MATRIX

Team Member Roll No.:	U12EC001	U12EC004	U12EC016	U12EC030	U12EC033	U12EC050	TOTAL
U12EC001	**NA**						
U12EC004		**NA**					
U12EC016			**NA**				
U12EC030				**NA**			
U12EC033					**NA**		
U12EC050						**NA**	

A PROJECT REPORT

ON

"E-PAYMENT SYSTEMS"

B.TECH- IV (ELECTRONICS & COMMUNICATION)

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DEPARTMENT OF ELECTRONICS ENGINEERING

Year: 2015-16

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CERTIFICATE

This is to certify that candidates **Mr. Samarth Patel ,Ms. Kesha Bodawala, Ms. Anusha Relwani, Mr. Umang Yadav,Mr. Jeshalraj Thakaria and Ms.Payal Shivram**, bearing **Roll Nos. -U12EC001, U12EC004, U12EC016, U12EC030, U12EC033 and U12EC050** of **B.TECH IV, 8TH Semester** have successfully and satisfactorily presented **UG Project**& submitted the report on the topic entitled "**E-Payment Systems"** for the partial fulfillment of the degree of Bachelor of Technology (B.TECH) in **February 2016**.

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ABSTRACT

In this report, First Generic Working of E-Payment System, Different Types of Payment Systems, Security Protocols for E-Payment Systems and Payment Cards are described. In main body of the report, E-Payment Systems in Context of Indian Economy as case study is included. Statistics for different payment systems used is also included. As a part of this case study, we conducted our own survey in SVNIT campus regarding Electronic payment of Fees. Results of this survey and suggestions from students is included in the end.

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1. Introduction

Every country has a financial system of its own that serves as backbone of its entire development. A financial system is a set of institutional arrangements through which financial surplus in the economy is mobilized from surplus units and transferred to deficit spenders. The financial system of any country consists of banking and non-banking financial institutes, these institutes are providing various types of financial services to the customers. In the financial services, financial clearing and fund transfer service is most important service than other services. Payment systems improve financial intelligibility, stimulating business growth and consumption .The success of the banking system has depends upon the efficient and quality of clearing system of the industry. If we overlook the worldwide this system has changing drastically with technological advancements. Last few years evident that, Information and Communication Technology (ICT) have become a mean for improvement of financial system worldwide. In India, most of banks and financial institutions are offering ICT based financial products and services to improve their business efficiency and speed of services e.g. called e-banking, internet banking, electronic fund transfer, electronic clearing, mobile banking etc.(Gupta et al., 2013)

What is E-payment system?

Electronic Payment is a financial exchange that takes place online between buyers and sellers. The content of this exchange is usually some form of digital financial instrument (such as encrypted credit card numbers, electronic cheques or digital cash) that is backed by a bank or an intermediary, or by a legal tender(“No Titl,” n.d.).

Scope of the report:

The following questions will be addressed in this report:

- What is the basic working of E-payment systems?
- Which are commonly used E-payment systems?
- What are the different protocols for Security involved in EPS?
- Which payments systems are prevalent in Indian Market?
- What are the drivers, impediments and Suggestions for development of efficient online payment systems?

- What are the preferences of SVNIT students for Annual Fees Payments?

This report discusses various modes of online payment that are used to purchase items on the Internet. The main focus is on online payment means (such as credit card, debit card, online banking and e-money), and these are set in the context of traditional payment options as many on-line payment systems are extensions of off-line systems. Mobile payments, defined as payments using wireless devices such as mobile phones and personal digital assistants (PDAs), wireless tablets and mobile computers, are also examined. The report concentrates on business-to-consumer online payments rather than on business-to business (B2B) financial transactions. With the success of online auctions person-to-person markets have gained in importance and are also considered.

GENERAL WORKING OF E-PAYMENT SYSTEMS:

Participants in a general e-payment system(Saxena, 2014):

There are four main participants of an e-payment system, 1) Consumer 2) Merchant 3) Issuing bank 4) Acquiring bank

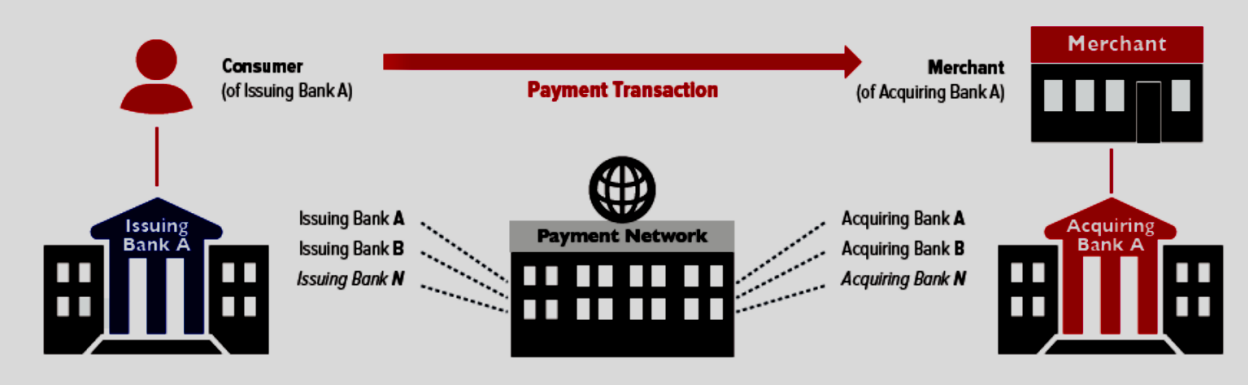


Figure 1: Participants in e-payment systems

The consumer is someone who initiates a transaction and provides payment while the merchant is any regulated business that accepts payments.

The Issuing bank is a regulated financial institution where the customer has his account. It is responsible for marketing, providing customers with means to perform their transaction (for e.g. issuing the plastic cards in case of credit or debit card transactions), authorizing and settling transactions and providing ongoing customer services.

The Acquiring bank maintains the relationship with the merchant. It has responsibility of acquiring merchants, Installing necessary hardware or software at merchant site where

necessary (e.g. Point-of-Sale terminal), processing and settling transactions and providing ongoing merchant services.

Many, if not all, retail banks have both issuing and acquiring units.

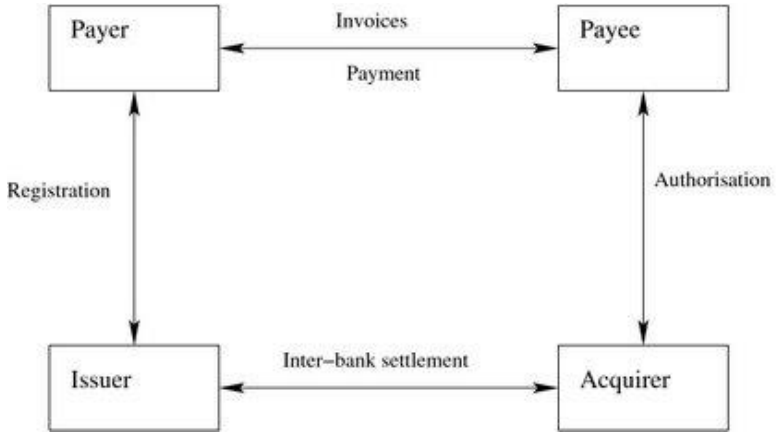


Figure 2 : Generic E-payment protocol(Pasupathinathan, n.d.)

There are various modes of E-payment systems and the working of each and every system are varied. Although the activities and mechanisms of all the systems vary, there is some basic data processing that each and every payment system have in common. Most of the system, if not all, work on the basis of three main functions:

- Authorization
- Clearing
- Settlement

1) Authorization: This involves checking of credentials and permitting the transaction to go through. The network performs pre-validation which involves checking the consumer information and verifying the information provided by him during transaction to be real and authentic. Once this is done the further check includes verifying if the consumer has sufficient funds for transaction. In most cases this step is performed by the consumer or Issuing bank.
2) Clearing: Once the transaction is authorized the next step performed by the network would be clearing the transaction which includes reconciling the amount in addition to any fees and sending information to both parties regarding the amount to be transferred.

3) Settlement: This step finally occurs when funds are transferred from one bank to other. The process time may differ according to different payment systems (for e.g. in card systems this process occurs at the end of the day).

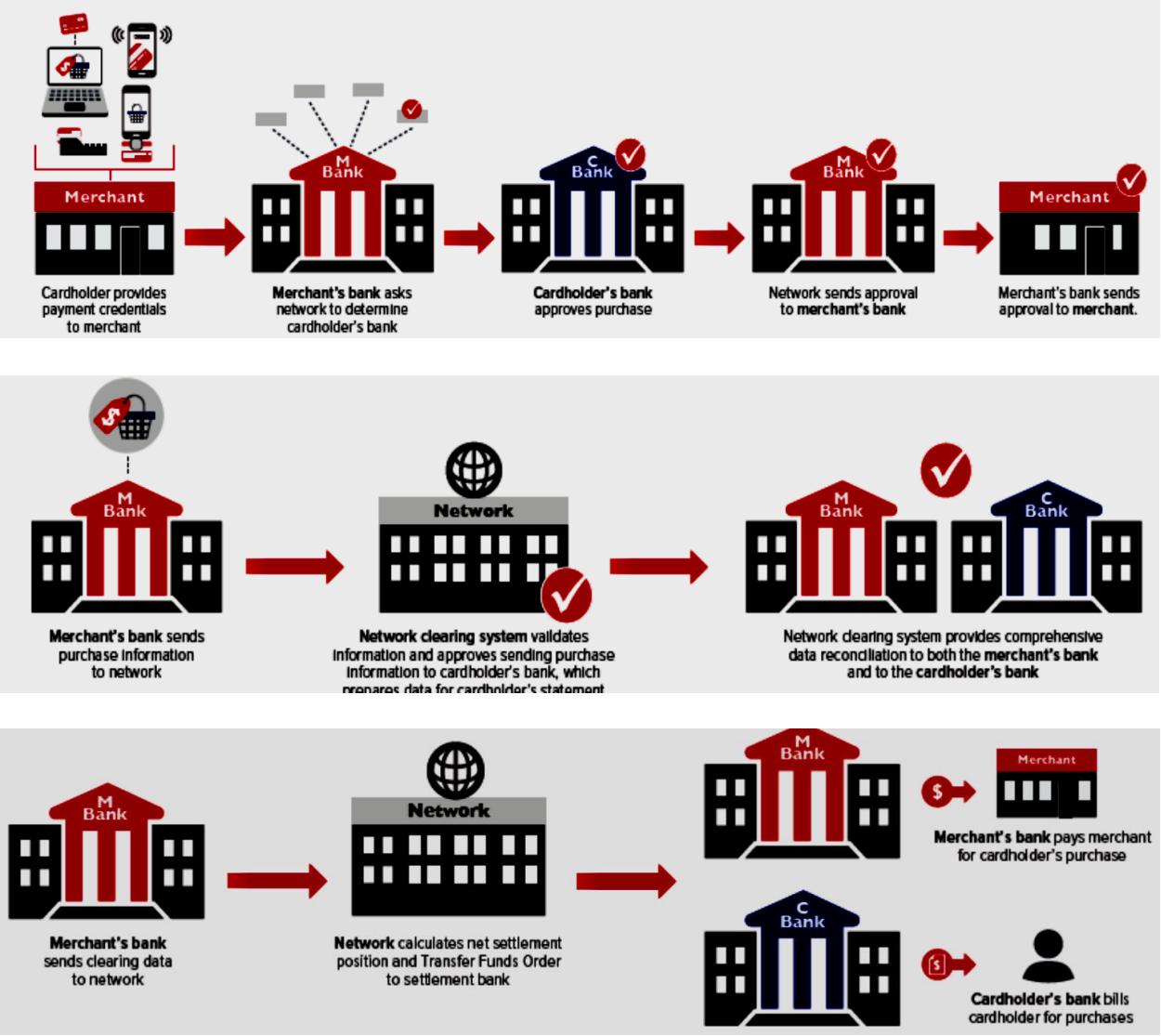


Figure 3: Processing steps with an example of card systems

2. Types of E-payment systems and security

Types of E-payment systems:

Electronic Funds Transfer

Electronic Funds Transfer (EFT) is a method in which the money is transferred from one bank account to other bank account in without the paper cheque and paper money. The transaction is done at bank ATM or using Credit Card or Debit card. In RBI-EFT system you authorize the bank to transfer money from your bank account to other bank account that is called as beneficiary account. However, this facility is restricted only to the 15 RBI defined cities such as Mumbai, New Delhi, Chennai, etc. Funds transfers using this service can be made from any branch of a bank at these centers to any other branch of any bank at these cities, both inter-city and intra-city. RBI remains intermediary between the sender's bank called as remitting bank and the receiving bank and affects the transfer of funds. Using this method, funds are credited into the receiver's account either on the same day or within a maximum period of 4 days, depending upon the time at which the EFT instructions are given and the city in which the beneficiary account is located. Usually the transactions done in first half of the day will get first priority of transfer than the transaction done in second half(VRIDHI, 2010).

National Electronic Funds Transfer (NEFT)

This is a better version of RBI-EFT system. In RBI-EFT there is a limit in location, whereas in NEFT there is no geographical location problem and only requires both the bank to be NEFT enabled system. The NEFT is a nation-wide payment system facilitating one-to-one funds transfer. Under this system, individuals, firms and corporate can electronically transfer funds from any bank branch to any individual, firm or corporate having an account with any other bank branch in the country participating in the system. Under NEFT, the transfer takes place either on the same day or on the next day, depending on the time of instructions given. NEFT is on net settlement basis. NEFT involves four settlement cycles a day 9.30 am, 10.30 am, 12 pm and 4 pm. Thus if a customer has given instruction to its bank to transfer money through NEFT to another bank in the morning hours, money would be transferred the same day, but if the instruction is given later during the day, money would be transferred next day(Goyal, n.d.).

Real Time Gross Settlement (RTGS)

RTGS can be defined as a continuous (real-time) settlement of funds transfers individually on an order by order basis (without netting)(Goyal, n.d.)

Here the words 'Real Time' refers to the process of instructions that are executed at the time they are received, rather than at some later time. On the other hand "Gross Settlement" means the settlement of funds transfer instructions occurs individually (on an instruction by instruction basis). The settlement of funds actually takes place in the books of RBI and thus the payments are considered as final and irrevocable(Gupte, 2011).

RTGS systems are typically used for high-value transactions that require immediate clearing. In some countries the RTGS systems may be the only way to get same day cleared funds and so may be used when payments need to be settled urgently(Goyal, n.d.).

RBI has prescribed the following operating hours for RTGS: The RTGS service window for customer's transactions is available from 8.00 hours to 16.30 hours (Monday through Friday and also on Working Saturdays i.e. Saturdays other than 2nd & 4th Saturdays)(Goyal, n.d.).

Difference between RTGS and NEFT

Thus, we can say that both RTGS and NEFT are schemes started by RBI for the benefit of the customers which allow accounts holders in the banks to electronically transfer the funds intra-bank. In the case of RTGS, settlement in on 'Real Time' basis whereas in case of NEFT the settlement inon batch basis and net basis(Goyal, n.d.).

However, remember that the timings of both RTGS and NEFT at the bank can vary depending on the customer timings of the bank branches. Moreover, normally, banks close their own window for accepting the transactions, about 15 minutes before the above time as to allow them to put the transaction in the system so that it reaches by the upper time limit at the RBI window. Thus, for each bank / branch the above timings may sometimes vary(Goyal, n.d.).

There is no ceiling on the minimum or maximum amount that can be transferred through NEFT. You can even transfer Re 1. However, a minimum of Rs. 2 lakh must be transferred through the RTGS service. There is no cap on the maximum amount, though. However, banks may restrict the amount you can transfer in one day. For example, Bank allows a maximum of Rs 10 lakh to be transferred in a day (Goyal, n.d.).

NEFT operates on a deferred net settlement (DNS) basis and settles transactions in batches. The settlement takes place with all transactions received till a particular cut-off time. It operates in hourly batches — there are 12 settlements from 8 am to 7 pm on weekdays and six between 8 am and 1 pm (July 24, 2015) on Saturdays. Any transaction initiated after the designated time would have to wait till the next settlement time. In RTGS, transactions are processed continuously, all through the business hours. RBI's settlement time is 9 am to 4:30 pm on weekdays and 9 am to 1:30 pm on Saturdays. Banks can function within this time frame or change it. Here, transfers made are quick and can be helpful in emergencies(Goyal, n.d.).

If the transaction fails, the beneficiary's bank must return the amount to your bank within two hours and the transaction must be reversed. Also, the bank must transfer the amount to your account within 30 minutes of receiving the same. The process can work quickly for RTGS. But, in case of NEFT the entire process could take an additional three-four hours(Goyal, n.d.).

Electronic Clearance Service (ECS)

The Electronic Clearance Service (ECS) scheme provides an alternative method of effecting bulk payment transactions like periodic (monthly/ quarterly/ half-yearly/ yearly) payments of interest/ salary/ pension/ commission/ dividend/ refund by Banks/Companies /Corporations /Government Departments. The transactions under this scheme move from a single User source (i.e. Banks/Companies /Corporations /Government Departments) to a large number of Destination Account Holders (Customers/Investors). This scheme obviates the need for issuing and handling paper instruments and thereby facilitates improved customer service by the Banks and Companies/Corporations/Government Departments effecting bulk payments(RBI, 2015).

ECS Credit

ECS Credit payments can be initiated by any institution (called ECS Credit User) which needs to make bulk or repetitive payments to a number of beneficiaries. The institutional User has to first register with an ECS Centre. The User has to also obtain the consent of beneficiaries (i.e., the recipients of salary, pension, dividend, interest etc.) and get their bank account particulars prior to participation in the ECS Credit scheme. The beneficiary account holders are required to give mandates to the user institutions to enable them to afford credit to their bank accounts through the ECS Credit mechanism(IIBF, n.d.).

ECS Debits

ECS Debit transaction can be initiated by any institution (called ECS Debit User) which has to receive / collect amounts towards telephone / electricity / water dues, cess / tax collections, loan installment repayments, periodic investments in mutual funds, insurance premium etc. It is a Scheme under which an account holder with a bank branch can authorise an ECS User to recover an amount at a prescribed frequency by raising a debit to his / her bank account. The User institution has to first register with an ECS Centre. The User institution has to also obtain the authorization (mandate) from its customers for debiting their account along with their bank account particulars prior to participation in the ECS Debit scheme. The mandate has to be duly verified by the beneficiary's bank(IIBF, n.d.).

Security:

It is generally accepted that, in order to be considered secure, a payment system must satisfy the following fundamental security requirements(Singh, Singh, Shahzad, & Khan, 2012)

Fundamental security requirements:

1) Authentication:

The assurance that the communicating parity is the one that it claims to be prevents the masquerade of one of the parties involved in the transaction. Applications usually perform authentication checks through security tokens or by verifying digital certificates issued by certificate authorities. Cryptography can help establish identity for authentication purposes.

2) Access Control:

The prevention of unauthorized use of a resource (i.e., this service controls who can have access to a resource, under what conditions access can occur, and what those accessing the resource are allowed to do).

3) Data Confidentiality (Secrecy):

The protection of data from unauthorized disclosure. The only way to ensure confidentiality on a public network is through strong encryption.

4) Data Integrity (Anti-tampering):

The assurance that data received are exactly as sent by an authorized entity (i.e., contain no medications, insertion, deletion, or replay).

5) Non-Repudiation:

Provides protection against denial by one of the entities involved in a communication of having participated in all or part of communication.

Non-repudiation, Origin- Proof that the message was sent by the specified party.
Non-repudiation, Destination- Proof that the message was received by the specified party.
Non-repudiation is usually provided through digital signatures and public key certificates.

Issues of Security Approach to Secure Payment System

Secure Sockets Layer (SSL) protocol.

Netscape Inc originally created the Secure Sockets Layer (SSL) protocol. On account of its popularity and acceptance, it is now implemented in all web browsers.

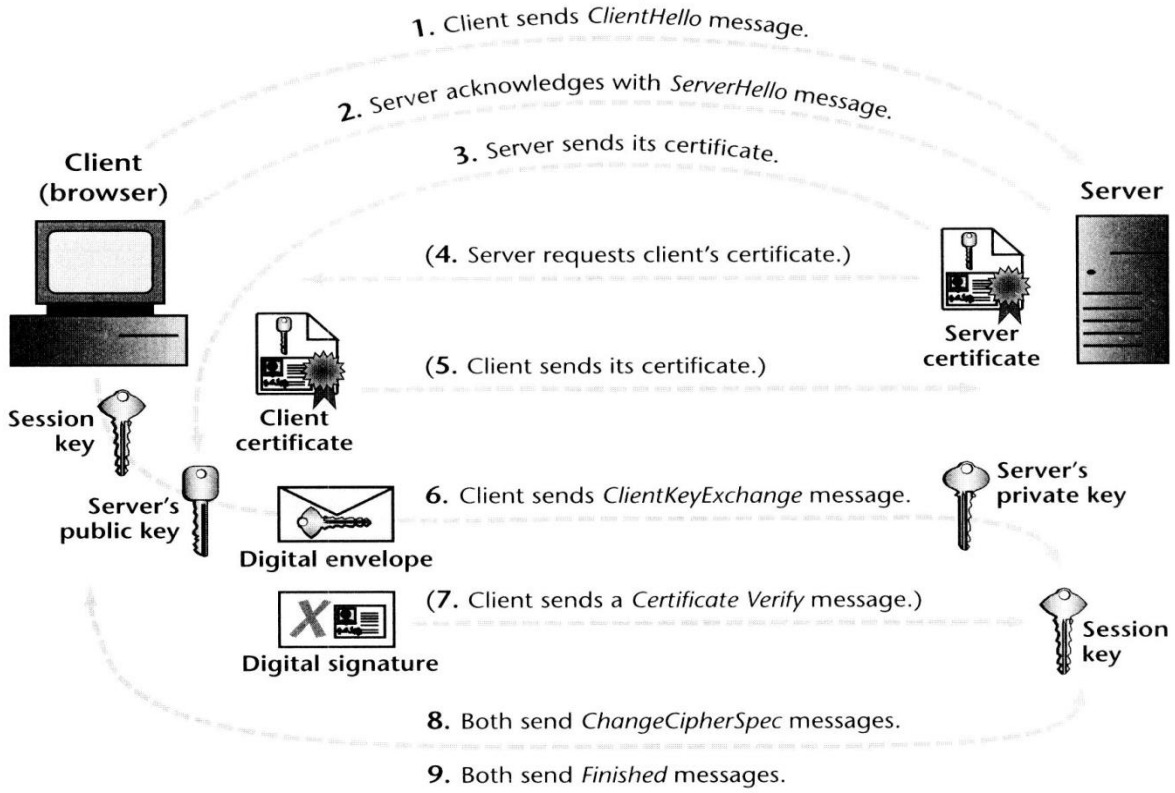


Figure 4: Steps involved in SSL protocol

SSL has two main objectives:

1. To ensure confidentiality, by encrypting the data that moves between the communicating parties (client and the server).

2. To provide authentication of the session partners, using RSA algorithm. The SSL protocol has two protocols:

A. The SSL Handshake protocol, in which the communicating parties (client and the server) authenticate themselves and negotiate an encryption key. One point to note here is that the SSL there is significant additional overhead in starting up an SSL session.

B. The SSL Record protocol, in which the session data is exchanged between the communicating parties (client and the server) in an encrypted fashion(Singh et al., 2012).

SSL is a great boon to the traditional network protocols, because it makes it easy to add transparent confidentiality and integrity services to an otherwise insecure TCP-based protocol. It can also provide authentication services, the most important being that clients can determine if they are talking to the intended server, not some attacker that is spoofing the server.

SSL is currently the most widely deployed security protocol. It is the security protocol behind secure HTTP (HTTPS), and thus is responsible for the little lock in the corner of your web browser. SSL is capable of securing any protocol that works over TCP(Singh et al., 2012).

An SSL transaction starts with the client sending a handshake to the server. In the server's response, it sends its certificate. A certificate is a piece of data that includes a public key associated with the server and other interesting information, such as the owner of the certificate, its expiration date, and the fully qualified domain name associated with the server.

Problems with SSL

1. The merchant cannot reliably identify the cardholder. While SSL does provide the possibility of client authentication with the use of client certificates, such certificates are not obligatory and are rarely used. Furthermore, even if the client possesses a certificate, it is not necessarily linked with his credit card. This means that the client might not be authorized to use the credit card in question.

2. SSL only protects the communication link between the customer and the merchant. The merchant is allowed to see the payment information. SSL can neither guarantee that the merchant will not misuse this information, nor can it protect it against intrusions whilst it is stored at the merchants' server(Singh et al., 2012).

3. Without a third-party server, SSL cannot provide assurance of non-repudiation.

4. SSL indiscriminately encrypts all communication data using the same key strength, which is unnecessary because not all data needs the same level of protection.

Efficiency

SSL is a lot slower than a traditional unsecured TCP/IP connection. This problem is a direct result of providing adequate security. When a new SSL session is being established, the server and the client exchange a sizable amount of information that is required for them to authenticate each other and agree on a key to be used for the session. This initial handshake involves heavy use of public key cryptography, which is very slow. It's also the biggest slowdown when using SSL(Singh et al., 2012).

Secure Electronic Transaction (SET) Protocol

To carry out transactions successfully and without compromising security and rust, business communities, financial institutions and companies offering technological solutions wanted a protocol that works very similar to the way how a credit card transactions work.

Visa and MasterCard, leading credit card companies in the world formed a consortium with computer vendors such as IBM and developed an open protocol which emerged as a standard in ensuring security, authenticity, privacy and trust in electronic transactions. The goal of SET is to ensure that the payment process is private, convenient and most-important-of-all-secure(Singh et al., 2012).

SET ensures that the order and payment information of the customers are kept confidential. SET also has the capacity to authenticate the customer is the legitimate user of the credit account. The payment process is easy and simple. When the customer made a purchase, the SET will authenticate the credit card against the details provided by the customer, and then the merchant which is the online store will send the order details to the bank. Transaction will occur between the two for the approval of the purchase. When approved the bank will digitally sign and an authorization will be given to the merchant who can then process the order. This type of e-commerce technology is truly a breakthrough in online shopping and-transactions. The e-commerce technology developed are very important in the online e-commerce especially the secure payment system. It provides the customers a piece of mind when doing Internet transactions. Now customers will be safe against scams. A reliable e-commerce technology is truly what we need(Singh et al., 2012).

Disadvantages of SET are as follows:

- Implementing SET is more costly and complicated than SSL for merchants as well. Furthermore, merchants must have accounts opened at business banks capable of handling SET transactions.
- Business banks must hire companies to manage their payment gateways, or install payment gateways by themselves.
- Despite being designed with security in mind, SET also has some security issues. In a variant of the SET protocol, the merchant is allowed to see the customer payment information. Just as with SSL.
- SET employs complex cryptographic mechanisms that may have an impact on the transaction speed.
- The overheads associated with SET are heavy.

  For a simple purchase transaction:

  - Four messages are exchanged between the merchant and customer,
  - Two messages are exchanged between the merchant and payment gateway,
  - 6 digital signatures are computed,
  - There are 9 RSA encryption/decryption cycles,
  - There are 4 DES encryption/decryption cycles and
  - Four certificate verifications
- It has been argued by merchants that they have to expend lot of money in order to process SET transactions. From consumer's point of view, they have to install appropriate software.
- With SET, while the payment information is secure, order information is not secure(Singh et al., 2012).

PAYMENT CARDS

Credit cards:

Credit cards are issued based on the customer's income level, credit history, and total wealth. The customer is supposed to pay his or her debts during the payment period; otherwise interest will accumulate. Two limitations of credit cards are their unsuitability for very small or very large payments. It is not cost-justified to use a credit card for small payments. Also, due to

security issues, these cards have a limit and cannot be used for excessively large transactions(OCW, n.d.).

Debit Cards:

Debit cards task similar to checks in that the charges will be taken from the customer's checking account. The benefit for the customer is the easiness of use and convenience. These cards also keep the customer under his or her budget because they do not allow the customer to go beyond his or her resources. The advantage to the merchant is the speed at which the merchant collects these charges(OCW, n.d.).

The difference between credit cards and debit cards is that in order to pay with a debit card you need to know your personal identification number (PIN) and need a hardware device that is able to read the information that is stored in the magnetic strip on the back.

Charge Cards:

Charge cards are similar to credit cards except they have no revolving credit line, so the balance must be paid off every month(OCW, n.d.).

Smart Cards:

A smart card is about the size of a credit card, made of a plastic with an embedded microprocessor chip that holds important financial and personal information. The microprocessor chip is loaded with the relevant information and periodically recharged. In addition to these pieces of information, systems have been developed to store cash onto the chip. The money on the card is saved in an encrypted form and is protected by a password to ensure the security of the smart card solution. In order to pay via smart card it is necessary to introduce the card into a hardware terminal. The device requires a special key from the issuing bank to start a money transfer in either direction. Smart cards can be disposable or rechargeable. A popular example of a disposable smart card is the one issued by telephone companies. After using the pre-specified amount, the card can be discarded(OCW, n.d.).

Electronic Case (E- cash):

Similar to regular cash, e-cash enables transactions between customers without the need for banks or other third parties. When used, e-cash is transferred directly and immediately to the participating merchants and vending machines. Electronic cash is a secure and convenient alternative to bills and coins. E-cash usually operates on a smart card.

E-cash is transferred directly from the customer's desktop to the merchant's site. Therefore, e-cash transactions usually require no remote authorization or personal identification number (PIN) codes at the point of sale. E-cash can be transferred over a telephone line or over the Web. The microprocessor chip embedded onto the card keeps track of the e-cash transactions.

A customer or merchant signs up with one of the participating banks or financial institutions. The customer receives specific software to install on his or her computer. The software allows the customer to download “electronic coins” to his or her desktop. The software manages the electronic coins. The initial purchase of coins is charged against the customer's bank account or against a credit card. When buying goods or services from a web site that accepts e-cash, the customer simply clicks the “Pay with e-cash” button. The merchant's software generates a payment request, describing the item(s) purchased, price, and the time and date.

When the customer accepts the payment request, the software residing on the customer's desktop subtracts the payment amount from the balance and creates a payment that is sent to the bank or the financial institution of the merchant, and then is deposited to the merchant's account. The attractive feature of the entire process is its turnaround time which is a few seconds. The merchant is notified and in turn ships the goods(OCW, n.d.).

Electronic Wallets:

Electronic wallets being very useful for frequent online shoppers are commercially available for pocket, palm-sized, handheld, and desktop PCs. They offer a secure, convenient, and portable tool for online shopping. They store personal and financial information such as credit cards, passwords, PINs, and much more. To facilitate the credit-card order process, many companies are introducing electronic wallet services. E-wallets allow you to keep track of your billing and shipping information so that it can be entered with one click at participating merchants' sites. E-wallets can also store e-checks, e-cash and your credit-card information for multiple cards(OCW, n.d.).

3. Case study: The Indian Scenario

The primary goal of any national payment system is to ensure smooth circulation of money. It is recognized worldwide that an efficient and secure payment system triggers of economic activity. Efficiency in payment systems in general and electronic payment systems in particular, benefits both customer and country's economic growth. There are diverse payment systems functioning in the country, ranging from the paper based systems where the instruments are physically exchanged and settlements worked out manually to the most sophisticated electronic fund transfer systems which are fully secured and transactions settled on a gross, real time basis. The retail payment systems in the country comprise of both paper based as well as electronic based systems. The proportions of electronic transactions, both in terms of volume and value, have increased sharply. It is indeed heartening to note that electronic payment in India has seen a huge growth and this augurs well for the corporate sector and the economy.

The main purpose of the study is to analyze and evaluate whether electronic payment systems have been proving to be effective in India during the period of study. Furthermore, this study also reveals that all electronic modes of payments have attained a vast growth compared to the physical paper- based payments like cheques or drafts etc.

Overview

Unlike other industries, banks and financial institutions rely on gathering, processing, analyzing and providing information in order to meet the needs of customers. Given the importance of information in banking, it is not surprising that banks were among the earliest adopters of automated information processing technology.

The Reserve bank of India (RBI) proactively encourages electronic payment systems for ushering in a less-cash society in India and to ensure payment and settlement systems in the country are safe, efficient, interoperable, authorized, accessible, inclusive and compliant with international standards as states the mission statement of India 2012-15. Regulation will channelize innovation and competition to meet these demands consistent with international standards and best practices. The overall regulatory policy stance is oriented towards promoting a paper less cash society. This "green" initiative has increased emphasis on the use of electronic

payment products and services that can be accessed anywhere and anytime by all at affordable prices.

Significance

Cash is the preferred mode of payment for those sections of society not having access to formal payment systems. Electronic payments, even with an associated fee, can be less expensive compared to the available alternatives. The use of electronic payment instruments allows the unbanked to start building a transaction history, which can be a step towards initiating them towards financial inclusion. There is a huge potential of migrating government transactions (payments and receipts) to electronic mode. It is estimated that Government subsidies alone constitute more than Rs.2.93 trillion and if these payments are effected electronically, it may translate to 4.13 billion electronic transactions in a year (rbi.org.in, vision12-15). The e-commerce and m-commerce platforms are poised for a big stride in coming years. Similarly, electronic bill payments and settlements involving insurance, utility bills, taxes, school fees, etc. present a huge opportunity. The country needs to move away from cash-based towards a cash free (electronic) payment system. This will help reduce currency management cost, track transactions, check tax avoidance / fraud etc., enhance financial inclusion and integrate the parallel economy with main stream.

According to World Bank Development report 2013, electronic payments can save over one per cent of India's gross domestic product (GDP). The "Cash may still be “king” at times, but compared with electronic payments, cash payments are inefficient," According to the multi-lateral agency, the rising use of payment by electronic medium can help to save 1.6 per cent of India’s GDP. "Cash can carry significant handling and transportation costs, and run the risks of theft, loss and counterfeiting." This means that if we take the size of India's GDP which stood at Rs 100, 20,620 crore in 2012-13, India could save Rs 1,60,330 crore thanks to electronic payments(RBI annual report). This study makes an attempt to evaluate and analyze and find out whether the electronic payments or paper based payments are growing fast to enable the financial institutions or banks adopt a right business strategy of achieving our vision 2012-15 is the significance of the study.

Study

In a system of inter-woven financial and international economic linkages, an efficient payment and settlement system is paramount. In the Indian set up with an enormous spread of banking and non-bank financial institutions and other financial organizations, ensuring adequate payment and settlement structures with strong security measures is critically significance.

The Indian financial system is characterized by the existence of a variety of payment systems and products reflecting continuation of traditional paper based mode of payments along with a significant growth in a range of diverse electronic modes of payments.

Paper-based versus Electronic Transactions

The magnitude of the paper transactions despite recording decrease continued to dominate the payment system of accounting. The Reserve Bank took several steps to both reduce the settlement time of paper clearing and also encourage the shift towards electronic mode of payments(S. vijay Kumar, n.d.).

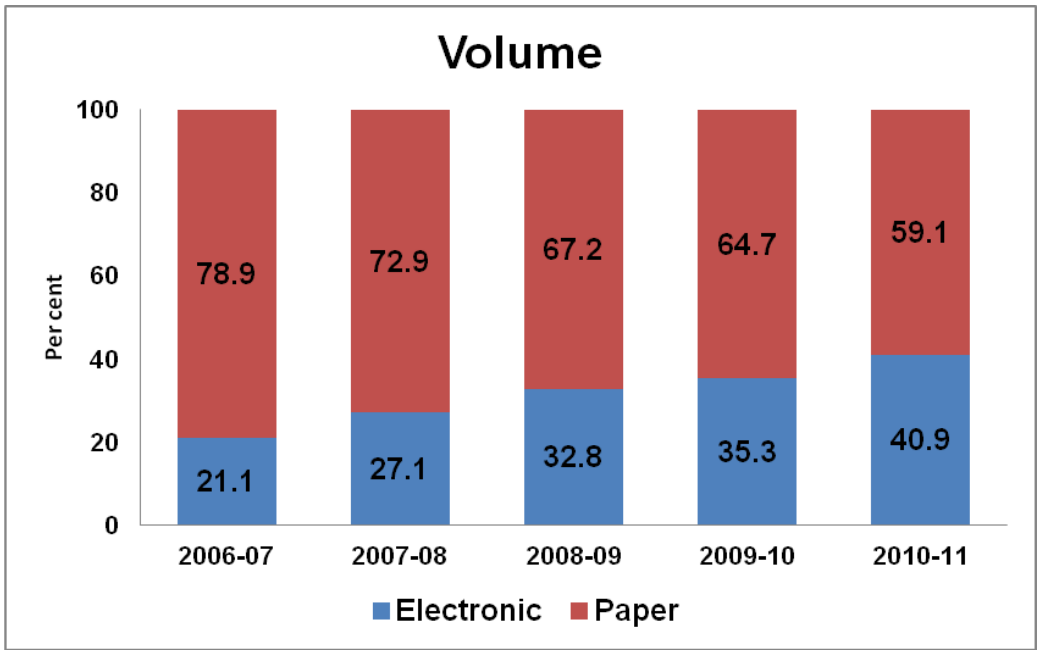


Figure 5: Bar graph of Electronic vs Paper transactions in India in terms of volume

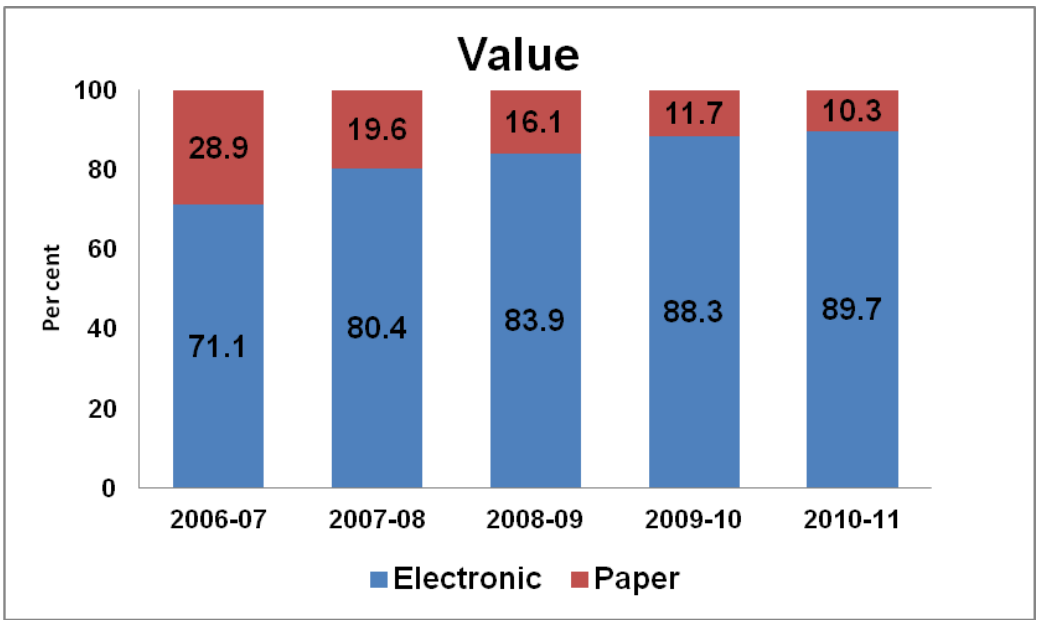


Figure 6: Bar graph of Electronic vs Paper transactions in India in terms of value

From the above Figure 4 and Figure 5 we clearly understand that the trends in the volume and value of paper clearing versus electronic clearing over the recent years show that while in value terms the share of electronic transactions has increased significantly, in volume terms paper based transactions still dominate.

Technology in Payment & Settlement System

The introduction of technology in Payment & Settlement System has made our system more efficient and at the same time harnessing this power of technology will be the most challenging. With the emergence of new technologies, the banking services will become more affordable and accessible(S. vijay Kumar, n.d.).

One of the areas where technology has facilitated significant revolution is payment systems. It started with the mechanization/automation of certain processes by introduction of cheque sorters and readers, MICR-based clearing, etc. and has moved on to use information technology for efficient funds transfer mechanisms such as Electronic Clearing System (ECS), National Electronic Fund Transfer (NEFT), Cheque Truncation System (CTS) and Real Time Gross Settlement (RTGS)(S. vijay Kumar, n.d.).

The Reserve Bank has already initiated work towards introduction of new generation Real Time Gross Settlement (RTGS), which will be able to handle rising volumes, provide better functionalities and has better technological adaptability. Our journey towards leveraging technology for making our payment systems at par with the best in the world will continue with appropriate contributions from all concerned.

Electronic Payment Systems

The electronic payment products provide speedier, cost effective and secure payment mechanism to customers in comparison to traditional paper based methods. The Reserve Bank of India has been proactively involved in promoting electronic mode payments.

Electronic payment products are expected to provide speedier, cheaper and hassle-free payment experience to customers in comparison to traditional paper-based payment instruments. The evolution of electronic payment products in the country have progressed through two main phases – (i) introductory phase and (ii) rationalization phase.

1. Real Time Gross Settlement (RTGS)

2. Retail Electronic Fund Transfer (REFT) or Retail Electronic Clearing (REC)

a. National Electronic Funds Transfer (NEFT)

b. Electronic Clearing Service (ECS) - Debit

c. Electronic Clearing Service (ECS) - Credit

Real Time Gross Settlement (RTGS):

The RTGS system in operation since March 2004 is primarily for large value transactions with the minimum threshold limit at Rs.2 lakh. The RTGS system has been exhibiting rapid growth, not only in terms of volume and value of transactions but also in the coverage of branches. During the year 2009-10, a total of 11,172 bank branches were added in the RTGS system, thereby increasing the number of RTGS enabled bank branches to 66,178(S. vijay Kumar, n.d.).

The situation in 2004 was only 4,800 branches offered RTGS. The rapid acceptance of RTGS by users can be measured by the daily transaction volume: today, we settle close to 100,000 transactions a day in the RTGS mode, up from just about 6000 transactions a day in 2004-05. In fact, quick, safe and efficient electronic movement of funds from virtually any part of the country to any other location is now almost guaranteed(S. vijay Kumar, n.d.).

Trend of Real Time Gross Settlement (RTGS)

Year	Volume (in Millions)	Volume – Growth	Value (Rupees in Crores)	Value – Growth
2006-07	3.8		1,84,81,155	
2007-08	5.8	52.63%	2,73,18,330	47.82%
2008-09	13.4	131.03%	3,22,79,881	18.16%
2009-10	33.2	147.76%	3,94,53,359	22.22%
2010-11	49.3	48.49%	4,84,87,234	22.90%

Source – Reserve Bank of India Annual reports

The above table clearly depicts that the trend in RTGS is positive and the initiatives by Reserve Bank of India to popularize this mode of payment is paying off. The progressive growth of both volume and value of RTGS portrays the acceptance by the customers which is also evident from the strong double digit growth rate recorded throughout the period of study.

Retail Electronic Funds Transfer (REFT):

National Electronic Fund Transfer (NEFT):

NEFT was introduced in November 2005 now covers 77,821 branches and offers eleven hourly near real- time settlements on weekdays and five settlements on Saturdays.

One of the unique features of the system is a mandatory ‘Positive Confirmation’ to the originator confirming successful credit to the beneficiary’s account. Since its inception, the system has witnessed a surge in the volume and value of transactions with 1.4 million transactions settling on a single day which is the highest volume processed till date.

Trend of National Electronic Fund Transfer (NEFT)

Year	Volume (in Millions)	Volume – Growth	Value (Rupees in Crores)	Value – Growth
2006-07	4.7		77,446	
2007-08	13.3	182.98%	1,40,326	81.19%
2008-09	32.2	142.11%	2,51,956	79.55%
2009-10	66.3	105.90%	4,09,507	62.53%
2010-11	132.3	99.55%	9,39,149	129.34%

Source – Reserve Bank of India Annual reports

The volume and value of NEFT is growing positively and the impressive rates recorded during the period of study are the evidence for the system's success.

Electronic Clearing Service (ECS):

The ECS suite of products enables bulk payments. The ECS suite consists of local ECS (jurisdiction limited to local clearing house branches), Regional ECS (state-wide jurisdiction in 9 centers) and National ECS (pan-India coverage). Both RECS and NECS facilitate STP-based processing of bulk payments in a centralized manner in all core-banking enabled bank branches within their jurisdiction(S. vijay Kumar, n.d.).

Trend of Electronic Clearing Service (ECS) - Debit

Year	Volume (in Millions)	Volume – Growth	Value (Rupees in Crores)	Value – Growth
2006-07	75.2		25,441	
2007-08	127.1	69.02%	48,937	92.35%
2008-09	160.1	25.96%	66,976	36.86%
2009-10	149.3	-6.75%	69,524	3.80%
2010-11	156.7	4.96%	73,646	5.93%

Source – Reserve Bank of India Annual reports

From the above table we understand that the growth trends have been steady and not exponential unlike other forms of electronic payments. The negative rate recorded in the year 2009-10 is an aberration as the volume for the same year did record a positive rate. But in general the rates have slowed down considerably in the last two years during the period of study as customers prefers the other payments modes like NEFT.

Trend of Electronic Clearing Service (ECS) - Credit

Year	Volume (in Millions)	Volume – Growth	Value (Rupees in Crores)	Value – Growth
2006-07	69		83,273	
2007-08	78.3	13.48%	7,82,222	839.35%
2008-09	88.4	12.90%	97,487	-87.54%
2009-10	98.1	10.97%	1,17,613	20.64%
2010-11	117.3	19.57%	1,81,686	54.48%

Source – Reserve Bank of India Annual reports

The abnormal growth rate recorded in the volume for the year 2007-08 was because it includes the refund of the over subscription amount of Initial Public Offers (IPO) floated by companies using electronic mode as mandated by the Stock Exchange. The growth rate of ECS – Credit is satisfactory during the period of study(S. vijay Kumar, n.d.).

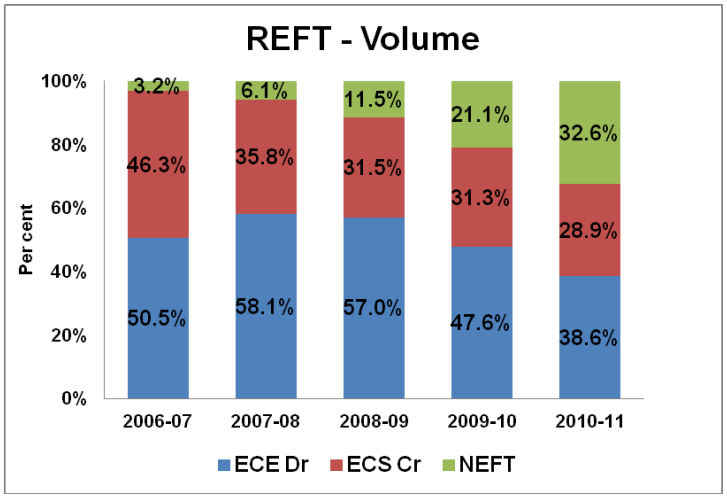
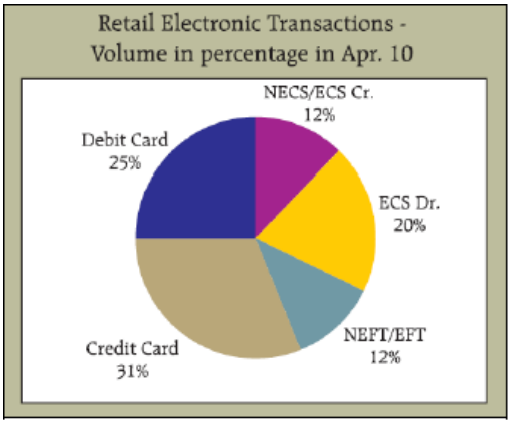


Figure 7: Share of Retail Electronic Funds Transfer (REFT)-Volume

Volume of card business in India

A snapshot, as in Figure 7 below, indicates that in volume terms 56% of retail electronic transactions are through credit and debit cards (though in value terms, it is only 10%).



Source: RBI Bulletin June 2010

Figure 8: Volume of card business in India

In India, the number of valid credit and debit cards in circulation is 2,000 lakh. During 2009-10, the number of transactions on such cards had been of the order of 4,040 lakh and the amount of transactions `89,270 crore. The number of card transactions increased by 193% during the period 2003-04 to 2009-10.

Role of the RBI in Encouraging E-Payments

As the apex financial and regulatory institution in the country it is compulsory for the RBI to ensure that the payments system in the country is as technologically advanced as possible and in view of this aim, the RBI has taken several initiatives to strengthen the E-payments system in India and encourage people to adopt it.

The Payment and Settlement Systems Act, 2007 was a major step in this direction. It enables the RBI to "regulate, supervise and lay down policies involving payment and settlement space in India." Apart from some basic instructions to banks as to the personal and confidential nature of customer payments, supervising the timely payment and settlement of all transactions, the RBI has actively encouraged all banks and consumers to embrace e-payments.

In pursuit of the above-mentioned goal the RBI has granted NBFC's (Non-Banking Financial Companies) the permission to issue co-branded credit cards forming partnerships with commercial banks.

The Kisan Credit Card Scheme was launched by NABARD in order to meet the credit needs of farmers, so that they can be free of paper money hassles and use only plastic money.

A domestic card scheme known as Rupay has recently been started by the National Payments Corporation of India (NPCI), promoted by RBI and Indian Banks Association (IBA), inspired by Union pay in China, which will be promoting the use of cards i.e. "plastic money". Initially functioning as an NPO, Rupay will focus on potential customers from rural and semi-urban areas of India. Rupay will have a much wider coverage than Visa, MasterCard or American Express cards which have always been used for card-based settlements.

However, the Indian banking system suffers from some defects due to certain sociocultural factors which hampers the spread of the e-payments culture even though there are many effective electronic payment channels and systems in place. Despite the infrastructure being there nearly 63% of all payments are still made in cash. A relatively small percentage of the population pays their bills electronically and most of that population is from urban India-the metropolitans. Also in some cases the transaction is done partially online and partially "offline". The main reason for this apathy switch to E-payments comes from lack of awareness of the customer despite various efforts by the Government.

Suggestion and Recommendations

The following suggestions and recommendations have been observed are:

The usage of a payment product is dependent on the customer being aware of the existence of such a product and its use as also the safeguards against its misuse. Therefore, it is necessary that awareness of various payment products is created through the innovative use of available mass media. Stakeholders, singly or as groups of common purpose, must make efforts to spread awareness in making both the urban and rural user (as user or beneficiary) aware of their respective payment products. Both regulators and the government can assist to widen this spectrum to wean away population from cash to less cash with attendant benefits of efficiency and better productivity.

Availability and awareness of payment products will not lead to increased usage unless the payment product is accepted by all. The acceptability of formal payment channels including e-payments is based on the ease of use, convenience, interoperability, language neutrality and incentive factors associated with the particular mode of payment. Thus, a multi-pronged strategy is required to increase the acceptability of payment products from the regulators, government and stakeholders.

It is important to create awareness amongst the consumers/customers using these electronic payment methods. Reserve Bank has initiated a series of awareness programs – e-BAAT (Electronic Banking Awareness Training) along with banks and other stakeholders. At the same time, serious attention needs to be paid to related issues of consumer protection, grievance redressal mechanisms, and issues of consumer liability in case of negligence or complicity in the event of unauthorized/fraudulent transactions.

Finally, for large value electronic payments systems, RBI's vision should be to bring them up to world standards like ISO 20022 message standards reduce the complexities and integrated with global systems. Cross-border payments are an important facet of international trade and integration, and this can lead to settlement risks. RBI should address operational and regulatory issues to minimize these risks.

Conclusion

Information Technology (IT) has revolutionized banking industry and the impact is for everyone to see and feel and experience. The technology in banking sector has touched people

from all walks of life. The emergence of technology in this most dynamic industry has helped in increasing the speed and efficiency of banking operations by facilitating the emergence of innovative products and new delivery channels. The rapid advancement in technology has enabled the Reserve Bank of India to initiate various technology-based changes to the banking environment in our country. In an environment of fast changing trends and ever increasing demands of users, IT adoption poses several challenges, spanning applications, security, network, vendor management and data management.

The visible benefits of IT in day-to-day banking in India are quite well known. There's 'Anywhere Banking' through Core Banking Systems, 'Anytime Banking' through new, 24/7/365 delivery channels such as Automated Teller Machines (ATMs), and Net and Mobile Banking. In addition, IT has enabled efficient, accurate and timely management of the increased transaction volume that comes with a larger customer base. It has also facilitated the movement from class banking to mass banking.

4. Campus Survey

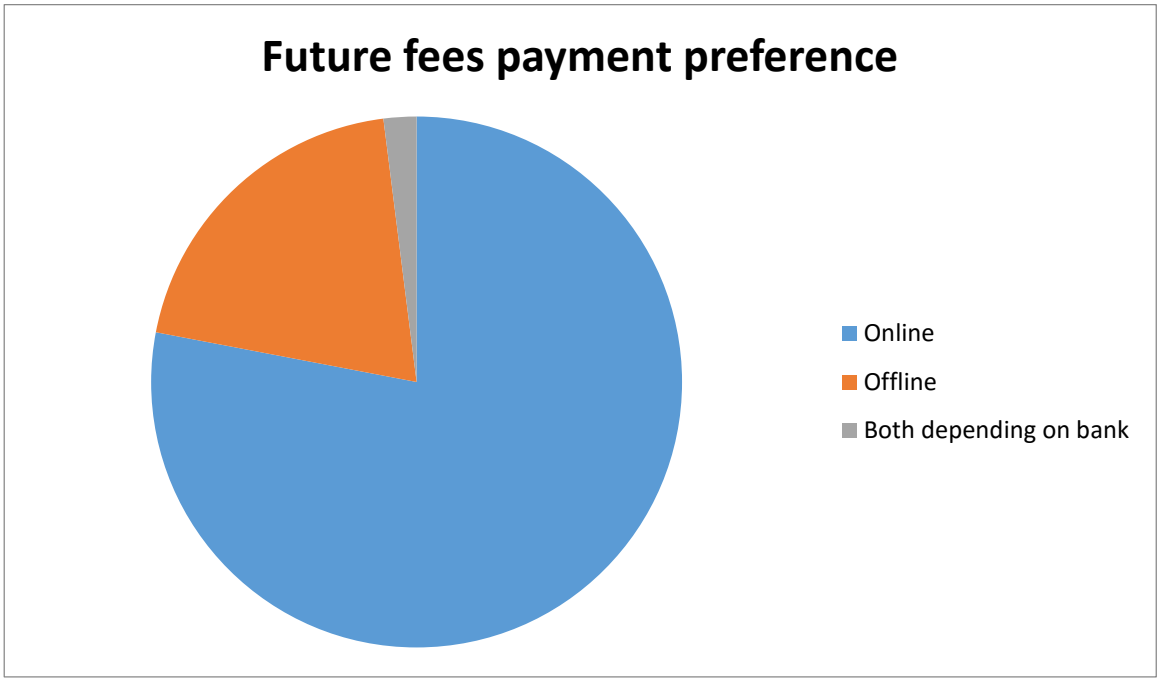
Introduction

The following is a case study of 100 students. This case study was made on random students to observe the reason and kind of fees payment preferred by these students. An attempt to find out the reasons why the students did not prefer the other method is also made. The students were asked to rank different payment methods depending on their usage. An analysis was made to see if the students find the electronic payment method reliable and if they would use it in the future.

Analysis

A. Amongst the 100 students, 48 students used the online method to pay their fees this semester and 52 students used offline method of payment.

B. Amongst 100 students, 79 students have preferred to use online payment to pay their fees in the future, 19 students preferred paying the fees through Offline method. And 2 students wouldn't mind using any payment method depending on the bank she has to deal with.



C. An analysis was made to observe if students find electronic payment reliable and would use it in the future. Each student who found electronic payment reliable would use it in the future. The rest of the students view are as below:-

1) The students who dint find it reliable yet would use it in the future are – 4.

2) The students who don't find it reliable and will not use it use it in the future – 4.

D. The following pie chart shows the preference of 81 students in percentage who have ranked Debit/Credit Card, Mobile Banking, Cash, Net Banking, Cheque on the basis of their usage.

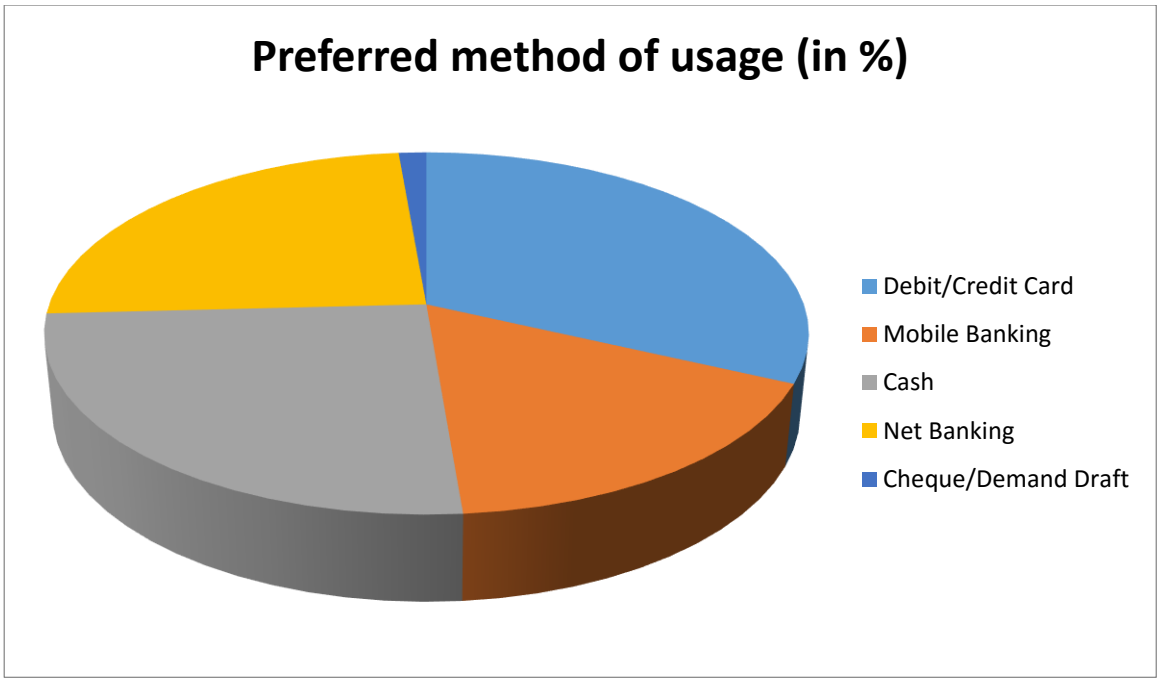
1) Debit/Credit card- 28.11%

2) Mobile banking- 14.8%

3) Cash- 22.46%

4) Net banking- 21.54%

5) Cheque- 13.06%



The reason why students choose online method was because of the following:-

1) Faster, not tedious
2) Easy/convenient
3) To get rid of long lines

4) Reliable
5) Lazy
6) No extra charges for payment
7) Save Time
8) Bad feedback of online payment methods

The reason why people choose offline method of payment was :-

1) Reliable and Safety
2) Bank loan
3) Online portal was down
4) Have to again approve the online payment
5) Deadline
6) DASA- big amount
7) Convenient
8) Habitual
9) Forgot the password of account
10) Had to make a DD for mess anyway (partial activation of services by the college i.e disparity in access)
11) Rely only on certain procedures (eg. Rupay not there)
12) Transaction failed
13) Not aware

As seen in our case study, students definitely want to start using online method of payments.

There are only 8 students who don't find it reliable and among the 8 students there are only 4 students who will not use it in the future. The remaining 4 students would want to use it in the future provided they find it more secured.

The remaining 92 students find it reliable. However, only 48 of them have used it in paying their fees this semester because of certain issues faced by them or their friends.

Proposed Solutions:

1) The deadline for the online fees payment and offline fees payment should be the same.
2) Ensure proper net connections
3) The college's server shouldn't be down when online fees payment system is being offered by them.

4) Banks should ensure their customers about the security steps taken by them.

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