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INTRODUCTION

The last decade has witnessed a drastic change in the economic and banking environment all over the world. With the economic and financial sector reforms introduced in the country since early 1990s, the operating environment for banks in India has also undergone a rapid change. The process of deregulation and reforms in the Indian banking system resulted in the creation of an efficient and competitive banking system. Deregulation has opened up new vistas for banks to increase their revenues by diversifying into universal banking, investment banking, bank assurance, mortgage financing, depository services, securitization, personal banking etc. An inevitable result of globalization is that it increases the soundness of financial system as a whole and facilitates global competition. At the same time, liberalization has opened the turf to new players and brought greater competition among banks. To survive in this competition, the information and communication technology significantly contributed to the exponential growth and profit of financial institutions worldwide. Technology is the key to move towards providing integrated banking services to customers. Indian banks have been late starter in the adoption of technology for automation of processes and the integrated banking services. But with the global adoption of technology, Indian banking is also at the threshold of paradigm shift due to the latest changes. There are various factors which have played vital role in the Indian banking sector for adoption of technology. Firstly, the economic reforms introduced by the government almost fifteen years back which resulted in opening up of new vistas for banks outside the world. Government relaxed rules and regulations, and simplified the processes for the FII to make investment in the banking and various sectors. This resulted in inflow of large funds in the economy thereby improving the economy as a whole and banking sector in particular. Due to this reason, banks need to provide such services, which satisfy the urge of foreign investors. Secondly, as a part of reforms Indian banking was opened for private sector by which old and new private sector came into limelight. They gave a big boost to technology and created a platform to use it for backside and front-side operations. When they started adopting it, this put a tremendous pressure on the nationalized and public sector banks. With the result of such healthy and competitive environment, overall banking system became more work prone, efficient and techno-
savy. Thirdly, for the economic development of a country, infrastructure plays a vital role. In the last few years, with the development of telecom sector, communication infrastructure, BPOs, the entire country became a single hub of transmitting the information and the major cities got connected with one another, which helped in the reduction of total cost. This had directly helped banks. During the same period banks were busy in connecting their branches with centralized database and core banking solution by offering anywhere, anytime services. Fourthly, Indian software industry has also impacted the Indian banking sector. To provide excellent services to the customers, banks need to have web based portals, wide area network (WAN), local area network, internet, etc. and all these services are provided by the software industry to Indian banking at reasonable prices and at the right time. Fifthly, most of the banks in public as well as private sector have technology thrust from RBI to adopt the changes in order to improve the operational efficiencies, security measures, risk reduction and quality upgradation. After liberalization RBI made several changes in the basic structure of banking sector and laid down numerous guidelines on electronic banking, fund transfer, core banking solution, payment system, clearing services, and internet banking. So, it becomes necessary for the banks to adapt sweeping changes in technology. Further, Indian Banking Association (IBA) has helped banks to create a forum to discuss various issues on computerization and automation of processes which further resolve the problem of adaptation. This change somehow affects the human resources of the banks as there is a change in their working hours, processing time and IBA created a very convenient environment to resolve the issue directly. Last but not the least one is the role played by Central Vigilance Commission for the facilitation of branch computerization by issuing the directive measures for speeding the branch computerization process. This issue was directly related to improve the vigilance administration in the banks. This helps in improving the automation process and to take strict action for the banks, wherever required.

All the above factors led to transformation in the Indian banking sector, and with the advancement and adoption of technology a lot of changes have been made in payment system and banking system as a whole. This evolution has transformed the way banks deliver their services using technologies and electronic modes. Now banks can reach their customers anywhere, anytime; and customers are able to get instant access to their accounts from any corner of the globe anytime. With increasing competition the customers are also becoming more demanding. To meet customers’ expectations banks
will have to offer wide range of services like ATM’s, telephone banking, mobile banking etc. by upgrading their branches. The key to attract and retain the customers lies in efficient customer service including customized and value added products to meet various needs of individual customers as well as to meet the diverse needs of customers.

1.1 Information and Communication Technology (ICT) in Banking Sector:

**Historical Perspective**

ICT came into picture in the year 1980 in banking industry through the Rangarajan Committee recommendations. It totally changed the way the banks and financial institutions were functioning. Quotation of Bill Gates, “we need banking, do we really need banks?” is totally true in this area. Today, no banking business or corporate strategy is complete without information technology. There were different phases introduced during the evolution of ICT in the banking sector. To have a clear picture regarding the developments of ICT, it has been divided into five phases.

During the **First phase** of development, the banks were focusing on automating the laborious accounting process and the functions performed at back office operations like maintenance of deposits, calculation of interest, and maintaining of ledger accounts. **Second phase** of development took place in 1980 when the front office and back office operations were automated. This helped in improving the customer service, reduction in processing time on the front office and back office operations. In this way, the time on carrying out the activities as well as providing the service to the customer was reduced to a large extent. Then came the **third phase** which was started by opening up of new generation private sector banks. These banks with small network and having the advantage of opening the branches under the computerized environment from day one of operations introduced the networking concept and centralized operations. With further investment in ICT the banks could provide innovative financial products at the minimum cost. The core banking solution was introduced and the banks have already captured substantial business under CBS. Now instead of branch-customer concept, bank-customer concept is introduced. This meant that the problems of decentralized network, data base and related operational costs are avoided. With the help of core banking solution, the banks were able to lower the service cost after the adoption of centralized operations.

The centralized operations led to the **fourth phase** of development where the customer carried out his own required transactions through automated teller machine, mobile banking, internet banking, and phone banking. The AAA mantra of anywhere, anytime
and anyhow implemented through ATMs, internet banking and mobile banking. The operational costs for transactions through ATMs are comparatively less and also provide flexible options to the customers. The other area where there is high potential to transact and operate by the customers and where operating cost is low is “Internet banking”. Internet banking has a least cost per transaction, i.e., $ 0.01 per transaction than mobile banking, ATM, telephone banking, and normal branch transaction.

The banking industry is now at the **fifth stage** of development known as inter-bank connectivity. This connectivity of inter-bank and inter-branch has been possible through “Real Time Gross Settlement System”. The concept of “bank-customer” has further improved to “banking industry-customer”. In this system, the transactions are on real time basis as and when they occurred.

From the different phases of banking sector, it is now clear that technological advancement has totally changed the scenario of banking sector. So, computerization, information technology and automation of services are key issues for banks to survive in a competitive environment; and are receiving prime attention as it touches everybody’s work in some way or the other. But this cannot be done in a day. Banks do need to have extensive investment on technology to meet all the requirements and to reduce the transaction costs. However, the implementation of IT in banking without undertaking appropriate business process re-engineering (BPR) exercise will not prove to be fruitful. Proper business process re-engineering ensures the IT initiatives to meet the required objectives, and ensures the financial outlay being properly utilized. There are number of benefits that can be achieved from IT through BPR. Firstly, BPR enables banks to reap up the maximum benefits from absorption of IT in business operations, be it by way of process simplification or handling the large volume of transactions. Secondly, BPR should facilitate in process simplification in banking operations so that IT initiatives can be rendered in a much simpler and effective way in manual operations. Thirdly, BPR should considerably reduce the time lag deliverables and hasten up the entire cycle of processes and procedures involved in banking operations. Fourthly, BPR process should enable the customers to undertake the banking transactions much more conveniently than earlier one. BPR process should target on improving the overall customer service levels. This can be achieved by popularizing the IT based delivery channels like tele-banking, remote customer enquiry terminals, kiosks, internet banking, ATMs, mobile banking, and phone banking so that customers are facilitated to carry out most of the transactions
without having to visit the branch premises. It is clear from the discussion that technology can be used in banking in four different ways:

• To handle the expanded customer database.
• To reduce substantially the cost of handling payments.
• To free the bank from traditional constraints on time and place.
• To introduce new products and services to the customers.

Due to these technological changes, the term which gains the utmost importance is “Electronic Banking”. E-banking is defined as the automated delivery of new and traditional banking products and services through electronic, interactive communication channels. Through e-banking individuals and corporate customers can access accounts, transact business, transfer funds or obtain information on products and services through the electronic media without any paper transactions. For many customers e-banking means 24 hours access to cash through ATM or direct deposit of pay cheques into savings account but electronic banking involves different types of transactions. E-banking also means transferring of funds electronically with the use of computer and other electronic modes. It allows customers to automate cash receipt payment.

Increased productivity and cutting of transaction costs are the most obvious benefits of e-banking. The dramatic difference in cost and speed between traditional ‘brick-to-brick’ banking and Internet-mediated financial ‘brick-to-click’ banking services and related information delivery has led to rapid growth of online payments, e-banking and online credit risk management. However, the Indian banking industry is expected to be a leading player in e-business while the banks in developed countries are working primarily via internet as non-branch banks.

1.2 Changing Scenario of IT in the Years 1990 and 2000

The technology in Indian industry is changing tremendously. The changing scenario of IT in the Indian banks in the years of 1990 and 2000 is as follows:

• **HRM/IR:** In 1990, there was a problem of overstaffing, high turnover of IT professionals, absence of attractive terms and career progression for IT technologies.

  In 2000, web based portals were designed for IT training and there was need to set up a separate IT institute for banking industry.

• **EDP/IT Organizational Set-up:** In 1990, telecommunication, security, audit and disaster recovery department set-up was still absent in majority of banks.
In 2000, need for IT security, audit, control and disaster recovery was felt to minimize IT related risks.

- **IT Management:** In 1990, IT management functioning remained highly centralized.

  By 2000, as IT investment grew and its usage spread, professional IT management was required across the hierarchy of the banks.

- **IT Infrastructure:** In 1990, telecommunication /ATM projects initiated yet to deliver required support both from customers and management.

  By 2000, huge investment was needed to create necessary IT infrastructure and strategies to ensure ROI.

- **Banking Business and its Spread:** In 1990, emergence of new private and foreign banks resulted into need for new products and services.

  By 2000, demand for e-commerce, internet based “one stop shopping” of financial services gained momentum.

- **IT Audit, Security and Control for Risk Management:** In 1990, many frauds were yet to surface. ROI in IT was still not done adequately.

  By 2000, relevant software packages were used for IT audit.

- **Management Function and IT Support:** In 1990, there was absence of management support system and decision support system for vital functions of management like credit investment, asset liability management.

  By 2000, indigenous solution for local problems based on technological innovations was needed.

- **IT Audit/Security/Control Related Awareness and Culture:** In 1990, password management yet not adequate, controls and inbuilt audit trials were far from satisfactory.

  By 2000, IT audit and control had been the responsibility of every employee of the bank as IT would become lifeblood of the financial system.

  So, technological changes transformed the banking structure and systems mainly in the years 1990 and 2000 and the major changes were related to risk, security, control, IT infrastructure, IT management and organizational set-up.

**1.3 Role of Websites in the Functioning of Electronic Banking**

On the basis of websites, the e-banking services are divided into two categories:
• **Informational Websites:** Informational websites provide customers access to general information about the financial institution and its products or services. The customer can get any sort of information about the bank from websites.

• **Transactional Websites:** Transactional websites provide customers with the ability to conduct transactions through the financial institution’s website by initiating banking transactions or buying products and services. Banking transactions can range from something as basic as a retail account balance inquiry to a large business-to-business funds transfer.

Since transactional websites typically enable the electronic exchange of confidential customer information and the transfer of funds, services provided through these websites expose a financial institution to higher risk than basic informational websites.

**1.4 Difference between Brick and Mortar Banking and E-banking**

Understanding the nature of innovation is a crucial step in managing the changes associated with any innovation (Afuah, 2003). In order to investigate the changes from traditional bricks and mortar banking to e-banking in terms of technological knowledge, we analyze the key differences in the IT infrastructure, transaction and service dimension. Due to the emergence of internet, the manual record maintaining was shifted from manual to mainframe, to personal computer, to client/server for the IT infrastructure.

Traditional banking requires the interaction with physical facilities, processes and payments (Suresh, 2008). The customers are also required to carry out transactions with having a physical presence in a particular geographical location. On the other hand, e-banking is a way of on-line transaction via internet. It constructs an alternative channel by which customers can easily make a transaction anywhere-anytime and reduce the needs for financial intermediaries (Cheung and Liao, 2003).

Further, there is a wide variation between brick and mortar banking and e-banking. In brick and mortar banking, the services are more comfortable, risk is less, trust can be easily maintained because of personal contact. However, in e-banking, the services are more convenient, efficient and based on market extension. With relation to market scope, traditional banking is related to physical transaction, customers centered and focused to the particular customers in a geographic boundary. On the other hand, e-banking is not confined to a particular area but the customers are connected with internet connection.
with wide customers’ base and having the active participants. From the cost point of view, traditional banking is having restricted networking, high transaction and operating cost. On the other hand, e-banking is having high technological cost, management cost and high creational cost. From the profit aspect, as the risk is low so profits are also low. In e-banking profits are very high due to the variety of services offered but at the same time advertisement cost, commissions, service charges are very high. However, transaction cost and labour charges are quite low. From the value point of view, the main stakeholders are consumers and financial institutions in traditional banking, whereas internet service providers, content portals, online stores, retail outlets are all the part of e-banking.

1.5 Global Scenario of E-banking

In 2001, approx. 60% of e-business in the U.K. was concentrated on financial services sector with zero fold increase of the British e-business. Around one-fifth of Finnish and Swedish bank customers are using banking online, while in US online banking is growing at an annual rate of 60 per cent and the number of online accounts are expected to reach 15 millions by 2003.

In Europe, the internet is accelerating the reconfiguration of the banking industry into three separate entities: production, distribution and advice. Several banks in Asia have started offering E-banking services, most of them are offering basic services like developed countries in the US and European countries.

In Asia, many customers are concerned about security. Products available so far tend to be unexciting and in the wake of Asia’s recent economic crisis, many smaller banks have been preoccupied with the more urgent issue of survival. However, if the banks handle the basic features of online banking like fund transfer, balance enquiry, bill payments then chances of success are there (Pasa and Sharman, 2002).

In 2001, over 50 per cent of the banks in US were offering e-banking services. In spite of the rapid growth in the number of banks offering e-banking, only a minority of banks in the US offered transactional e-banking. A bank is considered as offering transactional e-banking if its customers can transact business over the internet. Thus, every bank having a website is not deemed as offering e-banking. On the customers’ side, most customers prefer to use banks that offer e-banking, so usage pattern could change suddenly (Furst et al., 2002).

In European countries, the local market is being intensified by globalization. In these countries, the basic objective of banks is to position oneself as “state of the art
factory” capable of issuing high volume products and services to customers at best price. The internet is making the market more transparent. Through online market places, customers and banks can instantly obtain accurate information about the products and services. New entrants do not possess bricks and mortar networks, but can use direct channels, such as internet to reach their target clients (Lange and Blandin, 2002).

In India, approx. one per cent of high and middle income group banking customers conducted banking on the internet in 2000 compared to 5 to 6 per cent in Singapore and South Korea. In 2001, it has been observed that more than 20 major banks were either offering e-banking services at various levels or planned to do so in the near future. Some of the private sector banks, viz. ICICI Bank, HDFC Bank, Indusind Bank, IDBI Bank, AXIS Bank, and SBI Bank are offering various e-banking services to their customers.

1.6 Electronic Banking Products and Services

E-banking has provided immense opportunities in offering goods and services to the customers. These products are totally changing the outlook of banking sector. Now the industry is shifting towards cashless society, where physical cash, notes and coins have become a thing of the past, and digital cash and electronic purse have taken their place. There are many non-cash payment methods which are in use. These are as follows:

• **Automated Teller Machine**

  ATM is a cash rending teller machine. This is a machine which is frequently seen at banks and other locations, such as shopping centres and building societies. Customers can withdraw any sum up to a limited amount, can view the status of his account and order a new cheque book. There is a number called Personal Identification Number (PIN), which is a key for carrying the desired transactions. On the other hand, we can say that it’s a machine which replaces the human aspect of providing the cash and standing in a long queue. ATMs can be installed on the bank’s premises (onsite ATMs) for which no license is required from RBI. However, for ATMs to be installed at public places (offsite ATMs), banks have to obtain a license. These offsite ATMs are mainly installed at airports, railway stations, market places, petrol pumps, etc.

• **Mobile Banking**

  The traditional brick and mortar is done from fixed branch premises, where the customer has to go personally for carrying out business transactions. Through mobile banking the customer can conduct a host of banking transactions and inquiries through the mobile. Mobile banking can also be carried through a mobile van with or without
computerized banking system. The mobile van moves from place to place on designated routes at designated hours and the customers can transact their banking business, such as deposit, withdrawal, cheque collection, draft issuance, pass book updates, etc. Mobile banking helps the customer to do his account management, electronically which was earlier possible through internet banking. Mobile banking service is divided into two categories:

(i) **SMS Based:** This service can be availed from any mobile having SMS based service. The customer types the required keywords and PIN number and send the message to the predefined number.

(ii) **Menu Based:** The customer downloads and installs the application on the mobile. Whenever the customer wants any sort of information, he selects the application, selects the request from menu and sends the request to the designated number. This request is internally sent as SMS text. The central computer at bank sends back the result to him.

**Functionalities of Mobile Banking**

Mobile banking functionalities have been divided into three parts. In public category, the customer can openly access the exchange rates and interest rates of the economy as well as the banks. In private category, the customer can check the account balances, can administer the credit lines and can check the transactions. While conducting the transactions, mobile banking helps in transfer of funds, and in paying invoices.

![Figure 1.1](image)

- **Phone Banking:** Phone banking or tele-banking refers to the authorized customers to use special telephone number of the bank. This facility is available with the help of a
voice response system (VRS). This system basically accepts only TONE dialled input (For callers phone instruments for dialing necessary numbers) and suitable voice response message/ information to the caller (Kaptan and Choubey, 2003). Tele-banking is of two kinds:

(i) **Public Enquiry**: General information about banking services can be obtained by customers and non-customers like dialing a special enquiry number of the bank (call centre) and desired information can be obtained.

(ii) **Private Enquiry**: This relates to account specific information and can be accessed only by accountholder by disclosing personal identification number (PIN) and customer ID.

- **Society for World-wide Inter-banking Financial Tele-communication (SWIFT)**: It is a computerized message system which links banks around the world. In 1996, it was updated from centralized system to decentralized system. SWIFT is a co-operative organization formed by international banks and financial institutions. The member banks are shareholders of this society. It provides guarantee to carry messages without any mutilation of the message. The network provides round the clock service to participating banks. It aims to improve the speed and service in order to prevent the individual bank setting up its own computerized messaging system in opposition.

- **E-commerce**: E-commerce refers as the transaction between the buyer and seller without exchanging any papers or any meeting between two persons and largely using the internet. Electronic commerce allows efficient transactions among customers, suppliers and partners for cutting the transaction time and reducing the costs of doing business. The Ministry of Commerce is supporting “Electronic Commerce (EC) / Electronic Data Interchange (EDI) for Trade” project for facilitating international trade. The community partners of this project are various trade regulatory and facilitating agencies like the Customs Department, the Directorate General of Foreign Trade (DGFT), Airports, the Reserve Bank of India (RBI), Export Promotion Organizations (EPOs), Exporters, Importers, Agents, Container Corporation of India (CONCOR) and banks. The objective of this project is to (i) facilitate electronic delivery of services; (ii) simplify procedures; (iii) provide 24 hour access to users with their partners; (iv) make procedure transparent; (v) reduce the transaction cost and time; and (vi) introduce international standards and best practices (Mathur, 2007).
• **Electronic Data Interchange (EDI):** EDI is the exchange of documents in the standardized electronic form, between organizations, in automated manners, directly from a computer application in one organization to an application in another. EDI can be compared and contrasted with electronic mail. Email enables free-format textual messages to be electronically transmitted from one person to another. EDI, on the other hand, supports structured business messages (those which are expressed in hard copy, pre-printed forms or business documents) and transmits them electronically between computer applications rather than between people (Kaptan and Choubey, 2003).

**Benefits of EDI:**
1. EDI enables paperless transactions, reduces mailing cost, and reduces inventory holdings because of fast filling of orders.
2. EDI facilitates higher quality and speed of information.
3. Results in lower processing costs.
4. Less reliance on human interpretation of data.
5. Creates innovative modern image.

As any monetary transaction involves banks, the banks have to offer EDI services to their customers. Banks that provide EDI services to their customers always have an advantage over those who do not provide such services. It can be said that EDI can be used for automating the existing processes, an opportunity to rationalize the procedures, reduce the costs and improve the quality of services.

• **Internet Banking:** As the banking industry has been constantly innovating and with the advent of technological development particularly in the area of telecommunication and information technology, one such innovation is internet banking. Internet banking is defined as an internet portal through which the customers can use different kinds of banking services from bill payments to making investment (Pikkarainen et al., 2004). All the banks using internet as an additional channel or banks using internet only as delivery channel are now on the equal footing to offer their banking services on the internet and to compete for customers around the world (Karjaluoto et al., 2002). Internet banking is useful for both the bankers and the customers. The rationale use of internet banking technology from the bank point of view is mainly related to cost savings (Robinson, 2000; Sathye, 1999). Internet banking sites can be segregated into four categories from level I, which offers just minimum functionalities, such as access...
to one’s deposit account data, to level IV sites that offer sophisticated services. Generally, internet banking is offered in two ways. First, an existing branch with physical offices can establish a website and offer its customer internet banking in addition to traditional banking channels. Second way is that bank may be established as “virtual”, “branchless” or “internet” with a computer server at its heart that is housed in an office that serves as bank’s legal address. Virtual banks may offer customers the ability to deposit and withdraw the funds at automated teller machine or other remote channels used by the banks (Furst et al., 2002).

Nevertheless, Internet banking has relatively high initial set-up costs (both technological and marketing) with savings following later and it appears, at present, that no major banks have achieved significant cost reductions through its provision (Lin et al., 2001).

*Figure 1.2*

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<th>Threats</th>
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<td>New Entrants</td>
<td>Business to Business (B-B)</td>
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<td>Disintermediation</td>
<td>Business to Consumer (B-C)</td>
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Consequences
- Role of financial middleman is threatened
- Pricing of financial products became more transparent
- Commodity Pricing pressures
- Loss of customers
- Rising technology expenses for banks
- Increased competition
- Increased costs
- Accelerated product cross-selling
- Promotes more rapid integration of financial services
- Accelerates industry consolidation

Source: Malhotra and Singh (2006)
• **Electronic Fund Transfer (EFT):** In the present age of integrated technology consisting of computers and communication facility, distances need no longer be constraint in providing customer service. EFT system hosted and operated by the RBI, permits transfer of funds, from any account to any other account at any branch of any member bank in any other city (Jain, 2006). In other words, electronic fund transfer facilitates the quick movement of deposit money from one bank account of one customer to the bank account of another customer. In this system, the sender and the receiver may be located at different cities. As an important tool of customer services, EFT system addresses the needs of individual customers to transfer money from one place to another within a day or two. Following are the participants of this scheme:
  - Individual customer through their banks/branches.
  - Service branches of the bank.
  - Reserve Bank of India (National Clearing Centre and deposit account of RBI)

• **E-Purse:** E-commerce has been marked as a steady trend towards growth of electronic mode of payments against paper based instruments. European Central Bank (ECB) defined, “E-Money as electronic store of monetary value on a technical device and used to making payments other than the issuer without the involvement of bank accounts in the transaction but acting as a prepaid bearing instrument”.

1.7 **Risks in E-banking**

E-banking improves a bank’s performance and competitiveness so that existing customers can benefit from greater degree of convenience in effecting transactions. However, the banks are facing with different levels of risks and expectations arising from electronic banking as compared to traditional banking services.

Financial institutions have faced difficulties over the years for a multitude of reasons. The major cause of serious banking problems continues to be directly related to lax credit standards for borrowers and counterparties, poor portfolio, risk management that can lead to deterioration in the credit standing of a bank’s counterparties. Banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits or transactions. Banks should also consider the relationships between credit risk and other categories of risks.

Various kinds of risks are involved with e-banking. Some of these risks are discussed below:
**Operational Risk:** Due to the introduction of e-banking technology, operational risks are on the rise and should be managed in a proper way. The bank needs to manage these risks in the areas of security, data confidentiality, data system integrity, system availability and outsourcing. These risks are closely linked to reputation risks and legal risks for banks as if the security breaches than it will have damaging effects on the reputation of bank which could have the legal consequences also. Security constitutes an important part in the operational risk of e-banking. Threats can come from inside and outside the system. It includes “hijacking”, “sniffing” or “spoofing” to retrieve and use confidential consumer information, add customer assets and subtract customer liabilities or interrupt operations.

Human resource management must ensure that personnel involved in maintaining and operating the websites and system are adequately trained in security practices. In order to have a proper security system, there should be segregation of duties, means accessing and control should be different. These practices should be regularly tested and reviewed by outside experts. Further, the key to control transaction risk lies in adapting effective policies, procedures and controls to meet the new risk exposures introduced by e-banking. These controls include division of duties, dual controls, information security controls, processes, tools, expertise and testing of different methods of e-banking.

**Reputational Risk:** Reputational risk is the risk related to negative opinion of the customers that result in critical loss of funding of the customers. Reputational risk may arise due to action taken by the bank itself or in response to action of the third parties. This risk mainly arises when the system is not able to perform as expected. This risk may also arise from targeted attacks on banks. For example, a hacker penetrating a bank’s website may alter to intentionally spread the inaccurate information among the customers regarding bank’s products and services. So, reputational risk is increased through e-banking if the bank fails to deliver secure, accurate and timely services on a consistent basis.

**Legal Risk:** Legal risks also arise in e-banking. Banks engaging in electronic banking and electronic money activities can face legal risks with respect to customer disclosures and privacy protection. Customers who have not been adequately informed about their rights and obligations may bring suit against a bank. Failure to provide adequate privacy protection may also subject a bank to regulatory sanctions in some countries. Banks choosing to enhance customer service by linking their internet sites to
other sites can also face legal risks. A hacker may use the linked site to defraud a bank customer; and the bank could face litigation from the customer.

- **Financial Risks**: It is the constant and terrible fear of transactions errors causing a potential monetary loss suffered by customers who perform online transactions. So, it is clear that e-banking is actually lacking the assurance provided in traditional banking (Lee, 2009) and this is due to the fact that online banking is considered as an innovation which is incompatible with consumers’ habits (Kuisma et al., 2007).

- **Performance Risk**: This is the risk caused due to malfunctioning of online banking websites. Customers are often afraid that a disconnection from the Internet will occur while performing electronic transactions that can lead to “huge” unexpected losses (Kuisma et al., 2007). This idea was confirmed by Sathye (1999) who argued that Internet access is a crucial variable on which the adoption of online banking depends and by Almogbil (2005) who succeeded to show that a significant relationship exists between the speed of internet access and the acceptance of electronic banking.

- **Privacy Risk**: It refers to the potential loss due to fraud or a hacker compromising the security of an online bank user (Lee, 2009). This risk is accentuated since the emergence of phishers whose hobby consists of attempting to collect personal information, such as usernames, passwords and credit card details. They not only lead to users’ monetary loss, but also violate users’ privacy (Entrust, 2008).

- **Time Risk**: It is the time loss; the lateness in receiving the payment or the difficulty of navigation (Lee, 2009). This can be due to a disorganised website, to slow-downloadable pages and long time needed to be a PC-literate.

- **Credit Risk**: Credit risk is not increased due to loan originated through e-banking channel. But sometimes bank may not be able to evaluate the credit worthiness of the customer due to remote banking procedures. However, online loan origination and approval tend to make risk management of lending tasks more difficult and challenging. The banks should always verify the customers’ identity for online credit applications and also the monitoring and controlling the growth, pricing, underwriting standards and ongoing credit quality of loans originated through e-banking channels.

- **Other Risks**: The use of electronic delivery channels for banking activities also has implications for other traditional banking risks such as strategic and business risk, credit risk, liquidity risk, market risk and foreign exchange risk.
Offering e-banking service to the customers involves strategic and business risk as the sophisticated technology involved in e-banking causes uncertainties in business transactions. To build a new customer base, the banks have to set up their prices very competitively. Investment in technology involves significant start up costs. Adequate opinion of experts is needed. Supervisors must ensure that management of banks are aware of these risks involved in e-banking and carefully access their strategic options so that the added uncertainties may be compensated by additional returns.

1.8 Principles to Manage Risks in E-banking

The Electronic Banking Group on the Basel Committee recommended certain principles to manage the risks of electronic banking. The e-banking risk management principles identified in the Report of EBG, fall into three broad, and often overlapping categories of issues. However, these principles are not weighted by order of preference or importance. It is so because such weighting might change over time. It is preferable to remain neutral and avoid such prioritization.

A. Board and Management Oversight (Principles 1 to 3):
1. Effective management oversight of e-banking activities;
2. Establishment of a comprehensive security control process;
3. Comprehensive due diligence and management oversight process for outsourcing relationships and other third party dependencies.

B. Security Controls (Principles 4 to 10):
4. Authentication of e-banking customers;
5. Non-repudiation and accountability for e-banking transactions;
6. Appropriate measures to ensure segregation of duties;
7. Proper authorization controls within e-banking systems, databases and applications;
8. Data integrity of e-banking transactions, records, and information;
9. Establishment of clear audit trails for e-banking transactions;
10. Confidentiality of key bank information.

C. Legal and Reputational Risk Management (Principles 11 to 14):
11. Appropriate disclosures for e-banking services;
12. Privacy of customer information;
13. Capacity, business continuity and contingency planning to ensure availability of e-banking systems and services;
IT development has propounded enormous benefits for banks, customers and the economy as a whole. These benefits are in terms of productivity and profitability increase, cost reduction, improvement in service quality, fast delivery of service through website, etc. E-banking has increased the output and reduced the cost as both IT capital investment and IT human resource have a positive relation to productivity and profitability. The time has come to move towards a customer-centric approach, as customers should be given an opportunity to enjoy their share of benefits stemming from IT development. But banks’ new strategy should not only be based on customer centric approach but it should also enable transaction cost reduction, financial inclusion, speedy and efficient services to customers. To make a real impact banks should change the real mindset, better utilize their IT human resources and capabilities and move towards more cost effective common or shared IT platforms.

1.9 Need and Significance of the Study

With the development of information technology, the world has become a global village and it has brought a revolution in the banking industry. The banks appear to be on fast track for IT based products and services. Bank customers are becoming very demanding and it is the extensive use of technology that enables banks to satisfy adequately the requirement of customers. Technology has become the fuel for rapid change. IT is no longer considered as mere transaction processing or confined to management information system. The wind of liberalization, globalization, and privatization has opened new vistas in the banking industry in the generation of an intensely competitive environment. The post-liberalized banking industry in India has been witnessing a discernible shift from the sellers’ to the buyers’ market. Further the banking sector reforms and introduction of e-banking has made very structural changes in service quality, managerial decisions, operational performance, profitability and productivity of the banks. E-banking is one of the emerging trends in the Indian banking and is playing a unique role in strengthening the banking sector and improving service quality. The banking sector in India has introduced E-banking in a phased manner. Foreign banks are the pioneers in e-banking, private banks introduced it in a big way and public sector banks are in the process of transformation from traditional banking to E-banking. E-banking impinges on operations of banking in a number of different ways. It has enabled the banks to handle the payments electronically and inter-bank settlement faster and in large volumes. There is increase in customer satisfaction level, reduction in cost of banking operations, increased productivity and as such there is a tremendous
scope for Indian banks to enlarge their E-banking services which could enhance their competitiveness. Further, new technology has rapidly altered the traditional ways of doing banking business. Customers can view the accounts, get account statements, transfer funds, purchase drafts by just making a few key punches. Availability of ATMs and plastic cards, EFT, electronic clearing services, internet banking, mobile banking and phone banking; to a large extent avoid customers going to branch premises and has provided a wider range of services to the customers. There is a degree of variation in the services provided by the banks with the emergence of E-banking services. So, it becomes necessary to study the nature, growth and extent of E-banking services and their impact on the operational performance and service quality. Despite the increasing importance of E-banking services, the research pertaining to e-banking in Indian context has been limited. So, the present study is a modest attempt to ascertain the changes taking place after e-banking, to evaluate the banks performance, and to know about customers’ perceptions regarding e-banking.

1.10 Objectives of the Study:

The specific objectives of the study are as follows:

1. To study the nature, growth and extent of electronic banking services in the Indian banking sector.
2. To assess the impact of e-banking on service quality in banking sector in India.
3. To examine the impact of e-banking on the operations, payment and clearing system in banking sector.
4. To make a comparative analysis of operational performance and service quality of public and private sector banks.
5. To identify the gaps in operational performance and service quality of banking sector and to make recommendations for improvement.

1.11 Chapter Scheme

The study has been structured into the following eight chapters:

Chapter-I:
- Introduction- This chapter presents an overview of Indian Banking with the main emphasis on electronic banking.
- It also highlights specific objectives of the study and explains the need for the present research work.

Chapter-II:
- Review of Literature- The present chapter is an attempt to review the studies already carried out on different aspects
of banking industry such as customers, information and communication technology (ICT), service quality, productivity and different aspects of e-banking. It lends support to draw some important conclusions that can serve as a guide mark for the study.

Research Design- In this chapter, the methodology adopted for the purpose of this study has been explained.

Chapter- III: It encompasses the purpose, data collection and scope of the study. The statistical tool used and objectives of the study are also stated.

Chapter-IV: Growth and Extent of Electronic Banking Services in India – This chapter provides an overview of nature, growth and extent of electronic banking services in India.

Chapter-V: Impact of Electronic Banking on Service Quality of Indian Banks- This chapter assesses the service quality level of e-banking services in public and private sector banks. It also compares the service quality of public and private sector banks.

Chapter-VI: Payment and Clearing System in Banking Sector- This chapter discuss the impact of e-banking on the payment and clearing system of both public and private sector banks. It also assesses the impact of e-payment on the customers’ satisfaction level.

Chapter-VII: Impact of E-banking on Operational Performance of Indian Banking Sector- This chapter discusses the efficiency, productivity and improvement in internal processes after electronic banking.

Chapter-VIII: Summary of Findings, Conclusion and Suggestions