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IMPACT OF SCIENCE AND TECHNOLOGY ON BANKING

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Impact of science and technology on banking

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 reality 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.¹

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 Bhubaneswar, 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)".

¹ <https://www.linkedin.com/pulse/impact-technology-banking-kaustuva-pradhan#:~:text=One%20of%20the%20most%20significant,comfort%20of%20their%20own%20homes.>

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 Bto Ce-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 ²regional 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

² <https://www.linkedin.com/pulse/impact-technology-banking-kaustuva-pradhan#:~:text=One%20of%20the%20most%20significant,comfort%20of%20their%20own%20homes.>

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 background. 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 constraints 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

³ https://www.researchgate.net/publication/269738960_Impact_of_Technology_on_Banking_Sector_in_India

⁴ <https://www.sciencedirect.com/science/article/pii/S1877042811018283>

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 (IN FIN ET): 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.L.F.Tnetwork.

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 services⁵.

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

⁵ <https://www.openteqgroup.com/blogs/impact-of-it-on-banking-sector>

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.

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⁶ <https://www.iibf.org.in/documents/Dr.%20Bansal%20Final%20Report.pdf>

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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 supports the assumption that the technology has a positive ⁷ impact on banking services and leads to the rejection of H01 and concludes 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

⁷ <https://www.icommercecentral.com/open-access/the-impact-of-technological-innovation-on-bank-performance.php?aid=87293>

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.

The impact of science and technology on banking has been profound, revolutionizing the industry in numerous ways. Here's a brief overview:

Automation and Efficiency: Science and technology have enabled banks to automate various processes, reducing the need for manual intervention. This has significantly increased operational efficiency, leading to faster transactions, reduced errors, and lower costs.

Digital Banking: The advent of the internet and mobile technology has facilitated the rise of digital banking. Customers can now perform various banking tasks online, such as checking

account balances, transferring funds, paying bills, and applying for loans. This has led to greater convenience and accessibility for customers, as they can bank anytime, anywhere.

Electronic Payments: Science and technology have played a crucial role in the development of electronic payment systems, such as credit/debit cards, online payment gateways, and mobile wallets. These systems have made transactions faster, more secure, and more convenient for both consumers and businesses.

Data Analytics and Personalization: Banks now have access to vast amounts of data about their customers' financial behavior. Advanced analytics techniques allow banks to analyze this data to gain insights into customer preferences and behavior. This enables them to offer personalized products and services tailored to individual needs, enhancing customer satisfaction and loyalty.

Risk Management: Science and technology have improved banks' ability to assess and manage risks. Advanced algorithms and models can analyze market data and customer behavior in real-time, helping banks identify potential risks and take proactive measures to mitigate them.

Blockchain and Cryptocurrency: Emerging technologies like blockchain have the potential to revolutionize banking by providing secure, transparent, and tamper-proof record-keeping systems. Cryptocurrencies, which are powered by blockchain technology, offer alternatives to traditional fiat currencies and could potentially disrupt the existing financial system⁸.

Regulatory Compliance: Science and technology have also helped banks comply with increasingly complex regulatory requirements. Automated systems can monitor transactions for suspicious activity, ensuring compliance with anti-money laundering (AML) and know-your-customer (KYC) regulations.

Overall, science and technology have transformed the banking industry, making it more efficient, convenient, and secure for both banks and their customers. However, these advancements also bring challenges such as cybersecurity threats and the need for continuous innovation to stay competitive in a rapidly evolving landscape.

⁸ <https://indiafreenotes.com/technological-impact-in-banking-operation/>

Digital Transformation: Banks have undergone a significant digital transformation, shifting from traditional brick-and-mortar branches to digital platforms. This transformation has been driven by advancements in technology such as cloud computing, artificial intelligence (AI), and big data analytics. Digital banking platforms offer customers a seamless and personalized experience, allowing them to access banking services through websites, mobile apps, and other digital channels.

Artificial Intelligence and Machine Learning: AI and machine learning technologies are being used by banks to improve customer service, streamline operations, and enhance risk management. Chatbots and virtual assistants powered by AI provide instant customer support, while machine learning algorithms analyze vast amounts of data to detect patterns, identify trends, and make data-driven decisions.

Biometric Authentication: Biometric authentication methods, such as fingerprint scanning, facial recognition, and voice recognition, have become increasingly common in banking. These technologies provide a higher level of security and convenience compared to traditional authentication methods like passwords and PINs.

Mobile Banking: The proliferation of smartphones and mobile devices has fueled the growth of mobile banking. Mobile banking apps allow customers to perform various banking tasks on the go, including account management, bill payment, and mobile check deposit. Banks are continually investing in mobile banking technology to improve usability, security, and functionality⁹.

Open Banking: Open banking initiatives leverage application programming interfaces (APIs) to enable third-party developers to build applications and services that access bank account data¹⁰. This allows customers to securely share their financial information with third-party apps for budgeting, financial planning, and other purposes. Open banking promotes innovation, competition, and collaboration within the financial services industry.

⁹ <https://www.icommercecentral.com/open-access/influence-of-technology-on-the-performance-of-indian-banking-sector--a-review.php?aid=85794>

¹⁰ <https://www.bankingfinance.in/impact-of-information-technology-in-indian-banking-industry.html>

Cybersecurity: As banks embrace digital technologies, cybersecurity becomes a top priority. Banks invest heavily in cybersecurity measures to protect customer data, prevent fraud, and ensure the integrity of their systems. Advanced cybersecurity solutions, such as encryption, multi-factor authentication, and real-time monitoring, help banks defend against cyber threats and comply with regulatory requirements.

Blockchain and Distributed Ledger Technology (DLT): Blockchain and DLT have the potential to transform banking by providing decentralized, transparent, and immutable record-keeping systems. These technologies can be used for various applications, including cross-border payments, trade finance, and smart contracts. Banks are exploring blockchain solutions to improve efficiency, reduce costs, and enhance security in their operations.

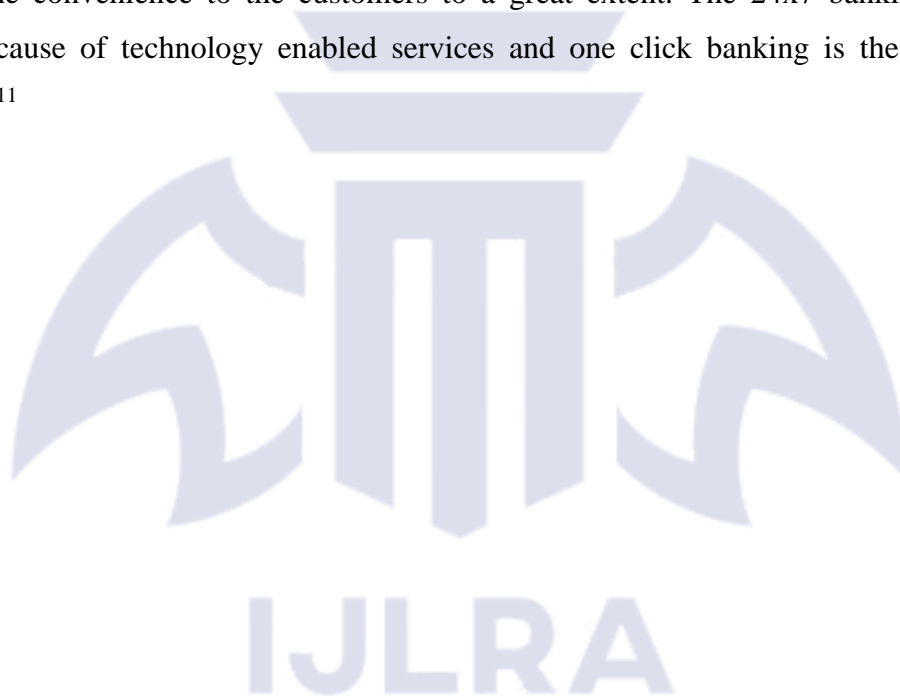
Regulatory Technology (Regtech): Regtech refers to the use of technology to facilitate regulatory compliance in the financial industry. Banks leverage regtech solutions to automate compliance processes, monitor regulatory changes, and ensure adherence to regulatory requirements. Regtech helps banks reduce compliance costs, mitigate risks, and enhance regulatory transparency.

In summary, science and technology have profoundly impacted the banking industry, driving innovation, improving efficiency, and enhancing the customer experience. As technology continues to evolve, banks will need to adapt and innovate to stay competitive in the dynamic landscape of modern banking.

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 an 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.¹¹



¹¹ <https://core.ac.uk/download/pdf/162155908.pdf>