

Digital Signatures: Bringing a Paradigm Shift in E-Banking

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Technology revolution at an accelerating rate has led to novel ways of handling the banking affairs especially via on line channels. Banking and Insurance being an inevitable part of our personal and professional lives, needs to be enhanced in terms of technology usage for validation and protection against malicious alterations. Digital signatures are widely used in various sectors as mandated by the Indian Government to authenticate the electronic data transactions. Just as signatures facilitate validation & verification of the authenticity of paper documents, digital signatures act as a tool of validation and authentication of electronic documents. The study suggests the usage of digital signatures in the opening up of various types of bank accounts. This study would focus the multifaceted implications of using digital signatures on operating costs, the quantum of paper formalities, customer satisfaction and enhancing customer engagement.

Findings: It shows a significant relation between the usage of digital authentication technology and the effect on the major factors leading to customer satisfaction. The study also concludes a handsome percentage reduction in the overall operating costs associated with the opening up of bank accounts. However, customer engagement can be enhanced by using the suggested technology which further leads to minimization of time & work efforts.

Key Words: Digital Signatures, operational efficiency, service recovery, customer engagement, co-creation strategy.

Introduction

Since the last decade, there has been a fundamental shift in banking sector with respect to the customer delivery channels, spectrum of products/services provided and the technology revolution.

E-commerce has emerged as a novel and differentiated way to perpetuate the business activities in the new economic era. E-contracts, Internet Banking and digital signatures have become standard tools of carrying out various business transactions (Everett Durante Cordy, 2003).

On line banking is gaining momentum which has further

accelerated the e-commerce activities. On line banking may be illustrated as an Internet portal, through which customers can use different kinds of banking services ranging from payment of various bills to making investments and reservations.

The World Bank's annual development report, Knowledge for Development (1998), focuses on the significance of leveraging new media technologies in the developing countries. The developing economies need to work upon their major constraints of communication infrastructure, information processes and technical knowhow.

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Europe, in general, may be considered as a leader in on line banking technology and usage (Schneider, 2001). But most of the developing economies are behind the advanced ones with regards to the number of Internet Service Providers (ISPs), web hosts connected to the Net and the number of organizations leasing line connections. Some of the common features of most developing nations are limited web content in terms of the number of websites, the quantum of local language content in it and the on line usage by the customers.

The various online applications, viz banking, derivatives and stock trading, dealings in merchandise and so on, are putting more focus on electronic transactions so that the various operating costs may be minimized and the quality of services may be improved (Subramanya & Byung K Yi, 2006).

The banking sector has embraced e-commerce on an open platform in order to improve their performance and use it as a tool for hedging as well as to gain a strategic competitive advantage. Four major factors are identified as significant driving forces for global acceleration of banking on the Internet. They are (NOIE et al., 1999):

- a) Increasing competition between banks and new entrants.
- b) Increase in the customer demand.
- c) Perpetual drive by the banks to reduce the costs and achieve new efficiency levels.
- d) Deregulation of the financial services market.

With reference to the above factors, many electronic surveys depict that the information security holds priority for both businesses and consumers (Ernst & Young, 1999). Thus, there is a need of companies that markets the highest calibre of secure messaging products as demanded by the customers.

This study would be of great usage and interest from

the standpoint of research, service security and IT usage in banking related issues.

This research paper has the following objectives

- To examine link between usage of digital signatures in opening of the bank accounts and improving the operating efficiency.
- To analyse the effect of digital signature usage on customer satisfaction and customer engagement.
- To examine the effect of digital signature usage in service failures and recovery procedures in banking sector.

In banking industry, service recovery means the response of the bank to the service failures.

Service failure in banking are related to the services offered by the bank, the procedure of delivering services and the ultimate outcome (Levesque and McDougall, 1993).

If there is any service failure, it leads to customer dissatisfaction and also service defection which in turn depends upon knowledge of customer regarding the availability of the alternative service provider (Ranaweera and Prabhu, 2003; Johnson et al., 2001; Capraro et al., 2003).

There is a close linkage between service recovery and customer satisfaction (Oliver and Swan, 1989; Kelley and Davis, 1994; McCollough and Berry, 1996; Singh and Wilkes, 1996; Tax et al., 1998; Zemke and Bell, 1990; Maxham, 2001).

Banking customers tends to have very high satisfaction levels if their problems with the bank are resolved in the manner they perceived (Dove and Robinson's, 2002). If there is service failure and it is resolved effectively in such a manner that the customer is satisfied with the recovery efforts, he is likely to increase the business of the bank three times

(International Journal of Retail & Distribution Management, 1995). Banking customer satisfaction can be achieved through efficient handling of the problems and resolving the problem completely over the telephone (Press et al., 1997). There is an increase in the customer loyalty towards the bank if service recovery was perceived to be effective (Craighead et al., 2004).

Service Recovery

Service recovery is the outcome of Service Failure. Service failure refers to the problems or inconvenience experienced by the customer which is out of the scope of the customer's mindset. Service failure occurs when the service provider fails to provide service according to the customer expectations.

Service failure may be observed in various areas namely operational failure, behavioural failure, hygiene failure & so on. Particularly, in this context operational failure is applicable. Banking and finance industry is probably the only industry in the service sector, where scope of service recovery is almost nil. One dissatisfied customer can spread his views to thousands of people via internet (social media) and may lead to permanent customer loss to the banks.

Thus, banks should try to provide services in a manner which minimizes the scope of service failure and thus the need of service recovery is vanished. The usage of digital signatures would help in minimizing the service failures with regards to forgery, misleading identity of the customer etc.

Electronic Banking

After the liberalization and globalization of banking services, there has been a widespread transformation in the procedural requisites of the banking services and products. The banking sector is constantly coming up with novel products and service categories for improving customer satisfaction.

Electronic banking originally means the information providing medium about the bank and its services via the World Wide Web on a uniquely identified web page address.

Initially, the online banking services were utilized for informational purposes only. The usage became all the more convenient as the customer was allowed to be engaged in online banking portals. This became a platform for enhancing the relationship with the customer and the banks started emphasizing on the various online linkage possibilities. It not only led to the reduction in the customer litanies but also improving the services requiring customer engagement.

Currently, the online banking facilitates the customers with transactional means to access their bank accounts, make varied category of payments, ability to move their monetary balance, make loan applications and an array of miscellaneous complementary services.

With the perpetual and rapid growth of internet banking services, there is a need of developing and implementing a sound security system. Thus, there is a need to design and develop certain methods of authentication so that the customers can work safely in the dynamic environment of technology upgradation. One such development in PKI based technology.

PKI technology refers to the public key infrastructure wherein pair of keys is used. One is the private key which is solely known to the owner and the second is the public key which is known to every person who wants to enter into any type of transaction with the owner. For maintaining secrecy and confidentiality of the message, it is encrypted with the owner's key.

When the message involves certain documents, there is a need of validation and authentication procedure which is free from any personal prejudice. Validation

means a procedure in which we try to find whether the contents mentioned in the documents are reliable and backed by appropriate certification. On the other hand, authentication refers to the procedure of certification of the sender of the message so that fishy circumstances may be wiped off.

The validation in case of paper documents may be conveniently done by written signatures but in case of electronic transactions, where documents are also stated in similar form, the authentication may be done by using 'Digital Signatures' based on the PKI technology.

Digital Signatures

A digital signature is an electronic signature that can be used to authenticate the identity of the sender of a message or the signer of the document and to ensure that the original content of the message or document that has been sent is unchanged. Digital signatures are easily transportable, cannot be imitated by someone else, and can be automatically time-stamped. The ability to ensure that the original signed message arrived means that the sender cannot easily repudiate it later.

A digital signature can be used with any type of message, whether it is encrypted or not, simply so that the receiver can be sure of the sender's identity and that the message arrived intact. A digital certificate contains the digital signature of the certificate-issuing authority so that anyone can verify that the certificate is real.

Non-repudiation of origin is an important aspect of digital signatures. By this property an entity that has signed some information cannot at a later time deny having signed it. Similarly, access to the public key only does not enable a fraudulent party to fake a valid signature.

Digital signatures are commonly used for software

distribution, financial transactions, and in other cases where it is important to detect forgery or tampering.

Governance by CCA

The Information Technology Act, 2000 provides the required legal sanctity to the digital signatures. The digital signatures are now accepted at par with handwritten signatures and the electronic documents that have been digitally signed are treated at par with paper documents.

The IT Act provides for the Controller of Certifying Authorities (CCA) to license and regulate the working of Certifying Authorities (CA). The certifying authorities (CAs) issue digital signature certificates for electronic authentication of users.

Various companies in India which are authorized by the Indian Government namely TCS, MTNL, GNFC, e-Mudhra etc. offers digital signatures in India.

Digital Signatures in Opening Bank Accounts

The usage of Digital Signatures is mandated by the Indian Government in some sections of the following fields namely

1. Registrar of Companies (ROC)
2. Value Added Tax (VAT)
3. Government Tenders
4. E-governance portals
5. Import and Export applications
6. Income Tax

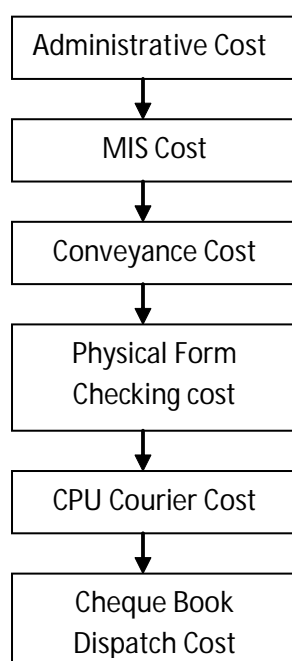
The usage of digital signatures in the above areas has led to major changes in working procedures which further entails the reduction in the operating costs. The end users in above cases are free from paper work which apart from physical signatures, it also requires various proofs for validation. By using the digital signatures, the above procedures has become time efficient, minimized the third party involvements, increased ease of the client, reduced the administrative

delays involved in approvals and thus, became cost effective from the viewpoint of the client as well as the service provider. So far digital signatures usage is successful in terms of security issues, signature issuance and its usage by the end clients.

Thus, on line services could reduce the overheads, technology investment costs and the insecurity issues associated specifically in the banking transactions. The opening up of the bank accounts is a perpetual activity, with banks striving on this activity always round the

clock. Opening new accounts is the initial stepping of the customer to avail the basic services. Gradually, the scope of usage may be widened to other services leading to enhancement of banking business. If the stepping stone is made concrete and convenient with the digital signatures, it may lead to cost reduction for the banks as well as for the customers.

Operating costs associated with the opening up of the bank accounts, on the part of banks, may be represented by the following generalised model:



(Figure 1) Operating Costs involved in opening bank accounts

The above model represents the various operating costs involved in sequence with reference to the opening of bank accounts.

The first cost is the administrative cost in which the remuneration of the executive involved in opening of bank accounts is paid by the bank. The executive visits the clients place on call, takes the form with him, to be filled by the client and take his physical signatures for validation and authentication. When demand for bank accounts increases with particular banks, the bank has

to employ many executives for performing the same job. When it comes to metropolitan cities, where physical presence is itself a challenging task, the clients prefer the nearest bank branch and the other banks may lose business in spite of being first priority of the client. The client also compromises with the services. Digital signatures usage would help to overcome this cost.

The second associated cost is the MIS cost. This cost is incurred to verify the contents and customer

information. This cost may to a great extent minimized with the usage of digital signatures.

The third cost is the conveyance cost incurred in sending the executive to the client's place. This cost is borne by the bank and it increases even more in case of metropolitan cities. This cost will be completely wiped off if the whole procedure becomes online and bank starts promoting digital documents. The authentication required in most of the digital documents may be done through the digital signatures.

The physical verification of the form is required while opening of bank accounts. This verification again involves certain cost which can be avoided to a great extent if the banks start accepting the digitally filled forms with digital signatures authentication.

The next cost involved is the courier cost. The physical documents are sent by courier to the Central Processing Unit (CPU), where the documents are finally analysed and approved. Then the particular account proceedings are completed and the account is activated. The banks can do away with this cost fully, by shifting to digital documents and accepting the digital signatures in account openings.

The cost associated with the dispatch of the cheque books cannot be avoided via digital signatures. 70% - 80% costs involved in the opening up procedure of the bank accounts may be avoided by implementing the usage of digital documents with digital signatures authentication.

The reduction in the procedural costs i.e. operating costs is the direct monetary impact of the digital signature usage.

Banking is a sector where customer expects high quality in service process. After having analysed the

extant literature, I perceived the circumstances and conceptualised the effects of Digital Signatures usage in opening up of the bank accounts that would improve the service quality in the following aspects:

- Saving in time: The customer would save his travelling time as well as the bank would not have to send their executive, thus saving the executive's time also.
- Saving in cost: Today 'time is money', so saving time directly means savings in cost. Paper work is reduced and many executives are not required to be maintained by the bank.
- Avoidance of fatigue: With increasing traffic, pollution and congestion, customers now prefer those methods in which home based solutions are offered. Digital signatures usage would minimize the fatigue, thus making the banking operations more convenient.
- Time convenience: Usually, the bank opening formalities are carried out within a time span bound (normal working hours). Digital signatures usage would result in overcoming this time constraint and the customer would be able to open accounts in odd business hours or even on the holidays also.
- Overcoming with distance problem: Customers due to shortage of time and inconvenience, many a times open accounts in those banks which are not preferable to them. Digital signature usage would encourage opening accounts at ease and that too in the preferred bank.
- Increasing viability of holding a digital signature: Digital signatures may be purchased or obtained from certifying authorities for various other purposes mentioned previously in the paper. This would enhance the usage of digital signature as many people do not have to purchase it specifically for opening the bank accounts.

The bank can develop a co-creation strategy in which the customer himself gets engaged in the proceedings

involved in opening the bank accounts. The cost of obtaining digital signature is very nominal. The 21st century generation likes to get engaged in the services offered, especially when they get improved services with ease at nominal cost. This enhances the customer loyalty and minimizes the switch overs.

Conclusion

Banking industry is the industry where customer expects highest quality, no failures, anonymity and is ready to pay more. The usage of digital signatures will lead to saving of time which ultimately means cost savings. It will make the life hustle free, increase flexibility in working, increase customer loyalty and will help to meet various quality parameters.

By using a digital signature, a customer would be able to securely access their account, portal, or other services from any location. The banks can offer to their clients online services that can personalise and manage each user's authentication token with personal certificates and PIN codes. Banks can retain control of key security areas while offering strong authentication services, electronic signatures, and the elimination of material support - all with complete freedom from the individual's workstation. The usage of digital signatures in opening bank accounts is a newer concept and the bank materialising this concept would get the first mover advantage in reducing operating costs and increasing customer ease which would widely contribute in raising the level of customer satisfaction, customer engagement and service recovery areas.

This technology is new and upcoming and its usage will gain momentum in the coming years.

References

- Andreassen, T.W. (2001), "From disgust to delight: do customers hold a grudge?", *Journal of Service Research*, Vol. 4 No. 1, pp. 39-49.
- ACM (The Association for Computing Machinery) (2001): *Computer Professionals Concerned DMCA Stifles Academic Freedom And Speech*.
- Beckett, A., Hewer, P. and Howcroft, B. (2000), "An exposition of consumer behavior in the financial services industry", *International Journal of Bank Marketing*, Vol. 18 No. 1, pp. 15-26.
- Bexley, J.B. and Maniam, B. (2003), "CEO perception of customer satisfaction: an empirical study", *Academy of Marketing Studies Journal*, Vol. 7 No. 1, pp. 11-18.
- Boshoff, C. and Staude, G. (2003), "Satisfaction with service recovery: its measurement and its outcomes", *South African Journal of Business Management*, Vol. 34 No. 3, pp. 9-17.
- Boshoff, D. and Leong, J. (1998), "Empowerment, attribution and apologizing as dimensions of service recovery: an experimental study", *International Journal of Service Industry Management*, Vol. 9 No. 1, pp. 24-47.
- Berry, M. (2002): *That's What I Want - Developing user friendly DRM*. CMP Media's New Architect.
- Bloemer, J. and Kasper, H. (1995), "The complex relationship between consumer satisfaction and brand loyalty", *Journal of Economic Psychology*, Vol. 16, pp. 311-29.
- Boshoff, C. (1999), "RECOVSAT: an instrument to measure satisfaction with transaction-specific service recovery", *Journal of Services Research*, Vol. 1 No. 3, pp. 236-49.
- Capraro, A.J., Broniarczyk, S. and Srivastava, R.K. (2003), "Factors influencing the likelihood of customer defection: the role of consumer knowledge", *Journal of the Academy of Marketing Science*, Vol. 31 No. 2, pp. 164-75.
- Craighead, C.W., Karwan, K.R. and Miller, J.L. (2004), "The effects of severity of failure and customer loyalty on service recovery strategies", *Production & Operations Management*, Vol. 13 No. 4, pp. 307-21.

- Chang, H. and Atallah, M.G. (2001): Protecting Software Code By Guards. ACM Workshop on Security and Privacy in Digital Rights Management 2001. Pennsylvania, USA.
- Cox, I.J. and Miller, M.L. (1997): A review of watermarking and the importance of perceptual modeling. Proc. of Electronic Imaging 97, February 1997. NEC Research Institute.
- C.P. Pfleeger and S.L. Pfleeger, Security in Computing, 3rd ed. Englewood Cliffs, NJ: Prentice-Hall, 2002.
- Dittmann, J., Wohlmacher, P. and Ackermann, R. (2001): Conditional and User Specific Access to Services and Resources using Annotation Watermarks. Communications and Multimedia Security Issues of The New Century. pp.137-142. Ralf Steinmetz, Jana Dittman and Martin Steinebach (eds). Kluwer Academic Publishers.
- Duffy, Jo Ann M., Miller John M. And Bexley James B. (2006): "Banking customers' varied reactions to service recovery strategies", International Journal of Bank Marketing, Emerald Group Publishing Limited, Vol.24 No. 2, pp. 112-132.
- EPIC (Electronic Privacy Information Center) (2002): Digital Rights Management and Privacy.
- Groenroos, C. (1988), "Service quality: the six criteria of good perceived service quality", Review of Business Administration, Vol. 9, Winter, pp. 10-13.
- Hart, C.W.L., Heskett, J.L. and Sasser, W.E. (1990), "The profitable art of service recovery", Harvard Business Review, Vol. 68 No. 4, pp. 148-56.
- Hess, R.L. Jr, Ganesan, S. and Klein, N.M. (2003), "Service failure and recovery: the impact of relationship factors on customer satisfaction", Journal of the Academy of Marketing Science, Vol. 31 No. 2, pp. 127-46.
- Johnston, R. (1995), "Service failure and recovery: impact, attributes and process", Advances in Services Management and Marketing, Vol. 4, pp. 211-28.
- J. Feghhi and P. Williams, Digital Certificates: Applied Internet Security 1st ed. Reading, MA: Addison-Wesley, 1999.
- Kangis, P. and Passa, V. (1997), "Awareness of service charges and its influence on customer expectations and perceptions of quality in banking", Journal of Services Marketing, Vol. 11 No. 2, pp. 105-17.
- Keaveney, S. (1995), "Customer switching behavior in service industries: an exploratory study", Journal of Marketing, Vol. 59, pp. 71-82, April.
- Lohmann, F.V. (2002): Fair Use and Digital Rights Management: Preliminary Thoughts on the (Irreconcilable?) tension between them. Electronic Frontier Foundation.
- Levesque, T.J. and McDougall, G.H. (1993), "Managing customer satisfaction: the nature of service problems and customer exit, voice and loyalty", Asia Pacific Journal of Quality Management, Vol. 2 No. 2, pp. 40-58.
- McDougall, G.H. and Levesque, T.J. (1999), "Waiting for service: the effectiveness of recovery strategies", International Journal of Contemporary Hospitality Management, Vol. 11 No. 1, pp. 6-15.
- Maxham, J.G. (2001), "Service recovery's influence on consumer satisfaction, positive word-of-mouth, and purchase intentions", Journal of Business Research, Vol. 54 No. 1, pp. 11-24.
- Michel, S. (2004), "Consequences of perceived acceptability of a bank's service failures", Journal of Financial Services Marketing, Vol. 8 No. 4, pp. 367-77.
- Miller, J.L., Craighead, C.W. and Karwan, K.R. (2000), "Service recovery: a framework and empirical investigation", Journal of Operation Management, Vol. 18 No. 4, pp. 387-400. IJBM 24,2 130
- M. Bishop, Introduction to Computer Security. Reading, MA: Addison-Wesley, 2005.
- Nunaz, M. and Yulinsky, C.M. (2005), "Better customer service in banks", McKinsey Quarterly, No. 1, p. 30.
- Oliva, T., Oliver, R. and MacMillan, I. (1992), "A

- catastrophe model for developing service satisfaction strategies", *Journal of Marketing*, Vol. 56, pp. 83-95, July.
- Parasuraman, A., Zeithaml, V. and Berry, L.L. (1988), "SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality", *Journal of Retailing*, Vol. 64 No. 1, pp. 39-48.
- Press, I., Ganey, R.F. and Hall, M.F. (1997), "What's most important to customer satisfaction?", *ABA Banking Journal*, Vol. 89 No. 9, pp. 73-4.
- P. Resnick and J. Miller, "PICS: Internet Access Controls without Censorship," *Communications of the ACM*, 39 (1996), pp. 87-93.
- Reichheld, F. (1996), "Learning from customer defections", *Harvard Business Review*, pp. 56-69, March/April.
- Subramanya, S.R. and Byung, K. Yi (2006), "Digital Signatures", *IEEE*, pp. 1-8.
- Sividas, E. and Baker-Prewitt, J. (2000), "An examination of the relationship between service\ quality, customer satisfaction and store loyalty", *International Journal of Retail and Distribution Management*, Vol. 28 No. 2, pp. 73-82.
- Singh, J. and Wilkes, R.E. (1996), "When consumers complain: a path analysis of the key antecedents of consumer complaint response estimates", *Journal of the Academy of Marketing Science*, Vol. 24 No. 4, pp. 350-65.
- Venkatesan, P., Kumar, V. and Bohling, T. (2005), "Selecting Valuable Customers Using a Customer Lifetime Value Framework", *Marketing Science Institute*, Cambridge, MA, working paper series.
- Webster, E. and Sundaram, D.S. (1998), "Service consumption criticality in failure recovery", *Journal of Business Research*, Vol. 41, pp. 153-9.
- Weun, S., Beatty, S.E. and Jones, M.A. (2004), "The impact of service failure severity on service recovery evaluations and post-recovery relationships", *Journal of Services Marketing*, Vol. 18 No. 2, pp. 133-46.
- W. Stallings, *Cryptography and Network Security*, 3rd ed. Englewood Cliffs, NJ: Prentice-Hall, 2002.
- Zeithaml, V. and Bitner, M-J. (2003), *Services Marketing: Integrating Customer Focus Across the Firm*, 3rd ed., McGraw Hill, Boston, MA.
- Goodwin, J.C. and Ross, I. (1992), "Consumer responses to service failures: influence of procedural and interactional fairness perceptions", *Journal of Business Research*, Vol. 25, pp. 149-63.
- Hart, C.W.L., Heskett, J.L. and Sasser, W.E. (1991), "Surviving a customer's rage", *Successful Meetings*, Vol. 40 No. 5, pp. 68-79.
- Oechsli, M. (2002), "Customer satisfaction isn't the same as client loyalty, but it's a start", *Bank Investment Marketing*, Vol. 10 No. 7, p. 56.
- Wong, N.Y. (2004), "The role of culture in the perception of service recovery", *Journal of Business Research*, Vol. 57 No. 9, pp. 957-63.