A Study on Mobile payment in mobile e-commerce

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Abstract: Mobile payment is implied as the accelerator of e-business and m-commerce. Currently mobile payments deal with several hindrances to improve requirements of m-commerce such as: simplifying the mobile payment processes for consumers, improving the security of payment, especially the application of digital signing in mobile payment. In this paper the alternate payments industry is defined as consisting of the following segments: on line payments, mobile payments and contactless payments. As mobile and Smartphone penetration increases and mobile internet usage accelerates, the mobile payment segment will witness substantial growth rates. We describe three mobile payment methods using two party value chain, three party value chain and four party value chain payments for mobile commerce applications, and person-to-person mobile payment. Furthermore, security policies between the security properties of the payment application and the resource limitations are defined. It not only provides strong security but also makes the system open to common payment. The Mobile Payment based on statistical techniques such as percentage method, chi-square method and Super SET protocol has improved the whole transaction process of the mobile e-payment transaction and all the parties interests have been guaranteed practically.

Keywords: e-business, m-commerce, SET protocol, mobile payment, Smartphone.

1.   Introduction

Business Insights anticipates that global alternate payments industry revenues (comprising online, mobile and contactless segments) will post a CAGR of 17.6% over the period 2010–15, increasing from $740bn in 2010 to $2,700bn in 2015 .The largest revenue generating segment of the advanced payments industry is the online payment segment,which will increase from $725bn to $1800bn to record a CAGR of 19.9% [1]. However, the highest growth rate will be witnessed by the mobile payments segment which will post a CAGR of 101.6% to increase from $15bn in 2010 to $500bn in 2015.

In 2010, in terms of revenues the global payments industry (consisting of both – online and offline segments) was dominated by North America with a regional share of 27.1%, followed by Western Europe at 24.8% and Asia Pacific at 24.8%. However, the dominance of North America and Western Europe will likely decline by 2015 to 22.8% and 21.2% respectively. It is Asia Pacific which will rise to a position of influence with its regional share increasing to 28.6%.

There are different business drivers consist of: growing internet penetration rates; rising fixed broadband subscriptions; e-commerce volumes; improved convenience and features; and declining channel transaction costs. Trends impacting the online payments industry include: Shifting consumer preference towards debit card usage; growing importance of micropayments; imminence of social networking, applications and online games; technological innovations that are changing the trade background; growing recognition of e-banking transactions; major internet players such as Google and Amazon taking on new roles in the payments industry landscape.

Universal alternate payments industry in accordance with market size by value

In this report the alternate payments industry is defined as consisting of the following segments:

- **Online payments**: These consist of payments or money transfers made over or undertaken over the internet for purchase of goods and services, paying bills, or electronic transfer of funds. These payments are made either directly through online banking, by using payment cards, or online wallets such as PayPal.

- **Mobile payments (Alternative payment methods of the future):**

New technology generations are fundamentally reshaping the traditional logic, as business processes become intertwined with surrounding ecosystems [15]. The past few years have also seen massive strides in the technology behind handheld devices, the widespread uptake by consumers of a whole family of competing smartphones, and the online world – and e-commerce – increasingly going mobile. It is no wonder then that both m-commerce and m-payments are destined to grow massively in the future. A 2009 study by Arthur D Little [8] estimates the value of worldwide mobile payment transactions at around US$29bn in

2008. Mobile payment technology continues to gain ground around the world with the number of mobile payment users projected to have grown by 55% by the end of 2010 on 2009 [9], equating to approximately 108.6 million people, up from 70 million in 2009.

Mobile payments consists of the following types: a) proximity payments at a point-of-sales (POS) terminal (see contactless payments, below); b) remote payments which can be done from anywhere in the world. Remote payments further include sub-segments - physical and digital. In the physical segment, a mobile device is used for buying physical goods and services while in digital segment it is used for buying digital goods such as apps and mobile entertainment content; and c) lastly mobile personal payments (domestic and international) in which mobile money transfers take place either within the same domestic territory or across borders.

SMS is currently the dominant mobile payment technology. The Asia-Pacific region accounts for approximately 85% of the world mobile payment users [10], but areas such as Latin America, the Middle East and Africa are expanding faster (albeit from a lower base). Mobile payments, relying on simple technology, enable large segments of populations to access online goods and services who would otherwise be unable to. Think for example of those without a computer, home internet connection, or the unbanked. The use of pre-paid cards in mobile communications is already well established in developing countries. Technologies such as Near Field Communications (NFC) (where a mobile user waves a phone over a wireless receiver connected to a pay terminal to make a payment) require individual banks to make their internet banking system accessible via wireless mobile technology. ESBG suggests this is happening in a fragmented way only and on a limited scale in Europe [11]. Third parties are required to manage customer authentication and aggregation and phones must contain a chip supporting this technology. The first mobile phone handset with fully integrated NFC technology embedded in its functionalities was launched by Nokia in 2007 (the Nokia 3161NFC) [12]. Cimbal, a San Francisco-based software company, recently launched an application which uses a two dimensional barcode that enables consumers to complete person-to-person payments, point of-sale transactions and online purchases [13]. The application's software turns a smartphone's camera into a scanner that reads barcodes displayed on another phone or a computer screen. Cimbal believe the application solves major issues with current mobile payment technology, such as eliminating the need for expensive chips in handsets and eliminating the cost to merchants in upgrading to terminals supporting contactless transactions. In Autumn 2010 Jack Dorsey, co-founder of Twitter, launched 'Square' a new mobile payments tool initially targeted at small businesses in the US that may not offer credit card payment facilities [14].

Contactless payments: These are those payment transactions which do not require physical contact between the consumer's payment device and the physical POS terminal. In a contactless mode of payment deal, the consumer holds either a contactless card, or device or a mobile phone in close proximity (less than 2-4 inches) to the merchant POS terminal and the payment account information is communicated wirelessly via radio frequency (RF) [2]. Devices can have the following form factors: a) payment cards used at POS terminal using radio technology; b) mobile handsets also called as mobile proximity payments using near field communication (NFC) technology, barcodes, or data over voice channel; and c) Others such as those placed in wrist watches and other items worn on one's person even those that can be embedded under the skin.

The highest growth rate will be witnessed by the mobile payments segment which will post a CAGR of 101.6% to increase from $15bn in 2010 to $500bn in 2015. On the other hand, contactless payments are yet to gain traction and will most likely grow at a CAGR of 51.6% to increase from $50bn in 2012 to $400bn in 2015.

The powerful forces of technological advancements, financial innovation, demanding customers and government regulation are reshaping the industry and driving change. As mobile and smartphone penetration increases and mobile internet usage accelerates, the mobile payment segment will witness substantial growth rates.
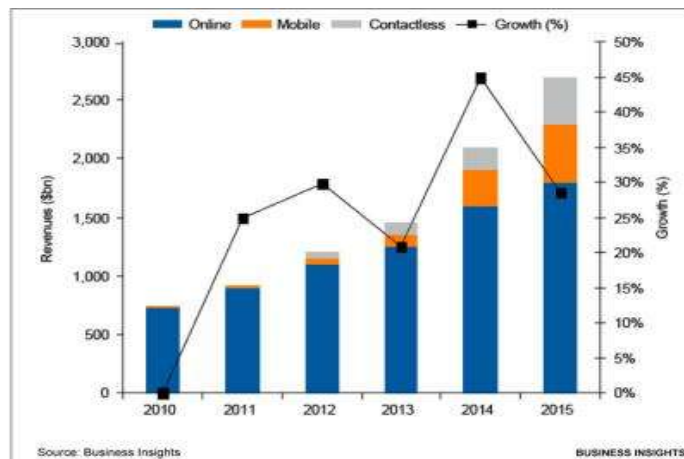

Figure 1: Global alternate payments industry market size by segment ($bn), 2010–15

Evolution of the online payments industry

The following figure traces the evolution of the online payments industry from the 1920's to-date. As illustrated, the online payments industry has come a long way from a two-party system to the current four- party system in terms of industry structure; from being largely government-controlled to being deregulated in terms of regulation; and from point-of-sales swipes to the current online, mobile and contactless payment systems in terms of technological advancements. Furthermore, financial innovation motivated by demanding customers – who are ready to switch loyalties at the drop of a hat - is facilitating convenience and cost reduction resulting in increased adoption of online and mobile payments.
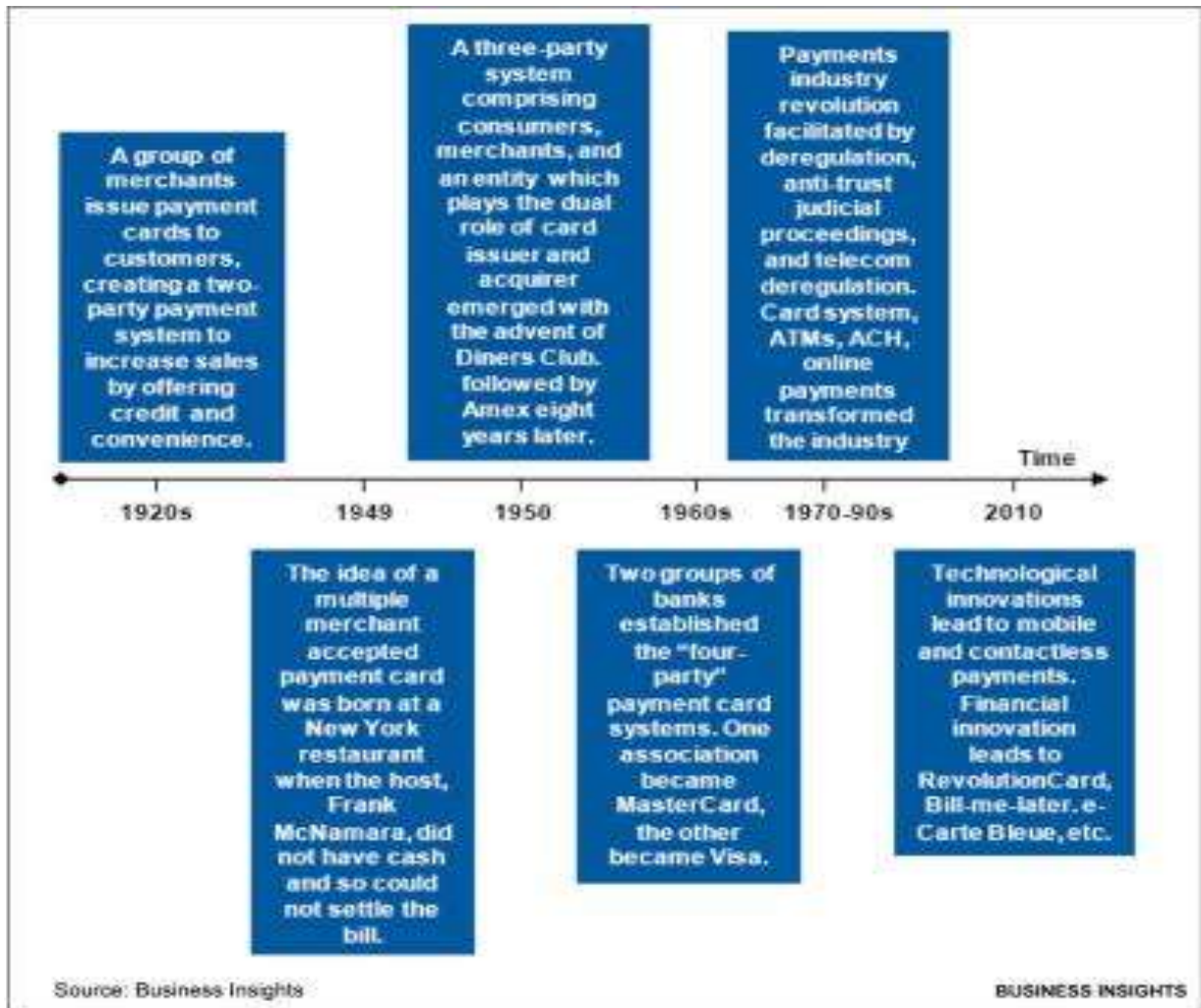

Figure 2: The evolution of the online payments industry – a timeline Two-party system

In a two-party system, the merchant issues the cards and also manages and funds, the systems, and the processing aspects of card acceptance.

Figure 3: Two-party value-chain Three-party system

In three-party systems, such as American Express and Discover, a single firm issues payment cards, manages the network, and provides merchant card acceptance. Increasingly, three-party (or closed-loop) payment networks are adopting the four-party open model of MasterCard, Visa, etc.
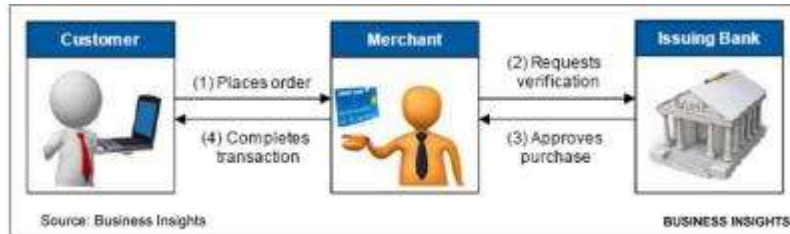

Figure 4: Three-party value-chain

The online payment industry value-chain with the four-party system

It is called a 'four-party' system because there are four primary parties involved: customers; merchants; banks FIs (both issuing and acquiring); and payment networks.

Card holder

These are customers who buy goods and services online using either credit or debit cards.

Merchant

Merchants accept payment via payment cards for the exchange of goods or services and generate payment transactions to settle the financial obligations created.

Acquiring bank

These are typically "merchant banks" which solicit relationships with merchants and charge them for the provision of authorization, clearing and settlement services. These banks also provide merchants and billers with the technology for accepting card transactions and process card payments on their behalf. Acquirers earn their revenue by taking a small portion of the "interchange fee" on each transaction. They are licensed by associations schemes such as Visa and MasterCard to accept their transactions.

Issuing bank

This is the bank which issues the credit card and associated credit line to the customer. For every transaction the acquirer seeks real time authorization from the issuer after which the transaction is guaranteed to the acquirer.
Typically issuers and acquirers are different entities, but American Express and Discovery are exceptions because they combine issuing and acquiring activities into one entity (an example of the so-called three party scheme). MasterCard and Visa are examples of the four-party schemes where issuing and acquiring are done by separate entities, thereby creating a strong global network.
Card issuer revenue comes from interchange (merchant discount rate) and interest on revolving balances or from membership and incidental fees collected from the customers for late payment and transactions that exceed the credit limit. For every transaction that is requested from a merchant, the acquirer seeks real time authorization from the issuer after which the transaction is guaranteed to the acquirer.

Associations

An association scheme lays out the set of rules and regulations with which its licensees have to comply. The term licensee here refers to the acquirer. The objective of a scheme is to maintain operational quality and confidence in the payment system. The scheme handles issues such as branding by issuers and acquirers, security and access criteria for payers and payees, and processing and terminal requirements. Additionally, schemes such as Visa and MasterCard also perform pricing and transaction routing functions.

Processors

There are three types of processors which act as service providers for issuers and acquirers. These include processing for the issuer, acquirer and interbank Automated Clearing House (ACH) andor scheme network). Examples of scheme networks include Visa, MasterCard, Discovery, Amex, etc.

However, generally there are two types of processors: Interbank - those who perform the ACH function – such as in case of online banking transfers and commercial processors who co-ordinate the industry as a whole. Examples of interbank processors are NACHA (National Automated Clearing House Ass'ociation) and EPN (Electronic Payments Network) in the US and VocaLink in UK, while examples of commercial processors include First Data and TSYS.

Payment networks payment service providers

A payment network gateway is a web-based service that integrates with the merchant's e-commerce website to collect payment information provided by the customer [3]. The data is encrypted by gateway and transmits it to the card issuing bank for authorization. In a nutshell, the payment gateway for online payments performs the same role as a point-of-sale (POS) terminal does for brick-and-mortar businesses. Examples of payment gateways are PayPal and VisaNet. However, e-wallets such as PayPal do not typically offer a full array of services, and so are usually a supplement to a payment processor.

Contactless payment is obviously quicker than both cash and traditional magnetic stripe credit card transactions. By eliminating the need for consumers to extract cash or cards and for retailers to make change or swipe a card. TowerGroup estimates that contactless payment using RFID fobs can save 10 to 15 seconds per transaction [4]. Sue Gordon Lathrop, vice president for emerging consumer environments at Visa International, has stated that contactless payment can decrease drive through transaction time by 90 seconds [5].

Increased revenue   results from increased spending per transaction, increased frequency of purchase, and increased loyalty(when the merchant becomes the customer's preferred retailer). Customers also potentially have access to more funds when they pay using a contactless payment device instead of cash. ExxonMobil has stated that a 4% increase in sales resulted from using Speedpass [6].

Additionally, the virtual terminal allows the merchant to generate and store customer summary within the gateway, which he can access to accelerate the payment process, or utilize it for recurring and deferred payments. Payment Service Providers (PSPs) or payment networks offer merchants various payment options such as credit card or debit card payments or online banking.
Usually, a PSP can link to multiple attaining banks and card networks. This makes the merchant less dependent on financial institutions and frees them from the barriers of launching connections with multiple financial institutions – especially when conducting global transactions. Furthermore, a PSP can offer reconciliation services, risk management and multi-currency functionality.

PSPs also play an important role in facilitating non-card payment methods. The examples of such transactions are bank transfers such as ACH and wallet systems such as PayPal.

According to Innopay, PSPs offer e-retailers a variety of advantages [7]:

- Reduced administration and agreements: a single supplier for all payment methods
- Simplified payments: all monies received from a single party
- Lower costs: able to aggregate not only acquiring banks and payment methods, PSPs offer economies of scale
- Access to local payment methods in different markets
- A single settlement procedure with an agreed frequency
- Access to specialist knowledge concerning payment process
- Risk management and fraud prevention tools

The online payment transaction process

The online payment transaction process consists of the following stages: Authorization, clearing and settlement.

Authorization

Step 1: An order is placed by a customer on an e-commerce website and offers card information for payment. Secure Sockets Layer (SSL) is encrypted and passed to the merchant's hosting server.

Step 2: The server assembles the tendered data and, after another SSL encryption, pass it to the merchant's attaining bank.

Step 3: The acquiring bank then sends the payment details to the payment network, or through a payment wallet system such as PayPal for authorization. In the case of Discover or American Express, both the authorization and issuing functions are rolled into one and so the authorization process is performed by the institutions themselves. However, in the case of Visa or MasterCard the transaction is forwarded to the issuing bank.

Step 4: The issuing bank either approves or rejects the transaction and sends a reply
(approval or rejection) back to the to the payment network.

Step 5: The payment network forwards the reply on to the merchant's acquiring bank.

Step 6: This reply is in turn forwarded to the merchant's website. If the transaction is authorized the merchant completes the transaction.

2.   OBJECTIVE OF THE STUDY

A.   Definition of Objective

The main objective of the study deals with analysis of different ways available for Secure transaction with focus on Mobile devices.

B.   Hypothesis

A hypothesis refers to a conjectural statement of the relation of two or more variables. It is in the force of a declarative sentence and always indicates relation at one or more variables with other variables in a general or specific way.

3.   STATEMENT OF PROBLEM

- What is the scenario at enterprise as well as industry level?
- How big is the impact?
- What are the major causes of such large impact?
- What are the initiatives taken so far at various levels to acess this?
- Were the initiatives effective enough?
- What can be an effective approach to the select open source?
- Way forward …?

4.   RESEARCH, PLANNING & RESEARCH METHODOLOGY

The first step is to develop an efficient sequential plan for the study. Keeping the objectives in mind, the researcher will take a macro level approach, i.e., largely the data will be collected at macro level. However, micro level data will also be collected in order to discuss, assess and verify the macro level data.

At initial level the data collection will be focused on defining the impact and determining the magnitude of the impact on industry. In this case the researcher will preferably follow a 'whole to part processes. He will first try to understand the global scenario and then try to understand the Indian scenario in global context.

Research Designs

In fact a research design seems to be a roadmap—you can observe where you currently stand, where you want to be at the completion of your journey, and can determine the best (most efficient and effective) route to take to get to your destination. We may have to take unforeseen detours along the way, but by keeping our ultimate objective constantly in mind and using our map we can arrive at our destination. Our research purpose and objectives suggest which route (design) might be best to get us where we want to go. but there is more than one way to "get there from here." Choice of research design is not like solving a problem in algebra where there is only one correct answer and an infinite number of wrong ones.

Data Collection
Both primary and secondary data were used in the research. Primary data is gathered for a specific purpose or for a specific research project. Secondary data are data that were collected for another purpose and that already exist somewhere else.

Primary Data

According to the methodology it was decided to collect the primary data from various information towards the respondents with the help of a structured questionnaire. The questionnaire was fabricated keeping is mind of the stated objectives.

Secondary Data

Information already exist somewhere having been collected for another purpose. The secondary data is collected from books, libraries, projects and Internet. But secondary data is inadequate for this study.

Sampling Design and Size

- Sampling size: The sample is the subset of the specific population from which the researcher collects data for the study.

- Population of the study: The sample frame of the study is the total number of people.
- Number of samples: The sample size decided for this study is 50. Which comprises the employees of different companies.

Research Instrument

Research instrument means the instrument employed in research for gathering the information.

Questionnaire

Questionnaire is used as a research instrument.
The success of survey methods depends on the strength of the questionnaire used. A questionnaire consists of a set of well. Formulated questions to probe and obtain responses from respondents.

Questionnaire Design

Designing and implementing the questionnaire is one of the most interesting tasks in the research. The questionnaire is prepared in such as way that is covers the objective of the study.
The questionnaire used in this study is a structured questionnaire, which contains opened ended, close ended, dichotomous and multiple-choice questionnaire.

Open-Ended Questions

An open-ended question gives the respondents complete freedom to decide the form length and detail of the form.

Closed-Ended Questions

Closed-ended questions also called fixed alternative questions refer to those in which the respondent is given a limited number of alternative responses from which he/she is to select the one that closely matches his/her option or attitude.
The fixed alternatives may take the form of:

1.   Dichotomous questions

The dichotomous questions have only two answers in the form of "yes" or "no", "true" or "false".

2.   Multiple choice questions

Multiple choice questions refer to one, which provides several set alternatives for its answers. This can be used when an issue has more than two aspects. The alternatives should be mutually exclusive.

Analysis of Data

The collected data was classified, analyzed, tabulated and statistical tools are used in processing the data. Bar charts and pie diagrams were also used to explain the tabulation.

Techniques of Statistical Methods

In this study statistical techniques such as percentage method, chi-square method and various types of charts are used.

1.   **Percentage Method**

Percentage refers to a special kind of ratio. Percentages are used in making comparisons between two or more series of data. Percentages are used to describe relationships
Percentage = (Number of respondents)/(Total number of samples) * 100

2.   Cross Tabulation
Statistical tool in which the variables are related either directly or indirectly is represented in the sample. The row percentage and column percentages are determined for a meaningful and understanding.

3.   Chi-square (x2) Analysis
The chi-square$(x2)$ is one of the simple and most widely used non-parametric tests in statistical work. The symbol x2 is the Greek letter chi-KARLPEARSON evolved the chi-square analysis in the year 1900. As it does not make any assumption about the population being sampled, It is called as distribution free analysis.

The quantity x2 describes the magnitude of the discrepancy between theory and observation.

$X2=\xi (0-E) 2/E$

0 refers to the observed frequencies into E refers to the expected frequencies. To determine the value of x2 the step

E=RT*CT/N

E=ET

RT=The row total for the row containing the cell

CT=The column total for the column containing the cell

N=Total number of observation

Charts

Charts are the graphical representation of data. It is mainly to give a clear picture of the collected data. Charts help to communicate the data. Easily to the viewer without consuming much time. It is done with more care and well planned before representing the data in a pictorial form.

Bar Diagram

It is a bar divided into various components and marked differently on proportion to the values given in the data. It helps in comparison.

Pie Diagram

It is a circle divided in to a number of sector to represent the values of the data. It is highly useful to known how the given data is distributed.

Limitations of The Study

The study is based on two methods of data collection: primary and secondary. Thus, the extent of reliability and validity of the findings of this study depends on the reliability and validity of these data.

Primary Data will be collected from various professionals working in the related field, professional & government bodies, NGOs, research Organizations etc. Tools to be used for collecting primary data will be formal/ informal observations, interviews, questionnaires, scientific tools etc. This will have an opportunity to cover a very small size of the sample, when compared to the problem of wide geographical spread.

Secondary data will be collected through literature review from various web sites, government reports, books, journals, newspapers and various professional organizations. Though the researcher will try to review all relevant literatures, but he will be able to review those documents only which will be practically accessible to him. Some of the current data / information may not be available.

References

[1].   Business   Insight,   "The   Future   of   Online   and   Mobile   Payments,"   retrieved   online   at :<http://www.emrreports.com/english/Report/The_Future_of_Online_and_Mobile_Payments.html>,2011.
[2].   Smart   Card   Alliance," Contactless   Payments: Frequently   Asked   Questions,"   retrieved   online at:<http://www.smartcardalliance.org/resources/pdf/Contactless_Payments_FAQ.pdf>,2007.
[3].   Unibul," How   Payment   Gateways   Work   and   Integrate   with   E-Commerce   Merchant   Accounts,"   retrieved   online at:<http://blog.unibulmerchantservices.com/how-payment-gateways-work-and-integrate-with-e-commerce-merchant-accounts>,2010.
[4].   Edward Kountz,"RFID Payment Fobs at Point of Sale: The Early Face of M-Payments in North America", TowerGroup, March 2002.
[5].   European Card Review."Visa, MasterCard diverge on proximity payments", August 2002.
[6].   Matthew Miller."A Smart Card Alliance Report," retrieved online at:<http://smartcardalliance.org>, March 2003.
[7].   Innopay, Boer, Hensen et Al,"Online payments 2010 – Increasingly a global game", 6th edition, May 2010, p.62.
[8].   Karim Taga & Gregory Oswald, Arthur D. Little, Vienna & Zurich," M-payments surging ahead: distinct opportunities in developed and emerging markets" , 2009.
[9].   Matt Hamblen."Asia Pacific leads strong growth in mobile payments," retrieved online at :<www.computerworld.com>,21 June 2010.
[10]. Budde, Baker, Bibolini et al, Paul Budde Communication Pty Ltd, Bucketty,Australia, "Global Digital Economy: E-Commerce & M-Commerce Trends & Statistics", October 2009, p. 46.
[11]. The SEPA e-Payments Framework in the context of the greater e-Payments landscape, "European Savings Banks Group", Brussels, June 2010.
[12]. Near Field Communication, Nokia, Helsinki, 2007, p. 7.
[13]. Cimbal, ,"imbal launches software-based NFC payment network", Cimbal, San Francisco, 31 August 2010.
[14]. Emma Barnett, Daily Telegraph,Square,"the mobile phone gadget that could revolutionise payments", 12 December 2010.
[15]. Basole, R.C.,"isualization of interfirm relations in a converging mobile ecosystem", Journal of Information Technology, 2009, 144-159.