CHAPTER-2: TECHNOLOGICAL DEVELOPMENT IN BANKING

2.1.Wave of technology in banking:

The technological development in banking can be traced as follows:-

1960 - Mechanized banking introduced.
1970 - Introduction of computer based banking industry.
1980 - Introduction of computer-linked communication based banking.

Advent of computer technology has created a major impact on working of banks. The computerization and subsequent development in history of Indian banks can be traced back to 1966 when Indian Bankers Association (IBA) along with exchange banks association signed first wage settlement with the union, which accounted for the use of IBM or ICT accounting machines for inter-branch reconciliation etc. As per the reports of RBI the first wave in banking technology began with the use of Advanced Ledger Posting Machines (ALPM) in the 1980s. The RBI advised all the banks to go in for huge computerization at the branch level. There were two options: Automate the front office or the back office. Many banks opted for automating the front office.

In the first phase, Whereas banks like State Bank of India also concentrated on the back office automation at the branch level. The Second wave of development was Total Branch Automation (TBA) which came in late 1980s. This automated both the front-end and back-end operations within the same branch. TBA comprised of total automation of a particular branch with its own database. In the third wave, the new private sector banks entered into the field of automation. These banks opted for different models of having a single centralized database instead of having multiple databases for all their branches. This was possible due to the availability of good network
infrastructure. Earlier, banks were not confident of running the whole operation through a single data center. However, when a couple of private sector banks showed that it could be done efficiently, other banks began to show interest and they also began consolidating their databases into a single database. The banks followed up on this move by choosing suitable application software that would support centralized operations. The fourth wave started with the evolution of the ATM delivery channel. This was the first stage of empowerment of the customer for his own transactions. The second stage was the Suvidha experiment in Bangalore. This showed the power of technology and how the reach can be increased amazingly at a great pace. Seeing these, all the banks started revamping their retail delivery channels. Their core focus became increasing the number of customers they can service at a lower cost. The main channels for these were internet banking and mobile banking. After this, came the alliances for payment through various other gateways. The third important development happening now is the real-time gross settlement system of the RBI. Once this was in place, transactions between banks could be done through the settlement system, online, electronically thereby, ensuring faster collection. The process of computerization had started from back Office application, after that Total Branch Automation and nowadays it is the period of implementation of Core Banking Solutions (CBS).

A key trend in the last couple of years has focused core banking systems. With the implementation of core banking systems across the banks, the usage level of IT for customer management has increased. Core banking systems have enabled banks to launch new products and services targeting specific customer segments after understanding their banking and investment requirements. ATM, internet banking and mobile banking has improved customer convenience by providing anywhere any time banking services. The utility bill presenting and payment has help customers to pay their bills online at the click of a button. Electronic clearing system and electronic funds transfer facilitate faster funds movement and settlement for the customers of different banks and different centers. The electronic data interchange and cash management service facilities have enabled better funds management for the customer. Very few banks offered customers the ability to access their accounts and perform at least simple money transactions using internet banking. Advancements in information technology had make possibility for the banks to
use the internet as a delivery channel for banking services. Technological developments has introduce tremendous changes in the ability of financial and non financial firms to efficiently collect, store, use and sell information about their customers.

Balasubramanya S.(2002) in his study analyzed that the automation in the banking sector has come a long way starting with the Rangarajan Committee report on the banking sector reforms during the eighties, followed by reports of the Narasimhan Committee in the nineties. With over 65,000 branches of the banks (public, private and the cooperative sector) in the country, the author found that the percentage of branches covered by automation was very low. Though many banks had claimed that more than 70% business has been automated due to the enforcement of RBI guidelines, in reality it was much lower, as many functions in each branch were still done manually or with partial automation. Hence, there is a significant amount of automation work to be achieve in the banking sector.

2.2. Technological developments in Banking:

Over a decade Indian banking system witnessed metamorphosis. The main driver of transformation has been the fast adoption of Information, Communication and Technology (ICT) based system in the banks. The huge red ledgers, row of racks of ledger holders, cash scrolls, registers, clearing cheque scrolls, totaling machines, long rolls of paper ribbons often gazing the floor formed part of hardware in the branches. It was also common to see staff hiding behind the tall branch counters, row of signature cabinets standing between the counters and supervisory staff, customers eyeing frantically on movement of ledgers and cheques until their transactions were done. But in the post bank reform era, more particularly after the ICT enablement there is semantic changes and innovation in the quality of customer services. Moreover, the beeline of customers standing in queue in bank branches staring anxiously at the staff, their eagerness to catch up bank timings to log in transactions, searching for known employees to deposit/receive payments late at the counters, receiving wads of currency notes in retail payments at the counters, waiting for updating pass books, receiving drafts, grumbling over the bad hand writing of some of the employees were also the common features of
manual banking. They are now no more relevant. The banking work space has changed for good. Bank branches are now sporting a smart look with refurbished interior, radiating corporate color, well dressed bank logos, wide glass doors, and plush interiors and well developed customer lounges etc.

The well painted signage, clear guidance in the branch, customer information, display of product information, enquiry kiosk, smiling relationship assistants in some banks adds to the modern branch set up. The low height counters handled by trained employees wearing inviting look, customers having one to one interface with departments, banking halls buzzing with clicks of mouse, laptops, computers, currency notes zipping through the counting machines form part of modernized attire of bank branches at least in metro cities. The eerie silence of customers and staff, an assured quick servicing system, provides an atmosphere for maintaining focused quality of service in the branches. The onsite ATMs, teller counters, swipe machines / kiosks have speed up standard transactions of every day need of consumers. With the onset of alternative delivery channels, even the branch timings are not very significant. Phone and mobile banking, smart cards, debit cards, rechargeable electronic purse are also some of the modern day banking facilities that allow round the clock access. With the profile and aptitude of bank consumers fast changing toward the use of ICT facilities, the popularity of e-channels of banking are set to assume more significance. Banks are fast gearing up to introduce add-on services to attract young generation of customers.

It can further be observe that with most of the banks migrating to Core Banking Solutions (CBS), the transaction platform has become common facilitating use of ATMs of any bank at the ATMs of any other bank / institution so long as they are connected with a common payment system like VISA/MasterCard. This connectivity has remove even the limitations in the use of debit/credit cards.
The technological developments are accompanied by the following sections:

**Section – I: Development of technology in banks**
**Section – II: Development of ICT based products / services**
**Section – III: Opportunities in the Banking Industry**
**Section – IV: Emerging Challenges in the Banking Industry**
**Section – IV: Scope of application of ICT models to tackle key challenges**
**Section VI: Mergers and Acquisitions**

### 2.2.1. Section – I: Development of technology in banks

The ICT driven value proposition has transformed the whole range of banking services to customers. It has proved to be a great customer centric enabler for banks to induce innovation. It has made the life of bank employees much better. The skill sets of employees can also be diversified and synchronized with current needs. The rigors of reconciliation, matching of entries, the time spent earlier on housekeeping are now better used for business development. Though technology brought relief to both banks and consumers, its entry into banking system was initially sluggish. The resistance to change is always a challenge. But the foundation for large-scale induction of IT in the banking sector was provided on the recommendations of the committees headed by Dr. C. Rangarajan, in 1984 and 1989. Subsequently, in 1994, the Reserve Bank constituted a committee on 'Technology Up-gradation in the Banking Sector'. This committee too made a number of recommendations covering payment systems including setting up of an autonomous centre for development and research in banking technology.

The Institute for Development and Research in Banking Technology (IDRBT), Hyderabad, was created as a sequel. It has establish Indian Financial Network (INFINET), to conduct research in banking technology and provide consultancy services to banks apart from providing educational and training facilities for the banking sector. It plays the role of an incubator for bringing innovation in banking technology. It has expanded its scope to cover intense research in technology to bring about better standard
of technology and works on evolving suitable security systems to protect the mass of bank data. It sets a framework for sustained scaling up of ICT capabilities of the banking industry to move towards international standards.

**i. Progress in the entry of ICT in banks:**

Banks began using IT with entry of Automated Ledger Posting Machines (ALPMs) followed by standalone PCs with migration to Local Area Network (LAN) connectivity. The system of intra branch connectivity with a common software continued for a few years before inter branch connectivity could be thought of. But with the advancement, innovations and development of ICT support more sophistication in its application could be possible. Thus, the stand alone IT infrastructure in banks developed in early 2000 began to migrate to core banking platform for facilitating access to bank account from anywhere. Thus going beyond the gathering, processing, analyzing and providing service at the counters locally within the branch, IT moved to provide anywhere and anytime banking. The new innovation of products based on CBS technology brought sea change in banking services.

The big change came from the move from localized banking to world-wide banking services through core banking solution, which provided the ultimate comfort to customers. Further the advancement of ICT now makes possible to network bank customers as a member of the whole financial system that facilitates interbank transactions. The payments, remittances and credit to accounts against outstation cheques can now move from one bank through electronic connectivity to another. The facilities which were beyond imagination earlier were made possible now with the onset of CBS platform and its innovative use.

**ii. Density of CBS operations in Banks:**

Having moved to CBS, banks began to introduce e-banking products and expanded network of on-site and off-site ATMs. The statistics of RBI of March 2010 indicates that 90.0% of Bank branches are on CBS mode. Of the remaining 10%, 7.8% are fully computerized, while 2.2% branches are partially computerized. The total number of
ATMs has reached 60153, of which 45.7% are off-site ATMs. The service charges on use of other bank's ATMs have been dispensed with in first five transactions in a month. The Regional Rural Banks (RRBs) have also begun to move to CBS mode. The cumulative ICT spent in banks from September 1999 up to March 2012 works out to Rs 22052 crores. In order to justify the spent, banks will have to derive the synergy of innovations to increase revenue streams of banks.

CBS enables use of central shared database support located at the data centre. Business processes in all the branches of a bank to update a common database in a central server located at data centre, which gives a consolidated view of the bank's operations. Branches function as delivery channel, providing innovative range of value added services to the customers. CBS is an integrated application that supports real-time, multi-banking and multi-channel services. The single biggest achievement of implementing the CBS is that each customer is truly the customer of the bank and not just the customer of the branch, where his / her account is maintained. With the interlinking of ATMs, the customer has been further transformed into constituent of the financial sector rather than a bank.

iii. Diversification of ICT delivery channels:

The benefits of ICT based products in day-to-day banking are quite well known. Diversification and setting up more delivery channels led to more facilities. There is 'Anywhere banking' and 'Anytime Banking' through 24*7*365 delivery channels such as Automated Teller Machines (ATMs), and Net and Mobile banking in some banks. In addition, ICT has enabled the efficient, accurate and timely management of the increased transaction volume that comes with a larger customer base. It has also improved the capability of banks to handle large number of transactions economically and facilitated the movement from class banking to mass banking and removed the limitations.

In the process, the banks have also undergone a massive change in terms of improvement in the IT communication network, which has greatly facilitated, not only the networking of the internal communication processes, but the integration with the external payment system gateways as well. CBS can also be used to process customer
relationship management, treasury, ATM application, electronic banking, management information system, internet banking, mobile banking, smart card operations, biometric ATMs; chip based electronic purse and such other customer convenient innovative electronic devices.

2.2.2. Section – II: Development of ICT based products / services

i. Key ICT led value propositions:

The application of ICT facilities goes much beyond the CBS. It is one of the enablers for driving innovation and to provide superior customer experience. On-line electronic payment systems, generation of SMS alerts against transactions, online swiping of transactions against debit / credit cards, online internet/e-banking, mobile banking, operations through point of sale terminals (POS) and a host of other products are some of the value added innovations. As a result of such innovations in ICT and application of global interface, further developments in the communication network and messaging system in India can be seen. The emergence of Indian Financial Network (INFINET), Structured Financial Messaging System (SFMS), VSAT connectivity, cable and leased line connection, fiber optics channels, etc., have contributed in using ICT more aggressively for customer convenience. There have been marked improvements in the Indian payment and settlement systems in the form of popularizing and strengthening of Real Time Gross Settlement (RTGS), Centralized Fund Management System (CFMS), Electronic Clearing System (ECS), National Electronic Fund Transfer (NEFT), Cheque Truncation, National Financial Switch (NFS), developments and initiatives at Clearing Corporation of India Limited (CCIL), ATMs, electronic banking channels etc.

ii. Electronic Clearing and Cheque truncation

The quick innovations: The Electronic Clearing System (ECS) is another popular and widely used product. ECS Debit/ECS Credit are introduced to facilitate execution of electronic standing instructions for timely settlement of payments. Banks are also in the process of shifting most of the back-office activities to remote processing centers, so that
branches are in a better position to attend to customer needs. These trends indicate that technology help to hive off many of the branch activities to a different location to enable branch employees to move in the market and satisfy the customer needs. The ICT has thus, come to be a strategic business enabler and a means for bringing innovation. The customers also have begun to enjoy the blend of technology in banking services.

However, despite the use of electronic methods of payments, the use of cheques may continue for some more years. In order to improve efficiency, reduce operational risk and time taken for cheque processing, the Reserve Bank has initiated steps to introduce a Cheque Truncation System (CTS) where scan images of cheques will travel to their destination in the place of physical cheques. A pilot project has commenced in the national capital region in Delhi where processing volumes have picked up substantially and about 70% of the cheques are being routed through the CTS. They are now expanding the CTS to other centers. Ultimately the whole country would be connected through 6 or 7 Grids. The stabilization of cheque truncation facility has benefit the customers immensely.

### iii. RTGS / NEFT a gateway for money transfers

As a remittance product, RTGS / NEFT are becoming more popular. RTGS is a large value payment system which processes both customer and interbank transactions of Rs.1, 00,000 and above, while the NEFT is essentially a retail payment system. Further, while RTGS is a real-time gross settlement arrangement, NEFT is a near-real time system with settlements taking place at hourly intervals. Both systems are operated by the Reserve Bank of India. The facility of RTGS and NEFT is available in over 70,000 branches with 119 members and 99 banks participating in the respective systems. The volume and value of transactions processed through the two systems has shown an impressive growth in the last two years as under:
### Table 2.1 Bank Group wise number of transaction in RTGS and NEFT

<table>
<thead>
<tr>
<th>Bank Group</th>
<th>RTGS</th>
<th>NEFT</th>
<th>RTGS</th>
<th>NEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBI Group</td>
<td>3.3</td>
<td>7.4</td>
<td>2.7</td>
<td>6.7</td>
</tr>
<tr>
<td>Nationalized Banks</td>
<td>3.5</td>
<td>9.0</td>
<td>2.2</td>
<td>7.7</td>
</tr>
<tr>
<td>Foreign Banks</td>
<td>2.2</td>
<td>5.3</td>
<td>12.4</td>
<td>21.6</td>
</tr>
<tr>
<td>Private Sector Banks</td>
<td>4.2</td>
<td>11.3</td>
<td>14.4</td>
<td>29.3</td>
</tr>
<tr>
<td>Others</td>
<td>0.1</td>
<td>0.3</td>
<td>0.03</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Source: Report on Trends and Progress in Banks: 2009-10, an RBI Publication, November 2010*

The advantages of popularizing the electronic transmission of funds are twofold. One is the enhanced speed and efficiency. The other is to ensure compliance with the bank's KYC policy. Funds coming through the banking channels have more authenticity. Going much beyond remittances, banks have begun to use the ICT systems to facilitate centralization of back office operations to ensure more efficiency in serving customers.

**iv. Centralization of work processes:**

Accordingly, many banks have improved the application areas. Besides the customer interfacing electronic channels, banks have developed several centralized ICT based innovative processing centers. Centralized loan processing hubs, city back offices, regional bank offices, call centers, centralized sales outfits and such other batch activities are getting pooled in one place. Such centralized processing centers meant for handling back office work relieves branches of the rigors of non-customer centric activities. Such approach enables branches to operate on thin model and able to convert into efficient customer centric sales and service outfit. The new lean branch models are emerging as customer focused entities providing superior customer experience.

**v. Advantages of technology in improving banking services:**

Overall, technological innovation has facilitated speedy processing and transmission of information, provided easy access to the data for marketing of banking products and
improved access of banking service to customers. The development of ICT has facilitated diversification of product range, broad based product development, and opened up new service channels. It has moved beyond the scope of inter branch connectivity to interbank connectivity. The financial services industry has thus become virtually more connected with the ICT enablers. Most banks made visible efforts to keep up with the new systems and processes to deliver improved services to customers. Moreover the spurt in broadband internet users from 35 million in 2007 to 50 million in 2010 is likely to increase density of internet banking base substantially. By 2020, the internet users are set to reach 250 million opening up new vistas of growth. The promotion of Internet services is an extensive, low-cost and convenient innovative online service. It has facilitated delivery of banking services to customers, anywhere and anytime. Further the integration of e-trading with internet banking and banks' websites is also a notable feature. These ICT advancements have enabled banks to gradually replace manual work by automated procedures with on-line real time processing. Use of ICT in a large way provides relief in the form of more effective work processes, capacity building to handle larger volume of transactions with remarkable ease. There is no pressure of incremental rise in the volume of transactions and rise in number of customers / users. The system would not feel the presence of such large number of transactions unlike in the manual mode where the physical queue always posed discomfort. Thus taking the help of technology, banks is fast moving from 'brick and mortar' banking to virtual banking, though physical presence is going to stay in India due to the unique nature of Indian banking and varied Indian demographic pattern. Personal touch and relationship management in banks in India continues to hold significance as a value proposition to customers despite the massive automation of banking services.

2.2.3. Section – III: Opportunities in the Banking Industry:

With globalization and changes in the technology, financial markets, world over have become closely integrated. Customers can access their accounts anywhere and banks’ customer base is also spread 126 across the world. Deregulation and liberalization has opened up new opportunities for banks but at the same time the pressure of competition have led to narrowing spreads, shrinking margins, consolidation and restructuring.
Increasingly, banks are focusing on core competencies, synchronizing strengths and shedding activities that are not remunerative. The face of banking is set to change as banks adopt technology to reduce costs, widen product range for customer convenience and to manage risks.

2.2.4 Section – IV: Emerging Challenges in the Banking Industry

i) Financial inclusion:

The key challenges faced by the banking Industry are as follows: Besides opening new branches in potential centers, setting up large number of ATMs, massive expansion of Point of Sale (POS) terminals etc., are needed to be planned to reach out to the hinterland. Banking system has the agenda to initially expand presence to over 1, 09,000 villages with population of 2000 and above by March, 2012. Appointment of Banking Correspondents (BCs) on a large scale can be done only if ICT model is scaled up to meet the larger requirements. The connectivity of base branch operating on CBS with the Pops terminals available with BCs will be used by the customers. Therefore, the entire success of implementation of Financial Inclusion Plan of banks will rest on wider usage of ICT platform and innovation of low cost delivery models.

ii) Risk Management:

Similarly, the up-gradation of the risk management modules and for better ALM, technology support needs to be strengthened. The credit risk management systems presently operating on standardized approach under Basel-II in most banks are set to be migrated to Internal Risk Based (IRB) module. Thereafter to advanced IRB module. These will require collection of historical data of minimum five year. The increased use of technology will be able to hasten the process of adopting higher modules of risk management. Moreover, ALM systems can also be further refined to capture residual maturity profile of assets and liabilities on online basis. In view of recent experience of global financial crisis, Bank for International Settlement (BIS) at the behest of global regulators have come out with the concept of Basel-III framework that calls for more fine tuned risk management system. ICT can be better used to refine risk management systems.
iii) Customer Relationship Management (CRM):

Another big challenge is to develop customer data that can support cross selling. In India the culture of cross selling is low. The average number of banking products sold to per customers in India is significantly lesser than the global benchmark. It is a tough challenge to harness the significant potential for cross selling. As of now the average products used by each bank customer in India is 2.2 and 2.1 in PSBs. According to the global benchmark, the best practice range is 6. That means each customer with the bank should possess six types of products. In that case the cost of acquisition of customers will substantially come down. But the gap in the sales is wide. One of the enabler could be collection and collation of CRM data from the customers. Given that cross selling is the most cost effective mechanism to develop business, an increased use of ICT will be able to address this issue.

iv) Leveraging ICT:

The most challenging task will be to make customers use technology. The e-Banking, ATMs and POS needs to be extensively used to reduce transaction cost. The procurement of ICT infrastructure is huge. The marginal utility of it can be increased with greater number of transactions. The basic purpose of using technology is two-fold. One is to enhance the quality of service. The other is to reduce transaction cost. Banks would be in a better position to offer affordable banking service to a larger number of customers. Imparting technology literacy among customers for wider use of ICT delivery model will be one of the key lasting strategies of the bank that will open up new vistas of growth. Putting customers on technology mode is an entrepreneurial task that requires a greater interface between bank and customers.

As a part of harnessing technology, wide publicity of benefits of ICT based products must reach consumers. Spreading awareness among the customers about the benefits of technology is to be taken up along with financial literacy launched as part of Financial Inclusion. This needs to be done on a mission mode to achieve optimum benefit of ICT. Innovations can be possible only if number of users is substantially increased. The cost of per transactions in the branch on an average works out to `40 while in ATM it is `17.
Through a call center the cost is still cheaper at ₹8. It comes down to ₹2 per transaction in net banking and will be only 50 paisa in mobile banking. The transactions limit in mobile is now limited to 5000 due to security reasons. The more customers are migrated to alternative delivery channels, the more will be the reduction in costs. Hence leveraging ICT will be a critical differentiator for the banks to innovate and save costs.

v) Management of human capital:

Banking industry has an immense intellectual skill set which needs to be mapped to deploy them in best fit assignments. ICT can be used as an effective tool to capture the skill sets of employees and the database can be used for optimum usage of human competence. In one of the recent studies by McKinsey & Company in its publication (Aug 2010) “The Zhuman capital key: unlocking a golden decade in Indian Banking”, He pointed out that “Over the decade, the Indian Banking Industry is poised for unprecedented growth but only if it can dramatically strengthen its human capital. For banks to realize their full potential, developing robust leadership capability and improving productivity will be critical”.

Mentoring, grooming, skill building, training and upgrading human competence and leadership can be possible only if the various capabilities are captured as part of HR function. In order to do so, ICT can be leveraged to parameterize and capture the granular set of competence. Gap analysis can be done. Skill gaps can be identified. Then the exercise of building up the missing skill sets will be possible. The ICT can be a good enabler for such critical improvements. Following are the other challenges in Banking are:

i. Coverage: One of the biggest challenges relates to the extension of the coverage of banking services to the remotest parts of the country and to the most vulnerable sections.

ii. Reliable and secure banking transactions.

iii. Proper understanding of the customer: proper identification of their needs and wants. For this a massive survey must be undertaken may be in collaboration with other banks.
iv. There is need for transparency in offering services as customers awareness has grown considerably.

v. Breach of privacy: online transactions enter straightaway into the records revealing the identity of customer. Thus black money cannot be transferred with ease.

vi. Bandwidth: Though companies claim to offer good speed and high bandwidth, still there are problems in accessing high speed on net. Internet banking can go high only on the wings of proper infrastructure comprising telecommunications and bandwidth.

vii. Computer literacy in India is still very low and that is a barrier in fast acceptance of Internet banking.

viii. The mindset of the Indian customer needs to be changed.

ix. Customer has to be protected against being "net-jacked" i.e. he needs to be protected from fraud.

x. Cracking login and passwords is a common way of fiddling with the data.

xi. Denial of services: Directing millions of queries can block computer network.

xii. Data Diddling: Data can be modified in an unauthorized manner. A customer can therefore receive bills of higher amounts than the actual transactions.

xiii. Session hijacking: Hijackers become unauthorized intermediaries between the server and the client; they can then hijack the data and prevent it from reaching the destination.

xiv. Application for account opening can be accepted over Internet but account should be opened only after proper introduction and physical verification of the customer. Security procedure adopted by bank, for authenticating user, must be recognized by law as a substitute for signature, from a legal perspective. Information technology Act, 2000 in section 3(2) provides for a particular technology (asymmetric crypto system and hash function) as means of authenticating electronic records. Any other method used by bank should be recognized as a source of legal risk.

xv. The secrecy and confidentiality of customers account has to be maintained.

xvi. Consumer Protection Act is applicable to banking services as well.
vi) Customers expectations:
In the era of e-banking and severe competition, the expectations of the bank customers have increased. Due to this banks should offer a broad range of deposits, investment and credit products through diverse distribution channels including upgraded branches, ATMs, telephone and Internet. All these changes require vision, determination and extensive communication across all levels in the organization so that the vision and mission of the banks is communicated and understood down the line and receiver unqualified support.

vii) Infrastructure:
The other challenge for e-banking is well developed infrastructure. For effective deployment of e-banking services, it is necessary to have a reliable and cost effective infrastructure that can be accessible to the majority of the population. The base communication infrastructure for e-banking is computer network with internet facility. Most of the transactions use internet to communicate with the customers. Automating the banking services is another prerequisite for e-banking. Close financial links between banks and other financial institutions is necessary. This link is used for clearing and payment systems among these institutions.

viii) Heavy Investment Costs:
In order to offer e-banking services, banks have to invest huge amount of money. They have to incur heavy maintenance costs also. This may not be the problem for well established banks. But in case of new and small banks, they have to face financial problems at the initial stage. Banks in developed countries have already deployed huge amount of investments for e-banking services.

ix) Socio-Cultural Challenges:
Normally customer’s confidence and trust in traditional banking system will make customers less likely to adopt new technologies. New technologies will not be successful until customers are satisfied with privacy and security aspects. It also requires some time
to earn confidence among the customers even it is easier and cheaper than the traditional methods.

2.2.5. **Section – V: Scope of application of ICT models to tackle key challenges:**

Innovation at every level is possible only if the key challenges could be addressed. An integrated application of ICT in customer facing and back office operations would substantially reduce the turnaround time of transactions and bring about improvement in the quality and efficiency of service. Many banks are in the process of integrating more activities into back office processing to derive full synergy of ICT capabilities. The benefits of ICT can be broadly classified into the following:

i. Branch level

ii. Back Office level

iii. MIS level

Many banks have completed the first level of usage and have migrated to the second level to integrate back office operations. In a dynamic ICT environment, up-gradation of technology and expanding scope of its usage is an ongoing process. As far as deriving synergy of technology for improving MIS is concerned, there is lot to be done. Banks have to adopt Automated Data Flow (ADF) system by developing data warehouse. A systematic ADF and Data Warehousing seeks to fulfill this requirement in which data is seamlessly transmitted from the host systems to the recipient system without any manual intervention thus making the whole process more efficient, consistent and reliable. At the same time, as a major spin-off benefit, the system of automated data flow also streamlines the information sharing mechanism at the host level thus serving as a potent MIS tool and encourages good data management practices. It should help banks not just to deliver robust and reliable services to their customers at a lower cost, but also generate and manage information more innovatively and effectively.

On the whole, the banking system is well on course to setup ICT driven delivery models to improve quality of customer services. In the area of centralize back office operations and ADF, more action is needed to derive its full synergy.
2.2.6. Section VI: Mergers and Acquisitions:

Today ‘size’ has become an important issue in financial market world over. Merger on commercial considerations and strategic mergers are the order of the day. One of the possible ways to remain in competition would be mergers and acquisition. The private/foreign banks have already set in the trend. We can say that a constructive and serious measure should be initiated for:

- Better and cheaper access to basic infrastructure requirements such as power, telecommunications i.e. VSAT, leased lines etc.
- Creation of customers’ awareness and education for technology adoption are imperative.
- The IT, Act 2000 should be implemented in totality to handle legal issues.
- Converting branches into boutiques catering to the requirements of clients and re-engineering the functions of branch banking using technology and delivery channels.
- Setting up an e-banking group to provide grid principles for risk management of e-banking activities.

2.3. Changes in banking system and services

The Indian banking sector is going through major changes as a consequence of economic reforms. The changes affect the ownership pattern of banks, availability of funds, the cost of funds as well as opportunities to earn, range of services (fee based and fund based), and management of priority sector lending. The new rules of competition require recognition of the importance of consumers and the necessity to address the needs through the innovative products supported by new technology. As a consequence of competition, the managerial challenges include market segmentation, product positioning, innovative delivery channels and cross selling. The banks may have to reorient their resources to form reorganize branch networks, reduced manpower, dramatic reduction in establishment cost, improving the skills of the staff, and innovative ways of attracting talented managerial pool. The Government of India and Reserve Bank of India on their
part would strengthen the existing norms in terms of governing and directing the functioning of these banks.

As regard the banking sector, technology has completely changed the nature and pace of delivery of banking services world over. Technology enables increased penetration of the banking system, increases cost effectiveness and makes small value transaction viable. Besides making product and services affordable and accessible, it simultaneously ensures viability and profitability to providers. Increased penetration brings further reduction in costs, which in turn attract more people to avail services. Technology has augmented the scope, reach and coverage of banking through significant networking and the availability of a wide variety of new delivery channels to such an extent that the death of the distances and death of identity has already been accomplished. In addition, banking is poised to be omnipresent through facilities such as ‘any time and anywhere banking’. Proliferation of services offer through ATM networks, IT enabled instant remittances across banks, customer payments, mobile payments and many more.

The changing face of the banking sector, aided by technological innovations, can be seen from various developments in the recent past. The most noteworthy has been the usage of ATM technology. ATM started as a substitute of bank branch allowing their customers to withdraw cash anytime and to extend their services wherever it would not be viable to operate a physical branch. The delivery channel revolution can be said to have begun with ATMs. The phenomenal success of ATMs has made the banking sector develop more innovative delivery channels to build on cost and service efficiencies. As a consequence, banks have begun to introduce tele-banking, call centers, internet banking and mobile banking.

Tele-banking is a good medium for customers to make routine queries and also an efficient tool for bank to cut down on their man power resources. The call centre is another channel that captured by imagination of bank as well as customers. At these centre enormous amount of information is at the fingertips of trained customer service representative. A call centre not only cut down cost but also improves customer
satisfaction. Moreover it facilitates 24*7 working and offers the ‘human touch’ that the customers’ seek. Mobile banking can be regarded as ‘the delivery channel of the future’. This is because it offers portability and convenience to the users. It is just like having a bank in the pocket. It would not have been possible for banks to give full benefits of tele banking, mobile banking, internet banking, and card banking to all its customers without an appropriate banking solution. CBS is one of the development that has revolutionize the banking sector. The implementation of core banking system has proven to be a big boon in providing anywhere access to banking services and the treatment of a customer as that of a bank not as a constituent of a specific branch. Alongside the banking sector as made significant efforts to identify security gaps in an IT enabled scenario and has addresses them effectively as well.

Technology implementation has benefited the banks also due to the facilitation of the Reserve Bank- both from the operational and legal perspective. In addition, the Reserve Bank had provided the broad framework for many innovative technology based system. The guide line on Internet banking and guideline for Information system security/audit in 2001 where early initiatives aimed at ensuring safe and secure technology based operations by banks. Keeping pace with time and marshalling international practices, RBI has issued broad guidelines on mobile banking and prepaid (store value cards). These along with sitting up of systematically important payment and settlement systems such as RTGS and other retail payment system like ECS (credit and debit clearing), NEFT, NECS, RTGS have transform the way of banking and today’s customer have a wide array of options to choose from. All these have safety and security at the heart of the respective system.

In the area of payment and settlement system, where technologies impact the customer transaction most, there have been significant advancements. The magnetic Ink Character Recognition (MICR) cheque clearing system processes a staggering 4.5 million cheques on a single day. The cheque transaction System (CTS) is another innovative solution that has been developed to enhance the efficiency of paper based clearing system. CTS have eliminated the need for physical movements of cheques. Speed
clearing has been introduced by the reserve bank to reduce the time taken in clearing up
country cheques and take advantage of and leverage the core banking technology adopted
by banks. The NECS (National Electronic Clearing System), with its centralized
processing capability coupled with the implementation of CBS has brought down the
clearing and settlement system to its current t+1 basis.

A major area where IT security assumes significant pertains to the transformation of
information using IT for communication. Traditionally paper based system have been
subject to certain controls to ensure that the basic requirements pertaining to genuineness,
authenticity etc, are meant with. In the IT based scenario this aspect gain greater
importance not only because of this speed with which IT based electronic information
flow but also on account of the potential havoc that could arise on account of incorrect
transaction.

2.4. Growth of Banking and Computerization

The Indian Banking industry has witnessed an 38.8% growth in its assets in the fiscal
year 2010-2011. A sustainable overall economic growth has laid the foundation of a
robust banking sector. The Industry has been largely classified on the basis of its origin &
ownership into Indian Public Sector Banks, the Indian Private Sector Banks and the
Foreign Banks.

Table 2.2: Trend in growth of banking assets

<table>
<thead>
<tr>
<th>Year</th>
<th>Total assets (Rs. billion)</th>
<th>Total credit (Rs. billion)</th>
<th>Growth in assets (RHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>10000</td>
<td>5000</td>
<td>5%</td>
</tr>
<tr>
<td>2004</td>
<td>12000</td>
<td>6000</td>
<td>10%</td>
</tr>
<tr>
<td>2005</td>
<td>15000</td>
<td>7000</td>
<td>20%</td>
</tr>
<tr>
<td>2006</td>
<td>18000</td>
<td>8000</td>
<td>30%</td>
</tr>
<tr>
<td>2007</td>
<td>21000</td>
<td>9000</td>
<td>40%</td>
</tr>
<tr>
<td>2008</td>
<td>24000</td>
<td>10000</td>
<td>50%</td>
</tr>
<tr>
<td>2009</td>
<td>27000</td>
<td>11000</td>
<td>60%</td>
</tr>
<tr>
<td>2010</td>
<td>30000</td>
<td>12000</td>
<td>70%</td>
</tr>
<tr>
<td>2011</td>
<td>33000</td>
<td>13000</td>
<td>80%</td>
</tr>
</tbody>
</table>

Source: RBI, ICRA Research
The trend in growth of banking assets is as follows:

i. While new private sector banks and foreign banks have the edge when it comes to computerization, public sector banks have not lagged behind in making investments to computerize their operations. As of end-March 2010, 97.8% of all the public sector bank branches have been fully computerized. Of them, 90% provide CBS. This figure was 79.4% at the end of the previous fiscal.

ii. In the past 10 years, public sector banks have spent close to Rs.22,000 crore on computerization and IT upgrades. For the final half of the 2010 fiscal alone, spending on this account stood at Rs.1,370 crore.

iii. The total value of the paper based clearing has been steadily declining, 59% in volume of transactions and 10% in value terms in the 2010 fiscal year.

iv. Thanks to CBS technology, State Bank of India's capability to handle transactions went up more than three times. As of April 2011, SBI could handle 35 million transactions a day as against 10 million earlier.

v. The bank started the move towards CBS in early 2000, and the implementation was complete by 2008. The entire project was handled by Tata Consultancy Services (TCS), which was the systems integrator, while the other major technology partners in the project were Hewlett-Packard (HP), Data craft, Cisco and Microsoft.

vi. CBS and computerization of its various branches helps in easier rectification of errors, minimization of fraud and the elimination of human error.

vii. Bank of India has spent close to Rs.1,500 crore on technological upgradation and computerization of its branches since September 1999.

viii. ATMs have been a big success. It help in reaching banking services to different parts of the country,” said Kalyan Sundar. Almost 75 per cent of Banks of India cash advances are made through ATMs. Off-site ATMs of public sector banks witnessed a 70% increase in the 2010 fiscal from the previous fiscal. The number grew from 9,898 in end-March 2009 to 16,883 by end-March 2010. For private sector banks, the growth in the number of off-site ATMs in the 2010 fiscal has been around 19%. The number stood at 9,844 in end-March 2010 as against 8,324
in the previous year. The number of on-site ATMs for public sector banks showed a growth of 36%. The number grew to 23,797 as of end-March 2010 from 17,379 in the previous fiscal.

Table 2.3: Growth of ATMs

<table>
<thead>
<tr>
<th>Growth of ATMs</th>
<th>Off site ATM</th>
<th>On site ATM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ATMs in %</td>
<td>No. of ATMs</td>
</tr>
<tr>
<td>Public banks</td>
<td>70% increase in 2010</td>
<td>16,883 in the end of March - 2010</td>
</tr>
<tr>
<td>Private bank</td>
<td>19% increase in 2010</td>
<td>9,844 in the end of March - 2010</td>
</tr>
</tbody>
</table>

Source: RBI, ICRA Research

ix. A better and safer environment for electronic transactions has resulted in a sharp increase in the number of online transactions. The number of RTGS transactions in public sector banks more than doubled from 6.8 million in the previous year to 16.4 million in 2009-10. The number of RTGS transactions in the private sector grew to 11.3 million in the 2010 fiscal from 4.2 million in the previous year.

x. In the private sector, NEFT transaction volumes jumped from 14.4 million in 2008-09 to 29.3 million in 2009-10.

xi. Almost 10% of our total transactions take place via the electronic mode.

xii. Axis Bank recently introduced the Instant Money Transfer (IMT) system. It is a remittance facility that allows a withdrawer to get money from an ATM even if the person does not have a bank account.

xiii. Bank of Maharashtra is already gearing up for the 3G revolution. The bank plans to set up three 3G techno-savvy specialized branches in Mumbai, Delhi and Pune to cater to the younger generation.
2.5. Adoption of Technology in Banking:

IT offers immense opportunities to significantly improve efficiency and effectiveness of the functioning of banks. IT will be a tool not only to improve the operational efficiency of banks but also to serve customers better.

1. **Financial inclusion:** Technology adoption has enabled a small percentage of financial inclusion in total rural households. Harnessing technology holds the key for faster reach even more than the brick and mortar model. The best way offer for inclusive banking is through twin-routes - mobile banking through a bank-led model and banking correspondent model. ATM/Smart card technology permits a bank customer to authenticate one self and then conduct banking transactions in a secured fashion. Mobile phone also can be used for authentication and banking transactions in a secured fashion.

2. **Enhancing the secured network:** Security is at the root of technology centric banking. The advent of low cost and all pervasive communication channels such as internet has made communication more efficient, but not necessarily safe and secure. With the Government planning to implement an e-payment gateway for a single point distribution of all the payments, the need for a secured network for transmission of such information becomes essential. IDRBT may explore the possibility of connecting the secured INFINET with the government (NICNET) so that the entire sensitive massive financial transfers take place under a secured environment.

3. **Capability of handling large volumes:** Financial transactions have increased phenomenally. Next generation products could handle any amount of volume with due scalability facilities.

4. **Fraud monitoring and prevention:** The Reserve bank of India has recently come out with the recommendations of a working group on Information security, Electronic Banking, Technology risk management and cyber frauds. Implementation of the recommendations calls for an assessment of the nature and scope of activities supported by technologies engaged by banks. In this Electronic age speed in detecting frauds has become extremely important. The response has
to be with the same blinding speed as the fraud committed, Or else, the fund could vanish in no time.

5. **Business Continuity Plan:** Technical experts are familiar with the processes to be kept ready for activation in response to any disaster that may strike. With the complexities of modern banking, the BCP is a must for every bank.

### Table 2.4: Cost per Transaction of various modes

<table>
<thead>
<tr>
<th>Type</th>
<th>Branch</th>
<th>Cheque</th>
<th>Phone</th>
<th>ATM</th>
<th>PC</th>
<th>Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Per Transaction</td>
<td>1.07</td>
<td>0.95</td>
<td>0.45</td>
<td>0.27</td>
<td>0.015</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Source: RBI, ICRA Research

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2.6. Impact of IT on Banks

Paradigm shift from traditional banking to customized banking is the service that can be delivered via computer and convenient banking i.e. "**Anytime, Anywhere banking**". A customer can check balance by logging into banks website through a user name and password. In this way he can enquire balance, status of cheques, perform funds transfers, order drafts, request issue of cheque books etc. Under the impact of technology, the organization structure of the banks, the role of various functionaries and the approach of bank to customer are undergoing a perceptible change. The technology helped the bank to strategically look at customer needs to offer efficient banking services, at the same time gearing its staff to cope with the stress of technology.

i. **Changes in Organization structure and orientation**

Information technology is a mean for increasing organizational productivity. IT, in fact, is much more than a series of new machines for organizational efficiency, since it brings about a new concept of self regulating system and principle in the organization.
Some of the usual change brought under the impact of IT relating to organizational change and orientation are as follows:

- The need for faster information and better control has a direct impact on reducing the hierarchical tier system in the banks.
- The management processes and controlling mechanism characteristic also undergone a change.
- Managerial attitude also undergone a change under the impact of IT. This is reflected in the way top executives look at IT as a functional requirement and apply it for improving organizational efficiency and effectiveness.
- The organizational change can facilitate the increased involvement of information system in the mainstream product offering in banking and financial sector.
- Integrated Internal accounting system: Bank’s book-keeping is automated, fast and accurate. It saves time of staff for marketing and other work after the banking hours.
- Management information system for middle and top management has improved due to data classification and retrieval, integrated accounting system, communication and conferencing system and inters- connectivity of branches.
- Cross-selling of various financial products due to data mining and electronic marketing channels.

ii. Impact on Service Quality

Banking which is primarily a service industry over the years, becoming more and more technology dependent. The impact of technology on service quality can be summarized as follow:

- By integration of IT in operations, new banks with limited network of branches become better place to compete with established banks.
- The technology is forcing the banks to develop a strategy for an online delivery system to broaden the customer relationship and to retain customer loyalty.
• In bank, the technology pushes the delivery of services out of the bank and the focus shift from cost reduction of market position.

• The advent of IT democratizes the information in the sense that bank customers, particularly the corporate customer, have access to the same real time information over which the bank has earlier control. This results in greater competition for banks.

iii. Changes in customer aspiration

Today customers are demanding fast, accurate and reliable services. This has improved considerably in the following ways:

• Increasing new banking channels: ATMs, Internet Banking, Tele-banking.

• Increasing customer convenience: ‘Any where and any time’ banking and ‘24 X 7 day banking’, home banking.

• Routine banking transactions are speedier, safe and secure.

• Greater flexibility and convenience

• Integrated banking service with Inter-connectivity of branches.

• Banker-customer communications are fast and neat and information service is available on ‘24 X 7 days’ basis via call centers.

• Banks can also handle non-banking services for their customers, e.g. payment of electricity/ telephone/ gas bills, insurance premium and receipt of pension/ interest/ dividends etc.

• Prospective customer can gather all the information from the website and thus if he comes to the branch his queries will be very specific and will take less time of employee. Customer can visit these websites and can compare the services offered by a bank with that of another. Customer can get all the information, by saving money and time. The trend thus emerging out is that of virtual corporate system where the human role is minimized to maximum effect.
iv. Impact on human resources

The technology has also brought about a visible impact on the human resources, which is the most vital component of banking businesses.

- The foremost impact of technology on the existing manpower is manifested in the resistance of the new system. The fear of change give rise to anxieties, inhibitions and skepticism, that can be overcome only with the spread of awareness at all levels. These fears can be of the following:
  
i. **Job Content:** Fears, such as whether the technology mean losing one expertise or personal skill to meet the challenges of adequate job
  
ii. **Job security:** Fear whether the change will mean a loss of the job itself, or whether it would be possible to retrain oneself in the new scheme of thing, or would it man a transfer from the existing work place, or whether the new computer literate have better job profile
  
iii. **Authority dilution:** fear such as whether the change in job requirements may mean erose in one’s authority within the organization.

- With the increased use of information technology, there is an ever increasing demand of the specialized personnel in the field of IT management.

- Another impact of IT on human resource is the high turnover rate of computer skilled manpower. This may necessitate the banks to formulate their own manpower policies to retain these professionals within the organization.

v. Impact on privacy and confidentiality of data:

The concern for the misuse of the stored data becomes more profound when the stored data pertain to financial transaction of individuals. Customer’s feels threatened about the inadequacy of privacy being maintained by banks with regard to their transaction and look at the computerized system with suspicion. Whereas when the system crashes the content of user’s profile get publically displayed at the terminal. Therefore data privacy assumes two significant dimensions:

- The authority to access data
- The authority to use data for specified purpose.
The following principles are broadly common in the privacy laws:

- The data must be accurate, up to date and kept no longer than necessary
- Special measures over and above the normal computer security procedures should be taken to preserve the privacy of personal data.

A multi-layered security architecture comprising firewalls, filtering routers, encryption and digital certification ensures that customer’s a/c information is protected from unauthorized access. Firewalls and filtering routers ensure that only the legitimate internet users are allowed to access the system. Encryption techniques used by the bank (including the sophisticated public key encryption) ensure that privacy of data flowing between the browser and the infinity system is protected. Digital certification procedures provide the assurance that the data receive is from the infinity system.

vi. Impact on payment and settlement system:

IT has a positive impact on the payment and settlement system of the country. With some path-breaking initiatives implemented in this area, the “Electronification” of payment system has become the hall mark of the decade electronic based payments are superior to paper system in terms of traceability, efficiency, speed and safety. The introduction of the Real Time Gross Settlement (RTGS) system has resulted not only compliance with international standards but also paved the way for risk-free fund transfers settlement on a real time basis.

- The facility for inter-bank funds settlement through RTGS is available across more than 88,000 branches of banks spanning more than 5,000 centers of the country.
- IDRBT plays an important role in promoting the electronic payment system, at the heart of IT enabled banking it provides safe, reliable and effective communication network and messaging system.
- Low cost yet reliable technologies in the form of Multi-Pocket-Label Switch” (MPLS) technology is an effort to offer state-of-the-art network.
2.7. Role of technology in achieving competitive advantage in Banks

For technology to drive the competitive advantage in a sustainable fashion, banks need to have clearly defined strategic goals and translate them into appropriate IT goals. To support the IT goals, banks need to invest in building architectures, infrastructure, processes, IT organizations and governance frameworks. This means,

i. Ensure business benefits expected from IT are clearly identified
ii. Policies and procedures around data quality, metadata management, disaster recovery, business continuity plan
iii. Ensuring governance has enterprise-wide coverage
iv. Ensuring core transactional applications are in place
v. Having a plan and solution in place for Infrastructure management, and finally,
vi. Having a clearly defined IT organization with appropriate skill sets.

2.8. The focus area for the organization in strategy and the business benefits expected out of IT

The banks in India are on a growth path as they are apparent from the organization strategy they focus on building top line growth while managing costs. The banks have responded that around 60% of the organization’s focus on building top line and around 40% for managing cost. The scenario is consistent across all classifications of the banks. Around 95% of firms have mentioned that retaining customers is critical and 88% of firms feel the same about acquiring new customers while only 53% of firms said that cutting costs is a top priority this year. This is in line with International trends. In conformance with the expressed plans for growth, banks have mentioned the following top 5 benefits expected from leveraging IT for business. Following are the strategy adopted by different banks to enhance their business benefits:

- New Customer Acquisition
- Leveraging Cross-Sell Opportunities
- Increasing Process Efficiency
- Increasing Customer Service Levels, and
- Adherence to Compliance
2.9. Issues of Technology in Banking:

Following are the important issues regarding e-banking:

i. **New business and new markets**: The Indian banking sector is at an exciting point of evolution. The opportunities to enter new business and new markets and to deliver higher levels of customer service are immense.

ii. **Competition**: As the Indian banks are positioning it as financial service provider, banking businesses are getting redefined. Technology is unsettling the earlier business processes and customer behavior is also undergoing a change. These have enhanced the focus of competition.

iii. **Competitive advantage**: Competitive advantage can be achieved by harnessing the potential of the employees by creating a positive work culture and enlisting the support of all the employees to achieve the organizational goals.

iv. **Operational strategies**: Indian banks have adopted better operational strategies upgraded their skill to withstood challenges and have become adaptive to the changing environment.

v. **Data quality and consistency**: Banks and financial institutions look at common data standards and protocols so as to make the information systems truly interoperable and facilitate easy data flow. Information governance is emerging as a distinct discipline and this deserves much more attention.

vi. **IT infrastructure**: Banks have accumulated lot of IT infrastructure over the years. They should actively explore consolidation to improve efficiency and minimize costs.

vii. **IT governance**: IT governance is an important component of corporate governance and banks should put necessary processes and organizational structures to improve performance as well as compliance.

viii. **IT Outsourcing**: Banks should develop in-house IT skills, broad IT management and leadership competencies. Banks have become increasingly dependent on third party IT service providers for all technology needs, to the extent that in many cases service providers are in control of the banks technology agenda.
ix. **IT-Business:** IT-Business alignment needs special attention to derive better value from IT investments.

x. **Issue of HRM:** Training, development and retaining talented and committed staff is a major emerging challenge before the public sector banks. Today, employee performance review systems are neither objective nor transparent. They do not differentiate high performers, risk takers and innovators lot from amongst the total staff. Time has come to measure the value of human capital and take urgent steps to ensure it to its optimum level.

xi. **Lack of Actionable Planning:** Lack of planning or ineffective planning is very relevant to public sector banks. Though all the banks have establish performance budgeting system and created MIS, it does not meet the management’s present requirements. Basically, the entire planning process is deposit and credit oriented. To tackle this challenge actionable strategic plans which are systematically broken-up into annual plans and performance is strictly reviewed in terms of the targets and accountability is fixed for non-performance.

xii. **Greater customer-Orienta**tion: Greater customer-orientation is the only way to retain customer loyalty and to stay ahead of competition. In a market-driven strategy of development, consumer preference is paramount. Gone are the days when customers come to the doors of the banks and now banks are required to chase the customers. Thus, only banks that are customer-centric and extremely focused on the needs of their clients will succeed and there is need to change the mindset of banks at all levels on this issue. In fact, they must realize that customer is the only profit center and all others are overheads. Identification of profitable customers, understanding their needs and preferences, improving the delivery systems and reducing the transaction costs for them should become important strategic issues for banks, to survive in the fiercely competitive environment. Enhancing the customer base, cross selling of products/services and strengthening the customer relationship management is the most important aspect.

xiii. **Security aspects of banking transactions:** Banks are developing alternative channels of delivery like ATM, Tele-banking, remote access, internet banking etc. The primary issues center on the following aspects of information security are:
a) Authentication and identity of user: The act of verifying the identity of a user.
b) Confidentiality: The information transmitted has not been intercepted or viewed by any other party in transit.
c) Integrity: The information sent, received or stored has not been tampered with modified at any time.
d) Non-repudiation: A particular transaction or action taking place, hold the tests of court of law.

xiv. Fraud: The kind of fraud that can happen in the emerging banking scenario are as follows:
   a) Mail Spoofing: Sending wrong information to bank customers as if it is from authentic bank sources.
   b) Web Spoofing: Diverting the customers of a bank to an exactly duplicated forged web site and impersonating those customers on real bank site.
   c) Attacking the user Computer: To take control of that machine.
   d) Attacking a Bank’s Server: To take control of that machine.
   e) Media tapping: Recording the whole transactions of a bank, or customer etc. and replaying the same for their advantage.
   f) Denying Service: Though the server is available, making it not able to render service, by poisoning the network Infrastructure.

2.10. Conclusion

The Indian Banking Industry is witnessing significant double digit growth. The sector is slowly emerging into a market and is becoming increasing, keeping with global trend and practices. Some of the key growth areas within the banking sector are private banking, wealth management and investment banking; they showed potential to become significant businesses in the coming years. With this high growth activity increasing competition in the banking sector has emerged as the key differentiator in the marketplace. The universal application of ICT can change the way banking has been perceived. Beginning with customer centric services, back office set up, MIS needs of banks has dimensions of innovations and change in quality. ICT application should further be used for
diversification of more value added services, pursuing financial inclusion with more PoS terminals, developing CRM data, moving more non-customer activities to remote locations, better mapping of manpower competence, setting up data warehousing and MIS architecture to reduce dependence on operational units for monitoring and control. Technology in Indian banking has surely emerged from being "reactive" to "proactive" and the need of the hour is to enhance the foundation on which applications of future can safely stand if the bank is to lead through the next wave of growth in banking.

References:

1. C. Rangarajan (Dr.) Chairman Economic Advisory Council to the Prime Minister delivered a lecture on “Role of Technology in Development of Banking” Institute for Development and Research in Banking Technology, Hyderabad, 28 November 2010.


11. Satish Tanaji Bhosale (Dr.), B.S. Sawant (Dr.), published an article on Technological Developments in Indian Banking Sector, ISRJ, and ISSN No: 2230-7850 Vol - I, ISSUE - X [November 2011].


13. Subba Rao (Dr.) D. V. Governor, Reserve Bank of India, A Speech delivered at the Banking Technology Excellence Awards 2009 at the IDRBT Hyderabad, June 18, 2010. On “Harnessing Technology to Bank the Unbanked”.

14. www.iibf.org.in

15. www.managementparadise.com

16. www.mckinseyquarterly.com

17. www.rbi.org.in

18. www.scribd.com

19. www.vikalpa.com/pdf/articles