Trends in mobile payments research: A literature review

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Abstract. Mobile payments (m-payments) are increasingly being adopted by organisations as a new way of doing business in the 21st century. During the last few years, the use of m-payments as a new payment channel has resulted in an increase in the volume of literature dedicated to the topic. For this reason, this paper presents the findings of a review of literature aimed at identifying the key research themes and methodologies researched. In order to uncover these trends the authors reviewed the top twenty cited papers since 1999 and the twenty most recently published papers on m-payments since August 2014.

Keywords. Literature Review, Mobile Payments, m-Payments.

1. Introduction

A 2009 study by Deloitte predicts that by the end of 2015, seventy percent of m-payment users will be under the age of 40 and that the annual spend of these Millennials (also referred to as Generation Y) will reach $2.45 trillion dollars in the US alone. Not surprisingly, m-payment solutions are a hot topic again after a chequered history of successes and failures since the turn of the millennium. However, the m-payments landscape is complex and continues to evolve as there are several types of services (i.e. contactless, remittance), various technologies (NFC, QR Codes, SMS) that enable the m-payment service, and various stakeholders (financial institutions, mobile network operators, regulators) each with their own motivations, expectations and capabilities (Au and Kauffman, 2008; Carr, 2007; de Bel and Gâza, 2011; Pandy, 2014). While the number of diverse stakeholders and solution providers has created many opportunities in the m-payment domain, it has also led to a highly fragmented market (Pandy, 2014).

Use of a mobile device has frequently been used when defining an m-payment (Au and Kauffman, 2008; Goode, 2008; Jacob, 2007; Karnouskos & Fokus, 2004; Pousttchi, 2008) which can include laptops, tablets, and mobile phones. More recently though, de Bel and Gâza (2011, p. 12) define an m-payment as "a transfer of funds in return for a good or service, where the mobile phone is involved in both the initiation and confirmation of the payment." This definition dovetails with the view expressed by Contini et al., (2011, p. 4) who believe that there has been a shift from "enabling a mobile device to be used as a browser, accessing existing internet-based banking and retail systems….to the use of an application-enabled mobile phone as a payment form, substituting for a check, cash or a card, to eventually create a mobile wallet". It is also the definition used in the context of this study.

The ubiquity of the mobile phone provides a compelling business case and it has been an influential factor in the adoption of m-payment systems, particularly when the majority of a population is unbanked (Contini et al., 2011; FINsights, 2008; Pandy, 2014), both in developed and developing countries. Estimates by the International

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Telecommunication Union (ITU) indicate that at the end of 2011 and out of a global population of 7 billion people, there were 4.9 billion mobile phone subscriptions which represent a global penetration rate of 87%. Of that 87%, 79% were in the developing world. Not surprisingly, in order to achieve sustainable growth rates, mobile network operators and mobile service providers in general, have shifted focus from developed countries to developing countries (Longoni and Gâza, 2013). A report published in 2012 by the FDIC (Federal Deposit Insurance Corporation) estimates that at least 28.3% of US households are either unbanked or under-banked. Specifically, this report estimated that 20.1% of households (or 24 million households) were 'under-banked' and 8.2% of households (9.9 million households) were 'unbanked', an increase of 0.6% (or 821,000 households) since 2009. An analysis of m-payment initiatives from around the world by Boer and de Boer (2009, p. 13) identified the following key drivers and barriers to the adoption of m-payments (see Table 1 below).

Table 1. Adoption of m-payments: drivers and barriers

Drivers	Barriers
Offering added value for consumers merchants, mobile operators, financial institutions and other participants in the ecosystem	Complex value-chain with lack of co-operation
	Financial regulation
	Security/Risk (perception of security/risk)
	Cost
User experience, easy-to-use	Unavailability of a broad range of mobile payment capable handset
	Lack of interoperability/ lack of technology standards

When it comes to m-payments, the chicken-or-egg analogy is frequently used to describe the challenge facing merchant and consumer adoption issues. On the one hand, merchants are unwilling to invest in the systems needed to enable an m-payment transaction unless there is consumer demand. On the other hand, consumers will not use m-payment systems unless merchants accept them (Begonha et al., 2002; Contini et al., 2011; de Bel and Gâza 2011). This would suggest that in order to achieve critical mass, which is a key indicator to assessing the universality of an m-payment system (Van der Heijden, 2002), other key stakeholders in the m-payment ecosystem need to encourage higher demand from consumers and merchants (Ondrus and Lyytinen, 2011). Educating consumers about the benefits of m-payments is closely linked to consumer demand (Deloitte, 2009). However, even though m-payments have become a hot topic in recent years, it has thus far failed to attract critical levels for mass adoption by consumers and merchants (Mallat, 2006; Pousttchi et al., 2009). In order to reach critical mass, there are a number of key requirements that influence adoption, simplicity and usability, universality, interoperability, security, privacy and trust, cost, speed and cross-border payments (Antovski and Gusev, 2003; Dahlberg et al., 2007; Karnouskos and Fokus 2004; Pousttchi, 2003). Failure to address these requirements may explain why m-payments have not lived up to the hype as promised by its proponents (Damsgaard and Hedman 2009).

In contrast to traditional payment channels, m-payments are a "relatively recent phenomenon and [are] evolving so rapidly" there will often be "scant opportunity for the research community to take a collective breath, and complete a global assessment of research activities to date" (Dibbern, et al., 2004, p.13). This provides the motivation for our paper. The outputs of this paper are similar in focus to those of Dibbern et al., (2004, p.14). These are: 1) to provide a comprehensive and coherent framework for cataloguing, synthesising, and integrating existing m-payments literature; 2) to identify and categorise the various research foci; 3) to determine the underlying theoretical perspectives used to frame the analysis of the topic; 4) to

ascertain the nature of the research – that is, the methodologies utilised to conduct the analysing; and 5) distinguish any themes or trends in the literature, identifying areas of consensus as well opportunities and suggestions for future research.

The remainder of the paper is structured as follows. First, context to the m-payment ecosystem and the classification used in the framework for the literature review is presented (section 2). Following this is a synthesis of the key findings which are presented in section 3. The next section (section 4) discusses implications for academia and practice. Conclusions of the study are provided in the final section (section 5).

2. Framework for the literature review

A business ecosystem represents the interplay between multiple industries (Chesbrough and Appleyard, 2007). The delivering of an m-payment system is an example of an ecosystem as there are several stakeholders from multiple industries: consumers, merchants, mobile network operators (MNO), financial institutions, mobile device manufacturers, software and technology providers and regulators (Boer and de Boer, 2009; Contini et al., 2011; Dahlberg et al., 2007; FINsights, 2008; Karnouskos and Fokus, 2004; Lu et al., 2011; Pandy, 2014). Worth noting is that mobile device manufacturers, software providers and technology providers were categorised as 'integration partners' as these partners are usually required in an m-payment initiative, irrespective of the business model adopted. There are currently 4 types of business models in use within the context of m-payments: bank-centric, telecom-centric, collaborative or independent service provider (Chaix and Torre, 2010). Although there are advantages and disadvantages with each type of business model, it is widely accepted that delivering a compelling value proposition to all stakeholders is an influential factor when designing a sustainable m-payment business model (Boer and de Boer, 2009; de Bel and Gâza, 2011; Hedman and Kalling, 2003). M-payments are attractive to the key stakeholders identified above for various reasons (Boer and de Boer, 2009, de Bel and Gâza 2011; Deloitte, 2009) and are listed in Table 2 below.

Table 2. Attractiveness of m-payments to the various stakeholders

Stakeholder	Potential Attractions
Financial Institutions	M-payments offer financial institutions the opportunity to protect the current account and associated loan products and to avoid further disintermediation from the consumer by third parties in the online payment space. M-payments also offer financial institutions the opportunity to reduce the use of cash and its associated costs, as well as the opportunity to service unbanked and under-banked communities in a cost-effective way.
Mobile Network Operators	M-payments provide MNOs with the opportunity to recoup the cost and return on investment made in infrastructure over the past decade through increased air time and data usage by consumers. M-payments also provide MNOs with the opportunity to create new revenue streams by diversifying into new areas of business based on evolving consumer needs and behaviours.
Integration Partners	As a new technology, m-payments offer technology providers with the opportunity to act as a trusted intermediary between banks and MNOs. For mobile device manufacturers, m-payments can result in increased sales to new or existing customers.

Merchants	The benefits of m-payments for the merchant include: higher throughput at the point-of-sale (POS); the ability to send real-time messaging to consumers; and the reduction of service costs through unmanned or remote POS locations. M-payments using NFC technology can also enable merchants to create deeper customer relationship and richer individualised shopping experiences by offering value added services such as digitised loyalty cards and coupons.
Consumers	M-payments could allow consumers to make payments 'anytime, anywhere', becoming less dependent on the need to carry cash which in turn could reduce the risk of theft.
Regulators	Regulation can provide secure and efficient payments systems to delivery of value to the markets. This in turn can provide governments with the opportunity to enhance financial services, particularly for the unbanked and under-banked populations.

A literature review was carried out to determine the current state of m-payments and future directions for research. A multi-phase approach to the literature review process was adopted, following established procedures and criteria adopted by other scholars in the IS field (Dibbern et al., 2004; Dahlberg et al., 2007; Finney and Corbett, 2007; Dezdar and Sulaiman, 2009; Okoli and Schabram, 2010). The aim of this research was to build on the literature review that was conducted by Dahlberg et al., (2007) as their review of m-payment literature spanned from 1999 to 2006 and it continues to be a highly cited paper. Similar to Dahlberg et al., (2007), papers were broadly classified against the contingency theory which was used as part of the framework in their review of literature. The contingency theory of technology adoption emphasises the importance of environmental influences such as cultural, social and economic factors, which in turn impact consumer and merchant adoption. The contingency theory is useful for the classification of m-payment research as m-payment services differ in each country due to differences in payment technology infrastructure, regulation, laws, or habits (*ibid*). For example, the M-Pesa system in Kenya uses SMS technology while other m-payment systems use technologies such as QR code or NFC technology, depending on the regulations of the host country. The contingency theory of adoption suggests that there is no 'best' model for successful innovation around m-payment systems (Au and Kauffman, 2008; Ondrus et al., 2005). The underlying assumption of the contingency theory is that there is no single best way to organise and that any one way of organising is not equally effective under all conditions (Ginsberg and Venkatraman, 1985; Dahlberg et al., 2007). Three categories were identied using the contingency theory lens: 1) legal, regulatory and standardisation, 2) technology, security and payment architectures and 3) social, cultural and economic. Papers that addressed a number of these categories but none in-depth were classified as multiple categories. Using these four categories and the categories of stakeholders in an m-payment ecosystem, a 7x4 matrix was created to classify the papers in the review of the m-payments literature.

To establish trends in m-payment research, the first phase of the search was to determine the scope of the review process and source material. As m-payments have been researched since 1999 and published in a wide range of academic journals and conference proceedings, the authors focused their search on Google Scholar as it is universally accessible. Papers that were not peer-reviewed (book chapters, trade papers) were excluded from the search. Searches were based on the descriptors *'m-payments'* and *'mobile payments'* and the resulting papers were then filtered, based on the most cited between 1999 and 2014. A second search using the same descriptors was conducted to identify the dominant topics in the most recently published

academic papers over the past year (2013-2014). Papers that did not discuss m-payments in detail (mobile banking, m-commerce) were excluded.

In the second phase, the authors independently reviewed the title, abstract, discussion/conclusions to establish the main focus of the paper. Both sets of classifications were then compared and agreed by the authors. Following the methodology classification used by Dahlberg et al., (2007), papers that focused on a number of topics, but did not discuss any one topic in detail, were categorised as *'multiple categories'*. In addition, we analysed the research methodology used and classified them as *theoretical* or *empirical*. Empirical studies were then classified as *qualitative (e.g. interview)*, *quantitative (e.g. survey)*, *mixed method*, and *design*. The results of the classifications are presented in the next section.

3. Discussion of Analysis

As highlighted above, matrix based on the various stakeholders in a typical m-payment ecosystem and the contingency factors was created. The top 20 cited papers between the years 1999 and 2014 are presented in Table 3 below. The categorised papers have been numbered to correspond with the number list used in the bibliography of this paper. There were no papers that examined m-payments from a legal, regulatory and standardisation standpoint. Four papers examined adoption from a technology, security & architecture lens and its impact on both the consumer and the merchant. Using this standpoint, one paper focused solely on the merchant perspective and another paper focused solely on integration partners. Of the papers that studied m-payment adoption from the social, cultural & economic point of view, 4 focused on the consumer perspective only and 2 focused on both the merchant and consumer perspectives. Seven papers were classified as multiple categories, of which 2 studied a number of adoption factors and their impact on both the consumer and merchant. One paper focused on the consumer only while another focused on integration partners and three other papers addressed a number of adoption factors and their impact on multiple stakeholders in the m-payment ecosystem.

Table 3. Classification of the top 20 cited papers between 1999 and 2014

	Legal, Regulatory & Standardisation	Technology, Security & Architecture	Social, Cultural & Economic	Multiple Categories
Merchant	-	40,46,48,62,64	21,36	49,58
Consumer	-	40,46,62,64	10,12,19,21,36,38	49,58,59
MNO	-	-	-	-
Financial Institutions	-	-	-	
Integration Partners	-	39	-	55
Regulators	-	-	-	-
Multiple Stakeholders	-	-	-	3,14,23

These papers were also categorised as being theoretical or empirical: 9 out of 20 papers were theoretical and 11 were empirical. Table 4 below lists the methods that were used in the eleven empirical studies. Four studies used interviews only, of which one used the focus group technique, 2 used surveys only, one used design science

research (to test a technological prototype) and four studies used mixed methods (interviews and surveys). In addition, 7 of the empirical studies used a version of the Technology Adoption Model (TAM), of which 5 were case studies in India, Tanzania, Korea, USA and Germany.

Table 4. Breakdown of empirical studies in the 20 most cited papers between 1999 and 2014

Method used	Number of papers
Interviews (includes one focus group)	4
Surveys	2
Design	1
Mixed Methods (interviews and surveys)	4

Having categorised the papers of the 20 most cited papers between 1999 and 2014, the next phase of the study was to categorise the 20 most recently published papers between 2013 and 2014. Following the same process as above, the 20 most recently published papers between 2013 and 2014 were categorised and are presented in Table 5 below. The categorised papers have been numbered to correspond with the number list used in the bibliography of this paper.

Table 5. Classification of the 20 most recently published papers between 2013 and 2014

	Legal, Regulatory & Standardisation	Technology, Security & Architecture	Social, Cultural & Economic	Multiple Categories
Merchant	-	61	50	-
Consumer	-	22,35,42,43,61,63, 65,66,67,68,69	50	-
MNO	-	-	-	-
Financial Institutions	-	-	-	-
Integration Partners	-	37,56	-	-
Regulators	-	-	-	60
Multiple Stakeholders	2	30,33,51	-	72

Table 5 shows that 17 papers studied adoption issues using a technology, security or architecture standpoint, of which 11 papers focused on consumer adoption, 2 focused on the integration partners and 1 on merchants and consumers only. Three papers were classified as multiple categories as these examined adoption issues which included merchants, consumers and other stakeholders. Of the remaining 4, one examined adoption from a legal, regulatory & standardisation standpoint and its impact on a number of stakeholders while another paper examined adoption by both the consumer and merchant from a social, cultural & economic standpoint. One paper was categorised as multiple categories because it examined a number of adoption factors and considered a number of stakeholders in an m-payment ecosystem.

To gain a deeper understanding of how researchers approached their chosen research topic, papers were categorised as being theoretical or empirical. Six papers were theoretical and 14 were empirical. Table 6 below lists the methods that were used in the 14 empirical studies. Eight of the empirical studies used surveys for data gathering, 3 used design science research (to test a technological prototype), 2 studies

employed mixed methods (interviews and surveys) and one study used only the interview technique. In addition, 9 of the empirical studies used a version of the Technology Adoption Model (TAM), of which 8 of these studies were case studies in Canada, Germany, Ireland, Jordan, Portugal, Tanzania, Kenya and the UK.

Table 6. Breakdown of empirical methods in the 20 most recently published papers between 2013 and 2014

Method used	Number of papers
Interviews	1
Surveys	8
Design	3
Mixed Methods (interviews and surveys)	2

The next phase of the research was to get an integrated view of the academic research trends of both time frames, the top 20 cited papers between 1999 and 2014 and the 20 most recently published papers between 2013 and 2014. This was achieved by assigning a symbol to papers categorised in each time period and are presented in Table 7 below.

Table 7. Main focus of the theoretical and empirical papers

	Legal, Regulatory & Standardisation	Technology, Security & Architecture	Social, Cultural & Economic	Multiple Categories
Merchant	-	▲○○○○	▲○○	○○
Consumer	-	▲▲▲▲▲○○ ▲▲▲▲▲▲○○	▲○○○ ○○	○○○
MNO	-	-	-	-
Financial Institutions	-	-	-	-
Integration Partners	-	▲▲○	-	○
Regulators	-	-	-	▲
Multiple Stakeholders	▲	▲▲▲	-	▲○○○

○ Top 20 cited papers (1999 to 2014)

▲ 20 most recently published papers (2013/2014)

This table indicates that consumer adoption remains the most popular area of focus by researchers. Also evident is that, in contrast to previous years where studies examined consumer adoption that considered technology, security & architecture issues or social, cultural & economic issues, or multiple categories, more recent studies are focusing on technology, security & architecture issues and impact on consumer adoption. Other shifts in research foci are also evident. For example, between 2013 and 2014 only 2 papers examined adoption from both the merchant and consumer perspectives, one paper examined adoption on the context of technology, security & architecture and another paper took the social, cultural & economic approach. On the other hand, between the years 1999 and 2014, 6 papers examined adoption from both the merchant and consumer perspectives, of which 4 considered technology, security

& architecture issues and 2 considered social, cultural & economic issues.

Also evident in this table is that between 2013 and 2014 there were no papers that examined multiple categories and their impact on the merchant and/or consumer whereas between 1999 and 2014 there were 3 papers that examined multiple categories, of which two focused on both the merchant and consumer and 1 focused on the consumer perspective only. There was a significant decrease in the number of papers that examined social, cultural & economic factors and their impact on the merchant and/or consumer. Most notable is the increase in papers between 2013 and 2014 that focused on technology, security & architecture adoption issues and its impact on the integration partners or multiple stakeholders, as well as in papers that examined the impact of legal, regulatory & standardisation on multiple stakeholders. One paper examined a number of adoption issues from the perspective of the regulator. There were also fewer papers that addressed multiple categories and its impact on multiple stakeholders.

By categorising the top 20 cited papers between 1999 and 2014 and the top 20 cited papers between 2013 and 2014, as well as identifying the type of research methods used by researchers to examine m-payments, the implications for stakeholders engaged in the design and delivery of m-payment systems and for researchers interested in this research domain are discussed in the next section.

4. Managerial and Academic Implications

This study revealed that there has been a shift in focus by researchers examining the m-payment phenomenon. An example of this shift is the increase in empirical studies which suggests that m-payments as a research phenomenon has stabilised in recent years as researchers in general have established the characteristics of an m-payment system that are widely accepted by the research community. There has also been an increase in studies examining the legal, regulatory & standardisation issues and the technology, security & architecture issues and how these impact multiple stakeholders. This would indicate that these are influential factors that shape the design of the m-payment business model, as well as being a key driver for the adoption of an m-payment system. For this reason, we make the call to action that future research examines the impact of legal, regulatory & standardisation issues on the various stakeholders in the m-payment ecosystem. By answering to this call, a deeper understanding of how regulation impacts business model innovation will be gained and can be used to inform national and international level policy-makers.

Similar to the findings of the study by Dahlberg et al., (2007), consumer adoption continues to be a popular aspect of research throughout the time frames this research, specifically studies that examine technology, security & architecture adoption issues. The high number of studies that adopted TAM or a variant of this model may explain the increase in research that focused on the technology, security & architecture adoption issues and their impact on consumers. It also indicates a tradition by researchers and PhD candidates who use TAM as a model for understanding technology adoption. The increase in design-oriented research is not surprising as there has been a revival of design science research, particularly within the IS discipline. Since the essence of design science research is to build and evaluate IT artifacts with the desire to improve an environment (Hevner et al., 2004), we call to action that future research adopt this problem solving paradigm when studying m-payment systems in the real world. In doing so, researchers will be addressing to the issue of relevance which has overshadowed IS research in recent years (Agarwal and Lucas, 2005; Benbasat and Zmud, 2003), as well as providing guidance to managers who need to make decisions in the practice of management.

While there has been an increase in country specific (single case) studies, there are no studies that adopted multi-case studies (multiple countries). Hence, we make the call that future research projects should examine the adoption of m-payment systems from across multiple countries and be continent specific as this will provide empirical evidence on the characteristics of both successful and unsuccessful m-payment initiatives within these continents. This would provide researchers with an integrated understanding of m-payment adoption. Such studies would also provide guidance to the stakeholders involved in the design and delivery of an m-payment system with the opportunity to advance the adoption and use of m-payment systems from isolated single case success stories to universal m-payment systems. Having discussed the implications of the research, a limitation of the study and conclusions about the current state of academic research in the m-payment domain are present in the next and final section.

5. Limitations and Conclusions

As with all research there are limitations. A limitation of this research is that the study focused on the Google Scholar database as it is universally accessible to researchers. Including other scholarly databases would address this limitation and may even provide evidence of similar trends. Nevertheless, from the papers reviewed and categorised in this study, there has been a significant increase in m-payment research appearing in peer-reviewed journals and even greater numbers appearing in conference proceedings. Based on this evidence and the identified trends in m-payment research, the authors conclude that the study of m-payment systems can no longer be considered a fad or fashion (Baskerville and Myers, 2009) but an established research domain that will continue to receive increased attention from researchers from diverse disciplines in the coming years. By leveraging the emergent body of knowledge generated by future research projects, stakeholders engaged in the design and delivery of m-payment systems will realise the potential of m-payment systems and the universal adoption of such systems will become reality.

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