Comparative analysis of payment system and suggesting solutions for data security issues in Pakistan

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***Abstract*— The payment system has been the back bone of financial systems of a country. The stability and growth of an economy is directly related to the strength, reliability, scalability and efficiency of payment system. There are various kinds of instruments and channels in payment system; some are slow like paper cheques and some electronic transfers. And after the introduction of Electronic payment methods and their wide spread acceptance in many developed countries has played an important roles in stabilizing and growing their economies. But the use of electronic payment methods is still in infancy in Pakistan due to various incidents of frauds and identity thefts. In Pakistan only 12% of population has access to Bank branches but internet is available in almost every small town and mobile penetration is almost 80-90% of population. Currently there are two major systems payment systems i.e. one is using clearance of amount based on settlement of Physical cheques drawn between difference banks and second is using online interbank fund transfer . The second one is also divided into two segments. i.e. large and small amounts of transaction. Larger transactions having no limit of amount are conducted between Banks using Real Time Gross settlement Systems (RTGS) managed by Stat bank of Pakistan and the other is using Online Interbank fund transfer for small payments having limitation of 250,000 (Two lacs fifty thousand rupees) categorized as retail payment systems. The cost of transfer for large amount is only 50 Rupees per transaction regardless of amount, but an ordinary customer has to be a good business client of bank to carry out transfer of amount online.**

The cost of low amount using interbank online transfer is at least 50 Rupees and goes up with amount of transfer.

The service fee or cost is also different among various payment methods. The major cost on cheque clearing is TIME which is from 24 hours to 36 Hours and this is the costlier methods. Further the movement of cheques between banks and central clearing house is a great threat in current situation of law and order. The amount written on cheques and the name of beneficiary and issuer could be the possible data security issue. So this is major issue in terms of cost , efficiency and data security.

In this study the emphasize would be to evaluate the problems in this section and to suggest more secure and efficient system. So this study is aimed at to suggest secure, efficient and reliable method of payment system.

Keywords—Payment systems; Data security issues; Electronic payment; Comparative analysis; Internet banking; RTGS.

I. INTRODUCTION

The payment systems are the backbone of any financial systems and the whole economic life of an economy. The payment systems is composed of various components including Financial and non-financial bodies, payment instruments, rules and regulation, standards and best practices, and Technical solution. The reliability and efficiency of technical solution determine the cost of transaction and time it takes to transfer the money. The cost and time of transfer of money is very important in promoting financial activity.

The banks all around the world are trying to make it efficient, reliable and scalable to promote their economy in terms of financial stability [13]. The fast and secure payment system is the key to build and maintain the trust of its users. The perception of users of system about the security and reliability plays an important role in development and sustainability of that system [14]. The users could be financial institutions making payments in millions and billion or small users making payment of 1 rupee to millions of rupees. The efficient and reliable payments system is the basic requirement to build and maintain the confidence of users of this system. Be it a small payment or a large payment. It could be local payment or cross boarder transaction. The time and cost of transaction in payment systems is of utmost importance. But the most important factor is the reliability in terms of security features in the payment system. The trust of people is the driving force in the success of payment system. The reach of payment instrument among masses and its acceptance require certain rules and regulation to be implemented and monitored for any breach or threat of breach and such kind of incident must be acted upon and be plugged in with better rules and techniques [15].

The first one is international g financial messaging system where across the border financial institutions around the world settle their account using SWIFT (Society of Worldwide Interbank Financial Telecommunication) system. This SWIFT system is a consortium of financial institutions and work as an independent cooperative body and provides various services

related to financial correspondence as well. This body was formed in Brussels, Belgium in 1973 by a group of banks.

The second one is Real Time Gross Settlement networks systems which are used to settle large value transaction amount among participating financial institutions in the country. The account are maintained in RTGS for every participant but its actual settlement is carried out in core banking software account in central banks , thus the RTGS systems are connected via core systems of respective central banks or Financial Authorities in respective countries. The boom of RTGS systems was started in 1990.

The third one is to retail payment settlement system which usually settles paper instruments like cheque based clearing on net settlement basis for banks. It can take from 1 day to 3 days for completing settlement cycle for individual cheques. Though the bank system run 2 to 3 cycles per day for processing of cheques but the various steps involved in settlement of payment instrument get 1 to 3 days. If the movement of cheques and instrument is physical than time is 1 -3 days and if the system is Cheque truncation where images of cheques are processed over some portal than time is reduced to hours to one day.

At consumer level and In electronic business the main source of payment is usually a credit card backed by Visa or Master Cards or American Express companies. The use of debit card having same backing by Visa and Master Cards is also gaining popularity. But the major issues in e-commerce acceptance among the masses are perceived security threats of identity compromise of user credentials. Some countries practice the security guidelines more than others and adopt the new technological advancement rapidly to maintain the trust and patronage by end users. Like European countries have been using Chip based credit cards for long time where as USA is still not using them. In Pakistan some of the issuing banks are using chip based cards but they are not offering PIN based authentication for use of credit cards.

II. FACTORS AFFECTING SECURITY ISSUES

Four major factors are used to analyze the security and reliability of payment systems [12]. They are:

A. Legal and Regulatory frame work
B. Supervisory body
C. Problems resolution mechanism.
D. Security standards for Technical solution

In this study, various payment systems and their methodology would be evaluated and analyzed with respect to their technology and their vulnerability. The incidents of frauds and the response to such threats would be evaluated. The information security standards to minimize the risk associated with the use of technology would also be evaluated. Data security issues in payment systems in Pakistan would be the main focus of study. Comparison of technologies implemented in various countries and their availability and implementation in Pakistan would be analyzed.

There are various Information security standards which are used by many business organizations as per their need and requirement [10]. The basic tools and techniques are almost same in these standards but the mode of implementation customized to cater the requirements. For Payment card industry there is a standard known as PCI DSS which has six control objectives and every objective is achieved using some requirements related to use of technology [7]. Likewise mobile based transactions authenticated through SMS messages sent to both increase the reliability and security of systems[8], [9].The architecture and cycle of payment systems and its main building blocks are required to be studied to evaluate vulnerabilities and suggesting steps to curtail the data breaching possibilities and making them more secure and building the user confidence.

III. DESCRIPTION OF FACTORS AFFECTING SECURITY

A. Legal and Regulatory frame work for payment system:

There must be some legal and regulatory framework for any financial institution to work in the designated country and follow the rules and instruction given under the legislation and instruction promulgated by an authority in the country. So mostly the central banks of the respective countries are the authority to control and monitor the payment system under their jurisdiction.

There is Bank for international settlement (BIS) which facilitate the regulation for settlement of international transaction among the countries.

B. Supervisory body

It is important that any payment system work under a legal framework and is regulated through some laws and is supervised through some Government agencies. Usually central banks which are mandated by the governments are responsible for regulating the payment systems. Sometimes autonomous bodies are setup to run the paper based clearing systems to settle interbank transactions but even they are supervised under some regulations or regulatory bodies.

C. Problems resolution mechanism.

There is always a room for improvement of systems and it is possible to have some issues in settlement of payment instruments or transaction settlement among the parties. But the presence of law and some mechanism to settle the issues is important to keep the system on track.

D. Security standards for Technical solution

With the advent of information technology and electronic settlement of payment instrument in various systems , it is important to keep the system secure and follow the standard of security and ensure the compliance of system policies.

IV. OVERVIEW AND COMPARISON OF PAYMENT SYSTEMS AND TECHNOLOGIES.

A. Legal and Regulatory frame work

Legal framework is the most important thing to successfully operate any system. Following is the comparative analysis of legal framework being used in various countries to oversee the operation of payment systems.

Table 1: Payment systems regulations types

Country	a. Central Bank Law	b. Banking Law	c. Payment Systems Law	d. Securities Markets Law
Australia	Y		Y	Y
Belgium	Y	Y	Y	Y
Canada	Y		Y	Y
China	Y			Y
France	Y	Y	Y	Y
Germany	Y	Y		
India	Y		Y	Y
Ireland	Y		Y	
Japan	Y	Y	Y	Y
Kuwait	Y	Y		Y
Netherlands	Y	Y	Y	Y
Oman		Y		
Pakistan	**Y**		**Y**	**Y**
Russia	Y	Y	Y	Y
Saudi Arabia	Y	Y		Y
Singapore	Y	Y	Y	Y
United Arab Emirates	Y			
United Kingdom	Y			Y
United States	Y	Y	Y	Y

Source:World_Bank_Global_Payment_Systems_Survey_2010 _AppendiY_WEB_final.

B. Supervisory body

Payment system operations and oversight is required by a regularity authority and almost in every country is operated and regulated by central bank. In some countries though some authorized companies manage the operation of systems but overall governing authority lies with central bank. Some countries are operating payment systems since long such as USA. But mostly electronic RTGS systems started to grow in 1990s and after 2000. Pakistan started in RTGS system in 2008.

Following is the comparative analysis of operator and settlement agents and commencement of operation of RTGS payment systems.

Table 2: Regulatory authorities for RTGS systems

Country	Operator	Settlement Agent	Year
Australia	Central Bank	Central Bank	1998
Austria (TARGET2)	Central Bank	Central Bank	2007
Belgium (TARGET2)	Central Bank	Central Bank	2008
Bulgaria	Central Bank	Central Bank	2003
Bulgaria (TARGET2)	Central Bank	Central Bank	2010
Canada	CPA	Central Bank	1999
Finland (TARGET2)	Central Bank	Central Bank	2008
France (TARGET2)	Central Bank	Central Bank	2008
Germany (TARGET2)	Central Bank	nap	2007
India	Central Bank	Central Bank	2004
Ireland (TARGET2)	Central Bank	Central Bank	2008
Italy (TARGET2)	Central Bank	Central Bank	2008
Namibia	Central Bank	Payment Clearing House	2002
Netherlands (TARGET2)	Central Bank	Central Bank	2008
Pakistan	**Central Bank**	**Central Bank**	**2008**
Switzerland	SIY Interbank Clearing Ltd	Central Bank	1987
United Arab Emirates	Central Bank	Central Bank	2001
United Kingdom	CHAPS Company	Central Bank	1996
United States	Central Bank	Central Bank	1918
Zambia	Central Bank	Central Bank	2004
Zimbabwe	Central Bank	Central Bank	2002

Source:World_Bank_Global_Payment_Systems_Survey_2010 _AppendiY_WEB_final.

C. Problems resolution mechanism.

Issues resolution is very important and essential part of any payment systems, so there must be some mechanism or laws to protect and resolve the issues of system users. The strength of court of law in such matter increases the trust, growth and acceptance of payment systems. Availability of problem resolution mechanism and related laws in various countries to settle issues are as under. In Pakistan there also some bodies and rule to protect the participant and consumer and to provide them relief under the given laws in cases of disputes.

Table 3: Comparison of resolution mechanism in payment systems

Country	b. Legal recognition of (bilateral and multilateral) netting arrangements	f. Protection from third-party claims of securities and other collateral pledged in a payment system	g. Consumer protection for retail payment services
Australia	Y	Y	Y
Belgium	Y	Y	Y
Canada	Y		
China	Y	Y	Y
Finland	Y	Y	Y
France	Y	Y	Y
Germany	Y	Y	Y
Ghana	Y	Y	Y
Guatemala	Y		
India	Y	Y	Y
Ireland		Y	Y
Japan	Y	Y	Y
Malaysia	Y		
Nigeria	Y		
Oman	Y	Y	Y
Pakistan		**Y**	**Y**
Russian Federation	Y		
Saudi Arabia		Y	
Singapore	Y		Y
United Arab Emirates			
United Kingdom	Y	Y	Y
United States	Y	Y	Y

D. Security standards for Technical solution

The three most used technology infrastructure used for RTGS system implementation in various countries is given below. Pakistan is using proprietary network along with many other countries.

V. CARD AND E-PAYMENTS SCENARIO IN PAKISTAN.

A. Usage pattern of electronic money

1. User perception about the security and reliability on cards and electronic payment systems based on internet or mobile is very important [11]. Their perception of security plays a decisive role in the growth and adaptability among the masses. The periodical auditing of systems to identify the risks and their mitigation process should be a continuous exercise to maintain the end user trust. The use of mobile banking is on the rise due to its speed and convenience. Use of mobile as payment device in recent years has been remarkable to due to its convenience and affordability. The security of communication in mobile is one of the factor to increase its usage. Mobile transfer of money in branchless banking in various countries is one of the success to ensure the robustness of systems [3],[5]. Use of card and electronic transaction is getting momentum in Pakistan as number of debit cards issues and use of internet are banking and interbank fund transfer using shown in following picture.

Table 4: Comparison of Technical Systems used for RTGS

Country	a. SWIFT international network	b. SWIFT closed users' group	c. Proprietary telecommunications network
Australia		Y	
Belgium		Y	
China			Y
France	Y	Y	
Germany		Y	
India			Y
Ireland		Y	
Japan			Y
Macedonia FYR	Y		Y
Oman			Y
Pakistan			**Y**
Russian Federation			Y
Saudi Arabia			Y
Singapore		Y	
South Africa	Y	Y	Y
Switzerland		Y	Y
Thailand		Y	Y
United Arab Emirates			Y
United Kingdom		Y	
United States			Y

Source:World_Bank_Global_Payment_Systems_Survey_2010_AppendiY_WEB_final.

B. Issues in cards and internet banking

Sometimes the cards are lost and the owner notices it after sometimes so he is unable to block the cards on time. The lost cards could easily be used at any merchant shop as the merchants in Pakistan does not pay due diligence in verification of identity of card through verifying the signature on back of cards or asking for identity match by asking for NIC or other identification from card user. This type of overlooking behaviour at merchant side is against the policy of card issuing authorities i.e. VISA, Master Card etc and issuer

banks. As per guidelines the merchants are to verify the identity by verifying the signature on card. But mostly cards which are used by customers are not properly put in with their signature at the back of the card before using it any merchant or point of sale.

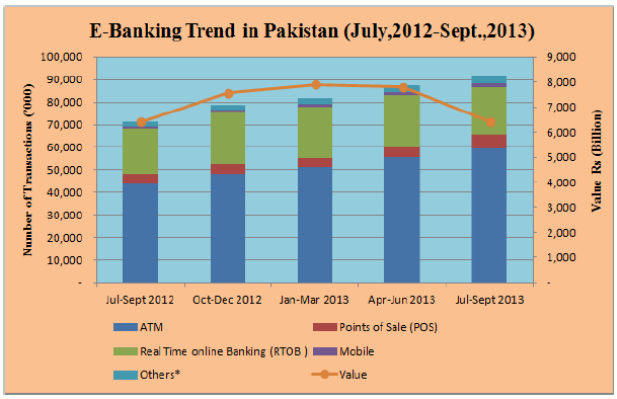

Fig. 1:State Bank of Pakistan report showing e-banking trends

The introduction of messages after every transaction are introduced in Pakistan and are they play a major role in informing the card holder of it possible misuse but they are post transactions so could not help to stop the transaction or roll back it. If the transaction over certain amount are required to be authorized via SMS than it could be a major step towards containing unauthorized transactions. This type of SMS based transaction authorization is practiced in EUROPE [4].

One time password based authorization of account is also a good security measures while adding online account for online fund transfer [6]

CONCLUSIONS

It is appears that Pakistan is using various payment systems with automated and semi-automated system and have the required regulations to protect the systems and transactions. There is a system of lodging complaints and resolving the issues to as per law and regulations. The Payment systems are regulated by central bank and Audited frequently to assess the potential risks and to take required measures to mitigate the risks.

As for comparing the gross payment systems with that of other countries is concerned, it appears that proprietary system used for RTGS by Pakistan is reliable and safe as it has limited access and based on private network inside the country and such proprietary systems are being used in many countries as well. It is using message standard of SWIFT systems and secure connectivity between clients and servers through PKI infrastructure setup and certificates are renewed periodically as well.

Regarding retail payments, it is suggested that Cheque Truncation System (CTS) or Automated clearing House should be implemented to standardize cheque features and reduce the time of settlement from 2 days to hours for cheque based clearing and n consumer side use two factor authentication be implemented by using of EMV chip-n-pin based card should be implemented on priority basis. There is also a need to create awareness among the masses about the prevailing scamming methods such us skimming of cards, keeping personal information secret, avoiding phishing and taking care while charging credit cards at service stations and restaurants as the card is not charged in front of them and chances of skimming are high.

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