European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol.8, No.8, 2016

The Future of the Mobile Payment as Electronic Payment System

Zlatko Bezhovski
Goce Delchev University, Krste Misirkov No.10-A, Stip, Macedonia,

Abstract
The development of the Internet and the arrival of e-commerce fostered digitalization in the payment processes by providing a variety of electronic payment options including payment cards (credit and debit), digital and mobile wallets, electronic cash, contactless payment methods etc. Mobile payment services with their increasing popularity are presently under the phase of transition, heading towards a promising future of tentative possibilities along with the innovation in technology. In this paper, we will evaluate the current state and growth of mobile payments and other electronic payment systems in markets around the world and take a look at the future of this industry. We analyze various systems of electronic payment services, security issues related to them and the future of the mobile payment mode. This paper will also examines the factors affecting adoption of mobile payment methods by consumers. With all the security and convenience provided by mobile electronic payment method, we can expect further growth of mobile payments worldwide even surpassing payments made by credit and debit cards. However, there are several barriers identified to the adoption of this payment method; so certain measures should be taken to grant this industry a promising future ahead.
Keywords: e-commerce, m-commerce, Payment Systems, Mobile Payments, e-business

1. Introduction

In the year 1990, the advent of electronic commerce (e-commerce) introduced a unique way of doing trade business to the consumer and business world. Since then, e-commerce has grown and changed incredibly with producing extraordinary benefits for customers and business all around the world. With a large number of organizations conducting business this way, it has become evident that the field of e-commerce has a promising future ahead and businesses are going to obtain maximum benefit from it (Abrazhevich, 2004, p.1). Most of the popularity gained by e-commerce is due to its online perspective of doing business. It enables buying and selling of goods online, provision of various services and information on the internet and instant exchange of money between transacting parties. Using e-commerce, business payments have taken the form of exchanging money electronically and are called as electronic payments.

The electronic payment system is considered as the backbone of e-commerce and one of its most crucial aspects. It can be defined as a payment service that utilizes the information and communication technologies including integrated circuit (IC) card, cryptography, and telecommunication networks' (Raja et. al., 2008). An efficient electronic payment system lessens the cost of trading and is thought to be essential for the functioning of capital and inter-bank markets. With the advancement of technology, electronic payment system has taken many forms including credit cards, debit cards, electronic cash and check systems, smart cards, digital wallets contactless payment methods and mobile payments and so on.

E-commerce has become a rapidly growing market today. With the proliferation of tablets and smartphones, the use of electronic payment methods has grown up to 21% in 2012 (Rau, 2013). The use of credit cards was the major international means of online payment that dominated in a variety of transaction markets. It was estimated that 95% of all e-commerce transactions in the United States are performed using credit cards (Abrazhevich, 2004). Other widely used online payment alternatives are debit cards (with rising number of users worldwide) and online payment systems like Paypal, Stripe or Skrill. With the availability of a variety of electronic payment means including mobile payments, mediating services, and electronic currency, an appropriate option can be chosen for a particular type of transaction (Paunov and Vickery, 2006).

As we know that security is the main concern of people today while using any technology because the use of every technology is exposed to fraud, data theft, and stealing. It becomes more dangerous when the data contains significant financial information (Raja et. al., 2008). Thus, despite the fact that e-commerce is a growing field with an increasing use of its online payment services, its further development and widespread use in future are dependent upon the security and authentication stability of various electronic payment systems (Aigbe and Akpojaro, 2014).

The future of a specific electronic payment system depends upon how it overcomes the practical and analytical challenges faced by various means of online payments. These challenges include issues of law and regulation (buyer and seller protection), technological capabilities of e-payment service providers, commercial relationships, and security considerations such as verification and authentication issues (Paunov and Vickery, 2006).

2. Major online payment systems

Studying various systems of electronic payments, Koponen (2006) explained that there are a wide variety of online payment systems that have been developed in past few years and these systems can be broadly classified into account-based and electronic currency systems. Account-based systems allow users to make payments via their personal bank accounts; whereas the other system allows the payment only if the consumer possesses an adequate amount of electronic currency. These systems offer a number of payment methods that include:

- Electronic payment cards (debit, credit, and charge cards)
- E-wallets
- Virtual credit cards
- Mobile payments
- Loyalty and Smart cards
- Electronic cash (E-cash)
- Stored-value card payments

Paunov and Vickery (2006) gives a description of electronic payment methods in their report evaluating the online payment systems for e-commerce, a summary of this description is given here to look at various characteristic features of the most commonly used online payment services.

2.1. Credit Cards

The most commonly used online payment mode so far was the use of credit cards. Initially, the security concerns hindered in the adoption of credit cards for making online payments but later with the provision of more secure features to protect every transaction made, customers developed trust on the use of credit cards. Applicability of credit cards is a strong factor that contributed to its wide use throughout the world. Credit card companies have established a wide network for their consumers ensuring a huge user base for a number of different transactions. However, it is considered a less-suitable method for small businesses and customers that need to make small payments due to high fees for credit cards (Paunov and Vickery, 2006). Aggregation or cumulative payment solution can be a way to adapt credit card payment system for micropayments.

One of the major advantages of credit cards is their easy to use functionality with making online transactions in no time and from anywhere. These cards are easy to obtain and use as customers don't need to purchase any extra software or hardware to work with them. Cardholder authentication procedure is also simple, with the provision of a name, credit card number, and expiry date. For the security of consumers' personal information, credit card companies have developed a number of complementary systems including MasterCard SecureCode and Verified by Visa. These systems allow users to create a password and use it when they shop online through their credit cards.

2.2. Debit Cards

The popularity of the debit cards is constantly rising and currently debit cards the most popular non-cash payments instrument globally (Capgemini and RBS, 2013). In contrast to credit cards, payments through debit cards are withdrawn directly from the personal account of the consumer instead of an intermediary account. This makes it difficult for consumers to handle payment disputes as there funds don't have an extra protection in a debit account. For debit payments, providing the account number is enough without the necessity of producing a physical card or card number. The use of debit cards is particularly high in most countries with a specific user base depending on the conditions and regulations attached to the issuance of credit cards. However, debit payments may not popular on merchant websites as debit cards do not cater the demand for payments made by international customers (Paunov and Vickery, 2006). Since there are lower costs for using debit cards unlike credit cards this method is suitable for micropayments. In addition, the overall security of debit card payments is found to be higher than that of credit card payments with extensive identification requirements demanded by the banks.

2.3. Mobile Payments

According to Hoofnagle, et al. (2012), payments made through wireless devices like mobile phones and smartphones are thought to provide more convenience, reduce the fee for the transaction, and increase the security of electronic payment. This payment system has also made it easier for businesses to collect useful information about their customers and their purchases. Paunov and Vickery (2006) found the applicability of mobile payment systems to be quite wide due to the remarkable growth and greater penetration of mobile devices as compared to other telecommunication infrastructure.

Mobile payment methods are suitable for offline micropayments as well as for online purchases. This method is a potential attraction for online traders due to an enormous user base of mobile phones. The use of mobile payment service does not only reduce the overall cost of a transaction but also offer a better payment

security (Hoofnagle, et al. 2012). However, mobile payment systems have encountered certain challenges in obtaining a significant consumer base for a number of reasons including privacy issues and their inability to cater international payments.

2.4. Mobile Wallets

In a study regarding consumer adoption of mobile wallets, Doan (2014) explained that 'Mobile wallet is formed when your Smartphone functions as a leather wallet: it can have digital coupons, digital money (transactions), digital cards, and digital receipts'. Mobile wallet service allows the user to install an application from online stores in their smartphones and use them to pay for their online and offline purchases. Using latest technologies that connect smartphones to the physical world such as NFC (Near Field Communication), sound waves, and QR codes, cloud-based solutions, mobile wallets are believed to provide more convenient payment solutions to the customers in future (Husson, 2015).

2.5. Electronic Cash

During initial stages of introducing online payment systems, electronic cash systems proposed in the form of DigiCash or CyberCash. However, these systems were not much appreciated and disappeared soon. At present, smart card-based systems are more common in use for the payment of small amounts by many businesses. Smart cards usually rely on specific hardware and card reader for their use and authentication. In addition to smart cards, numerous electronic cash systems have also been established such as Virtual BBVA and Clic-e. These systems work with the use of pre-paid cards or electronic tokens that represent a certain value and can be exchanged for hard cash (Paunov and Vickery, 2006).

3. Security Requirements for Electronic Payment System

In order to be widely accepted payment method across the globe, electronic payment systems have to follow an efficient security protocol that must ensure a high security for online transactions. Reviewing the prior work of Koponen (2006), two common protocols are identified that ensure secure e-commerce transactions. These protocols include Security Socket Layer Protocol (SSL) and Secure Electronic Transaction (SET). SSL is more commonly used e-commerce transactions protocol and it works by encoding the entire session amongst computers so that it enables to provide a safer communication over the internet. SSL encrypts the online communication between Web servers and a client by using public-key technology. On the other hand, SET protocol works by preventing consumer's entire credit card number from traveling across the internet instead allows pieces of it to flow through web communication. SET also offers information integration, coding of sensitive information, and verification of all business data by using latest technologies such as digital signature and data coding.

Ismaili et al. (2014) have explored some other requirements that must be exhibited by the electronic payment systems, these include;

- Confidentiality of information shared by consumers
- Data integrity
- Authentication of all the participants
- Non-repudiation
- End-user requirements that include usability, flexibility, affordability, reliability, speed of transactions, and availability

The introduction of mobile payments has risen several security issues by itself like cloning a device, app malware, identity theft and so on. On the other hand the device itself can also help add extra layers of security in the payment like tokenization, device and sim authentication, location patterns, user authentication including fingerprint authentication etc.

4. Consumer Adoption of Electronic and Mobile Payment Systems

According to Mallat (2007), the adoption of mobile payment methods is dependent upon several factors that affect the consumers' choice and willingness to make use of latest technology for making payments. Reviewing of literature regarding this topic we have identified certain factors that impact the consumer adoption of mobile payment methods either positively or negatively.

Advantages of mobile payment systems: Prior studies suggest that mobile payment methods provide their customers with a number of advantages including location-free access (Laukkanen & Lauronen, 2005), a wide variety of purchase possibilities, an easy alternative to cash payments, and timely contact with their financial resources. These advantages have attracted consumers to make their payments via mobile devices.

Convenience: Convenience (or compatibility) is explained as the consistency between an advancement and experiences, values, and need of consumers. An important aspect of compatibility for users to adopt mobile payment methods is the flexibility of these systems so that they can be easily integrated into consumers' daily

lives. Mallat (2007) has identified in a study that mobile payment methods are found to be most convenient for small payments for purchasing movie tickets, mobile games, and content online.

Complexity: According to Laukkanen and Lauronen (2005), complexity in the use of various electronic payment methods including smart cards and mobile payments, have contributed to the low adoption of these services. It is logically to expect mobile payments in future will become les and les complex.

Costs: One of the major factors affecting consumer adoption of mobile payment systems is the effective cost of a transaction. Mallat (2007) has explored that many users have refrained from mobile payment methods because of premium pricing of these services.

Security of mobile payment systems and trust in service providers: Siau et al. (2004) have considered the lack of security and consumer trust in service providers as a major barrier to adoption of e-commerce transactions. Consumers need confidentiality, authentication, data integrity, and non-repudiation as key requirements for making secure payments over the internet.

According to Karp (2015), one of the major challenges faced by mobile payment systems is the increasing rate of cyber-crime that results in data theft and cyber-attacks on financial data. In addition, security risks accompanied with mobile payments can be classified as either emerging or traditional. Emerging risks entail the use of this payment mode in terrorist funding and money laundering while traditional risks involve the theft of data and services, loss of revenue, customer base, and brand reputation (Mobile Payments: Risk and Security, 2011).

5. The Future of mobile payments

According to MEF's third annual Global Mobile Money report 2015, e-commerce and mobile banking continue to grow with 69% of mobile users carrying out their banking activity via mobile devices (Perelmuter, 2015). The report conducted a study of 15,000 mobile users across 15 different countries of the world. The report defined the term Mobile Money for the services including in-store payments, carrier billing, online payments, peer-to-peer payments, and payments via mobile wallets. Growing use of mobile payment methods also encouraged developed markets to install device penetration system and infrastructure that should support mobile transactions in-store. In addition, contactless payment methods are also becoming popular with their wearable technology (Sacco, 2015) that offers fast, easy, and a secure way to pay at various places. The wearable payment technology includes smart watches, rings, wrist bands, and a number of Android or iOS smartphones applications.

GSMA State of the Industry report for 2013 has also displayed some statistics that shade some light on the future of mobile payments. According to this report, 'By the mid-2013, there were over 203 million registered mobile money accounts across the globe with mobile money outlets outnumbering bank branches in over 80% of markets worldwide' (Oracle, 2014). The rate of mobile payment transactions is increasing remarkably worldwide and their value is predicted to rise from US$ 12.8 billion (estimated in 2012) to US$ 90 billion by 2017 (Oracle, 2014). These statistics clearly show that we have a cashless future ahead with more secure and convenient options for making payments via smartphones and tablets.

Where mobile payment systems have brought new opportunities for merchants and customers, they have also exposed them to new risks regarding privacy and security issues. According to a report on mobile payments, careful planning is required to make security an intrinsic element of online payment methods in future. For a prosperous future of mobile payment market, mobile phones manufacturers, telecommunication companies and payment industry need to collaborate with each other so that a platform can be developed ensuring the most secure environment for online payment transactions. However, it is believed that mobile payment systems have the potential to tackle all of the major security and privacy concerns related to this industry, and current developments reveal that innovations are already being deployed (Oracle, 2014).

According to Reddy (2004), the future of mobile payments can be secured by using the latest technology in order to overcome practical and analytical challenges faced by this industry. Radio barcodes technology is believed to be a revolutionary addition to mobile payment systems. These radio bar-codes send out radio signals that can be used to locate the position of things they are embedded on. With the use of radio bar-codes, the mobile payment market can enjoy a promising future by providing enhanced security and convenience to its consumers. Radio bar-codes technology could enable the sales personal to read the numbers and expiry date on consumers' credit cards as they walk by. With enhancing the security protocols and using the latest technology like radio bar-codes, mobile payment service providers can create a system that is not only scalable at greater levels but is also most convenient to use for the consumers.

6. Discussion

E-commerce has changed the way people used to do business. It is not limited to making electronic payments on the internet only, but it also it provides the opportunity to buy movie or airplane tickets, download music, buy a book, or search the worldwide markets for desired products in any time at any place. While enabling these kinds of services, preventing fraud, protecting consumers' privacy, application technology, and computer security

become major issues to maintain the provision of appropriate services. The successful management of these issues is likely to ensure the future progress of e-commerce and its online payment systems including mobile payments.

The findings of the study suggest that although there are a large number of online payment services available to consumers, the use of payment cards dominates this industry. Similarly, the SSL security protocol is found to be highly effective in providing secure payment transactions over the internet. The use of payment cards for online purchases has developed a huge user base due to simplicity and familiarity of its use. These cards also allow the international payments but are not suitable for micropayments.

Table 1. Factors for adoption of Mobile Payments

Adoption determinant	Contributing factors	Impact on adoption
Advantages	• Purchases that are time and place independent • Avoidance of queue • Increased availability of payment instruments • Complement to cash	Positive Positive Positive Positive
Convenience	• High with small payments and purchasing digital content and services • Low with large and international payments	Positive Negative
Complexity	• Complicated procedure of registration • Maintenance of separate financial accounts • Complex service numbers and codes • Contactless and one-click payments • New simpler and safer solutions	Negative Negative Negative Positive Positive
Costs	• Increased cost of transaction and high premium pricing • Economy of scale as user base rises	Negative Positive
Trust in service providers	• Merchants, financial institutions, and telecom operators are highly trusted	Positive
Security risks	• Privacy concerns • Frauds • Data theft • User and device Authentication	Negative Negative Negative Positive

Source: Adopted and enhanced from Mallet (2007)

Research findings suggest that the use of mobile devices for making online payments is increasingly becoming popular due to a large user base of mobile phones. This payment method best suits micropayments and offers more convenient and secure payment transactions if appropriately implemented. Electronic cash systems are under way in achieving high uptake by consumers despite their strength to cater small and varied payments. A central challenge, for all these payment methods, is the provision of an authentication system that must ensure the security and convenience of each transaction made.

Factors affecting consumer adoption of mobile payment services were also examined. The summary of findings is given in the following table that contains a list of adoption determinants with their specific contributing factors. The final column of table displays whether these factors have a positive or negative impact on consumer adoption.

According to our observations advantages of mobile payment methods are usually related to the particular benefits provided by the latest cellular technology, which includes place and time independent payments, easy access to payment services anywhere, and the likelihood to avoid making queues and cash payments. While the factors that prevent the adoption of mobile payment methods include premium pricing of the payment system, perceived security risks, incompatibility with large payments, and the immaturity of the mobile payments market.

The findings also suggest that mobile payment industry has to overcome certain security and authentication challenges in order to a make a steady progress in future. Mobile payment service providers need to implement the proper security and privacy governance programs. Latest technology like biometric authentication and radio bar-codes should be used in order to boost security and improve the efficiency of mobile payment systems. As these technologies advance and the market base expands all barriers for adoption of mobile payments will be eliminated.

7. Conclusion

As the introduction of smartphones has replaced a several things in our daily lives like an alarm clock, watch,

music player, and tape recorder it seems that cash and wallets are soon to be added to this list. Payment methods have been through a series of evolutions from cash to checks, to debit cards and credit cards, and now to e-commerce and mobile banking. This study finds that customers are increasingly using mobile payment methods for their routine online purchases and for their on-site purchases as well. With growing advanced technology that supports mobile transactions and makes them transparent and more convenient, consumers have developed their trust and habits on using mobile payment systems. The changing behaviour of consumers making a shift from traditional payment methods to more advanced online payment systems is quite evident in banking and retailing, and with most of the mobile devices available. Since it is evident that the mobile devices became unavoidable part of almost everyone's life form one side and the opportunities this technology enables for online and offline payment regarding convenience and security, it is unavoidable that the use of mobile payment systems will further rise with ambition to surpass or even replace cash and other cashless payment option.

This research also concluded that for a promising future of this industry, mobile payment systems have to be better integrated with present telecommunication and financial infrastructures. Enhancing the compatibility with a wide range of users, the use of latest technology and establishment of common standards for various service providers, and overcoming the security and privacy issues could help in facilitating faster adoption of electronic payment methods and advance the rising market of mobile payments.

This research was aimed to embrace a brief spectrum of possible issues with electronic payment methods and consumer adoption of e-commerce to make payments for their purchases. Future research may focus on the validation of factors that can contribute to the successful adoption of mobile payment methods across the globe.

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