

CHAPTER 1

INTRODUCTION

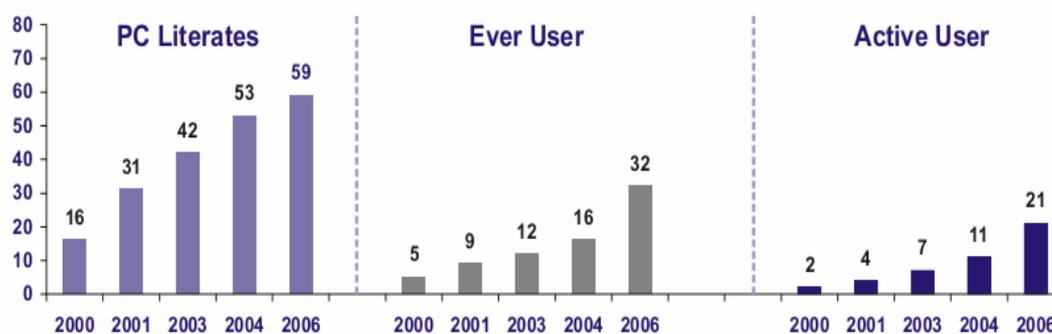
1.1 Background

August 15th 1995 marked a new dawn in India's communications history, when Videsh Sanchar Nigam Ltd (VSNL) then a state owned Telecom Company introduced commercial Internet services. Till then Internet connectivity was available to only select few researchers and government officials through the ERNET or NICNET networks. VSNL launched its "Gateway Internet Access Services" (GIAS) to Indian public in the form of shell and TCP/IP dial-up connections with a modest estimate of 20,000 connections in the first year of operations(Ghosh, 1995).

By mid nineties Indian government allowed private companies to enter the protected Telecom industry and issued licenses for offering a broad spectrum of telecom services which included Basic telephony services, Wire-less telephony (GSM/CDMA) services and Internet services. Seeing the immense potential that existed in the industry space many new players entered into the foray of offering telecom services. The main players were still the state owned

Bharat Sanchar Nigam Ltd (BSNL) and Mahanager Nigam Ltd (MTNL), followed by Private Indian owned companies (Reliance Infocomm, Tata Teleservices) and Foreign invested companies (Hutchison-Essar, Bharti Tele-Ventures, Escotel, Idea Cellular, BPL Mobile, Spice Communications). Together with the availability of affordable quality services and a huge pool of technically qualified techno-savvy urban population, Internet users soared from few thousands in mid nineties to 37 million users in 2006 (IMRB & IMAI,2006). Figure 1.1 illustrates the growth of Internet users in India from 2000 – 2006. In Figure 1.2 Urban Internet users in India is depicted in a “funnel” like graphic.

#Source: All India Figures, I-Cube 2006; Figures in millions



*Study not conducted in 2002 and 2005

Figure 1.1: Internet users in India
(Source: I-cuber 2006 survey ((IMRB & IMAI,2006).

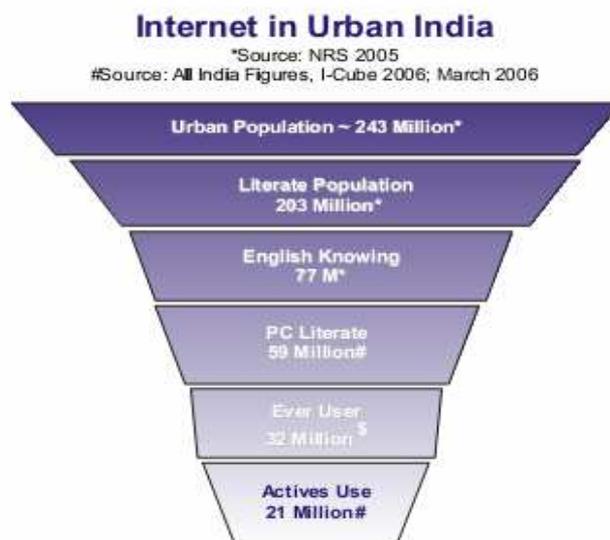


Figure 1.2: Internet in Urban India (Source: I-cuber 2006 survey ((IMRB & IMAI,2006).

Internet which is a “network of networks” evolved out of a research network developed by US military establishment in last sixties. ARPANET established in 1969 could be designated as the beginning point of the now mammoth network of computers spanning all throughout the globe. Earlier, Internet was mainly used for transmitting electronic mails or e-mail and transfer of files across servers located in different locations. But with the introduction of Hyper Text Transfer Protocol or HTTP and HTTP Server (commonly referred as WWW server) in 1990’s changed the way Internet was used or could be used. The World Wide Web as the name denoted allowed creation of modern world wide network

of computers as we know today. From simple applications like e-mail and file transfer, Internet got transformed itself into a source of huge information provider which offered wide variety of content for its users. The usability of Internet also increased many fold and the user needed a software tool named 'Web browser' to access any content anywhere in the world. Internet slowly changed its role as a tool for researchers to a medium for common people to gather knowledge and even to do commercial transactions. As seen from Figure 1.3, the number of computers connected to Internet increased enormously from mid-nineties which is a result of the introduction of new user friendly technological innovation in that sphere. Commercial activities carried out using Internet included showcasing of products or services, allowing buying or selling of products/services using electronic mechanisms. As of 2007, approximately 1.1 billion people are online around the world, North America and Western Europe account for nearly half of the world Internet users (Figure 1.4). Even though Asia has half the world's population, its share in Internet users is 399m or 36% of total Internet users. The penetration of Internet is low for countries in Africa, the Middle East and Latin America mainly due to lack of access to new technologies (Figure 1.5). Table 1.1 contains global

Internet usage and population statistics for the year 2007. From Table 1.1; it could be observed that Internet users nearly doubled between 2000 and 2007, with regions like Africa, Asia, Middle East and Latin America achieving a growth rate of 638.4 %, 248.8 %, 491.4 % and 433.4 % respectively.

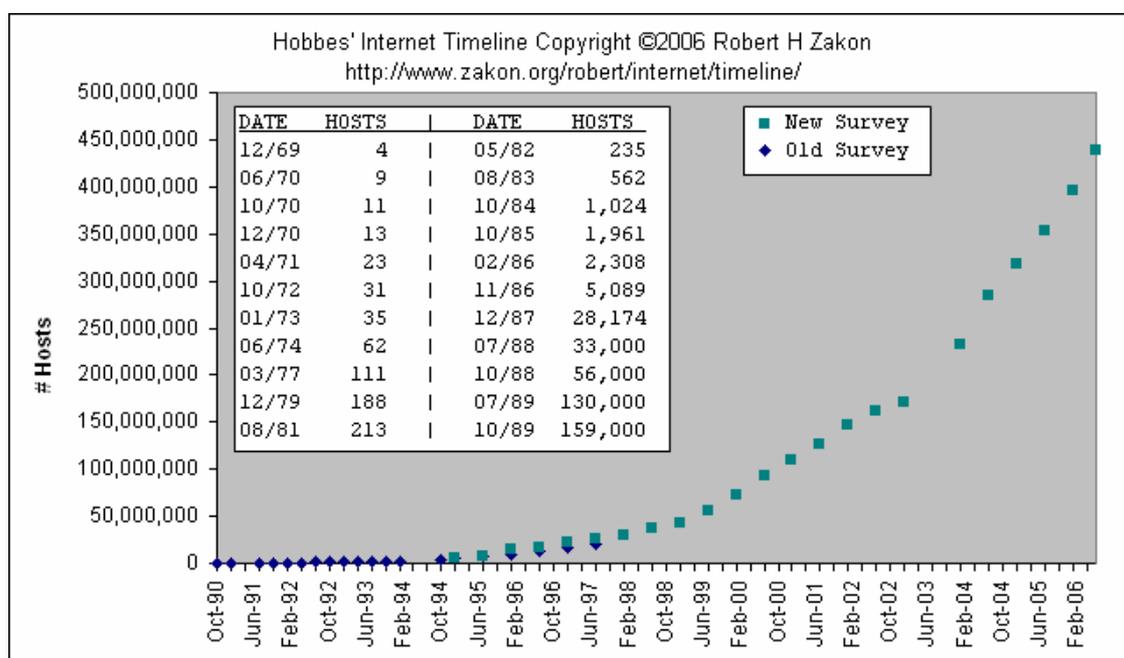


Figure 1.3: Internet Timeline 1990-006 (Scoure: Hobbe’s Internet Timeline)

WORLD INTERNET USAGE AND POPULATION STATISTICS						
World Regions	Population (2007 Est.)	Population % of World	Internet Usage, Latest Data	% Population (Penetration)	Usage % of World	Usage Growth 2000-2007
Africa	933,448,292	14.2 %	33,334,800	3.6 %	3.0 %	638.4 %
Asia	3,712,527,624	56.5 %	398,709,065	10.7 %	35.8 %	248.8 %
Europe	809,624,686	12.3 %	314,792,225	38.9 %	28.3%	199.5 %
Middle East	193,452,727	2.9 %	19,424,700	10.0 %	1.7 %	491.4 %
North America	334,538,018	5.1 %	233,188,086	69.7 %	20.9%	115.7 %

Latin America/Caribbean	556,606,627	8.5 %	96,386,009	17.3 %	8.7 %	433.4 %
Oceania / Australia	34,468,443	0.5 %	18,439,541	53.5 %	1.7 %	142.0 %
WORLD TOTAL	6,574,666,417	100.0 %	1,114,274,426	16.9 %	100.0 %	208.7 %

NOTES: (1) Internet Usage and World Population Statistics were updated on Mar. 10, 2007. (2) CLICK on each world region for detailed regional information. (3) Demographic (Population) numbers are based on data contained in the world-gazetteer website. (4) Internet usage information comes from data published by Nielsen//NetRatings, by the International Telecommunications Union, by local NICs, and other other reliable sources. (5) For definitions, disclaimer, and navigation help, see the Site Surfing Guide. (6) Information from this site may be cited, giving due credit and establishing an active link back to www.internetworldstats.com. Copyright © 2007, Miniwatts Marketing Group. All rights reserved worldwide.

Table 1.1: World internet usage and population statistics (Source: www.internetworldstats.com)

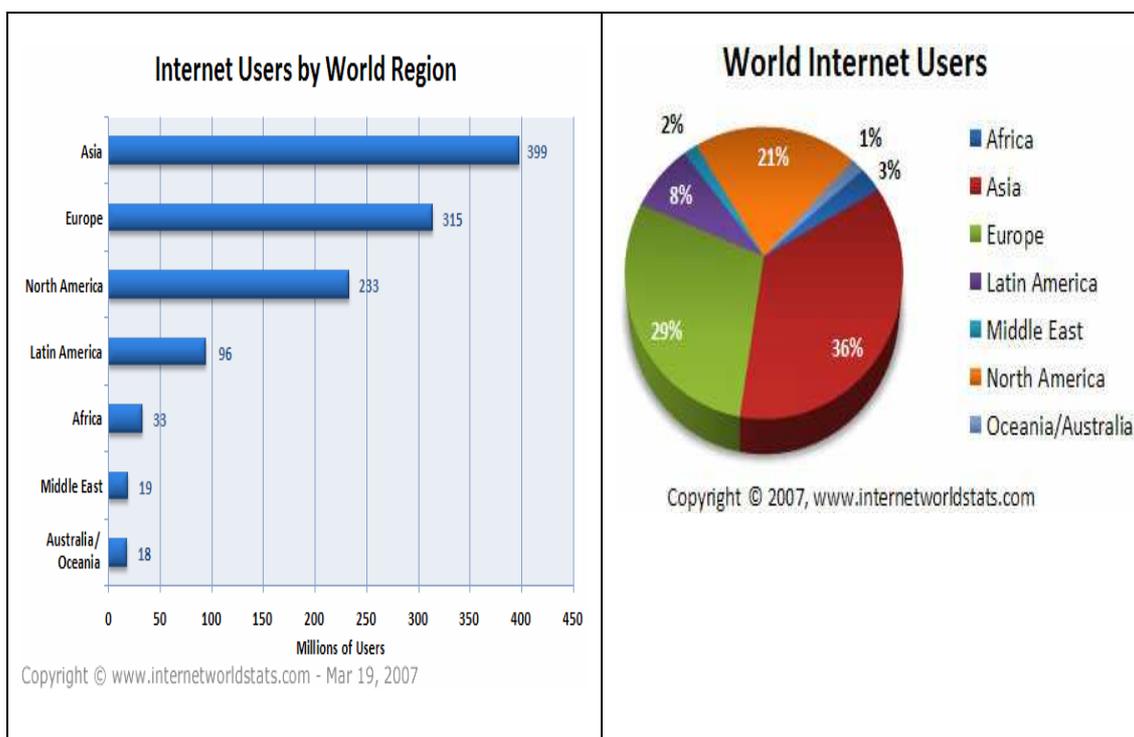


Figure 1.4: Worldwide Internet Users as of September 2007 (in m) (Source: www.internetworldstats.com)

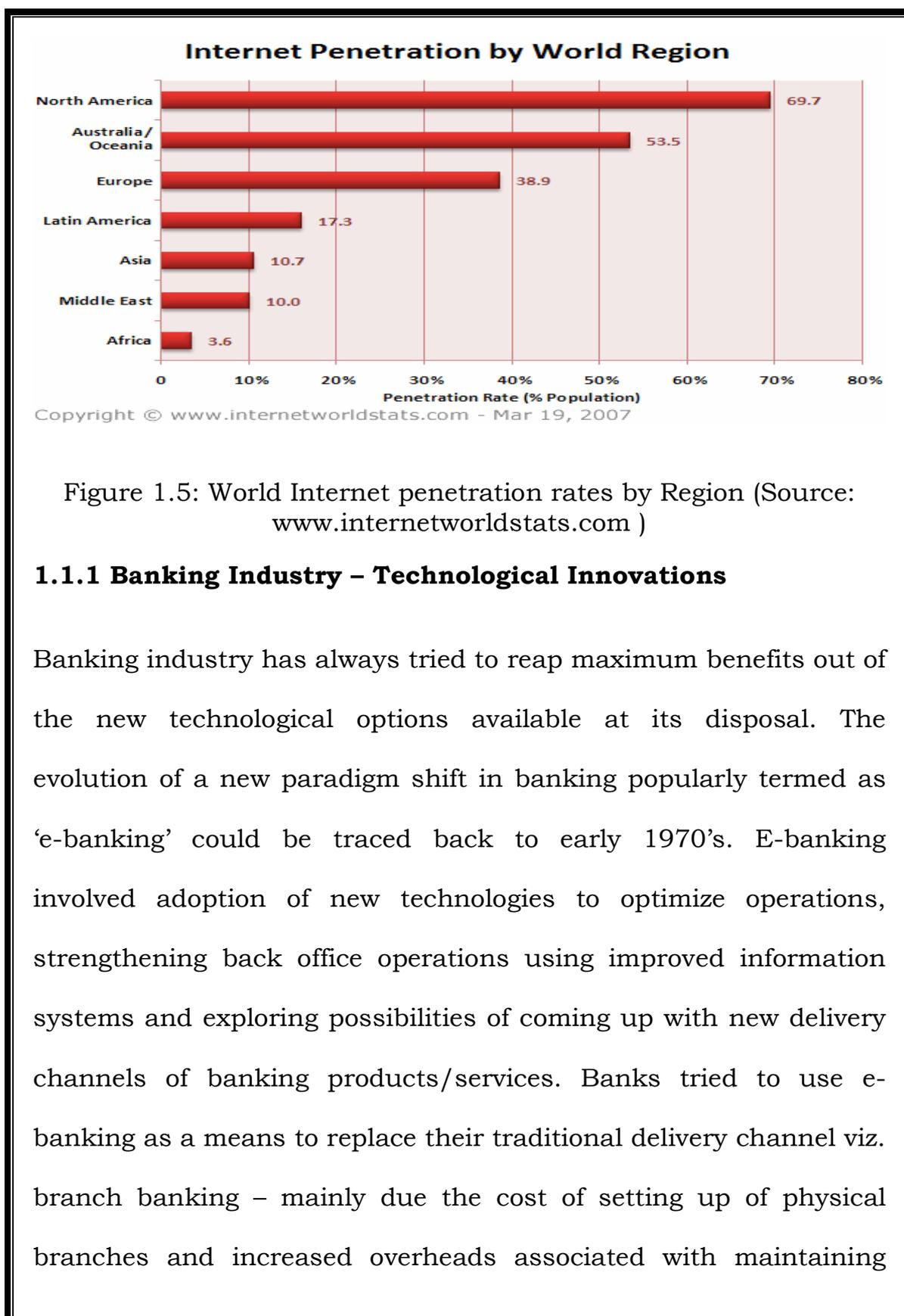


Figure 1.5: World Internet penetration rates by Region (Source: www.internetworldstats.com)

1.1.1 Banking Industry – Technological Innovations

Banking industry has always tried to reap maximum benefits out of the new technological options available at its disposal. The evolution of a new paradigm shift in banking popularly termed as ‘e-banking’ could be traced back to early 1970’s. E-banking involved adoption of new technologies to optimize operations, strengthening back office operations using improved information systems and exploring possibilities of coming up with new delivery channels of banking products/services. Banks tried to use e-banking as a means to replace their traditional delivery channel viz. branch banking – mainly due the cost of setting up of physical branches and increased overheads associated with maintaining

them. As part of their e-banking initiatives banks offered the following new delivery channels to customers' – Automated Teller Machines (ATM)/ Cash Dispensers (CD), Phone banking, Internet Banking and Mobile banking. Banks used e-banking as mechanism to fight fierce competition that existed in the market and also to retain the customer base they had. Customers' response to e-banking was enthusiastic and followed predicted path of Technology Adoption Life Cycle models (Shreyan et al., 2002).

New delivery channels available through e-banking allowed banks to provide a wide variety of specialty services to their customers. Services available from each of new e-banking channel are briefly discussed below:

ATM: Main function of a banking institution is the safe custody of their customer's money. They allowed their customer to deposit excess cash into their account and withdrawal of the same through their branches. Bank maintained counters known as 'Teller counter' for accepting and dispensing customer cash. A main lacuna of this system is the restriction it placed on the transactions timings – banking could be done only during specific time when the bank is open. To add to this problem increasing labour costs

during the 1960's forced banks to look for alternatives which included automating their labour intensive functions. Automated Teller Machines or ATMs as they are popularly known; allowed banks to dispense cash throughout 24 hours a day. Barclays Bank was the first to envisage the potential of ATMs, and introduced the first ever ATM in 1967(Automated teller machine. (2007, May 10)). Initially, ATMs were not very sophisticated, and served only as cash dispensers and were normally attached to the branch itself. But as technology improved, banks started setting ATMs in remote places which were connected to the central hub of the bank through various communication links. To operate an ATM the customer should possess a valid ATM or Debit card issued by the bank and need to know a secret 4 digit code called PIN (Personal Identification Number) code. The latest generation ATMs allowed customers do many branch banking functionalities like cash withdrawal, cash/cheque deposit, mini statement of transactions, application of cheque books etc.

Phone Banking: Phone banking is a relatively new delivery channel in which most of the banking functions (except cash withdrawals or deposits) could be carried out by a customer using a telephone. In Phone banking the customer has to dial a phone

banking number provided by the bank, after that customer could do banking through an Interactive Voice Response System (IVRS) provided by the bank. To guarantee security, the customer has to punch in a secret code called Tele-banking PIN (TPIN). A customer could conduct the following transactions via Phone banking: account balance information and list of latest transactions, electronic bill payments, funds transfers between a customer's accounts, etc. It has been seen that customer acceptance of phone banking channel has been the lowest among the new delivery channels. The main reason of this could be difficulty in using an IVRS system and lack of options for withdrawing cash.

Mobile Banking: Mobile banking also popularly known as M-Banking or mBanking is a delivery channel which opened up after the tremendous success of mobile telephony. Banks started offering M-Banking during the late nineties and with the introduction of 3G mobile telephony that allowed accessing Internet using a mobile phone in the early 2000, acceptance of M-Banking showed good growth rates. M-banking customers could conduct banking transactions using Short Messaging Service (SMS) or mobile Internet. Instruction for a banking operation is send as a SMS to a predefined number given by the bank. M-Banking provide the

following banking services to a customer: account balance information and list of latest transactions, electronic bill payments, micro payments, mobile recharge, cheque book request, cheque status, stop payment instruction for cheque payments, funds transfers between customer's accounts, etc. The provision of real-time updates of critical banking transactions is the main benefit of M-Banking– for example soon after a transaction like ATM cash withdrawal customer gets a mobile alert about it through M-Banking. In spite of having good potential to become a medium for electronic payments and mobile cash, M-Banking has not been well accepted by customers world wide (Figure 1.6). M-Banking penetration and usage is notably high in Korea and Japan. Korea has around 23.4 m M-Banking customers as of 2001. The social structure of Korea which allows collective adoption of new developments is attributed to the very rapid adoption and penetration of new technologies like M-Banking or Internet Banking in that county(Chang, 2005). In Japan 'i-mode' which is NTT DocoMo's proprietary mobile Internet platform have around 47 million customers in Japan as of October 2006. i-mode allows users to conduct a wide variety of commercial activities like mobile reservations, e-mail, online shopping, Mobile Banking, ticket

reservations, and restaurant reviews. Success of i-mode is mainly due its wide availability, ease of use, affordability and security (NTT DoCoMo. (2007, May 6)). Although the penetration of mobile telephony is very high in Europe, adoption of M-Banking among European mobile phone customers is very low. As seen in Figure 1.7 only 3% of the mobile phone customers were using mobile banking. Customers in Europe prefer other channels for banking operations compared to M-Banking as of 2007.

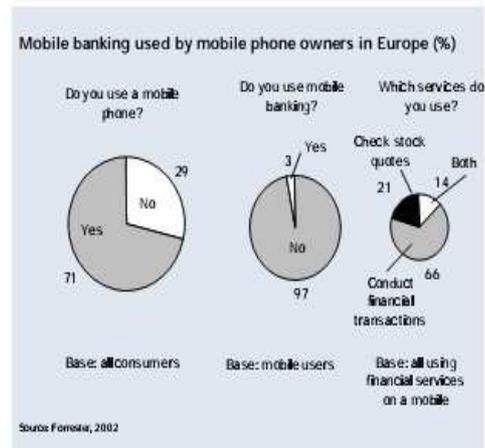
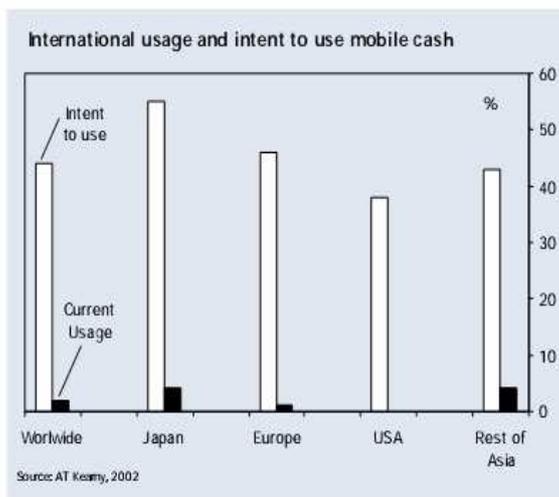


Figure 1.6: World wide Mobile banking adoption (Source: DBR (Schaaf, September 2002))

Figure 1.7: Mobile banking adoption in Europe (Source: DBR (Schaaf, September 2002)

Internet Banking: Tremendous growth of Internet during the mid-nineties prompted banks to utilize Internet as a medium for offering banking services. In Internet Banking banks allow their customers to perform banking transactions through their web site in a secure way. For accessing Internet banking, a customer has to browse to the net banking site of the Bank and login with the 'username' and 'password' provided to him/her by the Bank. Banks normally provide wide variety of banking service through their Internet banking facility which includes: account summary, details of historical banking transactions, funds transfer, new service announcements, loan applications, bill payment, cheque book request, cheque status enquiry, stop cheque request, credit card payments/statement, facilities to contact account manager etc. Table 1.2 provides a possible classification of services offered through Internet Banking.

Type of service	Services provided
Basic bank products/Account Control	Account opening/ closing/management Account summary Details of historical banking transactions Funds transfer E-cheques Cheque book request Cheque status enquiry Stop cheque request Standing orders, Direct debit Debit card application
Credit products	Loan application Loan limit Loan Approval Loan delivery Credit card application Credit card payments
Investment products	Deposit account opening & management Domestic / foreign equity investment Mutual funds / bonds investment Insurance investment
3rd Party services	E-commerce payment (shopping) Tax payment on-line Utilities bill payments e-Billing
Other	Contact A/c manager Online financial advice Other financial products

Table 1.2: Classification of Internet banking services

1.1.2 Internet Banking – Prospects & Issues

Rapid growth of Internet ensures that Internet banking acceptance will also grow in the coming years. A report from Internet Data Corporation (IDC) estimates around 122.3 million Internet banking users worldwide as of 2004 (Perumal, 2004). According to IDC estimates nearly 58 million Internet banking users in Western European countries which is roughly equivalent to users from USA, Japan & Asia-Pacific countries and Japan's users are almost equal to that of USA. (shown in Figure 1.8).

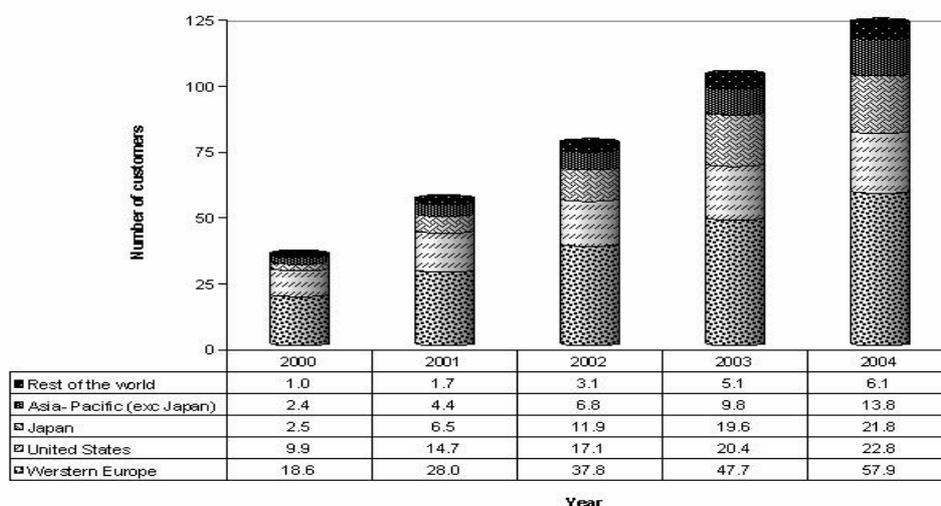


Figure 1.8: Growth in Internet Banking (Millions)
(Source: Perumal, 2004)

Table 1.3 which provides selected E-banking indicators from few countries. It is interesting to note that globally European countries are far ahead in Internet banking usage (Centeno, 2003; Claessens et al., 2001; Nitsure, 2003; Sato & Hawkins, 2001).

Internet Banking and Customer Acceptance: The Indian Scenario

Country	Real GNP per capita (US = 100)	Internet users as % of inhabitants	Mobile phones per 100 Inhabitants	Bank customers using online banking (%)	Electronic brokerage transactions: % of total
Australia	75	32	34	4	22
Finland	71	41	65		
Germany	74	18	29	12	32
Japan	79	21	45		32
Sweden	69	41	58	31	55
United Kingdom	70	21	46	6	26
United States	100	27	31	6	56
Hong Kong	71	36	64	2	1
Korea	49	23	50		65
Singapore	70	24	42	5	10
Argentina	37	2	12		
Brazil	21	2	9	4	6
China	11	1	3		3
Czech Republic	40	7	19	3	
India	7	0	0	2	
Malaysia	24	7	14	<1	
Mexico	25	2	8	4	41
Nigeria	2	0	0		
Poland	26	5	10	<1	
South Africa	27	4	12		
Thailand	19	1	4		

Table 1.3: World E-Banking Indicators (Source: BIS)

Figure 1.9 illustrates Internet banking users and online users in European nations. From the figure it is clear that Nordic countries particularly Sweden, Finland, Norway, Austria, Czech Republic lead in Internet banking adoption, while countries like Greece and Portugal lag behind. Key factor affecting adoption of Internet banking is the penetration of Internet in a country, there exists a clear correlation between Internet penetration and Internet banking acceptance among customers – the higher the Internet penetration rate, the higher the number of Internet banking customers as a percentage of the online population (Schaaf, March 2003).

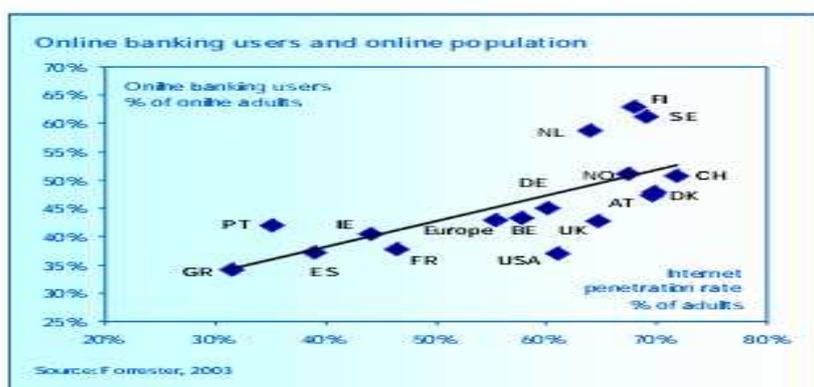


Figure 1.9: Online banking users and online population (Source: DBR)

Analyses of demographic characteristics of European Internet banking users over a period of five years from 2002-2007 show that more than fifty percent of the users belonged to the age group of

25-45 years (Figure 1.10). It is interesting to note that the band of “25-45 years old” users is narrowing over the years, mainly due to the increase in Internet banking adoption among the older age group of customers.

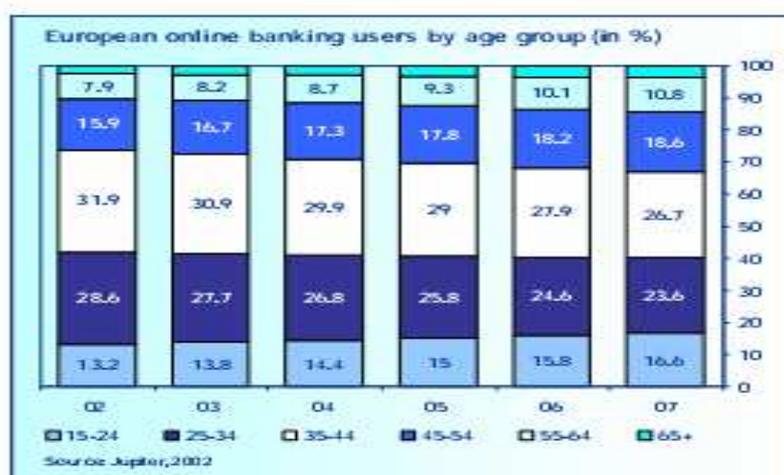


Figure 1.10: European online banking users by age group (%) (Source: DBR)

DB Research in their research report (Schaaf, June 2002) have mentioned about the demographic characteristics of a typical German Internet banking user, who is middle aged, higher income male (Figure 1.11). A European Commission study (Centeno, 2003) on Internet banking adoption in EU region has identified the following factors as deterrent to Internet banking in EU region:

- i. Limited PC/Internet penetration at home

- ii. Consumer security and privacy concerns
- iii. Low trust in banking institutions
- iv. Lower development of e-banking culture
- v. Lower development and use of financial services

The typical online banker is middle-aged, higher-income and male

	Online banker	Internet user	All
Male	59%	55%	48%
Average age (years)	38	38	45
High education	42%	35%	23%
High income	42%	36%	27%
Household assets (EUR)	92,000	85,000	74,000
Online experience (years)	2.6	2.1	N/A
Technology optimist	72%	66%	50%
Career-motivated	31%	28%	21%

Source: Forrester, 2002

Figure 1.11: German Internet banking user profile (Source: DBR)

It is heartening to note that Banks are allocating substantial amount of their investments in building credible Internet banking platform for their customers. This could justify the argument that Internet banking is going to be an integral banking channel in the coming years. It is seen from Figure 1.12 that German banks invested around 10% of their budget in strengthening their Internet banking service.

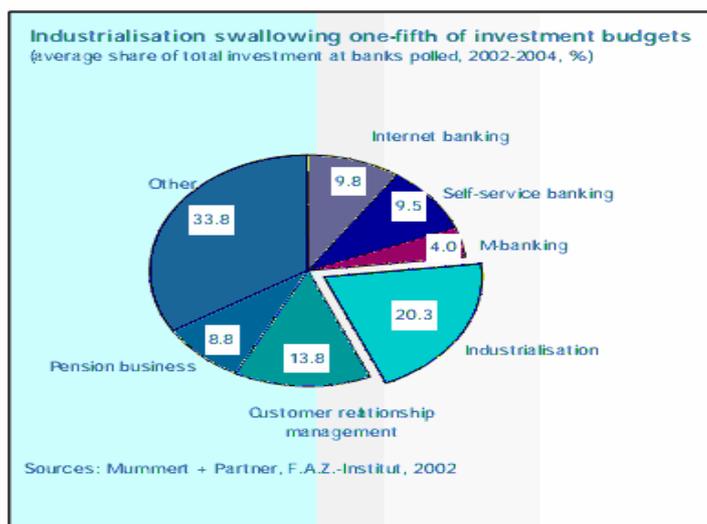


Figure 1.12: Investment pattern of German Banks (Source: DBR)

In spite of having high Internet penetration rate (nearly 70%), the adoption of Internet banking among North American customers has been low (less than 45% in 2005). From figure 1.13 it is seen that Internet banking has been rising steadily during the last five years. Pew report (Fox & Beier, 2006), identified consumers fear of security of Internet or the “trust gap” as the main negative factor affecting Internet banking adoption. Customer confidence in Internet banking is low among US customers owing to the constant stream of news of threats like identity theft, phishing, worms etc. A 2005 report by Consumer Web Watch (Consumer Reports WebWatch, 2005) found that customers who are comfortable with

using e-commerce or financial services are more open to adopting Internet banking compared with non e-commerce users.

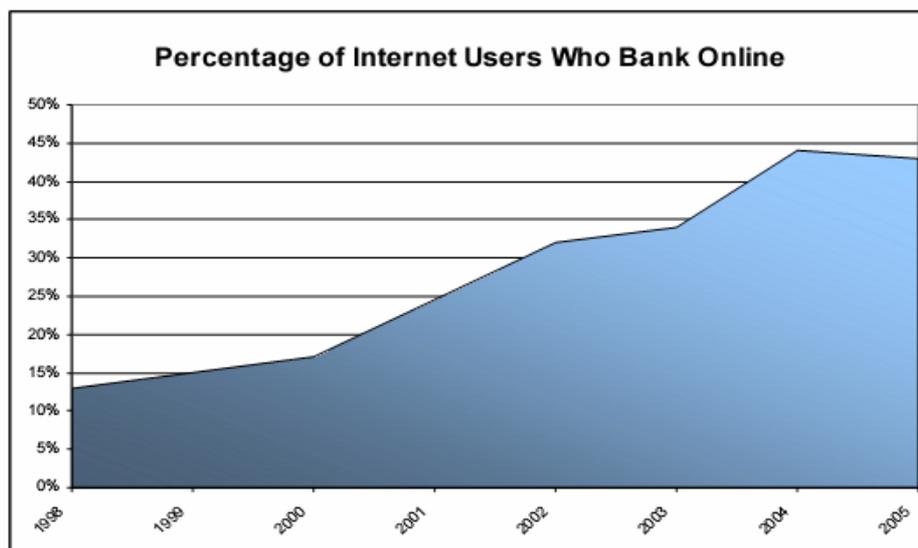


Figure 1.13: Percent of Internet banking users among Internet users in USA. (Source: Pew Report)

From an earlier Pew Report (Fox,2005) it is clear that demographic characteristics of an American Internet banking user matches that of a European user - a typical American customer has broadband and online experience , belong to the GenX (age group 28-39), is a male and has high socio-economic status (Table 1.4).

Growth in online banking 2002-2004		
The percentage of those in each group with internet connections who have tried online banking. In other words, 31% of online men had done online banking in October 2002 and 29% of online women had done it.		
	October 2002 N=1027 internet users	November 2004 N=537 internet users
All internet users	30%	44%
Sex		
Men	31%	49%
Women	29%	39%
Age		
Generation Y (ages 18-27)	29%	38%
Generation X (ages 28-39)	34%	60%
Younger Baby Boomers (ages 40-49)	33%	42%
Older Baby Boomers (ages 50-58)	26%	49%
Household income		
Live in households earning less than \$30,000	21%	32%
\$30,000-\$49,999	31%	44%
\$50,000-\$74,999	33%	51%
\$75,000 or more	35%	55%
Educational attainment		
High school graduate	27%	42%
Some college	27%	41%
College and graduate school degree	37%	52%
Internet connection at home		
Dial-up	24%	35%
Broadband	35%	63%
Source: Pew Internet & American Life Project Surveys: Oct 7-27, 2002 (margin of error is $\pm 3\%$); Nov. 23-30, 2004 (margin of error is $\pm 5\%$).		

Table 1.4: Typical US Internet banking User profile

Few Internet only banks which started operations in US, had limited success in establishing themselves as credible alternatives to traditional banks. Some of the Internet only banks wound up their business or merged itself with some other financial institution (Carlson et al., 2001). DeYoung (DeYoung, 2001) in his paper argues that Internet banking could be seen as a new delivery channel only, which will not have any independent impact on the bank's profitability. Since most of the customers have access to Internet, there could be sudden change in customer Internet banking usage patterns. From a Bank's point of view, more transactions through Internet banking channel would improve its operational efficiency as relative cost of Internet banking transactions is the cheapest among the delivery channels. Few studies concluded that cost of Internet banking transactions is only fraction of that of a branch banking (Table 1.5).

Channel	United States ¹	India
Physical branch	100	100
Postal	-	40
Telephone	50	18
ATM	27	18
PC-Dialup	8	Na
Internet	1	12

¹ Simple average of three studies (i) US Department of Commerce ;(ii) Booz,Allen & Hamilton; and (iii) Goldman Sachs and Boston Consulting Group. Sources Sato et al (2001); ICICI Bank.

Table 1.5: Relative costs of banking transactions (Source: BIS)

Internet banking usage in the rest of the world (except Japan) is comparatively low as of 2007. But there are few notable exceptions like South Korea which had around 25 million users in mid 2002 which corresponds to more that 53% of the population. Higher adoption level of Internet banking is mainly to the proactive steps taken by the Government in developing the Internet in the country and marketing efforts from the part of banks. Another country which has higher Internet banking rate is Estonia which has an adoption rate between 18-25% in 2001 (Centeno, 2003).

DB Research has come up with the following five trends in the Internet banking space in 2005 (Schaaf, March 2005)

- i) Security: Concerns with security is the main issue in front of Internet banking user. Banks need to create awareness among customers regarding the various threats that exists and also see that customer doesn't stop using Internet banking owing to the fear of security.
- ii) Customer retention: For a bank acquiring a new customer is more costlier than keeping an existing customer. The profitability of the bank increases when the customer uses more services from the bank. Customer loyalty therefore, acquires importance and customer relation management should be carefully carried out.
- iii) Technological progress: Progress in technology is expected to be a great force which would increase Internet banking acceptance. More spread of technology which is cheaper and quicker would result in increased penetration of Internet as well as Internet banking.
- iv) Mobile banking: Mobile banking may come up after the introduction of 3G mobile technology like GPRS or EDGE. Mobile devices could be used to connect to an Internet

banking channel which offers more convenience and ease of use.

- v) Online research grows: Growing number of customers is using Internet to search for information on various matters. This is true even for matters related to financial services. They shop around for financial products, and make their own investment decisions. Internet banking acceptance should increase as a result of researching via Internet.

1.1.3 E-Threats – A primer

A serious impediment to faster diffusion of E-Banking and particularly Internet banking is the various electronic security threats it faces. Just as technology could be used for the betterment of mankind, it could also be abused for conducting many type of heinous activities by entities inside or outside of an organization. E-banking infrastructure of a banking institution is at risk of modification/destruction/fabrication/ disclosure /intrusion or theft of its information from criminal software developers normally referred to as hackers or crackers. The U.S. National Information Systems Security Glossary defines

Information systems Security as “the protection of information systems against unauthorized access to or modification of information, whether in, processing or transit, and against the denial of service to authorized users or the provision of service to unauthorized users, including those measures necessary to detect, document, and counter such threats” (NSTISSC, 2000). NIST (NIST, 1997) in their special publication named SP800-12 lists the following threats commonly faced by a computer network:

Errors and Omissions: Data and system integrity of an information system is threatened due to errors and omissions occurred during capture of data. It could be either intentional or unintentional from the part of the user, but detecting it could be difficult for a program. Computers lack the intelligence to detect and correct error or omissions that is a part of the user inputs.

Fraud or theft: Computer software could be misused to conduct frauds, which is normally committed by insiders who could be employees or persons having access to computer networks internally like contractor personnel or consultants. Insider frauds are more serious in nature, because of their nature and difficulty in detection. In the report of Global Security Survey conducted by

Deloitte (Deloitte, 2006), it is mentioned that 28% Internal breaches identified by its respondents were due to internal fraud. Findings of 2006 CSI/FBI survey (Gordon et al., 2006) also give similar findings, 39% of that survey respondents attributes a percentage of their organization's losses greater than 20 percent to insiders (Figure 1.14). Frauds like 'Salami Attack' which is skimming of small amounts of money from a large number of financial accounts, assuming that small discrepancies may not be investigated is very common in financial institutions.

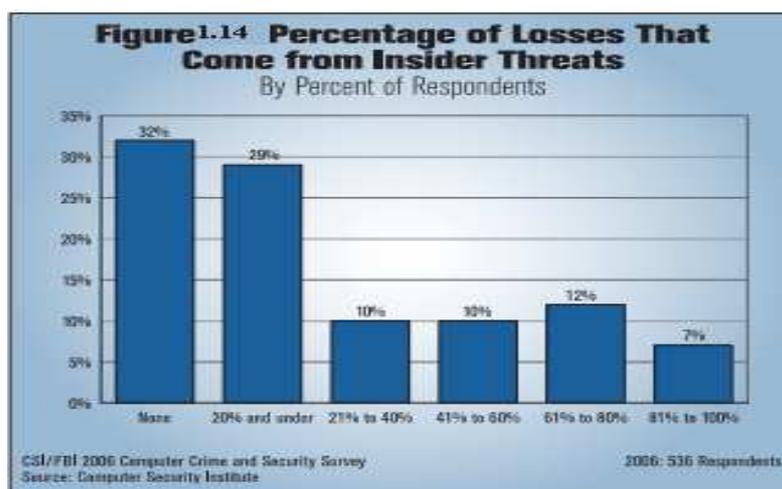


Figure 1.14: Percentage of Losses That Come from Insider Threats (Source: CSI/FBI)

Employee Sabotage: Disgruntled employees unhappy with their management may resort to damaging of information system resources available at their disposal as a display of revenge.

Although this type of threat is less compared to other threats, it still is a threat a company has to watch out particularly when there is a strike call by workers or when an employee is fired as a part of downsizing exercise. Common examples of computer-related employee sabotage include:

- destroying hardware or facilities,
- planting logic bombs that destroy
- programs or data,
- entering data incorrectly,
- "crashing" systems,
- deleting data,
- holding data hostage, and
- changing data.

Loss of Physical and Infrastructure Support: Physical loss infrastructure could be due man made disasters like terrorist attack, war etc or natural disasters like acts of God viz earthquakes, fires, floods, storms and accidents like water spills , fires due to electrical short circuiting etc.

Malicious Hackers: Hackers or crackers, refer to those who break into computers without proper authorization or permission. They can include both insiders and outsiders. Hacking as an activity has

become more prevalent after the advancement in connectivity among computers – this allowed hackers to remotely access computers. Hackers could break into computer systems or supporting equipments like switches or routers and could severely damage the network reliability & speed. As Figure 1.15 shows, there is increased number of unauthorized access incidents during the year 2006. Attacks from malicious hackers have caused lots of panic among organizations and customers which has adversely affected the adoption of e-banking services like Internet banking. Finding of many surveys points out that concern of security with activities like hacking is the main reason for non usage of Internet banking.

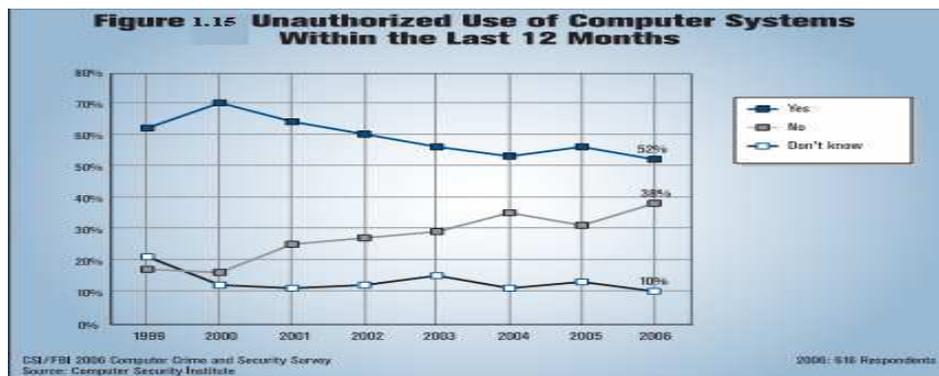


Figure 1.15 Unauthorized Use of Computer Systems (Source: CSI/FBI)

Industrial Espionage: Industrial espionage is the gathering of proprietary information by organizations about their rivals for some

specific purpose. It is also a type of information theft, but carried with more resources and has an institutional support.

Malicious code: Malicious code refers to viruses, worms, Trojan horses, logic bombs, and other "uninvited" software. As the name indicates malicious code are programs written for damaging the host computer or network they invade and spread itself through network. From customer's perspective these type of threat is the most dreaded because most of these threats are targeted against personal computers. Programs like virus or worm cause great damage to the user and forces lots of computer downtime. They also capture personal information of a user and send them to the hacker, who could then misuse it.

Threats to Personal Privacy: With massive quantity of personal information being kept by various agencies government & private, protection of personal privacy is a big responsibility. Threats like 'identity theft' where hackers misuse personal details like social security numbers, driving license etc to conduct fraudulent transactions force governments to pass legislation like Identity Theft and Assumption Deterrence Act. Personal information should

be stored and protected from the prying eyes of hackers for the benefit of customers Identity theft. (2007, May 18).

1.1.4 E-threats and Internet Banking

Acceptance of Internet banking is directly influenced by the confidence of customers with regards to the security of the computer, network and most importantly the infrastructure of the bank they wish to access. A survey among UK customers clearly highlights this concern about the security of online banking (Schaaf, December 2004). Findings of the survey show that customers are wary of the common e-threats like viruses, identity theft, snooping of information when they access an Internet banking web site (Figure 1.16). As mentioned earlier, malicious hacking has increased after the prominence of Internet from mid-nineties. More enterprises are using Internet as a medium for connecting their computers across the globe; this has prompted hackers to try gain unauthorized access to computer networks. Computer programs are becoming more complex day by day and vendors are not able to plug all the security vulnerabilities in operating systems or application programs before they are released for public use. Hackers are quick to exploit these vulnerabilities to

gain illegal access to computer and perform malicious activities. As the Figure 1.17 shows, the graph computer vulnerabilities reported and incidents reported are going high over the last few years. This high rise of incidents has worried the customers and made them stay away from Internet banking usage.

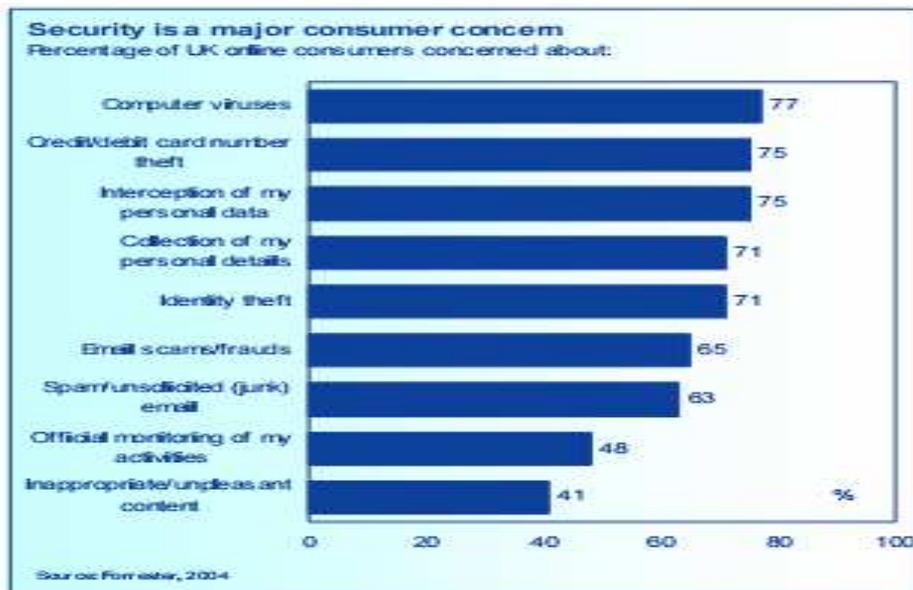


Figure 1.16: Internet banking concerns among UK Customers (Source: DB Research)

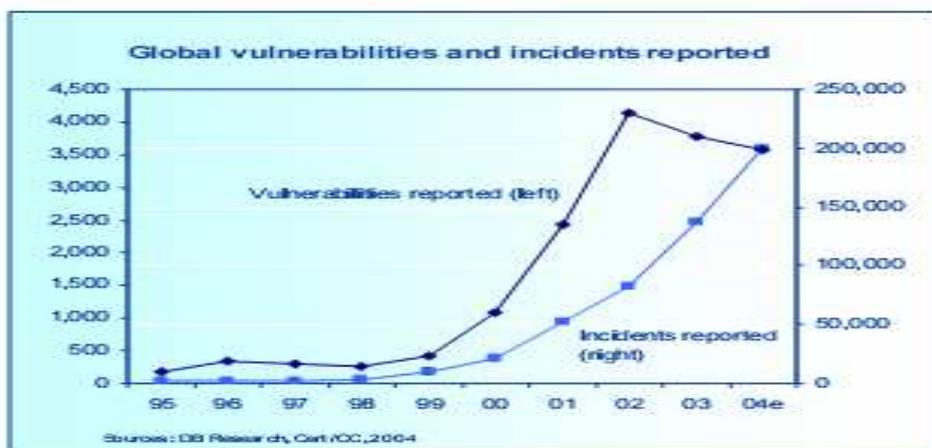


Figure 1.17: Global Vulnerabilities Reported (Source: DB Research)

1.1.4 Banking Industry in India

The Indian Banking industry, which is governed by the Banking Regulation Act of India, 1949 can be broadly classified into two major categories, non-scheduled banks and scheduled banks. Scheduled banks comprise commercial banks and the co-operative banks. In terms of ownership, commercial banks can be further grouped into nationalized banks, the State Bank of India and its group of banks, regional rural banks and private sector banks (the old/ new domestic and foreign). These banks have over 54,000 branches spread across the country. The Indian banking sector functions under the regulatory and supervisory guidelines issued

by the central bank, the Reserve Bank of India (RBI). Table 1.6 gives details of the commercial banks operating in India.

Banks	Nos.	Branches					ATMs		
		Rural	Semi-urban	Urban	Metro-politan	Total	On-site	Off-site	Total
State Bank Group	8	5,229	4,043	2,449	2,110	13,831	1,775	3,668	5,443
Nationalised Bank	19	12,990	7,103	6,990	6,929	34,012	4,812	2,353	7,165
Other Public Sector Bank	1	2	17	66	88	173	135	241	376
Old Private Sector Banks	19	936	1,447	1,236	947	4,566	1,054	493	1,547
New Private Sector Banks	8	97	322	674	857	1,950	2,255	3,857	6,112
Foreign Banks	29	–	1	37	221	259	232	648	880

Table 1.6: Indian Banking at a glance (As at end-March 2006)
(Source:RBI) (73885.pdf)

E-banking initiatives in India took off from the early 1980's both in the industry level and in an organizational level. Industry wide electronic banking offerings were coordinated and implemented by the Reserve Bank of India, which is the central bank and market regulator (Rishi & Saxena, 2004). During the 1980's, the RBI commenced banking modernization exercises. Several committees were setup by the RBI to work out the kind of automation required for increasing efficiency of banking operations like clearing of

cheques, electronic transfer of funds between and within banks, computerization of front office and back office operations of a bank etc. Computerization which concentrated mainly at head office and regional office level slowly started to percolate down the line. Computerization of branches started by late eighties with the introduction of ledger posting machines (LPMs) and later substituted by advanced ledger posting machines (ALPMs). Soon, stand alone mini-computers were deployed at branch level to automate more tasks. But after the introduction of new channels of banking services like ATM and Internet banking – banks had to network their branches in order to provide the new services. During late nineties banks tried many models for networking their branches spread across the country with their head quarters. With the introduction of new technology in telecommunication like VSAT and VPNs through Internet which were cost effective, reliable and fast, most of the banks started to install Core Banking Solutions (CBS) for running their operations. CBS allowed banks to automate their operations more efficiently and also allowed them to automate more branches simultaneously. Presently, all new private sector banks and public sector banks have gone for CBS. Table 1.7 gives details of computerization of public sector banks. From Table 1.7, it

is seen that about 50 % of branches of public sector banks are fully computerized as on march 2006 (RBI, 2006). Out of these nearly 30% PSB branches are running under core banking solutions. In spite of being the group with the largest number of branches spread all over this vast country, State Bank Group has already fully computerized 99.9 percent of its branches. Fifty percent of the State Bank group branches are presently running on CBS and few of its associates like State Bank of Bikaner and Jaipur, State Bank of Hyderabad, State Bank of Patiala, State Bank of Saurashtra and State Bank of Travancore have all their branches under CBS.

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Sr. No.	Name of the Bank	Branches already Fully Computerised #	Branches Under Core Banking Solution	Fully Computerised Branches (3+4)	Branches Partially Computerised
1	2	3	4	5	6
	Public Sector Banks (I+II)	48.5	28.9	77.5	18.2
I)	Nationalised Bank	48.0	20.5	68.5	25.4
1.	Allahabad Bank	79.5	–	79.5	20.5
2.	Andhra Bank	26.7	73.3	100.0	–
3.	Bank of Baroda	95.3	4.7	100.0	–
4.	Bank of India	75.5	21.2	96.6	3.4
5.	Bank of Maharashtra	57.0	–	57.0	–
6.	Canara Bank	63.4	0.1	63.4	36.6
7.	Central Bank of India	51.1	0.5	51.6	2.0
8.	Corporation Bank	39.9	60.1	100.0	–
9.	Dena Bank	99.4	–	99.4	0.6
10.	Indian Bank	36.8	36.1	72.9	27.1
11.	Indian Overseas Bank	42.8	12.2	55.1	44.9
12.	Oriental Bank of Commerce	6.0	57.3	63.3	38.4
13.	Punjab National Bank	45.8	51.8	97.6	2.4
14.	Punjab and Sind Bank	9.6	–	9.6	90.4
15.	Syndicate Bank	8.7	26.4	35.0	65.5
16.	UCO Bank	27.5	–	27.5	66.2
17.	Union Bank of India	–	33.3	33.3	66.7
18.	United Bank of India	26.6	–	26.6	73.4
19.	Vijaya Bank	69.6	30.3	99.9	0.1
II)	State Bank Group	49.8	50.1	99.9	–
20.	State Bank of India	70.2	29.8	100.0	–
21.	State Bank of Bikaner and Jaipur	–	100.0	100.0	–
22.	State Bank of Hyderabad	–	100.0	100.0	–
23.	State Bank of Indore	–	98.4	98.4	–
24.	State Bank of Mysore	76.1	23.9	100.0	–
25.	State Bank of Patiala	–	100.0	100.0	–
26.	State Bank of Saurashtra	–	100.0	100.0	–
27.	State Bank of Travancore	–	100.0	100.0	–

– :Nil/Negligible. # :Other than branches under Core Banking Solution.

Table 1.7: Computerization in Public Sector banks (Source: Trend and Progress in Banking 2005-06, RBI)

1.1.5 E-banking initiatives in India and the role of RBI

Reserve Bank initiated several electronic banking mechanisms in the early 2000(Kamesam, 2003; Kamesam, 2001; Mohan, 2004; RBI, 2005; Reddy, 2006). Some of the important e-banking mechanisms that came into existence are discussed below:

1. Magnetic Ink Character Recognition (MICR) Cheque processing: MICR was introduced during the years 1986-88. MICR resulted in quicker realization of cheques.
2. Indian Financial Net (INFINET) : INFINET, a wide area satellite based network (WAN) using VSAT (Very Small Aperture Terminals) technology, was jointly set up by the Reserve Bank and Institute for Development and Research in Banking Technology (IDRBT) in June 1999. The Indian Financial Network (INFINET) which initially comprised only the public sector banks was opened up for participation by other categories of members. Various inter-bank and intra-bank applications ranging from simple messaging, MIS, EFT (Retail), Electronic Clearing Service (ECS) for both Credits and Debits, online dealing and trading in Government securities, Centralized Funds Management System(CFMS) for Banks and

FIs, Anywhere/Anytime Banking, Inter-Branch Reconciliation, Structured Financial Messaging System (SFMS) and Real Time Gross Settlement (RTGS) System are being implemented using the INFINET as the backbone

3. Real Time Gross Settlement (RTGS) System: RTGS is an online system for inter-bank fund transfer on a transaction-by-transaction basis. RTGS resulted in risk free credit mode of funds settlement. The facility for inter-bank funds settlement through RTGS is available across more than 23,700 branches of banks spanning more than 500 centres in the country.
4. Electronic Funds Transfer (EFT)/National Electronic Funds Transfer (NEFT) System: EFT is a safe, secure and quick electronic fund transfer system for both corporate and retail segments. Reserve Bank implemented the Electronic Funds Transfer (EFT) System in the mid nineties, which was later upgraded as the Special Electronic Funds Transfer (SEFT) System in 2003 and has now been further enhanced as the National Electronic Funds Transfer (NEFT) System since

November 2005. As of 2006 the NEFT facility covers more than 5000 branches of 32 banks spread across 200 centres.

5. Cheque Truncation System (CTS):CTS would improve the efficiency of cheque clearing system substantially, it also would result in faster clearing of out station cheque. A pilot project for implementing CTS underway in the National Capital Region.
6. The setting up of the Institute for Development and Research in Banking Technology (IDRBT), Hyderabad in the mid nineties, as a research and technology centre for the Banking sector; has resulted tremendous pace in the introduction of new technology in this domain. IDRBT contributed extensively in the setting up of INFINET and also is a Certifying Authority for the issuance of digital signature and certificates in India

1.1.6 E-Banking services for Indian customers

E-banking initiatives by the Reserve Bank and the deployment of Core Banking Solutions has allowed Indian banks to offer a new banking 'experience' for their customers. Indian customers suddenly became at par with their counter parts in developed

countries in terms of services obtained from their banks. Gone are the days of branch only banking – computerization allowed banks to offer many new channels of delivery. Indian banks, particularly the new generation banks which started their operations after 1993, were the first to offer new channels of delivery like ATMs, Phone Banking, Internet Banking and Mobile Banking. The new generation banks did not have the branch network that public sector banks possessed and they also had to introduce some differentiator to the customers. New generation banks like ICICI Bank, HDFC Bank, UTI Bank and foreign banks like ABN Amro Bank and Citibank kicked the ATM revolution in India. ICICI Bank employed a very aggressive strategy of ATM deployment to counter its lack of branch presence across the country. ICICI's ATM count surged from 125 ATMs in January 2000 to 1200 ATMs by the end of 2002 (Srikanth & Padmanabhan, 2-Dec-2002). The bank also saw the impact of that deployment in the form exceptional growth in customers in the same period, customer base swelled to 5 million from 2 million. ATMs not only worked as an attraction for customers but also allowed banks to lower its transaction cost. ATMs as a delivery channels became a huge success, which prompted public sector banks also to invest in them. Customer

acceptance of ATMs were very high, customers in semi-urban also welcomed this innovation with both hands. Efforts are being done to develop ATMs that could be deployed in rural markets, the multi-lingual ATM developed by IIT Chennai promises new market for this channel.

Another major innovation that was introduced in India during the last decade is Internet banking which offered many new services to the customer (Rajneesh & Padmanabhan, 16-Sep-2002). ICICI Bank was the first bank in India which offered this delivery channel, by kicking off its online banking services in 1996. Other private sector banks like Citibank, IndusInd Bank and HDFC Bank and Times bank (now part of HDFC Bank) started offering internet banking services in 1999. SBI launched its internet banking services in July 2001. Other public sector banks like State Bank of Travancore, Bank of Baroda, Allahabad Bank, Syndicate Bank and Bank of India, also rolled their services during the same time. Although, the acceptance of internet banking is lower compared to that of ATMs, banks are expecting usage levels to go up as internet penetration in the country improves. Details of internet banking services offered by some major banks is given in Table 1.8.

Bank Name	Technology Vendor	Service offering
ABN AMRO Bank	Infosys (BankAway)	NetBanking
Abu Dhabi Commercial Bank	Infosys (BankAway)	ADCB NetLink
Bank of India	I-flex	BOOnline
Centurion Bank	Logica	MyCBOL
Citibank	Orbitech (now Polaris)	Citibank Online
Corporation Bank	I-flex	CorpNet
Deutsche Bank	-	db direct
Federal Bank	Infosys	FedNet
Global Trust Bank	Infosys (BankAway)	ibank@gtb
HDFC Bank	i-flex/ Satyam	NetBanking
HSBC	-	Online@hsbc
ICICI Bank	Infosys, ICICI Infotech	Infinity
IDBI Bank	Infosys (BankAway)	i-net banking
IndusInd Bank	CR2	IndusNet
Punjab National Bank	Infosys (BankAway)	
Saraswat Bank		
Standard Chartered Bank	In-House	Me Standard Chartered Online
State Bank of India	Satyam/Broadvision	onlinesbi.com
UTI Bank	Infosys (BankAway)	iConnect

Table 1.8: Net Banking services in India (Source : Express Computers)

Reserve Bank constituted a Working Group under the Chairmanship of S.R. Mittal. The working group came up with the “Report on Internet Banking” in 2001(RBI, 2001). This report gave guidelines for offering internet banking services in India. It discussed the technical, legal, regulatory and supervisory aspects of internet banking. The Information Technology Act of 2000 took care of the legal aspects of electronic commerce in India that allowed banks to offer full suite of internet banking. Banks in India

currently offer 'Fully Transactional Websites' to their customers. The customers could conduct variety of transactions through internet banking facility which includes: account summary, details of historical banking transactions, funds transfer, new service announcements, loan applications, bill payment, cheque book request, cheque status enquiry, stop cheque request, credit card payments/statement, facilities to contact account manager etc. Internet banking is the least cost delivery channel available for a bank; the working report suggests the following comparative costs for different channels – teller cost at Rs. 1 per transaction, ATM transaction cost at 45 paise, phone banking at 35 paise, debit cards at 20 paise and Internet banking at 10 paise per transaction. The main deterrent for acceptance of internet banking among customers is lack of confidence in the security. The committee recommended implementing latest security technology to safeguard internet banking infrastructure in a bank. The report estimates that round 1% of the 9 lakh internet users in India used Internet banking in 1998. A survey conducted by IAMAI and IMRB (IMRB & IMAI, 2006) in September 2006, estimated around 37 million Internet users in India and the number of 'active' users is pegged around 25 million. The survey also estimates around 2.4

million E-Commerce users, which included internet banking users. As of 2007, around 4.6 million Indians are availing Internet banking services (Kothari, 2007). In contrast to internet banking, usage of Telephone Banking and Mobile banking is limited. Mobile banking is expected to pick-up once the mobile companies offer 3G services.

1.2 Need for the study

Introduction of new technologies allowed banking institutions to offer new channels of service outlets like ATM facility, Internet Banking, Telephone Banking and Mobile Banking. Indian consumers too have access to many new channels to interact with their bank. Banks race against each other in bringing the latest technology for the benefit of their customers and themselves. But not many studies have been conducted to evaluate if “Internet Banking” channel is utilized properly by the customers in India. Reasons for customer apathy towards Internet banking channel, if that exist, have also not been analyzed in an Indian context earlier.

1.3 Objective of the Study

This study plans to “plug” the gap in research in acceptance of Internet banking among Indian customers. The primary objectives of this study are to:

- Identify factors influencing the adoption and usage of Internet banking in India
- Examine whether Theory of Planned Behaviour (TPB) or Technology Acceptance Model can be applied in Internet banking adoption and usage.
- Develop a model to explain behavioral intention to use internet banking.

1.4 Significance of the Study

This study has a number of theoretical contributions. It is one of the first study to empirically examine the behavioral intentions to adopt or use Internet banking services in India using a modified version TAM construct. In this study TAM constructs along with influences of *security awareness* and *security concerns* among consumers is analyzed. Even though TAM has been considered as one of the most important models for analyzing user acceptance of

computer & IT in a wide range of end-user computing technologies, not many studies were conducted among Indian IT users. This study tries to verify if the results of TAM constructs reflect the results of other studies conducted in other countries. From a business point, commerce through Internet is showing tremendous increase over the past few years. But there are few factors which affect the decisions of customers when adopting Internet commerce, positively or negatively. This study tries to analyze the customer feeling about Internet Banking. Findings of this survey could help banks operating in India to fine tune their Internet Banking products.

1.5 Organization of the Thesis

This thesis is organized into five chapters. Chapter 1 provides an introduction to the growth of Internet and technological innovations that happened in the banking industry over the last few decades. The need for the study, research objectives and significance of the study is also discussed. Chapter 2 contains review of literature and the discussion of the theoretical models used in this study. In Chapter 3, the methodology used for conducting the study is discussed along with the research model

and hypotheses framed for the study. The results of the survey conducted as part of the research study is presented and analyzed in Chapter 4. Finally, Chapter 5 contains the discussion of the findings, contributions of the study, limitations of the study, conclusions of the study, and suggestions for further research.