightened global

interconnectedness, largely facilitated by information and communication technologies, especially the internet. Roy, M. N., et al (2022).

To mitigate the risk of COVID-19 transmission via contaminated surfaces, governments have widely embraced social distancing strategies to minimize direct or close contact with infected individuals and surfaces (Salhan., 2023; Eikenberry et al., 2020; Ghaisani, N., (2022), (Sreelakshmi et al., 2020). In this context, the potential transmission of the virus through physical cash usage has been recognized, underscoring the significance of transitioning to online lifestyles, particularly through mobile applications, to adhere to social distancing guidelines like mobile wallets.

The M-Wallet, a new payment system revolutionizing financial transactions, offers a range of services through accounts managed by banking or payment institutions. Users can securely perform person-to-person fund transfers, make payments to merchants displaying "Maroc Pay," settle various bills, and carry out fund withdrawals instantly. (El Haloui., 2023)

Financial inclusion is a crucial aspect of economic development and social empowerment, providing opportunities for individuals to access formal financial services and participate in the modern economy. However, Morocco faces significant challenges in achieving this goal, as a large segment of its adult population remains unbanked. Despite having a high mobile penetration rate of 137% and widespread internet access exceeding 93%, the existing payment systems have not delivered the desired results in promoting financial inclusion.

However, the widespread adoption of mobile payment faces challenges, particularly in merchant acceptance of electronic payments. To overcome these obstacles and promote mobile payment usage, an institutional communication strategy was implemented in collaboration with GP2M. This initiative involved an audiovisual campaign and a strong presence on social networks to educate the public about the benefits of this new electronic payment method. Additionally, integrating the generation of dynamic QR codes into existing electronic payment terminals facilitated M-Wallet acceptance by merchants, especially in large-scale retail outlets.

Morocco faces significant challenges in achieving financial inclusion, with two-thirds of its adult population remaining unbanked. While the mobile payment initiative has shown progress, it has yet to meet expectations. However, in 2021, M-Wallets played a pivotal role, facilitating an impressive 4.9 million transactions totaling 1.1 billion dirhams, according to Bank Al-Maghrib's latest statistics. Remarkably, the number of M-Wallets more than doubled from 3.1 million in 2020 to 6.3 million in 2021.

Of particular note is the significant increase in M-Wallets issued by payment institutions, representing 75% of the total, a remarkable 107% rise in 2021, surpassing the 52% increase in M-Wallets issued by banks. Furthermore, the volume of transactions executed by M-Wallets saw an astounding 242% surge in 2021, with a remarkable 151% increase compared to the previous year. Notably, the majority of these transactions were conducted via M-Wallets issued by payment institutions.

The World Bank identifies a prevailing lack of trust in both public administration and commercial enterprises as a key factor contributing to hesitancy towards mobile payments. To overcome this obstacle, comprehensive communication and awareness campaigns are essential to instill confidence among potential users.

In light of these challenges, Morocco is exploring the implementation of a unified mobile payment brand, inspired by successful experiences with monetics, to enhance the recognition of payment acceptance points, regardless of the users' mobile operators. The objective is to establish a widely embraced solution, but fine-tuning and perseverance are necessary for widespread adoption, as demonstrated in the success stories of other African countries like Kenya.

2. Literature review:

2.1 Mobile wallet:

Mobile wallets, also known as m-wallets, have been a rapidly growing area of interest in the fields of financial technology, consumer behavior, and mobile commerce over the past decade. Studies have explored multiple dimensions of m-wallets, from their technological foundation to user acceptance, security concerns, and implications on monetary policy and financial inclusion. Balu., (2023).

The technological framework of m-wallets has been significantly studied. Ondrus and Pigneur (2007) noted early on the transformative potential of m-wallets, with their research predicting a shift towards mobile payments. They discussed the architectural foundation of m-wallets, which laid the groundwork for further studies. Other researchers like Sun et al. (2016) expanded on this, exploring the integration of mobile wallets with existing banking systems, NFC technology, and digital tokens.

M-wallet adoption and consumer behavior have been extensively studied. Zhou (2012) examined the determinants of mobile wallet adoption, emphasizing perceived usefulness, ease of use, and trust as primary factors. Later research by De Kerviler et al. (2016) showed similar findings and added that socio-demographic factors, such as age and income, play a role in m-wallet adoption.

Security and privacy concerns surrounding m-wallets have also received considerable attention. Kim et al. (2016) studied user perceptions of m-wallet security, concluding that security concerns were a significant factor inhibiting wider adoption. This view is echoed in studies by Shaikh et al (2015), who highlighted the need for robust security measures to gain consumer trust.

The impact of m-wallets on monetary policy and financial inclusion has been another key area of research. Agur et al., (2021) evaluated the impact of digital wallets on monetary policy, particularly with regards to interest rate policy. Similarly, the work of Mbiti et al (2016) investigated m-wallets, like M-PESA in Kenya, to emphasize their potential role in promoting financial inclusion, especially in areas with limited banking infrastructure.

In conclusion, the body of literature on m-wallets is extensive and growing, reflecting the technology's growing importance. Further research is expected to focus on the continuing evolution of this technology, its adoption, and the policy implications as the world moves toward a more digital financial system.

2.2 Concepts and Models

Write The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh and colleagues in 2003, represents a significant advancement in the field of information technology research, where the plethora of theoretical models explaining technology acceptance had created some confusion (Venkatesh et al., 2003). The UTAUT is the result of a substantial effort to unify and streamline the key findings from eight pre-existing technology acceptance models: the Technology Acceptance Model (TAM), the Theory of the Diffusion of Innovation (IDT), the Theory of Reasoned Action (TRA), the Motivation Model (MM), the Theory of Planned Behavior (TPB), and the Social Cognitive Theory (Bandura, 1986, Compeau et al., 1995).

Venkatesh and colleagues' work was based on a rigorous empirical evaluation of these models to identify the best predictors of usage intention in both mandatory and voluntary contexts. This initiative led to the design of a more integrative and accurate model, which identifies four fundamental determinants of the intention to use and the actual use of a technology: performance expectancy, effort expectancy, social influence, and facilitating conditions. Gender, age, experience, and the voluntariness of use were also taken into account as moderating variables, thus allowing for greater precision in analyzing user behavior towards technologies (Venkatesh et al., 2003).

In the years following the creation of the UTAUT, numerous studies have been conducted to verify its relevance and validity in various contexts. For instance, perceived usefulness, which is the degree to which an individual believes that using a system will bring about significant benefits, has been supported by numerous studies as a potent predictor of usage intention (Davis et al., 1992; Taylor et al., 1995; Venkatesh et al., 2000; Venkatesh et al., 2003; Hanif & Lallie, 2021; Hew et al., 2015; Saprikis et al., 2022; Thusi & Maduku, 2020).

Effort expectancy, which represents the perceived ease of use of the system, has also been validated as a factor influencing the acceptance of technologies, as demonstrated by three of the four recent studies that used the UTAUT (Hanif & Lallie, 2021; Hew et al., 2015; Thusi & AADuku, 2020).

Performance expectancy, is the degree to which an individual believes that utilizing a particular system or technology will aid in achieving gains in job performance. In various contexts, from corporate environments to everyday consumer use-cases, performance expectancy remains a primary determinant, substantiated by a plethora of studies (Davis et al., 1992; Venkatesh et al., 2003; Thusi & Maduku, 2020).

On its part, social influence, which is the degree to which a person perceives that others think they should adopt the new system, has been recognized as a key factor in technology adoption, as highlighted in previous studies (Karahanna, et al., 1999; Venkatesh & Davis, 2000; Taylor et al., 1995).

Lastly, facilitating conditions, which evaluate an individual's perception of the presence of an organizational or technical infrastructure to support system usage, have been identified as having a positive impact on the behavioral intention to adopt, especially in the context of mobile banking applications (Saprikis et al., 2022; Hew et al., 2015).

In conclusion, the UTAUT has succeeded in providing a more robust and accurate theoretical framework for understanding the acceptance and use of technologies. However, as its creators have pointed out, the application of this model is intrinsically context-dependent. This means that while the UTAUT is a powerful tool for understanding technology acceptance, it is crucial to continue adapting and validating the model in various situations to ensure its relevance and accuracy

Perceived susceptibility stands as a pivotal element of the Health Belief Model (HBM), shaping health-related attitudes and behaviors (Kim et al, 2020). Contemporary studies underscore its profound influence on preventative measures and screenings, such as the intent to get vaccinated against COVID-19 (Kim et al, 2021) or partake in colorectal cancer screenings (Lin et al., 2020). Such perceptions can gracefully steer individuals towards healthier habits, as observed among Malaysian adolescents (Soe, M et al., 2022).

Perceived severity, a crucial component of the Health Belief Model (HBM), impacts the adoption of new health technologies (Chen et al., 2021). Studies by Liu et al. (2021) and Vaghefi and Tulu (2020) highlight its decisive role in the use of mobile health apps and the evaluation of health technologies. Moreover, perceived severity influences the adoption of telemedicine and medication tracking apps, as demonstrated by Al-Rawashdeh, et al. (2022) and Kim et al. (2021).

trust is defined in various ways, often centered on positive expectations and an acceptance of vulnerability (Paliszkiewicz, 2011; Sztompka, 1999; Six, 2007). Different types of trust, such as cognitive and affective, have been identified (Chowdhury 2005; Lewis et al 1985; Mayer et al 1995). It is considered essential in the context of mobile banking services, especially because of security and privacy concerns (Kim et al. 2009; Lee et al 2009). The antecedents of technological trust include confidentiality, integrity, and authentication, among others (Ratnasingam et al, 2002; Hwang et al. 2007).

Since the 1960s, perceived risk theory has been employed to understand consumer behavior, with various studies focusing on its impact on decision-making (Lin, 2008; Zhou et al., 2007). Perceived risk in online banking encompasses potential losses like security breaches (Reavley, 2005; Littler et al,

2006), transactional errors (Kuisma et al. 2007), societal judgment, time wastage (Forsythe et al 2003), and website malfunctions (Kuisma et al. 2007). Garner (1986) identified six dimensions of perceived risk, including financial, performance, and social risks, although these dimensions can vary depending on the product or service (Featherman et al 2003).

3. Method:

Write For this study, the Delphi method was chosen to design and validate a questionnaire gauging the perception of banking application adoption by professionals in the banking sector within a Moroccan context. One significant advantage of this research method is that it allows the group's diverse views to be replaced with a single representative opinion. As Schmidt et al. (2001) noted, the method aims to enhance the understanding of the previously conceived research model, its constituent concepts, and their respective elements.

The Delphi method, originally developed by Dalkey and Helmer (1963) and later refined by Murry and Hammons (1995), facilitates a structured group communication process, enhancing the focus on selected themes through well-predefined questions grounded in meticulous preliminary research. This not only increases the initial response rate but also narrows down the discussion to well-established work, saving time and fostering concentrated dialogues on specific research topics, as supported by studies from scholars including Jones & Hunter (1995), Huang, et al, (2007) and Huang, et al, (2012)
This method was devised by the RAND Corporation in the 1950s and 1960s (Dakey and Helmer, 1963). It is extensively employed across various research disciplines to measure, forecast, and aid decision-making. It is especially suited for theoretical construction on interdisciplinary issues and identifying emerging trends. It is acknowledged in research on technological and socio-economic forecasting.

By collecting agreement and importance scores, along with comments, this approach yields both quantitative and qualitative data that can be specifically analyzed. Such data allows for a deeper understanding and draws valuable insights for the ongoing research.
Traditionally aiming for a consensus agreement of at least 75%, the method, with its cycle of feedback and questionnaires, ensures anonymity, controlling feedback adeptly to minimize biases from dominant influences, thereby standing as a powerful tool for management audits and detailed analyses yielding both qualitative and quantitative data. Dalkey & Helmer, (1963).
The cycle operates through distinct rounds:

- **Round 1**: Identifying pertinent individuals or a team to outline initial viewpoints based on expertise, which forms the questionnaire's framework. Jones & Hunter (1995)
- **Round 2:** Participants indicate their agreement with the questionnaire statements, leading to a synthesized, updated questionnaire. Jones & Hunter (1995)
- **Round 3:** Participants reassess their stances considering the collective feedback, aiming for satisfactory consensus, and repeating if necessary to attain the desired agreement level. If the third round yields a satisfactory level of agreement, the process comes to a halt and the definitive results are then shared with the participants. If a satisfactory consensus is not reached, the third round is conducted again. Jones & Hunter (1995)

The modified Delphi method, introduced by Murry & Hammons (1995), replaces the traditional first-round open-ended questionnaire with predetermined items. This adjustment enhances efficiency and bases discussions on previously established work (Murry & Hammons, 1995; Sung, 2001). Using an open-ended format in the first round of a Delphi study lowers the risk of overlooking significant details that might not have been considered by the researcher. Conversely, providing participants with a

questionnaire aid in identifying potential issues that they might not recall spontaneously. Nworie, J. (2011).

This modification has proven beneficial in various fields including technological and socio-economic research, aiding in the identification of emerging trends and offering profound insights into complex issues.

In our study, we employed a comprehensive approach to quantitative data analysis, focusing on identifying consensus and divergences across expert propositions. Each expert's numeric responses were systematically recorded into a spreadsheet, facilitating the calculation of key descriptive statistics such as the median and the Average Absolute Deviation (AAD) from the median for each proposition.

The level of consensus or divergence on each proposition was evaluated through a threshold applied to the AAD. An AAD nearing 1 was deemed indicative of a consensus, aligning with the findings of previous research (Isaac, 1996; Vella et al., 2000; Zenou, 2004).

To gauge the overall level of consensus, we utilized the Kendall's concordance coefficient (W), interpreted through the SPSS software. This coefficient provided insight into whether the global consensus level exhibited a significant increase from one step to the next. According to an interpretation table established by Schmidt (1997), a Kendall's W exceeding 0.7 represented a high level of consensus, while a W of 0.5 or above was considered acceptable.

Subsequently, the convergence or divergence of evaluations was assessed using the Wilcoxon signed-rank test, a non-parametric statistical method, focusing on the distribution of the average absolute deviations from the median (AAD) across all propositions. Our hypotheses were structured as follows: H0 posited that the distribution of AAD between rounds 1 and 2 would be identical, whereas H1 proposed that AAD in round 2 would be lower than in round 1, indicating a convergence of responses. The validation of the alternative hypothesis (H1) at a high confidence level (at least 1%) would corroborate the convergence of responses between the two rounds.

4. Results and Discussions

4.1. Phase 1: Selection of the panelist:

For the present study, the Delphi consisted of two rounds. Out of the 20 experts contacted, only 13 participated (65% response rate). The respondents were from various fields to ensure a diversity of opinions (Table 1). All respondents had at least 5 years of experience in their areas of expertise.

The composition of Delphi panels is often diverse in size, but a predominant number of studies feature a relatively small group of participants. Linstone (1978) indicated that seven is the optimal minimal number for a panel, with the precision decreasing significantly with fewer members and increasing marginally with more. The recommendation from Cantrill, Sibbald, and Buetow (1996) is that the determination of panel size should align with the study's objectives. In alignment with this, Turoff (1970) proposed a range of 10 to 50 individuals for a "policy" Delphi, contrasting with health-related studies which may incorporate several hundred participants (Cantrill et al., 1996). Consistent with Turoff's (1970) guideline, the current study's Delphi involved 13 participants across both rounds, demonstrating an adequate count for policy-oriented Delphi. The study was confined to two rounds as Hogarth (1978) observed only slight enhancements in Delphi results with group sizes exceeding 20–25.

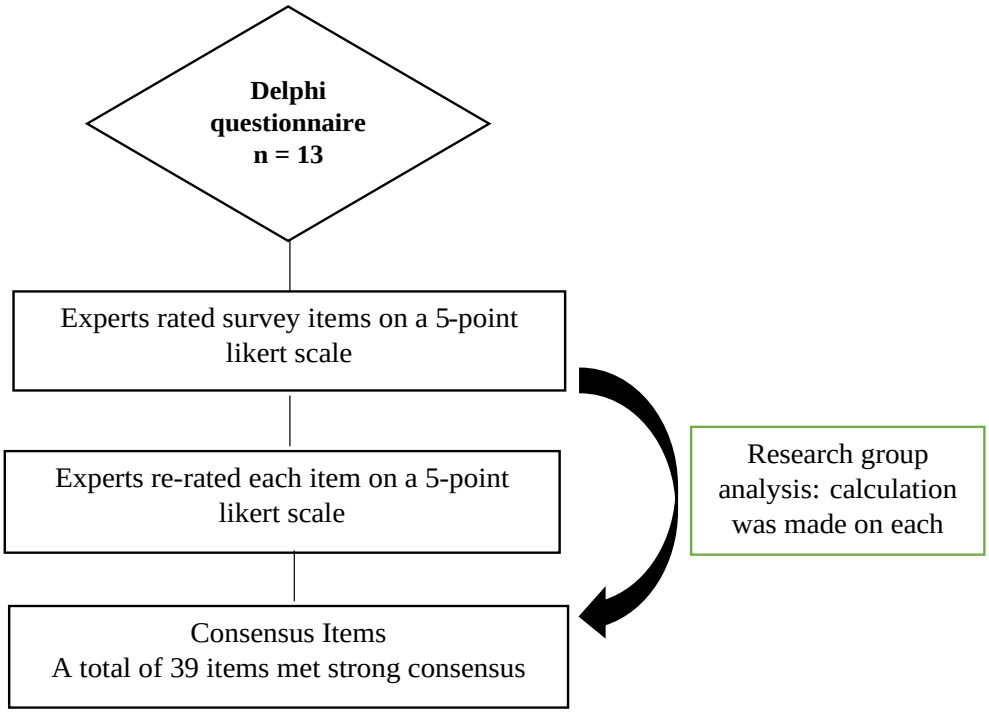

Figure 1. Delphi process

After conducting a literature review on all our variables and operationalizing our constructs, we will proceed to examine, using the exploratory Delphi method, the opinions of experts in banking applications and the factors that explain the behavior of their use and adoption.

To successfully conduct this study, we sought out professionals specialized in the field of banking applications. The selection of these experts is of paramount importance, as it determines the reliability of the results obtained (Adler and Ziglio, 1996; Bolger and Wright, 1994). The validity of conclusions from a Delphi study does not depend on sampling, but rather on the expertise, competence, and above all, the voluntary collaboration of the consulted experts. It is therefore essential to select experts based on their expertise, familiarity with the subject of the study, and their understanding of the inherent characteristics of the topic (Isaac, 1996; Larréché and Montgomery, 1977). It is also recommended to diversify the composition of the expert group to enhance the quality of responses obtained.

Existing literature does not provide specific guidelines in this regard. The composition of the expert panel can vary significantly from one study to another, ranging from a limited number of experts to several hundred. We were able to identify 20 experts in various fields related to banking applications; however, only 13 agreed to participate in the study. Table (1) represents the category of profiles that make up our panel of 13 experts.

Table 1. Expertise and experience of Delphi Panel Participants

Number	Job title	Number of years of of experience
1	Marketing Specialist	>5 years
3	Mobile banking application developer	
2	Banking Business Analyst	
2	Phd Researcher in Information systems	
2	Banking project manager of an IT projet	
3	Cybersecurity engineer	

Source: Based on our collected data.

4.2 Phase 2: Ranking

The ranking approach consists of three phases: brainstorming, narrowing down, and ranking. We conducted an initial survey among the selected experts for the study to assess their degree of agreement on the questions posed following data collection. After this first step was completed, we re-administered the same questionnaire to the same experts but presented them with the results of the first survey, specifically the median and histograms related to each criterion, highlighting in red the response of the particular expert. During this second panel, each expert saw, anonymously, how others had responded and could either maintain their answer or decide to converge towards the consensus opinion. If an expert chose to change their stance, we asked for comments regarding this shift in their position.

As seen earlier in the chapter related to the methodology, we opted for Isaac's (1996) method to analyze our data and measure the level of consensus among experts in each of the two rounds of questioning. This method relies on studying the median, the mean absolute deviation (AAD), Kendall's concordance coefficient, and finally measuring the overall convergence between the two rounds using the Wilcoxon signed-rank test.

Table (2) displays the indices used in the Delphi survey. In fact, the questionnaire comprises 39 criteria, which primarily derive from the literature review developed in the previous chapters.

Table 2. List of questions used in the study

Theme	Item	Reference(s)
Perceived susceptibility	I think I am at high risk of contracting COVID-19	Hsieh et al., (2017)
	I feel more vulnerable to COVID-19 than others.	
	There has been a person among my family members who contracted COVID-19.	Huang et al., (2016)
	I have a high probability of contracting COVID-19 due to my daily habits.	
	Due to my physical health, I am more likely to get COVID-19.	Ahadzadeh al., and (2015)
Perceived severity	I would be afraid of catching COVID-19.	Hsieh et al., (2017)
	Thinking about COVID-19 scares me.	Huang et al., (2016)
	If I were to suffer from COVID-19, it would be serious.	Sun and al (2013)
	If I am faced with COVID-19, I will have difficulties in my professional life.	Ahadzadeh al., and (2015)
	If I am faced with an attack of COVID-19, it will hinder my personal relationships.	

Effort expectancy	Learning to use M-Wallet is easy for me.	Zhou et al.(2010)
	My interactions with M-Wallet are clear and understandable.	Venkatesh et al.,(2003)
	It's easy to find an M-Wallet through which I can do what I want.	Li et Yeh,(2010)
	It's easy for me to become proficient at using M-Wallet.	Luan et Lin,(2005)
Performance expectancy	M-Wallet helps me be more efficient.	Li et Yeh,(2010)
	M-Wallet requires the fewest steps possible to accomplish what I want to do.	Zhou et al.(2010)
	It's easier for me to perform banking transactions through mobile using M-Wallet.	Luan et Lin, (2005)
	I find M-Wallet useful for conducting my banking transactions.	Li et Yeh,(2010)
Social Influence	My peers, colleagues, friends, and family think I should try M-Wallet to manage my bank accounts.	Zolait and Mattila, (2009)
	People who are important to me (boss, supervisor..) think I should use M-Wallet.	Zhou et al., (2010) Venkatesh et al., (2012).
	Those who influence my behavior think I should try mobile banking services like M-Wallet to manage my bank accounts.	
Facilitating Conditions	I have the necessary knowledge that allows me to use M-Wallet.	Venkatesh et al.,(2003)
	I can easily get help from others in case I encounter difficulties using M-Wallet.	
	I have the necessary resources to use M-Wallet (Smartphone, internet..).	

Perceived risk	Using M-Wallet is not secure.	Ozdemir et Trott,(2009)
	My personal information will be disclosed when using M-Wallet.	
	I prefer to use other channels as using M-Wallet can be risky.	Im et al., (2008)
	I avoid using M-Wallet as it involves unexpected risks.	
Trust	Your bank is trustworthy	Gu et al. (2009)
	This bank has the skills to provide good mobile service through M-Wallet.	Li et Yeh., (2010)
	You feel confident in this bank as it takes my interests into account through M-Wallet.	Pavlou, (2003)
	The bank prioritizes me as a customer through M-Wallet.	Malaquias and Hwang (2016)
Intention of usage	I intend to use M-Wallet to manage my bank account in the next 12 months.	Venkatesh et al.,(2003) Šumak, et al (2016).
	I plan to use M-Wallet provided by my bank on a daily basis in the next 12 months.	Kim et al.,(2009)
	I intend to use some of the services offered by M-Wallet because I need them in the next 12 months.	
Adoption of M-wallet	I would use M-Wallet.	Venkatesh et al. (2012)
	I would regularly use M-Wallet.	
	I would spend a lot of time on M-Wallet.	Venkatesh et al. (2012)
	I really want to use the services of M-Wallet to preserve my health.	Alam et al (2020)

Source: Based on the literature review.

4.3 1st round results:

After calculating the mean absolute scores (AAD) of the various criteria selected during the first phase, it became clear that all our criteria generally garnered strong agreement among the 13 experts consulted. Indeed, 39 criteria show high dispersion (AAD > 1).

The results from the analysis of the distribution of AADs by criteria led to a satisfactory conclusion. In fact, a consensus is observed for all the criteria in our questionnaire. To support this observation, the empirical validity of the conclusions is contingent upon the results of a non-parametric statistical test known as the Kendall concordance test. This test assesses the overall degree of agreement among the responses of the consulted experts. For this, we will use the SPSS software to calculate the statistic known as Kendall's W.

In our expert sample, the Kendall correlation test reveals a moderate correlation between the studied variables. The test statistic (Kendall's W) is 0.480, indicating a moderate positive or negative correlation. The p-value is very low (0.000), suggesting a significant correlation between the variables. Thus, the results suggest that there is a statistically significant relationship between the variables in the studied population.

4.4. 2nd round results:

During this second Delphi stage, there is unanimous agreement regarding all the criteria. This observation strengthens the evidence of a marked convergence of opinions during this second phase. However, it is essential to confirm this trend by calculating Kendall's W coefficient, in the same manner as before.

The second Kendall correlation analysis this time indicates a strong correlation between the studied variables. The correlation coefficient (Kendall's W) is 0.720, revealing a robust positive or negative correlation. Moreover, the confidence level is high, as the p-value is very low (0.000), confirming the significant correlation between our variables. Thus, the results strongly suggest the existence of a statistically significant relationship between the analyzed variables.

4.5 Convergence of Results Between the Two Phases: The Wilcoxon Test

The Wilcoxon index was used to evaluate the level of convergence between the two panels by examining the distribution of AAD1 and AAD2 across all criteria. The table (3) extracted from the results obtained on SPSS presents the ranks of the differences AAD_2 - AAD_1. It indicates that there are 24 observations with negative ranks, which means in these cases, the value of AAD_2 is lower than AAD_1. There are no observations with positive ranks, indicating that no cases showed a value of AAD_2 higher than AAD_1. Additionally, there are 15 tie observations, where AAD_2 is equal to AAD_1.

Table 3. Wilcoxon Test's results

Ranks				
		N	**Average Rank:**	**Total of ranks**
AAD_2 - AAD_1	**Negative Ranks**	24[a]	12,50	300,00
	Positive Ranks	0[b]	,00	,00
	Ties	15[c]		
	Total	39		

a. AAD_2 < AAD_1

b. AAD_2 > AAD_1

c. AAD_2 = AAD_1

Source: Based on our empirical results

The statistical test conducted is the Wilcoxon rank-sum test, which determines if the distributions of the differences "AAD_2 - AAD_1" significantly differ from zero. The test statistic Z is -4.335, and the associated p-value is very low (0.000). This suggests that there is a statistically significant difference between the distributions of the differences AAD_2 - AAD_1. (Table 4)

Table 4. Wilcoxon test of significance

Z	-4,335[b]
Asymptotic Sig. (two-tailed)	,000
a. Wilcoxon Rank-Sum Test	
b. Based on positive ranks.	

Source: Based on our empirical results

The results indicate that in the majority of cases, AAD_2 is lower than AAD_1, suggesting an improvement or convergence in the experts' opinions during the second panel of the Delphi analysis. Moreover, the Wilcoxon rank-sum test confirms that there is a significant difference between the distributions of the differences AAD_2 - AAD_1. This can suggest that the results of the second panel showed a more convergent trend compared to the first survey, aligning with our conclusions drawn from the analysis of the Kendall's W coefficient result.

Having demonstrated the convergence of responses among the 13 interviewed experts, we have decided to retain all our criteria as measuring instruments for the variables that make up our research model. All items reached an acceptable consensus following the second Delphi phase, in addition to the significant concordance and convergence tests.

5. Conclusion

In this study, a Delphi method encompassing two rounds was employed to engage experts specializing in banking applications, aiming to uncover the determinants impacting their utilization and adoption. An initial cohort of 20 experts was approached, yielding a participation of 13, which translates to a 65% response rate. The composition and scale of the panel align with the guidelines set forth in the literature, notably by Linstone (1978) and Turoff (1970), endorsing optimal panel size for policy-oriented Delphi studies.

Preceding the Delphi rounds, an exhaustive literature review was undertaken, culminating in the operationalization of diverse constructs and the recognition of 39 criteria, distilled from extensive antecedent research. These criteria served as the foundational elements of the survey dispensed to the expert panel, guaranteeing an in-depth examination of the subject at hand. The assembly of the panel was crucial, prioritizing not only proficiency and competency but also the voluntary propensity to contribute, as accentuated by Adler & Ziglio (1996) and Bolger & Wright (1994).

The findings of the Delphi study yielded multifaceted conclusions. Initially, a foundational consensus on the scrutinized criteria was established, evidenced by a high dispersion (AAD > 1) and a moderate, yet statistically significant Kendall’s W of 0.480, during the first round. This initial agreement saw amplification and reinforcement in the subsequent round, underscored by an elevated Kendall’s W of 0.720 and a negligible p-value, denoting a robust and significant correlation amongst the variables under consideration.

Furthermore, a marked convergence in opinions between the rounds was noted, corroborated statistically by the Wilcoxon signed-rank test. The resulting Z statistic of -4.335, along with a p-value of 0.000, signaled a significant differential between the distributions of AAD_2 and AAD_1, affirming the observed convergence in expert perspectives.

This transition from moderate to robust correlation, complemented by the authenticated convergence of opinions, not only underscores the reliability of expert responses but also accentuates the robustness of the selected criteria. These validated criteria are henceforth poised to be instrumental in assessing the adoption levels of m-wallets by both users and non-users, bolstering the integrity and depth of the forthcoming research phases.

Upon the culmination of the Delphi study, and given the validated convergence and significant results of concordance and convergence tests, a decisive resolution was attained to retain all 39 identified criteria. These meticulously validated criteria stand as robust and pertinent measures of the variables integral to our research model.

The validated items are set to underpin a subsequent questionnaire, tailored to gauge the adoption levels of m-wallets among both user and non-user demographics. This structured investigative tool aims to delve into behavioral nuances and preferences, offering a granular understanding of the adoption landscape.

Capitalizing on the validated criteria, the questionnaire is meticulously designed to explore the multifaceted aspects of m-wallet adoption, thereby providing a holistic and detailed insight into the factors and barriers influencing adoption. The incorporation of both user and non-user perspectives in the questionnaire is imperative for a comprehensive view of the m-wallet adoption ecosystem, enabling a comparative analysis and unearthing differential adoption drivers and barriers. This dual perspective approach facilitates the generation of nuanced insights and the crafting of bespoke strategies, aiming to augment the adoption of m-wallets across diverse user segments.

Reference

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