

# Mapping Mobile Payment Adoption: Customers' Trends and Challenges

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## Abstract

The continuous advancement of the mobile technology industry and the wide acceptance of mobile devices worldwide have provided great prospects to customers regarding their monetary transactions. As a result, numerous individuals use their mobile devices, mainly their smartphone; to pay online and even more are expected to take advantage of the mobile payments in the near future. This study conducts an up-to-date review to survey the landscape of individuals' behavioral intention to adopt m-payments systems and services in the last five years (2015-2019 period). In specific, the aim of this review paper is twofold. First, it collects and summarizes the review papers that focus on customers' m-payment adoption intention as an umbrella review. Second, it analyzes all recently top quantitative primary research papers that examined the aforementioned topic and presents a detailed examination of their objectives and research outcomes as a scoping review. Both of these analyzes are expected to increase the understanding of m-payments adoption and their underlying factors that influence individuals' decision to adopt them, as well as reveal research gaps. Consequently, the paper aims to be a useful tool for mapping the research trends in current literature regarding mobile payment.

**Keywords:** mobile payment, intention to adopt, consumer mobile payment behavior, umbrella review, scoping review

## 1. Introduction

Mobile payment (m-payment) is an up-to-date and highly interested topic and a field that is evolving really fast as it takes advantage of the continuous progress of the mobile technology industry and the wide acceptance of the mobile devices (m-devices) and systems. M-payment is defined as any type of individual use of mobile devices linked with a wireless network supporting the process of financial interactions. In 2007, Mallat defined m-payment as a monetary, directly or via an intermediate transaction, from the buyer to the seller by the use of m-device. Similarly, Liébana-Cabanillas et al. (2014) mentioned that any type of customer's or merchant's activity linking a mobile device with a wireless telecommunication network, enabling the successful completion of a financial transaction can be characterized as m-payment. Thus, individuals as well as firms can utilize m-devices, mainly smartphones, and take advantage of their ability to be connected with wireless communication technologies aiming at paying for goods or services (Dahlberg et al. 2008). Overall, according to (Chandra 2017), m-payment has some specific characteristics in any economic transaction which are ease of use, atomicity, availability, confidentiality, security and profitability.

The wide acceptance of m-payments as a novel payment channel tempted various researchers to examine the topic. Therefore, there have been an increase in the volume of literature concerning m-payments, most of which are from the perspective of consumers. Among these investigations, a number of variables (or factors) were selected to study m-payment services and systems adoption; and different research models were applied. However, despite the fact that numerous studies have been conducted about the adoption of m-payments, there is still a need to systematically bring this research efforts together in order to inform m-payment providers and potential users about enablers and inhibitors affecting the adoption of m-payment services based on several technology adoption frameworks; and used in different geographical and cultural areas during the last years. This

attempt aims to reveal the contemporary factors that influence the adoption of m-payments by the customers, and inform future research about the main gaps of the previous literature.

The scope of this paper is to increase the understanding related to mobile payments adoption and their underlying factors that influence individuals' decision of usage of m-payments, reviewing m-payment adoption papers per continent and country. Furthermore, the basic framework theories and intention models most frequently utilized to investigate m-payments customers' acceptance have been explored.

The main contribution of this research is a) to collect and summarize the review papers published between 2015 and 2019 as an umbrella review and b) to analyze all recently top quantitative primary research papers which investigated individuals' mobile payment adoption intention the last five years -2015 to 2019- as a scoping review, with the aim to present an updated view based on the most recent empirical studies on this topic; and identify issues that have been examined or have not deeply investigated; and need to be updated taking into consideration the recent research. In specific, our study conducts an up-to-date review to survey the landscape of individuals' behavior towards their intention to adopt m-payments systems along with the following Research Questions (RQ):

RQ1: Which publishing companies have demonstrated the most papers and which of them are highly cited?

RQ2: Which are the most active continents and countries that have undertaken m-payment adoption studies?

RQ3: Which technology adoption theories and intention models have been used more frequently the last years?

RQ4: What factors are enablers or inhibitors regarding the adoption of m-payment?

RQ5: Among all these factors, which are used more frequently and found to be the most significant ones?

In our study we address the above mentioned issues by systematically reviewing the m-payment adoption literature published in recent years (2015-2019 period). Therefore, it is useful to study the relevant trends from the recent literature to predict possible adverse reactions when adopting mobile payments, as well as to provide constructive suggestions for future research and practice.

The following session outlines the methodologies adopted to both umbrella review and scoping review. The paper, then, presents the outcomes of the relevant literature before recommending a series of future research proposals.

## 2. Research Methodology

Two different research approaches were followed with the aim to respond to both aims of the study, which are an umbrella review and a scoping review regarding individuals' m-payment adoption. The combination of them is considered as an opportunity for providing a 'big picture' of the most recent reviews and empirical research studies in this topic; and identify issues that have been examined or have not deeply investigated and need to be further studied in the future. Moreover, the current review helps to answer the research questions of this paper.

Therefore, the first aim of the article is to collect and summarize the review papers published between 2015 and 2019 as an umbrella review. Umbrella review, also called an overview of reviews, is a comparatively new technique of evidence synthesis that has emerged as a result of the continuously increasing in the number of systematic reviews papers published. According to Becker and Oxman (2008) and Smith et al. (2011), it summarizes related evidence from various SLRs (Systematic Literature Review) into one handy and practical paper with the aim to response to a specific research question. Overall, this type of review employs the majority of the analysis procedure, techniques and methodological steps which are utilized in systematic literature reviews (Paré et al. 2015). Therefore, it can be inferred that it can provide a complete guide to gain a clean understanding of a topic. This is the reason why it was selected as the most preferable type of review to address the first aim of this paper.

A detailed investigation in the following databases conducted. In specific, 1) ACM Digital Library, 2) AIS eLibrary, 3) Emerald Insight, 4) Google Scholar, 5) Inderscience Publishers, 6) IEEE Xplore Digital Library, 7) ProQuest Direct, 8) Wiley and Sons, 9) Taylor and Francis, 10) Sage Journals, 11) Springer Link and 12) Science Direct were examined in order to search for m-payment literature review papers. The search terms were ("mobile payment adoption" or "m-payment adoption") and ("literature review" or "critical review" or "systematic literature review"). A total of fifteen literature review papers were revealed. Then, all papers were further screened through their keywords and by reading the abstract. Five of them were excluded because they examined a specific m-payment technology, such as mobile wallets, NFC payments; or dealt with technical aspects of the technology. Therefore, the analysis revealed a total of ten articles that investigated the topic.

Afterwards, a comprehensive collection, analysis and presentation of all top quantitative primary research papers

which investigated individuals' m-payment adoption intention the last five years -2015 to 2019- was conducted aimed to respond to the second aim of the study and answer to the aforementioned research questions of the scoping review. Specifically, a scoping review intends to present a first sign of the prospective extent and nature of the available literature on a specific subject (Arksey & O'Malley, 2005; Daudt et al., 2013; Levac et al., 2010). According to Kitchenham et al. (2011), Rumrill et al. (2010) and Arksey and O'Malley (2005), researchers might conduct such a review when they want to investigate the size, the variety and the nature of research activities, detect research gaps in the existing studies, or determine the importance of carrying out a full systematic review. Scoping reviews have a tendency to focus on the extent of coverage of the literature rather than the depth of coverage (Rumrill et al., 2010; Arksey & O'Malley, 2005). According to Tricco et al. (2016), they are utilized to reveal knowledge gaps, define research plans and detect suggestions for decision-making. The main goal of such a review is to be as comprehensive as possible to the topic examined (Arksey & O'Malley, 2005). Exclusion and inclusion criteria should be applied to help researchers exclude literature which are not aligned with the primary research questions (Paré et al. 2015). According to Anderson et al. (2008), if scoping reviews focus on investigating the nature and the extent of a broad subject are characterized as mapping reviews. The research questions in these studies are broad and regularly are associated with research trends. Paré et al. (2015) pointed out, however, that there is not any defined plan to systematically review the literature based on this type of review. As an alternative, researchers may just consider setting a precise timeframe for the literature to be mapped; for example, investigate the studies that have been conducted in the last 5 years. Therefore, regarding the methodology applied for the final selection of the papers, it was conducted in four steps which are as follows.

First, the study begins looking for empirical research publications in the following databases: 1) ACM Digital Library, 2) AIS eLibrary, 3) Emerald Insight, 4) Google Scholar, 5) Inderscience Publishers, 6) IEEE Xplore Digital Library, 7) ProQuest Direct, 8) Wiley and Sons, 9) Taylor and Francis, 10) Sage Journals, 11) Springer Link and 12) Science Direct were "mobile payment adoption" or "m-payment adoption". All papers that did not include m-payment in their title were excluded.

Second, after the initial assessment, all selected articles were further screened through their keywords and by reading the abstract. A number of papers concentrated on the monetary impact of m-payment were excluded. There were also removed papers that deal with specific technical aspects, such as communication protocols and processes, as well as security issues.

Third, the reference sections of the remained papers were also reviewed to find potential additional m-payment empirical studies (review backward reference list checking). After deleting the duplicate and non-full text articles, a total of 183 papers from the 2015-2019 period was remained.

Forth, each of them was further reviewed based on the following inclusion criteria:

- Involved m-payment adoption intention as a primary condition.
- Conducted a quantitative primary study.
- Was written in English language.
- Did not examine a specific m-payment technology, such as mobile wallets, NFC payments, etc.
- Proposed and examined a well-developed conceptual research framework or model with constructs impacting adoption.
- Was published in a peer-reviewed academic journal that was included in one of the four quartiles -Q1-Q4 - of the SCImago Journal Rank.

After a persistent and detailed examination process 27 out of the 183 empirical papers met the aforementioned criteria and comprised the final sample (Table 2). A number of papers that focused on retailers or enterprises m-payment adoption were excluded because there were not relevant to individuals' adoption. There were also a number of rejected papers that examined m-payment via a behavioral theoretical model/ framework but were not focused on m-payment adoption. For example, various articles focused on continuance intention or level of m-payment use. Furthermore, primary studies stating only percentages of adopters were excluded as well. Therefore, the criteria provided revealed the most significant empirical studies that had research models/ frameworks and investigated individuals' m-payment adoption from a broad perspective; and were published in the top academic journals as well.

### **3. Mobile Payment Adoption Literature Review**

This section describes the results of both umbrella review and scoping review. The section starts with the analysis and presentation of 10 literature review papers (umbrella review) within the 2015-2019 period.

Afterwards, the scoping review of the top quantitative empirical papers which investigated customers' m-payment adoption intention the last five years was conducted to answer the research questions.

### *3.1 Umbrella Review*

Thus, concerning mobile payment investigation, it immediately began since the first m-payment transaction took place in 1997. Dahlberg et al. (2015) conducted a critical systematic literature review in order to assess the research improvements regarding the m-payment systems between 2007 and 2014; and critically analyzed differences and similarities with their previous results (Dahlberg et al. 2008). In specific, the aim was to compare outcomes and statistics about the m-payment ecosystem, such as specific research topics, usage of several research methodologies and approaches, etc., between the two periods (1998-2006 versus 2007-2014). The literature review of 2015 revealed that research on this subject has continued to focus mainly on technology aspects and individuals' adoption, without extending the research efforts to the provision of additional knowledge on remaining factors affecting the m-payment ecosystem. Finally, they proposed new prospects to strengthen future m-payment research avenues.

Based on trends identified in m-payment research, Dennehy and Sammon (2015) concluded that the investigation of m-payment constitutes an established research area that will continue to receive increased attention from diverse disciplines in the coming years, realizing the potential and the enrichment of m-payment services, as the adoption of such services is becoming more and more imperative. Customers' adoption still seems to be of interest to many researchers to date, but the focus remains on investigating the adoption of payments in specific countries separately, while a comparison of the results of the survey, which was conducted in more than one country with reference to differences between them, does not attract yet the interest of researchers. Furthermore, regarding adoption issues, recently studies examined in specific technology, security and architecture.

Results of literature analysis conducted by Patil et al. (2017), revealed that first of all performance expectancy and perceived usefulness, followed by perceived ease of use are the factors affecting positive consumers' behavioral intention towards mobile payment services, while perceived risk appears as the main inhibitor. Furthermore, regarding the methodology used to study factors affecting the adoption of individuals regarding m-payment, the majority of researchers adopted Technology Acceptance Model (TAM) and several extensions of this methodology followed in more recent years by the Unified Theory of Acceptance and Use of the Technology (UTAUT).

Lai (2017a) provides a useful knowledge by examining in detail the development of methodologies and theories of technology adoption based on the literature review with emphasis on the possible application of the innovation of the single electronic payment platform. The results of this work can help researchers understand the appropriate methodology they will choose.

In 2019 Abhipsa Pal et al. stated research questions regarding the important contextual factors that influence m-payment adoption in the current literature. The outcome of this effort was the development of a "context-based framework for m-payment adoption and use" that can be used as a guideline for future researchers. Finally, they conducted an interview empirical study exploring m-payment users in India to check the validity of their proposed model.

Furthermore, Liu et al. (2019a) mentioned that factors such as perceived usefulness, perceived ease of use, trust and perceived risk, social influence, should be carefully examined and integrated into payment services and their promotion in order to motivate consumers' behavior.

The main purpose of the study of Tansakul et al. (2019) was to review various peer-reviewed scholarly articles to point out the important factors that directly influence user behavior and m-payment adoption based on different adoption theories and methods.

According to results of the research study of Tse et al. (2019), more attention has to be paid to security factors, while the main factors identified as affecting customers' adoption of m-payment products are risk issues, age and gender, and finally the type of mobile payment platforms.

Furthermore, results of Harris et al. (2019) review analysis supported the previous study from Dahlberg et al. (2015). In specific, they also confirmed that the TAM and UTAUT/UTAU2 models have dominated the investigations into m-payment systems' adoption. To better investigate the topic from a personal use perspective, they proposed a "risk/ trust valence" framework incorporating security and privacy constructs.

Finally, the systematic literature review conducted in 2019 by Karsen et al. revealed 44 factors that influence individuals on using m-payment in financial institutions as the basis for the development of mobile payment

products. In specific, they propose 17 key technological factors which can be used to develop up to date mobile payment services appropriate for the needs of financial institutions.

Table 1 summarizes the literature review papers along with their characteristics. These are their objectives, their research outcomes and their review period.

Table 1. Mobile payment adoption literature review papers – 2015-2019 (10 review papers)

#	Literature review paper (author/s)	Objectives	Review period and number of papers	Research Outcomes
1	Dahlberg et al. 2015	To critically analyze m-payment research (2007-2014) and compare statistics and methodologies about m-payment systems between the two periods (1998-2006 vs 2007-2014)	87 papers between 2007 and 2014	Technology and consumer adoption are still the dominant categories, followed by ecosystem research.
2	Dennehy and Sammon 2015	A review of literature aimed at identifying the key research themes and methodologies investigated on m-payments	Review of the 20 most cited papers since 1999 and the 20 most recently published papers since August 2014	Consumer adoption remains the most popular area of focus by researchers. Specifically, recently studies examine technology, security and architecture regarding adoption issues.
3	Lai 2017a	To present the literature review of theories and methodologies leading to an innovative “single platform e-payment theoretical framework”	-	Aims to help future researchers conceptualize, distinguish and comprehend underlying technology models and theories related to m-payment adoption. Most significant influencing factors related to customers’ behavioral intention: performance expectancy & perceived usefulness, perceived ease of use. Inhibitor to the adoption of m-payments: perceived risk. TAM (extensions) followed by UTAUT usage to explore consumer adoption to m-payment.
4	Patil et al. 2017	To review and analyze digital and m-payment adoption and use	-	Development of a context-based framework for m-payment adoption and use. Factors with significant impact over individuals’ intention to use m-payment: perceived usefulness, perceived ease of use, perceived risk, trust, social influence.
5	Pal et al. 2019	To study the factors that influence m-payment adoption in the extant literature and contextual variables	79 papers up to 2018	Development of a context-based framework for m-payment adoption and use. Factors with significant impact over individuals’ intention to use m-payment: perceived usefulness, perceived ease of use, perceived risk, trust, social influence.
6	Liu et al. 2019a	A meta-analysis was conducted to build consensus about what are the factors that significantly affect consumers’ m-payment behavior	61 papers between 2008 and 2017	Development of a context-based framework for m-payment adoption and use. Factors with significant impact over individuals’ intention to use m-payment: perceived usefulness, perceived ease of use, perceived risk, trust, social influence.
7	Tansakul et al. 2019	The main purpose was to review various peer-reviewed articles in order to indicate	39 papers between 2015	Describe users’ adoption of various m-payment

		the main adoption factors that directly affect users' behavioral intention	and 2018	approaches. encompassing methods, theories, technologies, adoption models, and variables of the adoption models.
8	Tse et al. 2019	This paper studies the factors enabling and hindering m-payments based on research articles in recent years	34 papers	M-payment acceptance is driven by the development of a m-payment platform, easy-to-use and more secure.
9	Harris et al. 2019	To review previous research that focuses on consumer m-payment adoption and presents the major methodologies used	57 papers up to fall 2018	TAM and UTAUT/ UTAUT2 were the primary models utilized. The authors proposed the "risk/trust valence framework" taking into consideration security and privacy antecedents.
10	Karsen et al. 2019	To present the key technological factors used in m-payment	54 papers between 2014 and 2019	44 factors influence individuals on using m-payment in financial institutions. Furthermore, there are 17 basic technological related factors that impact m-payments.

### 3.2 Scoping Review

Regarding the scoping review, the research questions along with their results are as follows.

RQ1: Which publishing companies have demonstrated the most papers and which of them are highly cited?

The findings present that the majority of the empirical papers were published very recently; in the year of 2019 (9), followed by 2015 (7), 2016 (5), 2018 (5) and 2017 (1) (Table 2). Regarding publishing companies, Elsevier tops the list (6), followed by Taylor and Francis (5), Emerald (3), Inderscience (3), Springer (3), Wiley (3), Sage (2), MDPI (1) and SERSC (1).

Table 2. Mobile payment adoption empirical papers, 2015-2019

#	Authors	Year	Source
1	Xin et al.	2015	Taylor and Francis
2	Koenig-Lewis et al.	2015	Taylor and Francis
3	Yan and Yang	2015	Science and Engineering Research Support Society (SERSC)
4	Musa et al.	2015	Inderscience
5	Slade et al.	2015	Wiley
6	Teo et al.	2015	Emerald
7	Teo et al.	2015	Inderscience
8	Phonthanakitithaworn et al.	2016	Sage
9	Phonthanakitithaworn et al.	2016	Emerald
10	Qasim and Abu-Shanab	2016	Springer
11	Ting et al.	2016	Elsevier
12	Oliveira et al.	2016	Elsevier
13	Gao and Waechter	2017	Springer
14	Humbani and Wiese	2018	Taylor and Francis
15	Shankar and Datta	2018	Sage
16	Su et al.	2018	Taylor and Francis
17	Johnson et al.	2018	Elsevier
18	Liébana-Cabanillas et al.	2018	Elsevier

19	Sharma et al.	2019	Taylor and Francis
20	Lee et al.	2019	Elsevier
21	Chen et al.	2019	MDPI
22	Park et al.	2019	Elsevier
23	Shahin et al.	2019	Inderscience
24	Sinha et al.	2019	Emerald
25	Park et al.	2019	Wiley
26	Liu et al.	2019b	Springer
27	Moorthy et al.	2019	Wiley

From the total of the 27 papers, there were only four journals -Computers in Human Behavior, Journal of Retailing and Consumer Services, Information Systems Frontier and International Journal- with two publications during this 5-year period. The rest of the journals demonstrated one publication. Regarding the most cited papers, Table 3 presents the top-5 articles. As it is clearly depicted, Oliveira's et al. (2016) paper tops the list with 472 citations followed by Slade's et al (2015) article with 372 citations.

Table 3. List of the top-5 most cited papers, as of October 5th 2020

#	Authors	Year	Journal	Citations
1	Oliveira et al.	2016	Computers in Human Behavior	472
2	Slade et al.	2015	Psychology and Marketing	372
3	Teo et al.	2015	Industrial Management and Data Systems	213
4	Koenig-Lewis et al.	2015	The Service Industries Journal	139
5	Qasim and Abu-Snab	2017	Information Systems Frontier	117

RQ2: Which are the most active continents and countries that have undertaken m-payment adoption studies?

Concerning the regions where researchers were focused on, the majority of the papers were based on respondents from Asian countries (Table 4). China and Malaysia were the most preferred ones resulting to the publication of four papers on each of them. However, very few studies from the Europe and the Americas were revealed. According to eMarketer's global m-payment users' report (Merchantsavvy, 2020), there were many countries in both continents with slow and very slow adoption rates in 2019. For example, m-payment adopt rate is 10.2% in Mexico, 12.5% in Germany, 14.6% in Argentina and Brazil; and 15.6% in France among smartphone users. Similarly, a comparative small number of studies were found out from Africa and Oceania where m-payment adoption rates are expected to be even lower.

Table 4. Mobile payment adoption papers per continent and country

Continent	Country	Quantity	Reference
Africa	South Africa	1	Humbani and Wiese 2018
Americas	USA	2	Johnson et al. 2018; Park et al. 2019a
	China	4	Yan and Yang 2015; Su et al. 2018; Chen et al. 2019; Liu et al. 2019b
	India	2	Shankar and Datta 2018; Sinha et al. 2019
	Iran	1	Shahin and Mahyari 2019
	Jordan	1	Qasim and Abu-Shanab 2016
Asia	Malaysia	4	Teo et al. 2015a,b; Ting et al. 2016; Moorthy et al. 2019
	Oman	1	Sharma et al. 2019
	Qatar	1	Musa et al. 2015
	South Korea	2	Park et al. 2019b; Lee et al. 2019
	Thailand	2	Phonthanukitithaworn et al. 2016a,b
	France	1	Koenig-Lewis et al. 2015
Europe	Portugal	1	Oliveira et al. 2016
	Spain	1	Liébana-Cabanillas et al. 2018
	UK	1	Slade et al. 2015b
Oceania	Australia	1	Gao and Waechter 2017
	New Zealand	1	Xin et al. 2015

RQ3: Which technology adoption theories and intention models have been used more frequently the last years?

Out of the 27 papers, in 8 studies the Technology Acceptance Model (TAM) was applied (Table 5). Specifically, in all of them the researchers tried to overcome the limitations of TAM to explain behavioral adoption intention by enhancing its original model with other constructs. TAM was also used as a part of a combined proposed conceptual model where more than one of the basic technology adoption theories was simultaneously applied. The presentation of the technology adoption theories and intention models utilized from the researchers of the sample is depicted on Table 5.

Table 5. Technology adoption theories and intention models

Technology Adoption Theories and Intention Models	Quantity	Reference
TAM	8	Yan and Yang 2015; Phonthanakitithaworn et al. 2016a,b; Liébana-Cabanillas et al. 2018; Shankar and Datta 2018; Lee et al. 2019; Liu et al. 2019b; Sharma et al. 2019
UTAUT	5	Musa et al. 2015; Slade et al. 2015b; Teo et al. 2015a,b; Qasim and Abu-Shanab 2016
UTAUT2	1	Moorthy et al. 2019
IDT	1	Johnson et al. 2018
TPB	1	Ting et al. 2016
TRI (Technology Readiness Index)	1	Humbani and Wiese 2018
TAM and IDT	1	Su et al. 2018
TAM and UTAUT2	1	Koenig-Lewis et al. 2015
TAM and ISS (Information System Success) Model and Transaction Cost Economics	1	Gao and Waechter 2017
Mix Used	1	TAM, UTAUT, TRA, IDT, TPB and SCT (Social Cognitive Theory)
	1	UTAUT2 and IDT
Other (framework by Authors)	5	Xin et al. 2015; Chen et al. 2019; Park et al. 2019a,b; Sinha et al. 2019

RQ4: What constructs/ factors are enablers or inhibitors regarding the adoption of m-payment?

RQ5: Among all these factors, which are used more frequently and found to be the most significant ones?

Table 6 presents the factors that were dispersed in the m-payment adoption literature. The analysis revealed 32 enablers and 7 inhibitors in the 27 papers. Researchers confirmed that some of the factors did impact m-payment adoption intention only directly (e.g., facilitating conditions and governmental support) or indirectly (e.g., customization and technology anxiety). However, there are quite a few of them that had a dual effect -directly and indirectly- as well. For example, Oliveira et al. (2016) and Gao and Waechter (2017) proved that compatibility and convenience impact the dependent variable in both ways; directly and indirectly, via their conceptual models in correspondence.

Table 6. Constructs/ Factors that encourage or inhibit m-payment adoption

Constructs/ Factors	Directly Affect m-payment Behavioral Intention		Indirectly Affect m-payment Behavioral Intention	
	Quantity	Quantity	Quantity	Quantity
<b>Enablers/ Facilitators</b>				
Absorptive capacity	Chen et al. 2019	1		
Accessibility/ Ubiquity			Yan and Yang 2015; Johnson et al. 2018; Lee et al. 2019	3
Affinity	Chen et al. 2019	1		
Additional value	Chen et al. 2019	1		
Attitude	Ting et al. 2016; Lee et al. 2019; Park et al. 2019a	3		
Benefit/ Economic Benefit/ Relative advantage/ Additional value	Gao and Waechter 2017; Johnson et al. 2018; Chen et al. 2019	3	Park et al. 2019a,b; Sharma et al. 2019	3

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Experiential benefit		
Compatibility	Oliveira et al. 2016; Phonthanukitithaworn 2016a,b; Humbani and Wiese 2018; Chen et al. 2019	Oliveira et al. 2016; Liébana-Cabanillas et al. 2018; Lee et al. 2019
Convenience/ Perceived transaction convenience	Gao and Waechter 2017; Humbani and Wiese 2018; Chen et al. 2019	Gao and Waechter 2017; Park et al. 2019a 2
Customization		Sharma et al. 2019 1
Effort expectancy	Teo et al. 2015a,b 2	Musa et al. 2015; Teo et al. 2015a; Oliveira et al. 2016 3
Facilitating conditions	Teo et al. 2015a,b; Moorthy et al. 2019; Sinha et al. 2019 4	
Governmental support	Chen et al. 2019 1	
Enjoyment/ Hedonic Motivation	Moorthy et al. 2019 1	Koenig-Lewis et al. 2015; Park et al. 2019a 2
Quality (system/ information/ service)		Gao and Waechter 2017 1
Innovativeness	Slade et al. 2015b Oliveira et al. 2016; Chen et al. 2019 3	Oliveira et al. 2016; Liébana-Cabanillas et al. 2018; Shankar and Datta 2018
Knowledge/ Internet experience/ Technology Readiness	Koenig-Lewis et al. 2015; Su et al. 2018 2	Sinha et al. 2019 1
Mobility		Liébana-Cabanillas et al. 2018; Liu et al. 2019b; Sharma et al. 2019 3
Network Externalities	Qasim and Abu-Shanab 2016 1	Lee et al. 2019 1
Perceived behavioral control	Ting et al. 2016 1	
Perceived Expressiveness	Shahin and Mahyari 2019 1	
Perceived Ease of Use	Phonthanukitithaworn 2016a; Johnson et al. 2018; Shankar and Datta 2018; Liu et al. 2019; Sinha et al. 2019 5	Yan and Yang 2015; Phonthanukitithaworn 2016a; Ting et al. 2016; Liébana-Cabanillas et al. 2018; Lee et al. 2019; Liu et al. 2019b; Sharma et al. 2019
Perceived safety		Ting et al. 2016 1
Perceived Usefulness	Koenig-Lewis et al. 2015; Liébana-Cabanillas et al. 2018; Shankar and Datta 2018; Liu et al. 2019b; Sharma et al. 2019 5	Yan and Yang 2015; Ting et al. 2016; Lee et al. 2019 3
Performance expectancy	Musa et al. 2015; Slade et al. 2015b; Teo et al. 2015b; Oliveira et al. 2016; Qasim and Abu-Shanab 2016; Moorthy et al. 2019; Sinha et al. 2019 7	
Reputation of mobile service		Xin et al. 2015 1

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provider/ vendor	Musa et al. 2015; Oliveira et al. 2016; Johnson et al. 2018; Liébana-Cabanillas et al. 2018; Moorthy et al. 2019; Sharma et al. 2019	Xin et al. 2015; Yan and Yang 2015; Park et al. 2019a	3
Security/ Structural assurance			
Self-Efficacy	Shankar and Datta 2018	Shankar and Datta 2018; Sharma et al. 2019	2
Social influence/ Subjective Norms	Koenig-Lewis et al. 2015; Musa et al. 2015; Slade et al. 2015b; Oliveira et al. 2016; Phonthanukitithaworn 2016a,b; Qasim and Abu-Shanab 2016; Ting et al. 2016; Sinha et al. 2019	Koenig-Lewis et al. 2015; Liébana-Cabanillas et al. 2018; Shankar and Datta 2018; Park et al. 2019a	4
Transaction speed	Teo et al. 2015a	Teo et al. 2015a	1
Trialability		Johnson et al. 2018	1
Trust	Teo et al. 2015b; Xin et al. 2015; Yan and Yang 2015; Phonthanukitithaworn 2016a,b; Qasim and Abu-Shanab 2016; Gao and Waechter 2017; Shankar and Datta 2018; Park et al. 2019b; Shahin and Mahyari 2019; Sharma et al. 2019	Slade et al. 2015b; Ting et al. 2016; Gao and Waechter 2017; Lee et al. 2019	11
Visibility Inhibitors	Johnson et al. 2018		1
Asset specificity		Gao and Waechter 2017	1
Cost	Phonthanukitithaworn 2016a; Humbani and Wiese 2018; Liu et al. 2019b	Teo et al. 2015a	1
Insecurity of Opportunity	Humbani and Wiese 2018		1
mobile service provider/ vendor		Xin et al. 2015	1
Technology anxiety		Park et al. 2019a	1
Risk (Environmental Risk/ Privacy Risk)	Lewis et al. 2015; Phonthanukitithaworn 2016a,b; Slade et al. 2015b; Wiese 2018; Chen et al. 2019; Humbani and Wiese 2018; Koenig-Liu et al. 2019b; Park et al. 2019b	Xin et al. 2015; Phonthanukitithaworn 2016b; Johnson et al. 2018; Park et al. 2019b	4
Uncertainty		Xin et al. 2015; Gao and Waechter 2017	2

#### 4. Discussion

In recent years, the use of mobile devices and mainly smartphones has sparked the adoption of mobile payments by buyers and sellers. As a new payment channel, m-payment has resulted in an increase in the volume of literature devoted to the subject (Zarpou et al. 2012), most of which are from the perspective of consumers. According to the extant literature, various factors were selected to examine the adoption of m-payment services and systems; and different research theories and methodologies were applied. Classifying the accumulated literature between 2015 and 2019 regarding individual's adoption in m-payment systems, the following outcomes are the most common results by the researchers; according to the above umbrella review and scoping review.

## 4.1 Umbrella Review

### 4.1.1 Technology Adoption Theories and Intention Models

Based on the research outputs of Karsen et al. (2019), the most commonly conducted framework theories and methodologies to explore m-payments acceptance regarding customers' behavioral intention were TAM (22%), TAM extensions (26%), as well as the combination of several theories, such as TAM, Theory of Reasoned Action / TRA, UTAUT and Theory of planned behavior (TPB).

TAM, along with its related extensions, was the first most popular and widely used methodological framework in most research approaches of m-payment customers' adoption, due to its explanatory power and robustness. UTAUT, which is also subject to modification since its first appearance, has been gaining more attention from researchers in recent years. Most researchers focused on consumer behavior, with constructs and factors such as: ease of use, usefulness, trust, security, privacy, and behavior intention.

### 4.1.2 Constructs/ Factors that Encourage or Inhibit M-Payment Adoption

The analysis results of Liu et al. (2019a) revealed that all studies that were conducted in Asian countries focused primary on factors, such as perceived usefulness, perceived ease of use, perceived risk, trust and social influence. In Western countries, subject norm, attitude and perceived innovativeness are the most preferred ones. However, perceived innovativeness, perceived usefulness, attitude to use, perceived ease of use, attitude and subject norm were all discussed. Nevertheless, previous research attempts haven't explicitly studied factors taking into consideration the culture and regulation issues. Thus Liu et al. (2019a), in their meta-analysis study, although they did not use culture or regulations as independent factors on their own, they initiated them as sub-factors implicitly contained in the place factor. Recently studies (e.g., Dennehy & Sammon 2015) examined technology, security and architecture regarding adoption issues. Although there is an increase in the specific studies per country, there are no research attempts that adopt a comparative study exploring data and results of multiple countries. Performance expectancy and perceived usefulness, followed by perceived ease of use revealed as the major factors influencing consumers' behavioral intention to use m-payments. Furthermore, as major inhibitor to the adoption of m-payments, "perceived risk" was found (Patil et al., 2017). In specific, the 10 most important factors for using m-payments are (Karsen et al., 2019): perceived ease of use, perceived security, perceived trust, perceived risk, perceived usefulness, social influence, effort and performance expectancy, attitude, and facilitating condition.

Thus, the most investigated constructs were perceived ease of use and perceived usefulness, following by perceived risk, trust, security, perceived enjoyment, personal innovativeness, self-efficacy, and perceived cost. Due to the astonishing increase in the use of m-payments, users are more concerned about their privacy and security when trading on their mobile devices. Due to the phenomenal rise in the usage of m-payments, users are more concerned about their privacy and security while performing transactions on their mobile devices.

Suggestions for future research is to incorporate social, cultural and regulatory influences as separate study factors, as consumers' behavioral intentions are influenced by culture or regulations environmental drivers as well.

## 4.2 Scoping Review

### 4.2.1 Technology Adoption Theories and Intention Models

Commonly to umbrella review, apart from TAM which was greatly applied from the researchers of the sample, the UTAUT was also utilized to a significant extent as well. In specific, in five studies the UTAUT was applied as the basic model and was further improved with other factors for a more holistic approach of the m-payment adoption examination by the researchers. Similar to TAM, UTAUT was also used as a part of a joint conceptual model. Apart from these two well-known behavioral decision models, there were other technology adoption theories that were applied from the academic community such as DOI, TPB, Technology Readiness Index (TRI) and UTAUT2. Finally, five studies examined m-payment adoption intention via a self-developed conceptual framework/ model deployed by their researchers (see Table 5).

### 4.2.2 Constructs/ Factors that Encourage or Inhibit M-Payment Adoption

Regarding enablers, trust was confirmed in almost half of the papers (11), followed by social influence (9), performance expectancy (7), security (6), compatibility (5), perceived ease of use (5), perceived usefulness (5) and facilitating conditions (4), whereas the rest of the enablers were applied 3 times or less in the empirical papers (see Table 6). Based on the results, it can be deduced that individuals paid a lot of attention to trust measures that m-payment systems and services applied. Therefore, the more trustful the transactional conditions

are, the more acceptable m-payment is to be adopted by the smartphone users (e.g., Phonthanukitithaworn, 2016b; Qasim & Abu-Shanab, 2016; Shankar & Datta, 2018). Concerning the rest of the enablers that were used more frequently in the literature, the results came as no surprise. With the exception of security and compatibility, all of them are fundamental factors in both TAM and UTAUT, which are the basic technology adoption models utilized by the researchers. Concerning security, it is a vital factor in online transactions and is widely used in the e-commerce research field (e.g., Makki and Chang 2015; Guzzo et al. 2016; Lai 2018b). Therefore, the mobile industry should examine all the parameters that make an individual feel secured to adopt and further use m-payment solutions. With reference to compatibility, the studies proved that m-payment will have more chances to be adopted if it fits well with individuals' lifestyle and the way they like to conduct payment transactions. Therefore, mobile IT companies should adapt m-payment features to the contemporary way of living and the specific characteristics of individuals in order to lure even more of them to adopt m-payments.

Regarding the inhibitors, risk was the most deterrent factor on adopting m-payment by far (8), followed by cost (3) (see Table 6). Moreover, risk was also proved to impact indirectly m-payment adoption in various papers (4). The importance of risk may be attributed to the doubts associated with technological and monetary issues. The rest of the inhibitors -asset specificity, insecurity, opportunism of the mobile service provider/ vendor and technology anxiety- were confirmed in only one out of the 27 empirical studies, with the exception of uncertainty, which was proved to impact both directly (1) and indirectly (2) m-payment adoption. Therefore, the mobile industry should examine more meticulously the reasons why individuals feel risky to adopt m-payments and find ways to minimize their hesitations.

Finally, the scoping review analysis revealed that despite the fact that m-payment adoption is greatly investigated in Asia, there are comparatively few studies in the rest of the globe. Especially in the western world where the majority of the developed countries are belong to; the number of top academic papers that were published during the last five years is small. Thus, it can be deduced that there is a significant research gap that definitely needs much more attention from the academic community. The slow m-payment adoption rates along with the lack of empirical studies in the pre-adoption stage reveal a field that definitely needs to be further examined.

## 5. Conclusion

The main contribution of this research is twofold. First, it collects and summarizes m-payment adoption literature review papers published between 2015 and 2019 as an umbrella review. Second, it analyzes all recently top quantitative primary research papers, which investigated individuals' m-payment adoption intention the last five years as a scoping review. Both of these analyses help to provide a comprehensive and updated view of the topic; and can be used as a guide from researchers and practitioners who are involved in the study of m-payments' adoption. Thus, the paper helps to increase the understanding related to m-payment adoption as well as summarize the contemporary underlying factors that influence individuals' decision to accept m-payments. The results present the technology adoption theories and intention models utilized by researchers, along with the factors that impact positively and negatively individuals to adopt m-payments. Furthermore, the study summarizes the most influential empirical studies on the topic along with the countries where researchers have spent too much effort on it. Overall, this paper helps to provide a complete understanding of m-payments adoption by individuals, the current trends and future challenges. As far as it is concerned, this is the first contemporary literature review paper that both includes an umbrella and a scoping review; and utilized such a strict criteria to reveal the top quality studies on the m-payment adoption field.

Concerning the managerial implications, the industry can greatly be benefited from the summarization of the main factors that impact positively or negatively individuals' m-payment adoption. Therefore, analogous actions can be taken place from the practitioners in order to minimize the constraints that inhibitors make to people. The fewer the perceived inhibitors the more adopted m-payments will be. On the other hand, the more enablers the proposed m-payment service has the more receptive can be. Therefore, managers can definitely use Table 6 as a guide to convince individuals adopt their m-payment services. Thus, the article provides an up-to-date both umbrella and scoping review of the topic and presents a holistic examination of individuals' m-payment adoption.

Due to the multiple factors and the different conditions depending on the technology of m-payment systems applied, but also the other drivers of the environment in which the customer operates, the mapping of consumer adoption behaviors contains pitfalls and difficulties, so that the outcoming results of a literature review cannot be easily generalized. Thus, obstacles and limitations arising from the analysis of previous literature reviews are that the time periods, sources (online academic publication databases), number of involved articles, and key terms used in several reviews of papers are different in each study. The next issue that needs special attention is

the characterization of different countries' or market's environment. Researchers need to establish a list of specific features that differentiate countries and markets, as each mobile payment service market is known to be different but they do not know which factors best characterizes the variations in different countries.

A very important issue for the analysis of the findings is the evolution of m-payment systems and technologies as they evolve over time in the context of the e-commerce growth. The respective techniques seem to have different acceptance by consumers, depending both on the ease of use and safety they offer and the personal characteristics of the customers involved, such as innovativeness, familiarity and education. We recommend and encourage future researchers to focus on comparative research on the security and trust of each m-payment technology/ service, exploring the factors that influence customer adoption and preferences.

Furthermore, today, many consumers have the opportunity to experience m-payments, while a great number of payment alternatives and systems try to reach the intended end users. Aspects also contributing to the ever-increasing demand for m-payment services constitute both innovative easy to use m-payment systems/ services, familiarity of customers, merchant providers (bonus, motivation, infrastructure availability, merchant provisions, etc.) and the influence of environmental factors, such as social/ cultural, legal and further market factors (e.g., COVID-19 epidemic, lockdown, debt crisis and financial bans, legislation).

Therefore, general studies on m-payment customers' adoption contribute only to a partial understanding of mobile payments. We suggest for future research the specific m-payment systems in comparison with different countries and markets, in order to provide new insights taking into consideration the characteristics of the customers regarding the different mobile payment technologies and markets (multi-technologies, multi-country and multi-market studies).

As we still know so little about merchants', m-payment service providers' and other actors' (device manufacturers, regulators, financial institutions, etc.) impact, it is also interesting to explore their possible influential role towards individuals' adoption of m-payments.

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