Impact of Technology in Banking Sector: A Study in NCR Delhi

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The application of technologies in the developing countries represents an important tool that can determine economic development and prosperity of the country. One of the main areas in which technology can have a powerful impact on the economic activity is the banking sector. Indian banks are investing heavily in the technologies such as automated teller machine (ATMs), net banking, mobile banking, tele -banking, credit cards, debit cards, smart cards, call centers, CRM, data warehousing etc. It is essential to evaluate the impact of technology on the performance of Indian banks in terms of extended value added services and customer satisfaction thereby. The present article investigates and analyzes the present situation of banking in NCR Delhi in terms of impact of ATM, Internet banking, Mobile banking and Tele-banking services on customer satisfaction and retention by leading Indian banks. The study examines the views of 400 banking customers on the implementation of technological delivery channels in banks.

The study has found that technology has a positive impact on the customers of the bank. Response to query, availability of cheque drop box, queues at ATM, time to process request, account balance enquiry, security of transaction, SMS reminder /confirmation of transaction, are the significant factors across the banks.

Key words: *ATM, Tele-banking, Internet banking, Public & private sector banks , Technology in banking , Customer attraction and retention.*

INTRODUCTION

The Indian banking system has come a long way since independence from nationalization to liberalization. It has witnessed from a slow business institution to a highly proactive and dynamic entity. The banks have been able to generate revenue by exploring new opportunities. This has been possible due to liberalization and economic reforms undertaken by the Indian Government. The need to become highly customer focused has forced the banks to adopt an appropriate and suitable approach. Technology has marked a turning point in the history of global banking and services. With ever increasing availability of international bandwidth and powerful workflow management, it is now possible to disaggregate any banking process, execute the sub-processes in multiple locations around the world, and reassemble it, at another location.

The development of new services and efficient delivery channels for the banking industry has been made possible with the application of technology. Some of the examples of technology adoption are electronic banking, mobile banking and internet banking.

It is well recognized that, technology holds the key to the future success of Indian Banks since it is information technology which has brought in a sea change in the way banking is being conducted today, which is but an indication of the future. It would be beyond anybody's imagination to even think about

conducting banking business anywhere in the country or using a powerful yet simple medium such as the Internet even from roadside kiosks. But today this is the reality which owes its credit to the rampant exploit of IT by banks. And concepts such as 'Anywhere Banking' or 'Automated Teller Machines' 'Internet Banking' and 'Mobile Banking' have become realty due to technology implementation by banks. Such innovations have had a positive impact on customer service efficiently and accurately over the counters of branches.

The objective of the study is to examine the impact of technology in banking services related to e-channels such as ATM, Tele-banking Mobile banking and Internet banking in National Capital Region Delhi. It also seeks to find the significant characteristics/ factors related to technology in banking services

LITERATURE REVIEW

The adoption of technology in Indian Banking sector commenced from the mid eighties when the Reserve Bank of India (RBI) started promoting automation in banking to improve customer service, book keeping, MIS and productivity. The banking sector has undergone a major revolution due to the adoption of information technology. It was the introduction of computer system which created right atmosphere for online banking in India. The Indian banking sector , after economic liberalization of 1991, has been the hallmark of innovation and use of technology. This has been facilitated by the development of world-class software and hardware system by some of the leading Indian IT companies such as Infosys, Wipro and TCS.

The massive dose of computerization and use of technology was the result of recommendation of a "Committee on Mechanization in the Banking Industry" formed by Reserve Bank of India in 1984. The committee was headed by Dr C Rangarajan, then Deputy Governor, Reserve Bank of India. The banks introduced 'MICR Technology" and standardized cheque forms and encoders after the recommendation of this committee.

On the recommendation of "Committee on Computerization in Banks" headed by Dr. C.R. Rangarajan, all the settlement operation were computerized in the clearing houses of RBI at Bhubaneshwar, Guwahati, Jaipur, Patna and Thiruvananthapuram. Further the 'National Clearing of inter-city cheques' at Kolkata, Mumbai, Delhi, Chennai and MICR were set up on the basis of recommendation of this committee.

Another committee on "Technology issues relating to payments system, cheque clearing and securities settlement in the banking industry" was set up in 1994. Mr. WS Saraf, Executive Director, Reserve Bank of India was chairman of the committee. Funds Transfer (EFT) system, a BANKNET communications, MICR clearing of cheque in all branches of all banks were introduces on the recommendation of this committee. 'Electronic Fund Transfer (EFT) was made on the recommendation of "Committee for proposing Legislation on Electronic Funds Transfer and other Electronic Payments (1995)".

The global business environment witnessed many changes in the last decade of the 20th century, among which is "electronic commerce or exchange of products and services through Internet and telecommunication networks" (Kalakota & Whinston, 1997). Most of the industries have been influenced by this emerging technology-based approach to business (Gunasekaran & Love, 1999). Previous literature on IT in developing countries has focused on development of national policies (Bhatnager & Odreda, 1992; Madon, 1992), development of manpower (Aladwadni, 2001; Bhatnager, 1992; Kanungo, Sadavarti, & Srinivas, 2001; Montealegre, 1998; Pawar, 1992), using tested technologies, managing IT investments (Avgerou, 1998; Heeks, 2002;), and role of consultants in deploying technologies (Palvia, Palvia, & Zigli, 1992). However, the impact of electronic commerce has been apparent in the banking and financial services industry when compared with other industry segments (Bughin, 2004; eMarketer, 2000).

It is clearly evident that use of internet banking will remain and continue to grow in Asian countries with the further penetration of internet services. Internet usage and Internet banking has grown to 45.4 million by 2006 in the Asia Pacific region (Jaffe, 2003). The percentage of banks that have launched on-line banking products and services has grown from 6% in 1998 to 75% in 2003 and the present scenario is that almost all banks offers on line banking products and services.

According to IDC, markets like Korea and Singapore have nearly 10% of their population banking over the Internet during the same period. Although these markets are way ahead of India both in terms of Internet penetration and on-line banking penetration, there is immense potential in India for the internet penetration and banking service through electronic channels. It is evident from the literature that banks across the world are motivated to implement e-banking to achieve either top-line or bottom-line benefits. This is achieved through increased market share due to product delivery convenience and product innovation (Jaleshgari, 1999; Orr, 1999). Further, it is found from the literature that banks in the developed markets with established telecommunications, commercial, and legal infrastructures and possessing the necessary resources and levels of operational efficiency in terms of costs and revenue have a greater chance of successfully implementing e-banking (Goodman, 1999; Messmer, 1999). According to Kalakota & Whinston, (1997) there are new opportunities for the banks in the form of re intermediation in the e-commerce market by identifying themselves as "trust authorities to validate and stand as security between business and consumers".

Although the Internet is revolutionizing the way in which companies offer their products and services, studies relating to customer acceptance of this technology are limited (Meuter, Ostrum, Roundtree, & Bitner, 2000). An understanding of different dimensions of creating value to the customer through the use of new technology and its impact on their performance in terms of return on investment is always a matter of concern for the banking and financial services industries (Lucas, & Spilter, 1999). Liao &Cheung, (2002) observed that individual expectations regarding "accuracy, security, transactions speed, user-friendliness, user involvement, and convenience" were the most important quality attributes in the perceived usefulness of Internet-based e-banking. Trust is also one of the important determinants of successful e-banking (Suh & Han, 2002). Many researchers have argued that trust is essential for understanding interpersonal behavior and is relevant to e-banking. There is generally agreement among the researchers that trust is most significant long-term barrier for realizing the potentials of B to C e-commerce and not just a short-term issue, (Gefen, 2002; Jarvenpaa, Tractinsky, & Vitale, 2000). Different models have been proposed by researchers to measure the impact of e-banking. A model was proposed for evaluating the business value of e-banking channels involving an internal view, (Stamoulis, Panagiotis, & Drakoulis, 2002) where the channel is considered as a resource whose utilization must be maximized, and an external view, where the channel as an interface to the bank's customer base should enable and support customer relationship management. Previous research also reveals that the effectiveness of Internet banking is related to the size of a bank and is projected to have significant impacts on various elements of the banking system, which is faced with many challenges. (Courchane, Nickerson, & Sullivan, 2002)

There is an intense debate in the economic literature regarding the effect of developing the information and the communication technology (ICT) infrastructure on the pace of economic development of a country (Baliamoune, 2004). A report of the World Bank (McNamara, 2003) outlines that ICT development is not an end in itself, but rather a tool that can be used to increase the capacity of poor and underdeveloped countries to accelerate economic development, to connect to the world, and to increase the opportunities offered to their citizens

(Hadidi, 2003). On the other hand, the development of ICT has to be directed towards areas where it can create the maximum economic and social effect; therefore, the ICT policy has to use a strategic approach, identifying the main priorities at national and regional levels. ICT strategies are only effective and sustainable if they are integrally linked to broader, more comprehensive development and poverty-reduction strategies (Steinberg, 2003).

There are mainly two role played by information technology in the banking sector. One is related to supportive functions as enables of different services, and second, the strategic role in providing strategic leadership in the field. The development of new products which may give the competitive edge using information technology platforms is the strategic role where as preparing the platform for business process reengineering and IT based financial products is the supportive or enables role . Both the roles have vital importance in banking sector as it leads to higher customer satisfaction and retaining the existing customer whereby reducing the need and cost of attracting new customers . In the emergence of e-banking and payment system, both play a vital role as infrastructure for ecommerce (Raihan A. 2001).

Online banking is becoming the indispensable part of modern day banking services. It is expected that 60 % of retail banking dealings will be online in ten years' time. Most of the Indian banking customers are likely to prefer the online banking activity but with ensured security.

A big concern about information technology on service delivery channels is security of transaction. According to Buchanan and Gilles (1990), "security is the condition of being protected against danger, loss, and criminals". In common language, we understand that, security is similar to safety, and banks must ensure full proof security of banking activities. The ultimate satisfaction of any value added banking facility offered to the customer is arrived only with the security level attached with that facility in India.

Internet banking is the newest delivery channel to be offered by retail banks in many developed countries. It allows customers to conduct financial transactions on a secure website operated by their retail or virtual bank. In this case, the internet is used as a message carrier where the customer uses a PC and a modem or local area network to connect to the bank using its online website or software provided by the bank. In India, Internet banking is offered to customers on the basis of their requirements.

Boon and Yu ,(2000) has defined 'E-channels' as the methods of delivering service products using electronic media such as the telephone, internet and automated teller machines (ATMs) . These delivery methods have become an increasingly important technique to retain customers in today's dynamic banking environment since customers can make withdrawals, deposits and access balances at their own convenience. E-Channels are preferred by the Indian customers nevertheless of their socio economic back ground. To enhance speed and efficiency of delivery of services banks have equipped themselves with the latest of technology application such as "Core Banking". Technological innovation and exposure creates a smooth competitiveness among the nationalized and private sector and foreign sector banks.

Major Contribution of Technology in Indian Banking Sector

Banking is an industry that provides vital service and support to the economic and financial sectors. It is information technology which enables banks in meeting such high expectations of the customers who are more demanding and are also more techno-savvy compared to their counterparts of the yester years. Present day customers are tech savvy and cannot wait for their banking needs. For them the banks have to use technology to provide instant banking facility without the constrains of branch or time. Technology has been providing solutions to banks to take care of their accounting and back office requirements.

Core Banking Solutions (CBS): CBS enables banks to consolidate their technology platforms across functions and geographies leveraging cost and at the same time acquiring flexibility and scalability to adapt to a fast changing and competitive environment. In core banking, banks are getting their data aggregation layers in place to facilitate projection of data in the form of static and dynamic reporting capability. The percentages of such branches has increased by 79.4 % at end March 2009 to 90% at the end of March-2010.

Magnetic Ink Character Reader (MICR) MICR was introduced in 1987 in the four metros cities. Initially the MICR clearing was available only in 14 clearing centers, which included the upcoming cities such as Pune, Trivandrum, Kanpur, Hyderabad, Japura, Nagpur, Baroda, Bangalore, Ahmadabad Gauhati. This facility was further extended to another eight centers. These 22 centers are the one where volume of clearing transactions is very large and they virtually cover the majority of transactions.

Automated Teller Machine (ATM) : An ATM is an Electronic Fund Transfer terminal facilitating cash deposits, inter and intra transfer between accounts, balance enquiries along with mini statement of accounts, cash withdrawals and pay bills. ATM itself can provide information about accounts of customers and also receive information's and instructions from customers like stop instruction, auto pay, cheque drop, etc.,

Internet Banking (I-Banking / E-Banking): Internet banking (or E-banking) means any user with a personal computer and a browser can get connected to his bank's website to perform any of the virtual banking functions. In internet banking system every bank has a centralized database that is connected with other banking system through web-based environment. All the services that the bank has permitted on the internet are displayed in menu. Through that any service can be selected by the customer and further the demo or working manual is provided by the nature of service. It would be a borderless entity permitting anytime, anywhere and anyhow banking. The intranet network connects the various locations of the same organisation and gives connectivity to these locations with the central office. However, intranet can be used only in the organisation which has created them. SWIFT is a live example of intranet application.

Mobile Banking / Phone Banking: In October, 2008, the first measure to regulate mobile banking in India was start up. Since then, it has progressively liberalized the manner and extent to which banks and their customer can conduct mobile banking. Mobile banking can prove to be an important extension of banking to the far flung areas of the country where there is neither a bank branch nor there is internet connectivity. Today, mobile phones have enhanced the functioning of the banks in India to facilitate intra and interbank funds transfer between bank accounts. In telephone banking, the telephone is used as a message carrier to enable person to person or voice activated automated communication between the bank and the customer. Mostly telephone banking uses an automated phone answering system with phone keypad response or voice recognition capability in India.

Credit Cards/Debit Cards: The Credit Card holder can spend wherever and whenever he wants with his Credit Card. However this spending cannot be beyond the credit card limit. In Credit Card you spend first and then you pay on the due date or before it. In case of a Debit Card, the user has to deposit in his bank account in advance and this deposited amount become the upper limit. This limit reduces when you make purchase using debit card and increases when you deposit the money in your account. When the debit card is used, money is transferred from buyer's account in the bank to the account of the seller. The bank never faces a default because the amount spent is debited immediately from the customer's account.

Smart Card: Banks are continuously adding new services to their existing one to enhance security and provide new service, this services are provided through Smart Cards. Smart Cards are the new

generation card where lot of information can be stored, with enhanced security features and can be used for different purposes. These card can also be used to store personal information like medical and health history, personal banking and personal preferences. Smart card technology is now familiarized in India.

Automated clearing House (ACH): Automated clearing house (ACH) is an electronic network for financial transaction. ACH processes large number of debit and credit transaction in batches. Computers are deployed in clearing house to speed up the process and clearing the operations quickly and efficiently which is voluminous work.

Electronic Fund Transfer: The customer has adopted to electronic payments in India in big way. From less than half a percent of transactions in the electronic mode in 2001, today the process is close to about 30 crores transactions per year in the electronic mode. RBI's initiative is moving "High Value Clearing" to electronic modes. It is a step aimed at creating a safer, secure funds transfer route.

National Electronic fund Transfer (NEFT): National Electronic Fund Transfer (NEFT) is an online system for transferring funds of Indian Financial Institution. This facility is used mainly to transfer funds below Rs. 2,00,000/ - The NEFT system in India has been in operation from 21 November 2005. NEFT covers all banks which were participating in the special electronic funds transfer (NEFT) clearing. Public key infrastructure (PKI) technique is used in NEFT for maintaining security.

Real Time Gross Settlement (RTGS) System: It is an electronic fund transfer system where the fund transfer take place from one bank to another on real time and gross basis . Gross settlement means the transaction is settled on one to one basis without bunching or netting with any other transaction. Once the transaction is processed, payment is final and irrevocable. It also provides the means for risk-free and credit push-based fund transfers settled on a real-time basis with the central bank money. There are 55000 branches of different banks using RTGS for inter-bank funds. This is the widest coverage of banking using RTGS in the whole world.

Indian Financial Network (INFINET): Institute for Development and Research in Banking Technology (IDRBT) implemented the Indian Financial Network, the INFINET a 'one-of-a-kind' initiative for the banking sector aimed at sharing expensive IT resources so as to achieve economies of scale. One of the notable achievements of IDRBT's has been the implementation of Public Key Infrastructure (PKI) based on electronic data transfer with very high security levels. The Institute has also developed a messaging standard known as Structured Financial Messaging System (SFMS) with security features superior even to SWIFT.

Security in Banking: Security in an Information Technology based transaction processing environment is also very much essential and critical. Adequate security controls must be exercised in place to protect the consumer interest. This includes the validation of transactions with the maker-checker concept, transmission of encrypted form of electronic messages over a network, due authentication by means of providing for digital signatures and warehousing of electronic records in conformity with the provisions of the "Information Technology Act, 2000 and amendment Act 2008".

Society for Word wide Interbank Financial Telecommunication (S.W.I.F.T): The S.W.I.F.T provides reliable and expeditious telecommunication facilities for exchange of financial message all over the world. Presently Mumbai acts as the gateway for S.W.I.F.T. Soon other cities will be joined in this network either through leased lines or public data network. The majority of international interbank messages use the S.W.I.F.T network.

BANKNET: It is an internet based communication network. It provides speed of financial transaction. BANKNET had been set up in 1991 by the RBI, and is meant to facilitate transfer of inter-bank (and inter-

branch) messages within India by Public Sector banks who are members of this network .

Institute for Development and Research in Banking Technology (IDRBT): The main purpose of IDRBT is to adopt research and development as well as consultancy in the application of technology to the banking and financial sector in the country. Reserve Bank of India (RBI) established IDRBT in 1996.

OBJECTIVES AND HYPOTHESES

This study seeks to examine the impact of technology on customer satisfaction in banking services related with e-channels such as ATM, Tele-banking Mobile banking and Internet banking in National Capital Region Delhi.

In pursuance of the above objectives, the following hypotheses were formulated for testing:

- H01 There is no impact of technology on customer satisfaction on banking services in NCR Delhi.
- H02 There are no significant characteristics/ factor related to technology in banking services.

RESEARCH METHODOLOGY

Sampling Unit, Sample Selection and Sample Size

The population studied here is Indian retail bank customers in Delhi and NCR region. The sampling unit was the customers of four selected banks, two banks from public sectors and two banks from private sector. (i.e. State Bank of India, Punjab National Bank, ICICI bank & HDFC Bank) who has an account in any branch located in NCR Delhi. Random sampling method was adopted to select the customers. There was no discrimination on the bases of occupation, age, or educational level. The sample is broadly representative of the population for purposes of cross sectional survey. Sample selection was to ensure generalization and validity of findings. Total 400 respondents were selected which comprises of 100 respondents from each bank.

Sampling procedure: To obtain a representative sample, a probability sample of population was drawn. 400 respondents were divided equally among the four selected banks. In each bank simple random sampling method was adopted. In simple random sampling every member of the population has an equal chance of being selected in sample.

Data Collection Method

The main instrument used for data collection in this research was the questionnaire; the responses have been collected by means of face-to-face interviews by the author.

Measurement Scales Employed

The overall satisfaction of the respondents towards the provision of different services was gauged using a questionnaire containing close-ended question, which were designed to ascertain the satisfaction level of the respondents using a five point Likert scale with following options: Excellent, Good, Satisfactory, Poor, Worst. Excellent being the highest satisfaction level followed by good, satisfactory and poor. Worst was considered as the no satisfaction level. The respondents were asked to read the questions and then choose the option for their response. Questions were explained to the respondent if he/ she could not understand a particular question. Prior to the final survey, the questionnaire was pre-tested using a sample of respondents similar in nature to the final sample.

Research and Statistical Tools Employed

The research and statistical tools employed in this study are frequency analysis, factor analysis, and ANOVA (Analysis of variance). SPSS 16 was used to perform the statistical analysis . The reliability of the data was carried out by using Cronbach's Alpha Value. Frequency analysis on the main factor under study, indicated overall satisfaction levels of the respondents with retail banking in general. ANOVA was employed to find the significant factor which will determine the overall customer satisfaction.

DATA ANALYSIS AND INTERPRETATION

The analysis of this data was divided into following section:

(i) Demographic Factor Analysis of Respondents : Table 1
(ii) Reliability and Validity : Table 2
(iii) Mean score of Customer satisfaction level : Table 3
(iv) Computation of ANOVA : Table 4
(V) KMO and Bartlett's Test : Tables 5
(Vi) Total Variance Explained : Tables 6
(Vii) Rotated Component Matrix : Tables 7

The respondent profile as displayed in table 1 indicates the current scenario of banking sector and their user's profile. Most of the respondents (35.8%) were employed in private sector, were either graduate (54.8%) or post graduate (35.5%)in the age group of 20-40 years. The profile of respondents indicates they are young, urban educated and decently employed, which is the new generation who are tech savvy and wants the services at the click of the button or mouse.

Reliability & Validity: Table 2 reflects the result of reliability analysis- Cronbach's Alpha Value. This test measured the consistency between survey scales. A Cronbach's Alpha score of 1.0 indicate 100 percent reliability. Cronbach's Alpha score were all greater than the Nunnally's (1976) generally accepted score of 0.7. The score was 0.936 for different characteristic in the findings that indicates reliability of the survey.

Table -1 : Demographic Factor Analysis of Respondents

Factor		Frequency	Percent	Valid Percent	Cumulative Percent
Occupation	Govt. service	90	22.5	22.5	22.5
	Private service	143	35.8	35.8	58.2
	Business	99	24.8	24.8	83.0
	Student	68	17.0	17.0	100.0
	Total	400	100.0	100.0	
Age Group	20-30yrs	143	35.0	35.8	35.8
	30-40yrs	126	31.5	31.5	67.2
	41-50yrs	100	25.0	25.0	92.2
	51yrs&above	31	7.8	7.8	100.0
	Total	400	100.0	100.0	
Educational Qualification	Post Graduation	142	35.5	35.5	35.5
	Graduation	219	54.8	54.8	90.2
	10+2	34	8.5	8.5	98.8
	Matriculation	5	1.2	1.2	100.0
	Total	400	100.0	100.0	
Respondent's Bank	SBI	100	25.0	25.0	25.0
	PNB	100	25.0	25.0	50.0
	ICICI	100	25.0	25.0	75.0
	HDHC	100	25.0	25.0	100.0
	Total	400	100.0	100.0	

Table -2: Reliability & Validity Statistics			
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	No of cases
.936	.932	29	400

Table 3 : Mean score of Customer satisfaction level

Characteristics	ICICI	HDFC	SBI	PNB	Mean score of four Banks
Location/proximity of ATM	3.97	3.79	3.77	3.58	3.77
Availability of cash	4.09	3.70	3.96	3.63	3.84
Time to process request	3.74	3.52	3.57	3.48	3.57
No of ATMs in locality	3.58	3.31	3.38	3.14	3.35
Response to query	3.68	3.39	3.42	3.14	3.40
Availability of desired forms	3.63	3.38	3.5	3.27	3..45
Availability of Cheque drop box	3.72	3.38	3.44	3.16	3.42
Printed statement of Transaction	3.63	3.37	3.64	3.63	3.57
Cash deposit facility	3.52	3.41	3.39	3.48	3.45
Availability of Networked (shared) ATM	3.55	3.15	3.14	3.14	3.24
Fee charged for using other banks ATMs	3.26	3..15	2.82	2.89	3.03
Time required to get a response	3.22	3.43	2.72	2.76	3.03
Account balance enquiry	3.34	3.38	2.78	2.86	3.10
Statement of specific Accounts dates	3.24	3.13	2.85	2.76	3.0
Cheque stop payment instruction	3.05	2.89	3.25	2.96	3.04
Demand draft facility	3.21	3.02	2.7	2.53	3.89
Requisition of new cheque book	3.18	3.12	3.02	2.86	3.04
Money transfer between Accounts	2.81	2.88	2.33	2.45	2.61
Payment of utility bills	2.88	2.89	2.28	2.48	2.75
Credit card information	3.01	2.41	2.48	2.51	2.60
Availability of desired information on website	2.62	2.91	2.34	2.04	2.48
Security of transaction	2.52	2.79	2.2	1.93	2.36
Time to get password & user id	2.38	2.72	2.19	1.90	2.30
User friendly website	2.44	2.59	2.21	1.91	2.29
Utility bill payment facility	2.45	2.40	2.13	1.83	2.20
Prompt response to email query	2.44	2.35	1.92	1.75	2.12
SMS reminder	2.44	2.27	1.92	1.82	2.11
Request for a new Cheque book	2.43	2.37	1.95	1.79	2.14

Scale used : ***Excellent -5, Good-4,satisfactory-3, poor-2, Worse -1***

In order to find the impact of the technological factors on the customer satisfaction, customers were asked to give their responses from excellent to worse. Excellent was given the score of 5, followed by good-4, satisfactory -3 poor-2 and worse as 1. These responses have been shown in the table-3. The mean score of two or less than two has been taken as poor satisfaction level. The mean score between two to three has been considered as satisfactory level. The mean score between three to four has been considered as positive or good satisfaction and any mean score above 4 is considered as excellent satisfaction level. Higher the mean score, higher is the satisfaction level similarly lower the mean score (less than two) will indicate lower satisfaction level or no satisfaction level .

Based on the mean score level as indicated in the table-3, it was found that all the characteristics of the e-banking channels have mean score above 2. This indicates that generally the customers have given satisfactory score to the e-banking channels facilitated by the technology implementation. Also there are 17 characteristics which have mean score above 3 indicating that the customer satisfaction is positive. This support the assumption that the technology has a positive impact on banking services and leads to the rejection of H01 and conclude that technology has a positive impact on customer satisfaction on the banking services in NCR Delhi

ANOVA Analysis : One way ANOVA was performed on the basis of occupation , age group education of the respondents and the bank used by these respondents. The objective of the analysis was to find if there are any significant characteristics related to different aspects of technology in the banking on the basis of these demographics. The researchers have taken occupation as a factor for ANOVA. We find that there are three characteristics, where there is significant difference that exists among the different occupation of the respondents. These characteristics are "response to query, availability of cheque drop box, queues at ATM". These differences are probably related to the availability of time , urgency of work and the nature of business/ occupation. Similarly when we have taken the age as a factor for ANOVA we find that there are only two characteristics where, there is significant difference existing among the different occupation of the respondents. These characteristics are in response to query, availability of cheque drop box. These differences are probably due to the use of technology driven channels by particular age group especially younger generation and not across all age groups. When we look at education as one of the factors for ANOVA analysis we find that there is significant difference that exists among the respondents for the same two characteristics : "response to query, availability of cheque drop box".

However, when we take bank as factor for ANOVA analysis we find that there is significant difference that exists among the of the respondents in many characteristics such as "response to query, availability of cheque drop box, queues at ATM, availability of cash, printed statement of transaction, time required to get a response, account balance enquiry, security of transaction, SMS reminder/ confirmation of transaction and different request through mobile banking . This further strengthens the arguments that there are significant variances in customer responses.

When we look at the overall ANOVA analysis, we find that there are significant difference in the responses in many characteristics such as "response to query , availability of cheque drop box , queues at ATM" on the basis of occupation , educational qualification of the respondents and across and banks. Whereas some characteristics such as "time to process request, cash deposit facility , printed statement of transaction , time required to get a response , availability of Networked (shared) ATMs, account balance enquiry , Security of transaction, SMS reminder / confirmation of transaction, different requests on mobile" are significant characteristics across the banks, which will have an impact on customer satisfaction. Hence we reject H02 and conclude there are significant characteristics related to technology in banking services as indicate above and all the banks should

ensure that these characteristics are taken care of in order to enhance customer satisfaction.

Results of the KMO and Bartlett's test of spherecity are shown in Table 4. Bartlett's test of spherecity was significant at the 0.000 level and that implies the presence of nonzero correlation. The overall measure of sampling adequacy (MSA) was 0.932 which exceeds the recommended cut-off level of 0.5 and individual measures were all well above this cut-off level.

Table -4 : Computation of ANOVA (0.05 Significance level)

Characteristics	Occupation		Age Group		Educational Qualification		Banks	
	F value	Sig.	F value	Sig.	F value	Sig.	F value	Sig.
Location/proximity of ATM	2.725	.044	1.210	.300	1.210	.300	3.406	.018
Availability of cash	1.711	.164	.722	.632	.722	.632	7.350	.000*
Time to process request	1.481	.219	1.803	.097	1.803	.097	1.602	.188
No of ATM in locality	2.678	.047	1.429	.202	1.429	.202	3.737	.011
Response to query	5.106	.002*	2.667	.015*	2.667	.015*	5.003	.002*
Availability of desired forms	3.148	.025	1.589	.149	1.589	.149	2.603	.052
Availability of cheque drop box	4.223	.006*	2.063	.057*	2.063	.057*	4.991	.002*
Queues at ATM	4.043	.008*	1.623	.139	1.623	.139	2.110	.098*
Printed statement of Transaction	3.644	.013	1.485	.182	1.485	.182	4.046	.007*
Cash deposit facility	3.736	.011	2.659	.015	2.659	.015	1.531	.206
Availability of Networked(shared) ATM	1.324	.266	1.453	.193	1.453	.193	9.530	.000*
Fee charged for using other banks ATMs	3.023	.030	1.352	.233	1.352	.233	3.720	.012
Time required to get a response	1.139	.333	1.475	.185	1.475	.185	5.750	.001*
Account balance enquiry	.845	.470	.765	.598	.765	.598	4.339	.005*
Statement of Accounts between specific dates	1.639	.180	1.954	.071	1.954	.071	2.957	.032
Cheque stop payment instruction	1.346	.259	.334	.919	.334	.919	.329	.804
Demand draft facility	2.822	.039	1.133	.342	1.133	.342	3.577	.014
Requisition of new cheque book	2.318	.075	1.298	.257	1.298	.257	3.466	.016
Money transfer between Accounts	2.115	.098	.869	.517	.869	.517	2.486	.060
Payment of utility bills	.535	.659	.844	.537	.844	.537	3.238	.022
Credit card information	.569	.635	1.395	.215	1.395	.215	2.847	.037
Availability of desired information on website	1.185	.315	1.714	.116	1.714	.116	3.750	.011
Security of transaction	.411	.745	1.619	.140	1.619	.140	4.050	.007*
Time to get password & user id	.619	.603	1.525	.169	1.525	.169	3.399	.018
User friendly website	.190	.903	1.582	.151	1.582	.151	2.458	.062
Utility bill payment facility	.453	.716	1.565	.156	1.565	.156	2.290	.078
Prompt response to email query	.924	.429	1.867	.085	1.867	.085	3.192	.024
SMS Reminder/ confirmation of transaction	.711	.546	1.722	.115	1.722	.115	8.218	.000*
Different Request through mobile	.490	.689	1.635	.136	1.635	.136	8.211	.000*

Responses are significant at 0.05 levels

Table -5 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.932
Bartlett's Test of Sphericity	Approx. Chi-Square	8431.234
	df	406
	Sig.	.000

Table -6 : Total Variance Explained

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.679	36.826	36.826	10.679	36.826	36.826	6.242	21.524	21.524
2	3.776	13.021	49.847	3.776	13.021	49.847	5.836	20.125	41.649
3	2.604	8.978	58.825	2.604	8.978	58.825	4.523	15.596	57.245
4	1.143	3.943	62.768	1.143	3.943	62.768	1.326	4.572	61.818
5	1.041	3.591	66.359	1.041	3.591	66.359	1.317	4.541	66.359
6	.936	3.228	69.586						
7	.830	2.861	72.447						
8	.764	2.633	75.081						
9	.674	2.323	77.403						
10	.634	2.186	79.589						
11	.617	2.129	81.717						
12	.559	1.927	83.645						
13	.509	1.756	85.400						
14	.492	1.698	87.098						
15	.454	1.565	88.663						
16	.447	1.540	90.203						
17	.425	1.465	91.668						
18	.364	1.256	92.924						
19	.310	1.070	93.994						
20	.303	1.044	95.037						
21	.257	.886	95.924						
22	.215	.741	96.664						
23	.193	.666	97.330						
24	.168	.579	97.910						
25	.156	.538	98.448						
26	.130	.448	98.896						
27	.127	.440	99.335						
28	.113	.391	99.726						
29	.079	.274	100.000						

Extraction Method: Principal Component Analysis.

Factor Analysis

To reduce the factors influencing the satisfaction level of the customers in availing the technology enabled services offered by banks in India, there are 29 different factors that have been taken into study and admitted into factor analysis to predict the most influencing factors which will determine the satisfaction level of the customers. Overall, the set of data meets the fundamental requirements of factor analysis satisfactorily (Hair et al, 1998). In analyzing the given data, the 29 response items were subjected to a factor analysis using the principal component method. Using the criteria of an Eigen value greater than 1, five clear factors emerged accounting for 66.35 % of the total variance. As in common practice, a Varimax rotation with Kaiser Normalization was performed to achieve a simpler and theoretically more meaningful factor solution. The Cronbach's alphas score for all the factors was 0.936 (Table 2).

Table -6 :Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Location/proximity of ATM	.065	.150	.624	.154	.287
Availability of cash	.045	.014	.704	-.022	-.007
Time to process request	.070	.091	.699	.013	-.134
No of ATM in locality	.083	-.027	.689	.089	.268
Response to query	.164	.000	.685	.000	-.083
Availability of desired forms	.148	.026	.632	-.071	.016
Availability of cheque drop box	.104	.050	.716	.093	.039
Queues at ATM	.118	.128	.647	.092	.039
Printed statement of Transaction	.053	.209	.523	.091	-.409
Cash deposit facility	.209	.118	.423	.379	-.314
Availability of Networked(shared) ATM	.227	.157	.444	.574	-.072
Fee charged for using other banks ATMs	.126	.144	-.011	.826	.124
Time required to get a response	.808	.224	.132	.097	.068
Account balance enquiry	.839	.166	.124	.058	.039
Statement of Accounts between specific dates	.817	.195	.159	.098	.060
Cheque stop payment instruction	.637	.054	.103	.140	.029
Demand draft facility	.832	.186	.143	.003	.014
Requisition of new cheque book	.801	.223	.107	.056	.083
Money transfer between Accounts	.748	.302	.136	.040	.052
Payment of utility bills	.777	.304	.080	.088	.044
Credit card information	.727	.351	.126	-.005	-.040
Availability of desired information on website	.307	.875	.073	.083	.026
Security of transaction	.264	.912	.077	.079	.016
Time to get password & user id	.258	.892	.045	.070	-.010
User friendly website	.251	.896	.062	.071	-.006
Utility bill payment facility	.291	.841	.112	.061	.158
Prompt response to email query	.251	.855	.135	.095	.129
SMS Reminder/ confirmation of transaction	.254	.561	.143	.063	.590
Different Request through mobile	.274	.472	.131	.114	.658

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
A. Rotation converged in 6 iterations.

It is clear from the factor loadings as highlighted in Table 7 that five factors emerged. These five factors represent different elements of technology related to services that form the underlying factors from the original 29 scale response items given. Referring to the Table 7 above, factor 1 represents elements of the internet banking directly related to function of websites of banks; it is therefore labeled as "Functionality of Internet banking ". These elements are: time required to get a response, account balance enquiry, Statement of Accounts between specific dates, demand draft facility, and requisition of new cheque book. Factor 2 represents operation of websites and has been labeled as "Operation of Internet Banking". These elements are: availability of desired information on website, security of transactions, time to get password & user id, user friendly website, utility bill payment facility, and prompt response to email query.

Factor 3 represents elements directly related to operation / function of the ATM . Therefore are labeled as "Operational / Functionality of ATM". These elements are availability of cash, time to process request, availability of cheque drop box, response to query. Factor 4 represents sharing of ATMs of others banks; it is therefore labeled as "Sharing of ATM". The elements are availability of shared/ networked ATM and fee charged for using shared ATM. Factor 5 represents elements of mobile banking and are labeled as "Mobile Banking Factors". These elements are SMS reminder/ confirmation of transaction and different request through mobile phone. Factor analysis leads us to rejection of Ho2, as we have found out there are five factors related to technology as described above which will have significant impact on the customer satisfaction.

CONCLUSION

Analysis of the customer responses indicates that technology has a positive impact on the customer satisfaction on banking services in NCR Delhi. It indicates that inclusion of technology driven channels such as ATM , Internet banking, Tele-banking and Mobile banking has helped the banks to improve the customer satisfaction and increased retention of customers which is a win-win situation for both banks and customers. The study has found that there are characteristics which will have an impact on the satisfaction levels of the customers. The most significant characteristics are "response to query, availability of cheque drop box, queues at ATM" across occupation , educational qualification of the respondents and across banks. Other characteristics such as "time to process request, cash deposit facility , printed statement of transaction , time required to get a response , availability of Networked (shared) ATMs, account balance enquiry , Security of transaction, SMS reminder / confirmation of transaction, different requests on mobile" are significant characteristics across the banks. In general, today's people live in an IT era, so the technological advancement and interaction in banking service industry is completely inevitable and most invited. The technological development has enhanced all the segments to update their business and individual operations in a simplified and most convenient manner and banking industry is not a exception to it. The technological advancement and intervention in the banking sector not only facilitates the banks to offer value added financial services to its customers, but also helps to maintain the bulk volume of daily financial

transactions and constructing a wide range of data warehousing, so that the bank can construct, develop and maintain a complete data base of the customer. This database will be used to build up strong customer relationship management. The technology enables retail delivery channels such as ATM, Internet banking, Mobile banking, Tele-banking which has helped the banks to reduce their transaction cost and enhanced the convenience to the customers to a great extent. The 24x7 banking was made possible because of technology enabled services and one click banking is the result of the technology.

LIMITATION OF THE STUDY

The study has been carried out in the National Capital Region, which is the metropolitan city area, where the education level and income level of the population is very high as compared to the rest of India, except the other metropolitan cities. Hence, the finding of the research can be generalised only for urban areas and cannot be generalised for the whole country.

IMPLICATION FOR THEORY AND PRACTICE

This research focused on determinants of e delivery channels and the significant factors associated with these delivery channels and how the technology has changed the way retail banking is carried out in India now by the customers. However, the research did not study the association between customer satisfaction and retention of customers. Additional research may well explore the relationship between these two constructs. Future research may explore the association between age and attitude and determine its effects on the delivery channels' quality and customers' satisfaction. Similar research can be undertaken in the rural area to find the differences between the customer satisfaction level of urban and rural customers.

MANAGERIAL IMPLICATIONS

Even though there is a rapid increase in the number of automated delivery channels but many a time the customers experiences that uninterrupted services are not available due many factors including the technological factors such as non availability of internet or server which hampers the smooth operation of e- delivery channels .The study provides necessary input to the bank management to increase customers' satisfaction through improving delivery quality of e-channels . Although banks have undertaken many measures related to security of transaction, the perception of the customer has not changed to that extent. It is more important in case of internet banking and mobile banking which has wide potential to reach to different segments of customer and reduce the transaction cost as well as lower the volume of transaction at bank. To further improve the service delivery quality, banks may provide enhanced interactivity, diversified offerings, and facilitate customers to participate in improving the service encounter with them and make it a memorable and pleasant experience. The banks should focus not only on the customer satisfaction, but also aim at delighting them to ensure their retention.

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