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ICT INNOVATION IN INDIAN BANKING INDUSTRY: OPPORTUNITIES AND CHALLENGES

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ABSTRACT
Today, digital technologies are evolving at an unprecedented rate all across the globe. India, too is witnessing radical growth in Information and Communication Technology at a very rapid pace. As a result, Indian Banking sector is undergoing huge transformation to offer better and enhanced services to its customers. Continuous innovation in ICT in the banking domain has made Virtual Banking a reality in India. Establishment of Innovation Labs is facilitating the banks to explore various avenues in the banking arena like Biometrics, Artificial Intelligence, Robotics, Data Analytics, Wearable technology etc. Digital wallets have already paved the way for cashless transactions. As the nation welcomes innovations in ICT, banks need to equip themselves with the required infrastructure. As significant proportion of educated urban youth in the nation accepts and adopts virtual banking, banks need to take efforts to reach out to uneducated rural poor too. As the nation witnesses promising ICT trends in next generation banking, banks also need to prepare a blueprint to overcome the challenges posed. This research paper undertakes the study of application of ICT in order to make the entire banking experience consumer centric. The study also highlights the application of emerging technology in few select banks in India. It also lists the challenges posed by innovations in ICT and suggests alternatives to overcome the same. This paper is descriptive in nature. Secondary data are collected from various websites, reports and journals.

Keywords: ICT, Innovation, Biometrics, Artificial Intelligence, Technology

INTRODUCTION
Information and Communications Technology or ICT is the infrastructure and components that enable modern computing. It refers to the convergence of audio-visual and telephone networks with computer networks. ICT facilitates interaction of people and organizations in digital world. ICT innovation in Indian banking sector has laid strong foundation of modern banking services. There has been a paradigm shift in the offerings made to the consumers. The expectations of tech savvy customers have increased manifold in last few years. Net Banking, digital wallets, mobile banking apps is the way of life of such customers who move around without any hard cash in their pockets. Emerging technologies will certainly take Indian banking to the next level in near future. The emerging trends will delight its tech savvy customers for sure, but will these banking services even reach rural customers? While the banks and customers completely start relying on technology, will the transactions be 100% secure? As banks adopt Artificial Intelligence and automation with Robotics, will minimal or no human control over transactions ensure security of data? This paper seeks to study the trends and challenges posed by ICT innovation

REVIEW OF LITERATURE
In the field of banking, information technology implies the transaction processing and the integration of information system with communication technology and of innovative.

Shastri R.V, (March, 2003) "Recent trends in Banking Industry‖ IT emergence, Charted Financial Analyst, (pp 45-56) in this article stated that liberalization policy and intense competition keeps every banker on his toes. Implementation of Information Technology (IT) helps for maintaining proper accounts especially in decision making process. He also stated that facilities like ATM, anywhere banking, Internet and mobile banking have imported customer service which in turn helps for better customer relations management. He

also explained the challenges faced by banks because of IT implementation like employment problem and security concerns. He suggested that the customer delight is the primary goal of all future IT initiatives.

Prabhakar Rao Ch. (Jan, 2004). ―Indian banking in 2010 IBA Bulletin Special Issues, (pp 170-173) in this study discussed about the revolutionary changes that witnessed in the financial sector around the world. He stated that net worked branches. ATMs, technology based payment and settlement system, technology vision of RBI, floating rate of interest have changed the Indian banking sector. He concluded that brick and mortar bank branches will disappear and customers will be able to operation their accounts through electronic devices.

ROLE OF IT IN BANKING SECTOR

Banking environment has become highly competitive today. To be able to survive and grow in the changing market environment banks are going for the latest technologies, which is being perceived as an enabling resource' that can help in developing learner and more flexible structure that can respond quickly to the dynamics of a fast changing market scenario. It is also viewed as an instrument of cost reduction and effective communication with people and institutions associated with the banking business. The Software Packages for banking applications in India had their beginnings in the middle of 80s, when the Banks started computerizing the branches in a limited manner. The early 90s saw the plummeting hardware prices and advent of cheap and inexpensive but high powered PC's and Services and banks went in for what was called Total Branch Automation (TBA) packages. The middle and late 90s witnessed the tornado of financial reforms, deregulation globalization coupled with rapid revolution in communication technologies and evolution of novel concept of convergence of communication technologies, like internet, mobile/cell phones etc. Technology has continuously played on important role in the working of banking institutions and the services provided by them. Safekeeping of public money, transfer of money, issuing drafts, exploring investment opportunities and lending drafts, exploring investment being provided. IT enables sophisticated product development, better market infrastructure, implementation of reliable techniques for control of risks and helps the financial intermediaries to reach geographically distant and diversified markets. Internet has significantly influenced delivery channels of the banks. Internet has emerged as an important medium for delivery of banking products and services. The customers can view the accounts get account statements, transfer funds and purchase drafts by just punching on few keys. The smart cards i.e., cards with micro processor chip have added new dimension to the scenario. An introduction of Cyber cash' the exchange of cash takes place entirely through Cyber-books'. Collection of Electricity bills and telephone bills has become easy. The upgradeability and flexibility of internet technology after unprecedented opportunities for the banks to reach out to its customers. No doubt banking services have undergone drastic changes and so also the expectation of customers from the banks has increased greater. IT is increasingly moving from a back office function to a prime assistant in increasing the value of a bank over time. IT does so by maximizing banks of pro-active measures such as strengthening and standardizing banks infrastructure in respect of security, communication and networking, achieving inter branch connectivity, moving towards Real Time Gross Settlement (RTGS) environment the forecasting of liquidity by building real time databases, use of Magnetic Ink Character Recognition and Imaging technology for cheque clearing to name a few. Indian banks are going for the retail banking in a big way. The key driver to charge has largely been the increasing sophistication in technology and the growing popularity of the internet. The shift from traditional banking to e-banking is changing customer's expectations.

WHAT IS ICT

It Stands for "Information and Communication Technologies." ICT refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums.

In the past few decades, information and communication technologies have provided society with a vast array of new communication capabilities. For example, people can communicate in real-time with others in different countries using technologies such as instant messaging, voice over IP (VoIP), and video-conferencing. Social networking websites like Facebook allow users from all over the world to remain in contact and communicate on a regular basis.

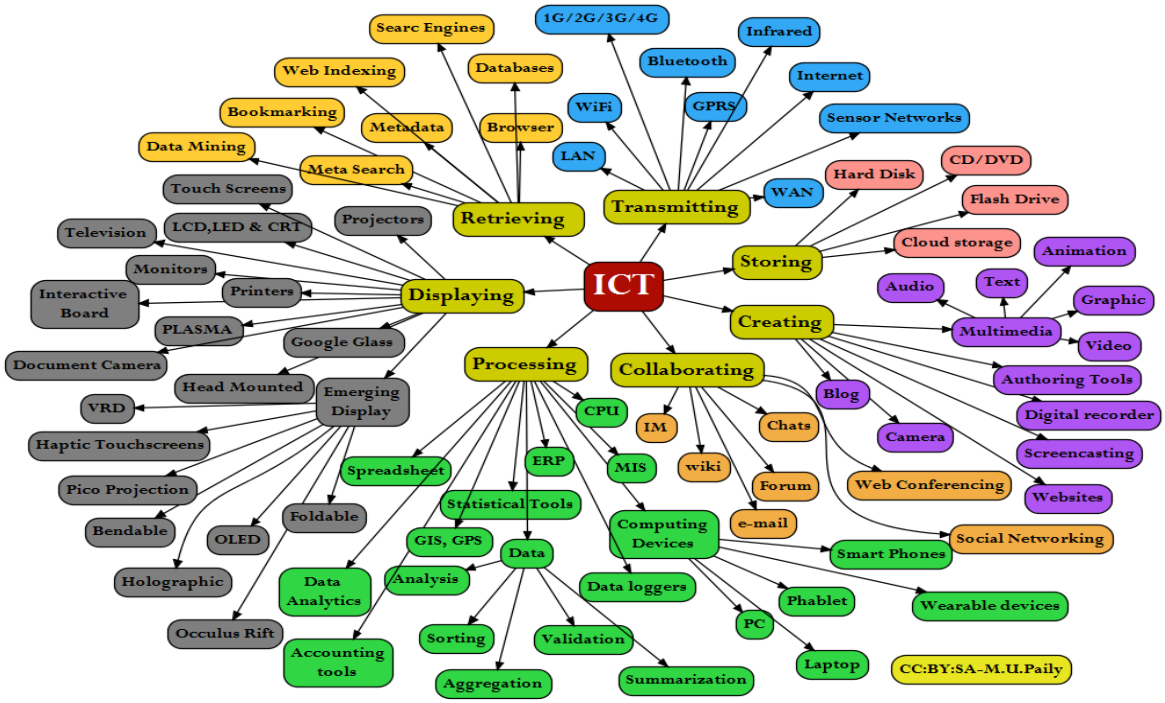
Modern information and communication technologies have created a "global village," in which people can communicate with others across the world as if they were living next door. For this reason, ICT is often studied in the context of how modern communication technologies affect society.

EXAMPLE

Prathibha is a trained graduate mathematics teacher working in a village in Chamarajanagara. Recently Prathibha organized a "Mathematics Day" on the eve of Ramanujan's birthday. She organized a video show on Ramanujan's life and his contributions. She had identified this video from YouTube. Based on the learning form the video, students took a quiz in the afternoon. Since the quiz was online, she could announce the winner immediately. Prathibha used Google form for this purpose. Prathibha shared pictures of the event in the subject teachers' group via WhatsApp messenger. One of her friends suggested her to open a blog on her experiences. She has a blog now, in which she regularly posts her teaching experiences and reflections. Prathibha uses web tools and technology in her class regularly. She finds that technology integration in teaching has made the learning experience very engaging. Prathibha is excited about the potentials of technology use in the classroom. This is only an example to show how information and communication technologies have started influencing the classroom practices.

Look at the following table to get an understanding of range of technologies that fall under the category of ICT.

Information	**Technologies**
Creation	Personal Computers, Digital camera, Scanner, Smartphone
Processing	Calculator, PC, Smartphone
Storage	CD, DVD, Pen drive, Microchip, Cloud
Display	PC, TV, Projector, Smartphone,
Transmission	Internet, Teleconference, Video conferencing, Mobile technology, Radio
Exchange	e-mail, Cellphone,



A graphical representation of what is ICT is represented in more details in the figure *(Graphic courtesy: Dr.M.U.Paily, RIE, Mysore)*

ICT IN EVERYDAY LIFE

The widespread use of ICT in Education is not just a coincidence. It is observed in all aspects our life. Let us take a look at the extent to which ICT has permeated our life.

ICT IN BUSINESS

Today a lot of business transactions happen through internet and hence called e-commerce. ICT facilitates marketing, customer visit, product browsing, shopping basket checkout, tax and shopping, receipt and process order. Through e-commerce one can also offer services pertaining to processing transactions, documentation, presentations, inventory management and gathering product information. In other words, every business activity can be done being at home.

ICT IN FINANCIAL SERVICES

Every service a traditional bank provides is available these days through online service. Starting from transferring money from one account to other up to running the day-today transactions of the bank are provided through internet. Through the networking of banks, this has become a reality. Capital market transactions, financial analysis and related services are available on the online platforms

ICT IN ENTERTAINMENT

Internet is a major source of entertainment. Internet is a hub of movies, games, books, and social networking. Due to digital broadcasting, the television experience itself is changing. We can easily record the television programs and view it. Digital broadcasting has changed the way we experience television, with more interactive programming and participation. Digital cameras, printers and scanners have enabled more people to experiment with image production.

ICT IN PUBLIC SERVICE

Both Central and State Governments are actively encouraging e-governance practices. Digital India initiative of Government of India and e-governance initiative of Government of Karnataka are best examples of this. With these, and even before many government services are available online. We can enroll ourselves in the electoral roll of the local assembly constituency through the State Election Commission portal. We can book an LPG cylinder through the website of the gas supplier, pay electricity bills online through an online bill desk. Land related RTC can be viewed through internet being at home. ICT is also providing a platform for a conversation between the public and the government through various social networking services.

ICT IN EDUCATION

Education is one major sector which has undergone the influence of innovations in ICT. Starting from providing online content service, platform for organizing learning experiences to managing learning and assessment has been changed greatly by ICT developments. Students, teachers and educational administrators and every stakeholder in education have been benefitted by the integration of ICT in education. Rests of the Units in this course are going to deal with these issues at a greater length.

METHODOLOGY

The study is descriptive in nature and is based on primary and secondary data. The data are collected from various reports, journals, news articles, various bank portals, RBI portal and internet sources.

The study has been conducted in Rohtak district of Meerut and mainly based on primary data collected from a sample size of 215 respondents via questionnaire method. Convenience non- probability sampling method was followed. About 200 of them were found to be suitable for analysis. The data has been collected from the general public by means of well-structured questionnaire and was classified and analyzed carefully. The data relates to the month of May 2018 to July 2018.

OBJECTIVES

- To study the emerging technology in Indian Banking Sector
- To study the challenges faced by ICT innovation in near future
- To examine the level of satisfaction of customers towards the use of ICT in Indian banking sector

CHALLENGES FACING ITC

1: Customer service

IT suffers from a bad reputation when it comes to satisfying customer needs. Unfortunately, it is often well deserved. Too many times, the work is done incorrectly or not to the customer's requirements — and it is the customer who ultimately determines what good customer service is and what is not.

Corporate IT has similar challenges with its customer service. There may be a lot of truth to the statement "The customer needs to be told what they want." However, the tone of the "recommendation" by the computer expert often comes across as arrogant. The customer may be ignorant but they are rarely stupid — and they don't like being treated as such. A little better bedside manner offering education and choice is far preferable to a simple "you need this" approach to customer service.

Challenge #1: Improve customer service by listening to and meeting the client's needs. Make customer service job number one.

2: Human resources

Burnout is an ever increasing concern as budgets become tighter and workloads increase. Creative ways need to be found to reduce stress and revitalize tired workers. More vacation time, sabbaticals, temporarily reduced responsibilities — anything that can give the IT professional a break should be considered. This might seem costly, but losing a valued employee due to burnout can be far more costly.

It has always bothered me when I or a fellow workmate requested a transfer only to have the request ignored or denied, seemingly without any thoughtful consideration. Organizational structures are not conducive to employee sharing and growth. Managers just don't want to give up a key member of their staff. The truly exceptional companies find ways to maximize their employees' full potential. After all, what is a company if not its people and their skills?

Challenge #2: Develop creative ways to minimize stress, satisfy employee needs, and match corporate needs to employee goals.

3: Productivity

First came the mainframes, then the minicomputers, PCs, and the Internet. Each was a tremendous technological leap that greatly increased user productivity. What will be the next great productivity innovation? The cloud? Mobile computing? Can these technologies deliver real, significant productivity gains? The law of unintended consequences warns that issues will arise with the introduction of any new technology. To name a few, security and privacy for cloud services and increased stress and burnout for employees tethered to mobile devices 24x7. Until these concerns are resolved, any productivity gains must be carefully weighed against the negatives before mainstream adoption.

Challenge #3: Make the best use of new technologies like cloud and mobile computing but search out additional ways to increase productivity.

4: Complexity

If you look at the progression of software from the introduction of the IBM PC to today's systems, one obvious trend is irrefutable: The IT world has gotten increasingly complex. The complexity is rapidly reaching a point of critical mass, where one single developer can no longer know everything needed to be proficient at his or her job. Because of this, teamwork is more important than ever. Forget KISS — it's a complex world and it is getting more complicated every day.

Challenge #4: Manage and tame the complexity beast.

5: Obsolescence

Everything from the PC you are using to the skills needed to perform your job seem to become obsolete in three to five years. As costs continue to be scrutinized, IT needs to find a way to reduce the costs of obsolescence. Expect Microsoft to continue the trend of planned obsolescence as it adheres to a regular release cycle. But upgrading to every new release of Windows may be one of the first costs to go. It is getting harder for companies to justify the costs without real documented productivity increases.

Obsolescence poses another problem: Which development software will still be around 10 years from now? Pick the wrong horse and you may be faced with the same challenge as those who were still supporting OS/2 in the late 1990s. OS/2 experts were as rare as original IBM PCs by then, but IBM was more than willing to help — for a considerable price.

Challenge #5: Increase the productive life of systems, software, and equipment.

6: Budgets

Meeting budget constraints is tough even in the best of times. It is especially challenging during hard times. Most IT budgets are expected to grow in 2011, but they continue to be tight. The growth of cloud computing and mobile technology will require more attention and resources. Managers will be faced with the tough decisions of how best to meet existing budget needs while still planning for the future.

Challenge #6: Accomplish more with budgets similar to last year.

7: Marketing/public relations

Aside from a handful of tech companies like Apple and Google, IT suffers from a poor public relations image. It may be an honest assessment for Microsoft CEO Steve Ballmer to state, "If people want to wait they really can. But I'd definitely deploy Vista." But when a statement like that leads to headlines like "Ballmer says it's okay to skip Windows Vista," you have a problem. Analytical thinkers make poor marketers.

Hiring a PR firm can be well worth the expense, but even then a nasty faux pas can occur. South by Southwest Interactive engaged Ink PR to meet its marketing needs. Ink PR came up with this speaker's tip for South by Southwest Interactive's green rooms: "A speech should be like a woman's skirt: long enough to cover the topic, yet short enough to be interesting." It has been said that any publicity is good publicity. But ask South by Southwest Interactive if it thinks Ink PR's marketing gaffe was good for its corporate image.

Challenge #7: If you don't have the expertise, hire marketing and PR experts who can get it right.

8: Multinational operations

The global economy is upon us. It is increasingly common to find offices and data centers in countries halfway around the world. And with this transition come a number of challenges. Travel, language, and time zone differences are all issues that must be addressed. But far and away the greatest challenge will likely be overcoming the cultural differences and changing the "us versus them" mindset. Emotions run high for those who have been affected by outsourcing. Salary differences between countries can lead to resentment. Both are difficult people problems to solve.

Challenge #8: Instill a culture of teamwork among international team members with diverse backgrounds and varying ethnicities.

9: The mobile generation

In 10 high-tech gadgets I can live without, I noted my dislike for mobile devices. I didn't like the electronic leashes that constantly tied me to work when I needed some downtime. The mobile generation appears to be poised to overtake the PC generation as users spend more time using their mobile devices. However, a caveat should be included in any discussion of the onset of the mobile generation. Any productivity gains achieved using mobile technology in the workplace may be more than offset by the additional burdens placed on the IT workforce during nonworking hours.

Challenge #9: Make use of mobile technology without tearing down the virtual wall between work and family and leisure time.

10: Data storage and retrieval

It is not obvious since most data needs are short-term, but there is trouble lurking in those data archives. Perhaps you are an unknowing victim of this silent crisis in the making. If you have important files on those old 5 1/4-inch floppies and you need to go back and retrieve one, you may be out of luck. Chances are that that the data is no longer readable and the device you need to read the media has long since been tossed into the trash bin. Or, as in my case, turning on the old antique microcomputer to read my single-sided, single-density floppies might lead to a fire and the quick end of your weekend data retrieval project.

As our data ages, it needs to be continually transferred to fresh media. The problem is bit rot, and it happens with every type of media, from disk drives to DVDs. Shelf life varies by media type and manufacturer.

Magnetic tape is claimed to be the best, with a shelf life of up to 30 years in optimal conditions, but even it eventually succumbs to the ravages of time.

Challenge #10: Determine what data, if any, is susceptible to bit rot and transfer to new media before it becomes a problem.

ALTERNATIVE SOLUTIONS

Following steps can be adopted by the banks to overcome the challenges

Transition to AI

Top management and Leadership of the banks should play a significant role. Effective communication regarding the need and implementation of AI in the organization to all the employees may help achieve smooth transition. All employees irrespective of their age, will have to equip themselves with latest technology innovation in the industry and upgrade their skills.

Voice Revolution

As voice revolution takes over, traditional online banking traffic is bound to get displaced. Banking industry should evolve its web presence by offering higher end products such as loans, mortgages and financial planning tools. Websites should soon evolve to focus on superior experiences for financial education, planning and simplifying complex financial decisions.

Biometrics

Multifactor authentication with biometrics being prominently used could help minimize frauds. Behavioral biometrics could provide additional protection to enhance banking security in the future.

Security

As mentioned rightly in KPMG report, Cyber Security should be shared responsibility of government, organizations, as well as the end users. Users should be aware of the basic security features. Organizations should regularly update their software and fraud detection systems. The government should focus more on educating the customers and should enforce basic security standards for organizations. All the breaches should be mandatorily reported.

Digital Literacy

The government of India has launched National Digital Literacy Mission with the vision to empower at least one person per household with crucial digital literacy skills by 2020. It targets to train 60 million rural Indians. This mission will help in educating the rural population to understand the importance, ease and benefits of digital transactions. This will boost competitiveness of Indian banking sector in years to come.

ANALYSIS OF DATA

The table I show that a significant ratio of the sample was male members. Majority of the respondents belonged to the age groups of below 30 years. Maximum of them were post graduate followed by graduation and higher education and were students.

Gender	**Frequency**	**Percentage**
Male	150	150
Female	50	50
total	200	200
Age	**Frequency**	**Percentage**
Less than 30	130	130
30-40	40	40

40-50	20	20
Above 50	10	10
total	200	200
Education level	**Frequency**	**Percentage**
Middle level	8	8
Matric Level	12	12
Higher education	36	36
Graduation	48	48
Post Graduation	72	72
Others	24	24
Total	200	200
Occupation	**Frequency**	**Percentage**
Public	34	34
student	70	70
IT	20	20
Professional	38	38
business	28	28
Retired	10	10
Total	200	200

Source: Primary questionnaire

It is clear from the table II that 100 % respondents were aware about ICT.

CUSTOMER AWARENESS TOWARDS ICT

Awareness	Frequency	Percentage
Yes	100	100
No	0	0
Total	100	100

Source:

The table III shows that out of 200 respondents, 75% prefer e-banking, 2% prefer traditional banking, and 23% prefer both. It is found that a large number of respondents prefer E-banking in the study area.

CUSTOMER PREFERENCE TOWARDS E-BANKING AND TRADITIONAL BANKING

Preference	Frequency	Percentage
Preference to E-Banking	150	75
Preference to Traditional Banking	4	2
Preference to both	46	23
Total	200	100

The Table IV depicts that 80% users use ATM Card, 58% users use Tele Banking, 52% users use Credit Cards, 71% users use internet banking, and 34% users use Mobile Banking services. It is found that a large number of respondent use E- banking services in the study area.

Usage/services	Use	Do not use
ATM Card	80%	20%

Credit Cards	58%	48%
Tele Banking	52%	42%
Internet Banking	71%	29%
Mobile Banking	34%	66%

The Table V shows the respondents are benefited with the use of ICT Banking. A good majority of the respondents (100%) was of the opinion that it saves time and get rid of risk of holding cash**.**

BENEFITS OF ICT BANKING

Ratings	**Responses**	**Percentage of Responses**
Saves time	100	12.36
Shopping Convenience	75	9.27
To make balance enquiry quickly	78	9.64
To check bank statements clearly	55	6.79
Any time withdrawal	95	11.74
No risk of holding cash	100	12.36
To transfer funds easily	95	1194
Any time banking	78	9.64
Home banking	34	3.20
Economical	65	8.03
others	24	2.97
Total	809	100

Table VI shows that out of 100 respondents, 62% have opinioned that the technology oriented services provided by the bank is good, followed by 19% satisfactory, 10% excellent, 4% unsatisfactory, and 5% inefficient. It is found that a large number of respondents rate the technology oriented service of the bank as good in the study area.

RATING OF TECHNOLOGY ORIENTED SERVICES PROVIDED BY BANKS

Ratings	**No. of Respondents**	**Percentage**
Excellent	20	10
Good	124	62
Satisfactory	38	19
Unsatisfactory	8	4
Inefficient	10	5
Total	200	100

Table VII shows that out of 100 respondents, 63% have opinioned that bank's operation is efficient, followed by 17% highly efficient, 13% neutral, and 7% inefficient. It is found that a good majority of respondents have opinioned that bank's operation is efficient after the introduction of computers in the banks.

RATING OF BANK'S EFFICIENCY AFTER COMPUTERIZATION

Ratings	**No. of Respondents**	**Percentage**

Highly efficient	34	17
Efficient	126	63
Neutral	26	13
Inefficient	14	7
Highly inefficient	0	0
Total	200	100

Table VIII shows that out of 100 respondents, 69% are satisfied with the level of security provided by bank, followed by 27% not dependable and 4% excellent. It is found that a majority of respondents are satisfied with the level of security provided by the bank for e-banking services.

SATISFACTION WITH THE LEVEL OF SECURITY IN USING E-BANKING SERVICES

Level of Satisfaction	**No. of Respondents**	**Percentage**
Excellent	8	4
Satisfied	138	69
Not dependable	54	27
Total	200	100

CONCLUSION

Indian public sector banks that hold around 75 % of market share do have taken initiative in the field of IT. They are moving towards the centralized database and decentralize decisions making process. They posses enviable quality manpower. Awareness and appreciation of IT are very much there. What is needed is a 'big push' the way it was given in the post nationalization period for expansionary activities. IT and India have become synonymous. Whether India becomes a destination for outsourcing or it becomes a development centre is matter of debate. As far as banking industry in India is concerned it can be said that although the Indian banks may not be as technologically advanced as their counterparts in the developed world, they are following the majority of international trends on the IT front. The strength of Indian banking lie in withering storms and rising up to the expectations from all the quarters-catching up with all the global trends is a matter of time.

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