# INFORMATION TECHNOLOGY AND ITS IMPACT ON THE ECONOMY OF ASSAM WITH SPECIAL REFERENCE TO KAMRUP METRO

A THESIS SUBMITTED TO GAUHATI UNIVERSITY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS IN THE FACULTY OF ARTS



# SUBMITTED BY MANALISHA BHATTACHARYYA

2018

# DECLARATION OF THE CANDIDATE

I hereby declared that the thesis on "INFORMATION TECHNOLOGY AND ITS IMPACT ON THE ECONOMY OF ASSAM WITH SPECIAL REFERENCE TO KAMRUP METRO", submitted by me for the award of the degree of Doctorate of Philosophy under the Department of Economics of Gauhati University is based upon my own research work carried out under the supervision of Dr. Chandrama Goswami, Associate Professor, Department of Economics, KK Handiqui State Open University. Neither this thesis nor any part of it has been submitted before for any degree/diploma to Gauhati University or to any other Universities/Institutions.

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### CERTIFICATE

This is to certify that this thesis entitled **"INFORMATION TECHNOLOGY AND ITS IMPACT ON THE ECONOMY OF ASSAM WITH SPECIAL REFERENCE TO KAMRUP METRO"**, submitted by Manalisha Bhattacharyya in fulfilment of the award of the degree of Doctor of Philosophy in the faculty of Arts (Economics) of Gauhati University is a record of bona fide research work carried out by her under my supervision and guidance.

I further certify that the candidate has fulfilled all the requirements of PhD regulations and no part of this thesis has been submitted to any other university/ institution for any research degree.

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# ACRONYMS

ATM	:	Automated Teller Machine
BPO	:	Business Process Outsourcing
CBS	:	Core Banking Solution
CIC	:	Community Information Centre
ECS	:	Electronic clearing services
EFT	:	Electronic Fund Transfer
GIS	:	Geographical Information System
GDP	:	Gross Domestic Product
IFFCO	:	Indian Farmers Fertilisers Co-operative Limited
IKSL	:	IFFCO Kisan Sanchar Limited
IIT	:	Indian Institute of Technology
IIIT	:	Indian Institute of Information Technology
IT	:	Information Technology
ICT	:	Information communication technology
ITES	:	Information Technology Enabled Service
KCC	:	Kisan Call Centre
Kwh	:	Killo Watt Hour
MW	:	Megh Watt
NASSCOM	:	National association of software and
		Services Companies
NER	:	North Eastern Region
OFC	:	Optical Fibre Cable

PE	:	Private Equity
RTGS	:	Right Time Gross Settlement
SBI	:	State Bank of India
STPI	:	Software Technology Park of India
TRAI	:	Telecom Regulatory Authority of India
USA	:	United States of America
USD	:	United States Dollar
VC	:	Venture Capital
VIF	:	Velocity Influence Factor

# CHAPTER-1 INTRODUCTION

#### **1.1 BACKGROUND OF THE STUDY:**

The term Information Technology is made up of two words, information and technology. Information is processed data with a meaning or an organized, meaning and interpretation of data. On the other hand technology is human using objects (tools, machines system, and materials) to change the natural and human-made-environment. Today Information Technology (IT) has become a major driving force in almost every country. This is because IT has given solution across sectors (be it agriculture or manufacturing sector), re-organised firm level behavior, empowering individuals by providing more information and is increasingly becoming an important tool for national and rural development.

Over the last few years it has been seen that Indian economy has shifted from an agricultural dominating economy to a service dominated economy where Information Technology plays an important role. Today, service has turned to be the most prominent sector of the Indian Economy contributing to 59 percent of India's GDP and the second largest employer after agriculture. India's trade in services has been consistently on a rise from 0.6 percent in 1990 to 1.0 percent in 2000 and further to 3.3 percent in 2011, and the services sector accounts for the largest share in FDI in flows in India. This tremendous growth of service sector has been mainly driven by the information technology and information technology-enabled services.

Today every industry such as, banking, financial services, retail, media, pharma, automobiles, manufacturing, telecom, hospitality, etc. depends on the IT sector. Technology and software solutions have become a part of all companies, government bodies, start up firms and small and medium enterprises. Newly emerging trends and technologies like cloud computing, mobile applications, social media and data analytics have given rise to new opportunities in this sector.

#### **1.2 CONCEPTUAL FRAME WORK:**

Information Technology (IT) is the application of computers and telecommunication equipment to store, retrieve, transmit and manipulate data. (Daintith, 2009) The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephone. Various industries such as computer hardware, software, electronics, semiconductors, internet, telecom equipment, e- commerce, computer service etc are associated with information technology. The Information Technology Associate of America (ITAM) defines information technology as:

"The study design, development, information, support or management of computer based information systems, particularly software applications and computer hardware". Thus IT is a system for storage, processing and dissemination of information based on computer and telecommunication technology.

#### **1.3 THEORETICAL BACKGROUND:**

Information Technology (IT) has played a special role in growth and development of a country. This can be studied through a growth model General Purpose Technology (GPT) developed by Bresnahan and Trajtenberg in the year (1996). In the traditional growth approach, the primary force behind economic growth is the accumulation of conventional inputs such as labour and capital. Today, however, many macroeconomists consider technological progress as the prime factor for economic growth and they viewed it as an incremental progress. This shift is mainly due to development of new theoretical aspects which allow researchers to link microeconomic aspects of the innovation process with macroeconomic outcomes. A few economists have emphasised on the role of drastic innovation- those that affect the entire economic system. They are concerned with the type of drastic innovation called General Purpose Technologies (GPTs). (Elhanan Helpman, 2003)

GPTs are the technologies which have the potential to transform both household life and the ways in which a firm conducts its business. It can lead to far-reaching changes in such social factors as working hours and constraints on family life. Steam Engines, Railways, Electricity, Internal Combustion and Information Technology (IT) are often categorised as GPTs for this reason. They can affect the whole economy. Bresnahan and Trajtenberg pointed out that a GPT should have the following three characteristics:

- Pervasiveness The GPT should spread to most sectors.
- Technological dynamism The GPT should have inherent potential for technical improvements and , hence should keep lowering the costs to its users.
- Innovation spawning The GPT should make it easier to invent and produce new products or processes.

All these three characteristics of GPTs are well fitted in case of Information Technology.

Now we give a few studies where this model has been applied.

A study made by Hailin Liao and Tom Weyman- Jones in 2016 on "ICT as a greneral purpose technology: The productivity of ICT in the United States revisited' investigates and reveals the multi-facets of ICT productivity in the US. By developing a two- level frontier- efficiency model they proved that ICT investment does contribute to productivity but not in the usual manner. They find a positive (but lagged) ICT effect on technical progress. They also find that capacity to learn from the embodied new technology was also crucial.

Another study made by Boyan Jovanovic in 2005 on "General Purpose Technology" analyzed how the US economy reacted to the creation of two GPTs with reference to the electrification (from 1894 until 1930) and IT (from 1971 until the present) eras. The study found that in both electrification and IT eras, productivity growth tended to be lower than it was in other periods and both GPTs were widely adopted, improved as they were adopted, spawned innovation and were accompanied by a rise in creative destruction.

In Indian economy also, we have seen that the IT industry has become a growth engine for the economy contributing the highest relative share in national GDP ie. 9.3 percent, largest share in total services exports i.e 45 percent and highest Foreign Direct Investment sector (USD >7 billions including USD 5 billion start up investment). This phenomenal growth has a multiplier effect on the economy and it is more significant in sectors like education, tourism, banking, agriculture, health,

transportation, entertainment, etc. In our research work, this impact is studied through use of IT in agriculture and in banking.

#### **1.4 IMPORTANCE AND ROLE OF INFORMATION TECHNOLOGY:**

Economic history shows that information technology is an enabler of growth, development and modernization for both developed as well as developing countries. For developed countries IT is crucial to continue innovating in their process and to maintain their competitive advantage. Equally for developing countries IT is important to leapfrog to higher stages of development and fostering economic and social transformation. All over the world IT has empowered individuals with unprecedented access to information and knowledge, thereby increasing access to education and markets for doing business as well as enhancing social interaction both within and across borders. Moreover by increasing productivity and therefore economic growth in developing countries, IT can play a formidable role in reducing poverty and improving living conditions and opportunities for the poor. In this challenging times of global economic crisis, IT can play a critical role not only in facilitating countries 'recovery but also in sustaining national competitiveness in the medium to long term (Global Information Technology Report, 2006-07).

Thus we see that IT can play three types of role in an economy viz initiators, facilitators and enablers. This is shown in the following figure:-







In this figure interpretation of IT as an initiator is a starting point of business in which IT starts an establishment. New operations begin as a result of the use of new IT. Then, new operation may lead to a new product innovation in which IT becomes a facilitator. IT is interpreted as an enabler when it gives the necessary support to accomplish things.

In the growth and development of an economy, IT can play the following fundamental roles:

- improve productivity by reducing transaction costs.
- provide instance connectivity voice, data, visual thereby improve efficiency, transparency and accuracy.
- offer more choice in the market place and enlarge the geographic scope of potential market.
- > channel knowledge, innovation, and new products and services.
- substitute for other, more expensive means of communicating and transacting, such as physical travel.

Above attributes support that IT have played an important part in micro and macro level growth. In both developed and developing countries, investment in information technology, telecommunications, and mobile telecommunications have shown significant positive impact on GDP (Ahmed, Nadim, Paul Schreyer, and Anita Wolfe, 2004). Again a report published by Information Technology and Innovation Foundation on Digital Prosperity- Understanding the Economics Benefits of the Information Technology Revolution in 2007 states that investment in information technology and telecommunications hardware, software applications and services turns out to be a powerful driver of growth, having an impact on productivity three to five times that of non-IT capital (*e.g.*, buildings, machine)

The NASSCOM-crisis report (2007) calculated that "Every rupee spent by the IT-ITES sector (on domestically sourced goods and services) translates into a total output of INR2 in the economy: Also for every job that is created in this sector, four jobs are created in the rest of the economy."

Similarly at the micro level, a survey made by World Bank on 50 developing countries reports that "firms using ICT see faster sales growth, higher productivity and faster employment growth." The attributes mention above are also important for individuals in expanding economic opportunity, enabling them to increase their knowledge and skills, select better paying jobs, manage their own income and business more wisely and efficiently and identify broader market for their goods and services (Kramer,Jenkins and Katz, 2007).

The following figure shows how IT can lead an economy to the path of prosperity



Fig. 1.2 : The Path from information technology to prosperity

Source: Report on Digital Prosperity-Understanding the Economic Benefits of Information Technology Revolution , 2007

Thus a digitally –enabled economy is responsible for generating the lion's share of economic growth and prosperity.

#### **1.5 CLASSIFICATION AND SALIENT FEATURES :**

IT industry can be broadly classified into three segments:

- IT SERVICES and SOFTWARES
- ITES (INFORMATION TECHONOLOGY ENABLED SERVICES), and BPO (Business process Outsourcing)
- HARDWARE

IT services are professional services that are performed by enterprises in the creation, management and optimization of or access to information and business processes. According to business requirement, IT services are delivered, ranging from basic internet connectivity to organization Software application. Software development, integration and management, Mobile services, Web development, Information Security (IS), Networking integration etc are included in the IT Services. Now-a days, the terms Software as a Service (SaaS) is common among industrialists, provides a way to deliver a service, to reduce human effort and increase work efficiency.

Involvement of IT in various fields like finance and banking, insurance telecommunication etc give rise to a form of outsourced service called ITES. In the ITES, requirement of IT is not hardcore like IT Services. Moreover ITES not only include outsource services, any services operated by information technology are included in ITES, such as modern security and attendance system. ITES has also a part called Business Process Outsourcing (BPO), the latest development in ITES field. In BPO, the secondary business activities and functions are given contract to a third party provider. Payroll, human resources accounting and customer/ call center relations are included in BPO.

The third category of IT industry is Hardware segment which comprises computer repair services, laptop services, desktops, servers, routers, firewalls, switches, printers and more.

Features of the IT:

IT industry has the following features-

- Information technology industry is characterized by high economics of scale.
  The marginal cost of each unit of additional software or hardware is insignificant compared to the value addition that results from it.
- IT industry is a knowledge intensive industry.
- IT industry can help the economy to achieve a rapid pace of growth as it utilizes skilled professionals.
- In the growth process the IT industry helps many other sectors.

#### **1.6 RATIONAL OF THE STUDY**

Information Technology can have a significant impact on the economy of Assam as it provides economic opportunities to both urban and rural population. When we analyse the issues of industrial development of the state the most crucial hurdle encountered is the geographical isolation and transportation bottleneck. But IT industry is such an industry, which defies geographical isolation and surface transport bottlenecks: It requires qualified manpower and proficiency in English, both of which Assam has in abundance. Therefore, the establishment of IT is very relevant in Assam. Moreover in a state like Assam, where unemployment, poverty, rural development are the core issues to address, the development of IT industry has a paramount importance. Besides facilitating the production process, information dissemination through ICT tools is critical to improvement in human welfare, education, health and the empowerment of under-represented groups. For example, the majority of poor people in developing countries are not just poor because they lack the essential resources in life. In many cases, the people are poor and continue to be so because they lack access to information about income-earning opportunities, existing market prices for their produce and also lack the knowledge about local institutions that shapes their lives (Marker et. al.2002). In such situations, the growth of IT industry can contribute to poverty reduction by improving poor people's access to market and institution, education, health, government and financial services.

In spite of having potentialities and incentives for the growth of IT industry in Assam, the share of Assam in the growth of IT Industry is not very significant. The present study focuses on these issues i.e. the potentialities and present statues of IT in Assam along with the problems associated with this industry. This study will also help to analyse the impact of information technology on other sectors of the economy in respect of agriculture and banking. Although there are a few research works in the field of IT and its allied subjects in the technical and scientific domain, but there has been no systematic study on how IT is impacting different sectors of the economy in Assam, specially in agriculture and banking sector. Thus the present study helps to find out how IT is impacting different sectors of the economy specially agriculture and banking and provide information to the government and non government organisations about its effectiveness in caring out the business of agriculture and banking. The problems are identified and suggestions given for increasing use of IT tools and services in the respective sectors will be of great help for policy makers so that IT can provide opportunities for both urban and rural people of Assam.

#### **1.7 OBJECTIVE OF THE STUDY:**

The present study has the following objectives

- To look into the overall growth of IT industry in India as well as in Assam.
- To analyzed the impact of Information technology on the agricultural sector
- To study the impact of Information technology on the banking services
- To identify the constraints faced by the people using IT tools and services in the study area in these two sectors.

#### **1.8 RESEARCH QUESTIONS:**

- Do farmers use ICT<sup>1</sup>s for accessing agriculture related information?
- Does use of ICT improve agricultural productivity?
- What are the factors that influence farmers to choose ICT as a source of agricultural information?
- Dose IT adoption in banks makes banking services available to customers more convenient.

#### **1.9 METHODOLOGY OF THE STUDY:**

This section basically describes methods and techniques of research used in the study. It deals with the following sub heads.

<sup>&</sup>lt;sup>1</sup> In this research work IT and ICT is interchangeably used as ICT covers all forms of computers, networks, information etc that IT covers and also gives extra focus on all forms of communication including telephony, mobiles, wireless networks, both hardware and software, other enterprise software, audio visual systems that enables movement or manipulation of data

- Research Design
- Data Source
- Study Area
- ✤ Sampling Procedure
- ✤ Analytical Frame Work
- Instrument for Data Collection

#### **1.9.1 Research Design**

The 'Expost-Facto Design' is considered for this study because it is a systematic empirical study where all the events have already taken place i.e. the researcher has no control over the independent variable (Kerlinger, 1996).

#### 1.9.2 Data Source

The study is based on both primary and secondary data. Information regarding various aspects of the study is collected from different secondary sources.

- Data regarding status of IT in Assam are collected from the state IT dept., AMTRON, STPI Guwahati.
- Data relating to growth and performance of IT industry in India are collected from NASSCOM, Indian Journal of Information Technology, Indian Journal of Science and Technology, various issues of Yojona, census report 2011, TRAI etc.
- Websites of NASSCOM, World bank e- library, India Brand Equity Foundation and Wikipedia are used for data relating to issus of national and international perspectives of IT industry.

The general and socio economic information of the state and the study area are collected from the statistical hand book of Assam and the Economic Survey of Assam.

#### 1.9.3 Study Area

**Kamrup Metro** has been selected for the study and is description is given below.

Guwahati city is the administered headquater of Kamrup Metro covering majority area of the district. Guwahati is also known as the gate way to the north east. Being the nerve of the North Eastern States the city is well connected by air, road and rail and has become the hub of industrial and commercial activities not only for Assam but also for entire North Eastern part of India. It is also being contemplated to be the future gateway of India's trade linkage with South East Asia.(Nayan Barua and Monalisa Choudhury, 2001). As such, most of the IT centric business and the infrastructure needed for IT growth are favourable here. Among the 89 registered IT units under industry department of Assam, most of the well functioning IT business units eg. 67 are available in Guwahati city. According to 2011 census, the population of Kamrup Metro is 1,253,938 of which male and female are 647,585 and 606,353 respectively. The density of population is 1,313 per sq. km. Total GDP of the city is \$1.5 billion. Literacy rate of the people is 88.71% where male and female literacy are 92.13 and 85.07 respectively.

#### **1.9.4 Sampling Procedure**

For the purpose of the evaluating the impact of IT on agriculture, we have selected two Community Development Blocks of Kamrup metropolitan, Dimoria and Rani. Dimoria is selected because it is the largest block of Kamrup metro and has the highest production of rice in Assam. The reason behind the selection of Rani block is that it is the 2<sup>nd</sup> largest Community Development Block of Kamrup metro. From these blocks, two villages of each block, Maloibari and Tatalia from Dimoria block and Khena Ali bari and Dharapur from Rani block is selected. The total number of households in all the four villages is 5740. Maloibari has 1020 households, Tetalia has 200, KhenaAlibari has 220, and Dharapur has 4300 households. From these households 5 percent of people ie 200 people enagaged/or involved in agriculture have been selected randomly as sample.

To analyse the impact of IT on banking services, we have selected two branches of SBI, namely Noonmati branch and Gauhati University branch. These two branches are selected as they are quite big branches offering almost every IT banking products & services and serving to a larger segments of the heterogeneous customers base. The total number of customers in both the branches is more than 10,000. The target population is customers and IT officers of these two branches of SBI. This group is targeted because the researcher believed that they could provide the required information to answer the research questions.

To determine the sample size, Lehmann (1989) points out that sample sizes, which have been used by others conducting similar studies in the past is an acceptable approach. Again 'Alreck and Settle (1995:63) mentioned that "For population of 10,000 and more, most experienced researchers would probably consider a sample size between 200 and 1000". Therefore in this research work, to analyze the impact of IT on banking, 250 bank customers and two IT officers are selected from the said branches and taken as sample size.

#### **1.9.5 Analytical Framework**

To analyze the different objectives, we have used both primary as well as secondary data. First objective is analyzed by secondary data; the other three objectives are analyzed by considering both primary and secondary data .In addition to this, to solve the research questions different statistical tools and economic methods are used such as percentage method, 5 point Liker Scale, Focus Group Discussion, Chi Square method, Co-relation co- efficient, Regression analysis and Garret ranking technique.

To analyze the impact of IT on agriculture, six focus group discussions are conducted in the four villages of the two community development block. Chi-square test and corelation co-efficient is applied to find the association between ICT as a source of information and the different socio – economic characteristics of the respondent.

In order to access the perception of banking customers in Guwahati with respect to the banking services rendered, five point liker scale is used and the information will be analyzed and interpret with the help of regression. Demographic profile of the bank customers are analyzed by simple percentage method. The relationship between the demography profile of the customers and type of service (ie mobile banking, Internet banking, branch visit) and frequency of use these services are tested with chi-square test.

Lastly, Garret ranking technique is used to find out problems faced by the people while using ICT tools in the study area. This technique has been explained in the chapter 6.

#### 1.9.6 Instruments for data collection

Questionnaire and interview methods are used for collection of data, Interview method is used to collect information regarding what type of IT services are available to the customers from the IT officers of the respective banks.

Two appropriate questionnaires have been prepared. One is constructed for collecting the information regarding people who have used ICT tools in agricultural activities and  $2^{nd}$  is constructed for customer of the banks who have used IT banking services in their day to day banking transaction. In the banking sector, the study has been analysed from the point of view of customer association with banking activities.

#### **1.10 POLICY IMPLICATIONS**

The proposed study will highlight the present status of information technology in Assam in comparison to other states of India. It will analyse the impact of IT on the economy of Assam through the use of IT in agriculture and banking sector.

In the agricultural sector, how IT will impact on different stake holders of agriculture and what factors motivate them to use IT as a source of agricultural information are analyzed by this study. Types of government policies likely to help farmers to use ICT in agricultural productivity improvement in the study area will also be analyzed by this study.

Again the study analyzes the perception of customers of SBI in Gauhati towards the IT introduction in banks and provides necessary measures to grab all type of customers (young to old) in their transformation strategies.

Further the study will analyze the problems of farmers and customers not using IT in agriculture and banking respectively.

Thus this study provides information to the government and NGOs about the growth of this industry and its impact on other sectors of the economy in respect of agriculture and banking. This is expected to be immense help for policy makers to formulate necessary and suitable plans and policies, so that IT can provide opportunities to both urban and rural people of Assam. IT can be a strategy for rural development in Assam as is seen in the other states of India.

#### **1.11 CHAPTERISATION**

The study consists of seven chapters

Chapter-1: Introduction:-

- a) Background of the study
- b) Conceptual frame work
- c) Theoretical background
- d) Importance and Role of information technology
- e) Classification and Salient features of IT industry
- f) Rationality
- g) Objectives
- h) Research Questions
- i) Methodology
- j) Limitation of the study

Chapter-2: Review of literature:-

- a) Meaning and evolution of Information Technology
- b) Importance of IT in an economy

c) IT industry in India as well as in Assam

d) Information technology and Agriculture

e) Information technology and Banking

f) Constraints of IT sector

g) Research gap

Chapter-3: Status of IT industry:-

a) Status of IT industry in India

b) Status of IT in Assam.

Chapter-4: Impact of Information Technology on Agriculture: -

a) Role of IT in agriculture

b) ICT initiatives for agriculture and rural development

c) Type of agricultural information required by the farmer

d) Information accessed through ICT sources

e) Impact of IT on different stake holders of agriculture

f) Factors motivating farmers to use ICT as a source of agricultural information.

Chapter 5: Impact of Information Technology on banking sector:-

a) Information technology in banking

b) Technology banking and reasons for its adoption by customers

c) Technological developments in Indian banks

d) Demographic profile of the customers

 e) An association between demographic profile of the customers and type of banking services (internet banking, mobile banking and branch visit) and frequency of use these services

 f) Factors influencing service accessibility of customers with the adoption of IT enabled system in the banks g) Benefits of IT services to customers.

Chapter-6: Problems of Information Technology:-

- a) The overall problems associated with the growth of IT in Assam
- b) Problems associated with ICT application in agriculture
- c) Problems associated with ICT application in banking

Chapter-7: Summary of the findings and conclusion:

- a) Major findings
- b) Policy implications
- c) Conclusion.

#### **1.12 LIMITATION OF THE STUDY**

As the study is made for academic purpose and the researcher alone carried out the whole survey process therefore certain limitation such as limitation on time, resources etc are in the study. Again the study is based on the opinion of the uneducated rural farmers who do not have any records of harvest and marketing transaction.

For evaluating the impact of IT on banking, the study examines only the IT adoption of customers of SBI and the scope covers Kamrup metro area. Further unwillingness on the part of most of the sample respondents for spending more time for interview, also limited the scope of the study.

In addition to these, this study analyze the impact of IT by considering only two sectors – agriculture and banking. The other sectors of the economy are not considered here. So there is further scope for analyzing the impact of IT on the other sectors such as education, tourism etc. This may be considered another limitation of the study from the point of view of the researcher.
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# CHAPTER-2 REVIEW OF LITERATURE

#### **2.1 INTRODUCTION**

Literature Review is a process of reading, analysing, evaluating and summarising scholarly articles, books, and other sources relevant to a particular area of research or interest. It provides historical background for research, describes issues, debates, theories, concept and related research in the field and also identifies gaps or controversies in the literature and topics needing further research. Therefore in this chapter and attempt is being made to studies made so far on various aspects of Information Technology.

#### 2.2 DIMENSIONS OF REVIEW OF LITERATURE

Dimensions of Review of literature studied on Information Technology and its impact on the economy of Assam are shown as below :

Serial No.	Dimension
1	Review on meaning and evolution of Information Technology
2	Review on importance of Information Technology in an economy
3	Review on India's Information Technology industry and Information Technology in Assam
4	Review on Information Technology and agriculture sector
5	Review on Information Technology and banking sector
6	Review on constraints in the Information Technology sector

#### 2.3 MEANING AND EVOLUTION OF INFORMATION TECHNOLOGY

Information Technology (IT) is the application of computers and telecommunication equipment to store, retrieve, transmit and manipulate data. The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephone. Several industries are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, e- commerce and computer service (Chandler and Rod, August 2012).

Humans have been storing, retrieving, manipulating and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC (Butler, Jeremy G, 2012)

In the year 1958 the term information technology appeared in an article published in the Harvard Business Review by authors Harold J. Lavitt and Thomas L. Whistler. In their definition, the meaning of IT is consists of three categories:

- Techniques for processing.
- Application of statistical and mathematical methods to decision making.
- The simulation of higher order thinking through computer programs.

Based on the storage and processing technologies employed, it is possible to distinguish four distinct phase of IT development. The first phase is pre-mechanical Age (3000 BC- 1450 AD). In this phase writing and alphabets-(communications), paper and pens (input technology), books and libraries (permanent storage device) and first numbering system and calculators called abacus were invented. The second phase

is Mechanical Age (1450-1840). The first general purpose computers, slides Rules, Pascalline and Leibniz's Machine, Babbage's Engines etc. were the invention of these age. The third phase is the Electro mechanical Age (1840-1940). The discovery of ways to harness electricity was the key advance made during this period. Knowledge and information could now be converted electrical impulses. The beginning of telecommunication, Voltaic battery, telegraph, Morse code (dots and dashes), telephone and radio are the main items that had been discovered in this period. The fourth phase of IT development is the Electronic Age (1940-present). The significant developments of this period were Vacuum tubes, Electronic Numerical Integrator and Computer (ENIAC), the Electronic Discrete Variable Computer (EDVAC), Electronic Delay Storage Automatic Calculator (EDSAC) and Universal Automatic Computer (UNIVAC).

An alternative way of analysed the evolution of IT can be done from the specific contribution of technological inventions and advances to the industry's key growth driver; digitization and the resulting growth in the amount of digital data created, shared and consumed.

Until 1980's all computer –related activities revolved around interactions between a person and a computer .The PC was simply a stream of personal productivity applications that in turn contributed to the growth of enterprises' data and the start of digitizing leisure-related , home-based activities. The major qualitative leap occurred only when work PCs were connected to each other via Local Area Networks (LANs) and then long-distance via Wide Area Networks (WANs) which makes the entire process digital and increased the amount of data created, moved and consumed. All these developments not only increased the amount of data generated but also led to

new ways of getting value out of it. This in turn changed the nature of competition and gave rise to new horizontal players in the industry. Thus in the 1990's decade we have seen Intel in semi-conductors, Microsoft in operating systems, Oracle in databases, Cisco in Networking, Dell in PCs and EMC in storage as the specialized IT vendors. The next phase in the evolution of IT industry came with the invention of the World Wide Web. While computer networks took IT from the accounting department to all corners of enterprises, the World Wide Web took IT to all corners of the globe, connecting people. (Gil Press, 2013).

#### 2.4 IMPORTANCE OF IT IN AN ECONOMY

Economic history shows that IT is an enabler of growth, development and modernization for both developed and developing countries. IT can play an important role in economic development through increased productivity in almost every sector of the economy. The most suitable example of the same is the resurgence of the American economy since 1995. The diffusion of information technology and telecommunications, hardware, software and services create a major driver of growth, thereby increasing productivity of labour three to five times that of non-IT capital (such a buildings and machines). It had been seen that during 1995-2002, IT boosted two-thirds of total factor growth in productivity in the United States. (Robert D Atkiuson and Andrew S Mckay, march 13, 2007). According to Greenspan, (2000), IT has produced a fundamental change in the US economy, leading to a permanent improvement in growth prospects. Jorgenson (2001) also argues that the development and development of IT is the foundation of American growth resurgence. The decline in the prices of semiconductors without stop and thus IT equipments has steadily increased the role of IT investment which is a source of American Economic growth.

This new technology has enhanced quality of life from health care to education, to giving consumers more convenience, while IT interacting with business and government, and to giving organizations greater opportunities and incentive to raise quality of products and services. It boosts economic output by allowing more people to work, including disable people, part-time workers and those people who work from home.

IT as a general-purpose technology, introduced by Bresnahan and Trajtenberg (1995) can influence the national economy in a number of ways, such as creating employment opportunities, reducing poverty, providing universal health service, and delivering good governance (through e- governance). IT is not only important for emerging sectors such as ITES, biotechnology, pharmaceutical research, nanotechnology etc. but also crucial for strategically important sectors such as defence and intelligence, space research and development, weather forecasting and transportation.

IT is not only one of the fastest growing industries which has created millions of jobs but it is also an enabler of innovation and development. The five common economic effects of ICT are-

- 1. Direct job creation
- 2. Contribution to GDP
- 3. Emergence of new services and industries
- 4. Workforce transformation
- 5. Business innovation. (Elena Kvochko, April 11, 2013)

Developing countries are characterized by some obstacles such a geographical isolation, lack of competition and high prices for consumers, lack of information and low prices for producers, legal exclusion, political voice and social capital. To remove these obstacles and bringing these countries into the path of growth and development ICT plays a major role (William et al 2007). So the developing countries must recognize the role of IT and consider this new technology as a resource for development. The application of IT provides new ways to make the managerial and institutional resources of developing countries. If IT is used in the priority sector of developing countries, then larger benefits are likely to come. Therefore to respond to a rapidly evolving global environment of 1990s, the government of these countries, identified the role of IT in all levels of development and as such acted as a provider and user of information, facilitated information technology diffusion, provided information technology infrastructure and recognized their role in setting IT policies. They cannot ignore this new technology and consider it as a "second industrial development" (Nagy, 1991).

It also observed that the global information technology revolution of 1990s created a debate among development specialists and policy makers about the place of ICT in development. In this context, United Nations Secretary General, Koffi Annan observed in his Millennium Report that, "New technology offers an unprecedented chance for developing countries to 'leapfrog' earlier stages of development. Everything must be done to maximize their people's access to new information networks''. This view not only focuses on the potential benefits of ICT but also points out that in an increasingly globalised economy, once a country's fails to connect will fall further and further behind (James, 2003).

Thus, ICT acts as a vector of social development and transformation, which provides increased access to basic services, creates employment opportunities and increases connectivity. However, the Global Information Technology Report observes that digital divides exists within a country. In a country only a few population are benefitted from the ICT revolution and many of them are left behind because of their age, limited literacy, and lack of access or remoteness (The Global Information Technology Report 2015).

#### 2.5 INDIA'S IT INDUSTRY AND IT IN ASSAM

The Indian Information Technology and Information Technology Enabled Services (IT-ITES) industry has contributed a lot to the economic and social transformation of India since after liberalization. Today this industry has emerged as a powerful driver of growth for the economy. By contributing an increase in the G.D.P, urban employment and export, IT- ITES industry helps India to achieve the vision of a powerful and resilient country. Apart from its chief contribution to growth, this industry gave biggest employment generation and created a number of ancillary businesses eg. transportation, real estate, and catering and has produced a young consumer class with a high disposable income.(Muhit&Ubey, Aarti Gagg, 2014)

The year 1974 was traced as the year of Indian IT industry; as Tata Consultancy Services was asked to export programmers for installing system software for a US client. At that time Indian economy was state controlled and remained hostile to the IT industry. High tariffs eg.(135% for hardware and 100% on software) were imposed on IT industry and exporters were not getting finance from banks . But the introduction of New Computer Policy (NPC) of 1984, changed the condition of IT industry towards goods by reducing the import tariffs on hardware and software to 60%.

The arrival of the internet and establishment of Software Technology Parks of India (STPI) led to further growth of industry in India. Thereafter IT industry demands on EQQ (which stands for English language skills for engineers and higher Quantities of Quality engineers), which led India to have an advantage over Ireland (which had fewer programmers), China (which lacked engineers proficient in English), and the Philippines (which lacked qualified programmers). The Y2K problem of 2000, which created a global shortage of programmers, finally placed Indian IT companies into a position of world leadership. (Sowmyanarayanan Sodagopan, 2012)

The IT industry in India plays a dominant part in the country's economy and has played a key role in putting India on the global map. This can be gauged from the fact that its contribution to national Gross Domestic Product (GDP) has increased by many fold from 1.2% in 1997-98 to 7.7% in 2016-17.

The Indian IT industry is broadly categorised into four major segments- IT Services and software, ITFS-BPO, Software Products and Engineering Services, and Hardware segments. The IT services and software sector accounted for the largest share of the IT industry followed by ITES-BPO sector and Software and Engineering services. Although IT services and software generates more revenue than the other two segments, the ITES-BPO is emerging as the fastest growing segment. The service and software segment of IT industry in India is more robust than its hardware counterpart. The Hardware segment of the IT sector in India has not shown the same level of progress as experienced by the ITEs and software segment. It is also true that the hardware segment of the IT industry has not received the kind of government support received by its counterparts. Complications in the local indirect tax structure and high rates of excise and sale taxes have only added to the industry's woes (Sanjay K. Singh 2003).

The growth and development of India's IT industries are concentrated only on certain Metro Cities like Bangalore, Mumbai, Delhi, Chennai, and Hyderabad. These cities have become the favourite destinations for all the big IT giants like HSBC, Dell, Microsoft, Hewlett Packard and many Indian multinationals firms like Infosys, Wipro and Micro land have set up their offices in these cities. (G.V. Vijayasri, 2013).

The most important benefit given by IT industry in India is the creation of employment opportunities among all section of people. The other benefits that are derived from IT industry are export earning and foreign direct investment. Apart from these benefits, the IT industry in India has also created some indirect benefits to the country like balanced regional growth, growth in private equity and venture capital, high quality products and services and has boosted the country's image globally.

The Indian government has taken many measures to develop this sector. To boost up this sector, both central and state government has provided major fiscals incentives like liberalization of external trade, elimination of duties on imports of information technology products, relaxation of controls on both inward and outward investments and foreign exchange. Again setting up of Export Oriented Units (EOU), Software Technology Parks (STPs), Special Economic Zones (SEZ) and National Taskforce on Information Technology and Software Development have given various supports for growth and development of this industry (Rahul Chattopadhyay, October 2015).

Like other states of India, Assam is also leapfrogging in wholesale adoption of IT to reap the benefits of this new technology. The government of Assam created a separated IT department on 22<sup>nd</sup> August, 2003 to focus its thrust on the development of ICT in the State. There are some reasons which make Assam have a competitive advantage in IT compared to other regions. Some of them are - establishment of software technology park of India in Assam, the work force's proficiency in English, setting up of national technical institutions like IIT, IIIT, etc in the State, establishment of North East BPO promotion schemes.

Though the government of Assam introduced several IT policies to boost up this sector, in reality the state IT industry cannot give a visible foot print in the IT map of India. The major problems faced by this industry in Assam are: lack of physical and social infrastructure, lack of training and development infrastructure, less attractive destination for investment, non availability of talent and opportunities, and lacunae of government polices etc.

#### 2.6 INFORMATION TECHNOLOGY AND AGRICULTURE:

Investing in IT can facilitate effective flow of information in all sectors of the economy. Agriculture is not exceptional. Quality information always helps in improving efficiency in all spheres of agriculture. In most developing countries the need for information on agriculture arises from the following factors such as:

- In these countries agriculture plays a critical role in economic and social development.
- Food security and welfare issues are related with agricultural productivity.

• To avoid costly mistakes and lead to an increase in yields and improvement in quality farming, information on agriculture is needed (Janet Kaaya1999).

From an agricultural viewpoint potential of IT can be measured in two ways -

- (a) As a tool for direct contribution to agricultural productivity and
- (b) As an indirect tool for empowering farmers.

In developed countries, precision farming uses IT to make direct contribution to agricultural productivity. To increase agricultural output, the technique of remote sensing using satellite technology, GIS, agronomy and soil sciences are used.

For Indian farmers indirect benefits of IT are significant which will help them to take informed and quality decisions (Mittal, 2013).

In Indian economy, one third of the population live in agricultural sector and most of the rural farmers depend on the rain-fed agriculture and fragile forests for their livelihoods. They have to face a situation of failed crops, frequent animal illness and due to lack of communication facilities, solutions to their problems never come out. (World Bank, 2009). Though IT industry has emerged as a fastest growing industry in India, rural India is still lagging behind in access to ICT. Hence the national policy for farmers emphasized the use of ICT at village level to bring changes of the life of rural people. The service role of ICTs can increase rural communities' opportunities and bring changes to socio-economic conditions of the poor in backward areas. (Patel et.al, 2014).

Don Richardson (1996) pointed out five main areas where IT can be used for agricultural and rural development, which are -

- 1. Economic development of agricultural producer.
- 2. Community development.
- 3. Research and development.
- 4. Small and medium enterprises development.
- 5. Media networks.

To improve quality of life in rural areas, IT plays an important role by developing agricultural research, education, and extension. By giving relevant information regarding pre-sowing (like agro-inputs, credit, weather, soil testing), pre-harvest (good agricultural practices, pest management, techniques of harvesting, packaging), post-harvest (like past harvest management, storing, grading and standardization) and Market information (like alternative market channels, commodity prices, Mundy information, consumer behavior), IT can help an average Indian farmer.

From the perspective of Agricultural Information and Knowledge System (AKIS), ICT can be seen as a useful tool in improving linkages between research, farmers and agricultural extension system (Bolaji et.al,2007). Today agricultural extension mechanism is dependent on IT, which provides appropriate and location specific technology for the farmers. Not only to develop extension mechanism but also to expand agricultural research and education system, IT can be the best means. There are some key areas of agriculture and rural development such as crop forecasting, input management, common area management, watershed management, land and water resources development, drinking water potential mapping, precision management, natural disaster management, fishery management, hill area development and post harvesting management, where IT can play its imperative role (Chauhan, 2010).

Despite the high potential of IT to improve agriculture and rural development, there are various common problems in adoption of IT in rural areas. Some of them are ITC illiteracy, unaffordable accessibility and other issues such as a lack of awareness and willingness for adoption of new technology.[G . Kumar , and R.Sankarakumar 2012 ].

#### 2.7 INFORMATION TECHNOLOGY AND BANKING

Economic liberalization initiated since 1991, brings significant changes in the financial institution. Financial sector reforms and banking sector reforms together strengthen the economic reforms in India, where, IT has created transformation in banking sector by increasing the productivity, profitability and efficiency of the banks to a great extent.

With the introduction of Indian Financial Net in the year 1999, IT revolution appeared in the Indian banking sector. It was the payment system; first segment of banking sector benefited much from IT. After introduction of ATM, this segment was fully mechanized and further enhanced by the internet facilities. IT Act 2000 also opened a new vision for the Indian banking system. It gave legal recognition to creation, transmission and retention of electronic data.

In banking sector, first stage of IT was introduced to automate the banking process through mechanization. To speed up basic transaction, note counters and accounting calculators was used. In the next stage of IT, storage and retrieval of information was done. During late 1950s and 1960s punched card equipment was used for business data processing. Then in the 1970s, introduction of Information Technology Management System (MIS and Decision Support System (DSS) had been seen in the banking industry. In 1980s for business deployment, the fusion of telecommunication and networking technologies evolved and also saw the emergence of data processing, office information system (OIS) and personal computers (Ibikunel, F and James, O, 2012).

Various literature reviews reveals that ICT plays a negative role in banking sector by reducing efficiency and productivity. In this context, Solow (1987) noted that "you can see the computer age everywhere these days, but in the productivity statistics". Even though ICT has been considered one of the most essential factors in banking sector it cannot improve the bank's earnings (Shu and Strassmann 2005). As against these views many studies show also a positive impact of IT on banking sector in terms of productivity, cashiers' work, banking transactions, bank patronage, bank services delivery, customers' services and bank services (Balachandher et.al, 2001; Idowu et.al, 2002; Hunter, 1991; Whaling, 1995; Yasuharu, 2003). In utilizing Automated Teller Machines the interest of network effect is significant in banking industry (Saloner and Shpand 1995, Milne, 2006). Similarly ICT's influence on the profit and cost effectiveness of banking system shows a positive relationship between the ICT, productivity and cost savings (Kozak, 2005). IT and the complementary resources of the firm affects the effectiveness of the business processes. Technology is changing the ways business is done and creates new ways for doing the same work in the most cost effective manner. Tele-banking and internet banking plays such a role that branch banking leads to home banking (Rao 2002). This new technology has transformed the traditional banking system in to simple single key pressing technology, resulting in speed, accuracy and efficiency of conducting business (Bhasin, 2001). The development of worldwide networks has bought immense improvement in banking systems all over the world. It has reduced considerably the cost of global funds

transfer. Banks that are using ICT related products, show good quality customer services delivery with less effort (Berger, 2003). The ICT products that are selected as most important banking purposes and are being adopted by the banks are ATMs, Electronic Fund Transfer (EFT), smart cards, telephone banking, computerized credit rating, point of sales system, electronic home and office banking and electronic data exchange. (Agboola, 2006). Similarly the use of ICT in banking has revolutionised some bank services such as account opening, customer account mandate and transaction processing and recording (Irechukwee 2000).

Customer service delivery is an important aspect in the banking industry and its implementations and evaluations is a very complex process. Long lines, limited time for customer servicing, transaction errors due to the banks' personnel, excessive bureaucracy etc. are the most common problems in using banking services. But introduction of IT in banks allows customers to access their banking accounts from any place and at any time. As a result, customers are able to manage their finances properly and in a more convenient way. Technology in banking services offer relative advantages to customers when compared to branch banking and other alternative channels in terms of price, convenience and performance (Suki 2010). As ICT has lowered information costs, customers are able to compare portfolios of investment between banks or even invest directly. Hence the reason why the banking sector is among the most intensive in deploying ICT (Shoebridge, 2005). ICT can make banks able to service customers not only in branches and other dedicated servicing sites but also in domiciles, work places and stop and shape stores as well as in a myriad of other channels(Al-Hawari et al 2005). However, the increasing development of ICT in financial transactions reduces the contact between bank and customers.

Though ICT creates unprecedented opportunities for the banking sector it also brings many challenges such as the innovation of ICT applications, the blurring of market boundaries, the breaching of industrial barriers, the entrance of new competitors, and the appearance of new business models.

As the amount of product and services offered by technology grows rapidly, there is a growing concern among customers about security and privacy issues. Lack of privacy and security and lack of trust in Web Systems are found to be important obstacles to the adoption of technology in banking sector (Sathye, 1999, Ratchanakitumnuai and speece, 2003). Apart from these, lack of comfort with computer technology, either due to lack of awareness or age factor is another hurdle that ICT has not been accepted warmly by consumers. Lastly banks themselves are unable to construct successfully the required contents of electronic banking environment for consumer.

#### 2.8 CONSTRAINTS IN IT SECTOR

Though India is still a major brand name in the global IT and ITES sector, the IT sector in India faces many challenges now a days. In the IT sector the model of services providing and operation which is popularly known as ADM (Application, Development and Maintenance) is becoming old and obsolete. So it is imperative that the sector resorts to the new model of "Outcome based billing" and fixed contract based services. Moreover the Indian IT industry has not gone in the new emerging trends like Social, Mobility, Analytics and Cloud (SMAC ). Again India's fame in low cost IT export is gradually shrinking as there is a stiff competition from China, Philippines and Eastern Europe. These countries are also proving to be low cost and competitive countries in respect of IT software export. A declining talent pool in our

country is another factor which has largely affected the IT sector. The number of employable graduates in the business sector is as low as 10 % to 15 % while that of qualified and employable engineers is 26% only.

The big IT giants like IBM and Accenture started their own centres in India. This also hinders the Indian IT industry because they use the same workforce as that of the Indian IT sector.

Again it is also found that the proposal of Indian government for the development of their 2-tier and 3-tier cities has not come up. So the entire IT sector has stagnated in the nine major cities, which again has created difficulties for the IT sector. Fund shortage is another problem which affects the medium and small IT enterprises. These enterprises need a basic financial push for their start-up.

As regard to software section of IT industry, the natural question that arises is that despite having India's potential on software development, why India does not diversify production and scale of software packages. The various constraints faced by Indian software industry can be broadly classified into four groups: infrastructural constraints; regulatory constraints; risk elements; and marketing and distribution related constraints. All these constraints together are responsible for keeping Indian software developers from venturing into the packaged software market.

#### 2.9 RESEARCH GAP

The review of existing literature done shows the importance of IT in all sectors of the economy. Starting from the introduction and evolution of IT, it has covered different sectors within a very short period of time. The benefits of IT are many. The present

study does not look into the growth of IT in Assam's economy; rather it tries to see the acceptability of people towards IT services. Assam (and north–east India) being one of the backward regions of India, we try to see whether the population of this state has been able to adapt to the IT industry. The two sectors chosen for study are – agriculture and banking. The agricultural sector has been considered because Assam is predominantly an agricultural state. The reason for choosing the banking sector is that it is the fastest growing service sector and caters to the needs of all people (rich or poor). The State Bank of India, as is well known, is the most popular bank, with its branches spread in all nooks and corners of the state.

Thus, this study is purely about the use of IT tools and services by the people in the two dominant sectors of the state's economy.

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# CHAPTER 3 STATUS OF IT INDUSTRY

#### **3.1 INTRODUCTION**

The Information Technology and Information Technology Enabled services (IT-ITeS ) industry in India is a major part of the country's economy and has played a key role in putting India on the global map. The industry has increased its contribution to India's GDP from 1.2% in 1998 to 7.7% in 2016 and continues to remain the highest impact sector for India among all industries with 8.1% relative industries share in national GDP. It also gives direct employment to 3.1 million people and has occupied fourth largest position in engaging urban women employees. Hence the industry has contributed a lot to economic and social transformation in the country. Apart from its chief contribution to growth, this industry gives biggest employment generation and has created a number of ancillary businesses eg. Transportation, Real Estate and Catering and has produced a young consumer class with high disposable income (Muhit and Ubey, Aarti Gagg, 2014).

In this chapter we will analyse the various aspects of IT industry in India like growth, composition, revenue, exports, size and share, localization etc. We will also discuss employment opportunities created by this sector and steps taken by government of India for promotion of this industry. Along with these, IT scenario of Assam will also be studied.

The year 1974 was traced as the year of Indian IT industry; as Tata Consultancy Services was asked to export programmers for installing system software for a US client. At that time Indian economy was state controlled imposing high tariffs on both hardware and software, eg.(135% for hardware and 100% on software ) and exporters were not financed by banks. But the introduction of New Computer Policy (NPC) of 1984, changed the condition of IT industry towards goods by reducing the import tariffs on hardware and software to 60%.

The arrival of the internet and establishment of Software Technology Parks of India (STPI) led to further growth of industry in India. Thereafter, IT industry demands on EQQ, (which stands for English language skills for engineers and higher Quantities of Quality engineers) which led India to have an advantage over Ireland (which had fewer programmers), China (which lacked engineers proficient in English), and the Philippines (which lacked qualified programmers). The Y2K problems of 2000, which created global shortage of programmers, finally placed Indian IT companies into a position of world leadership (Sowmyanarayanan Sodagopan, 2012).

This evolution of Indian IT industry can be studied in four phases as shown in the following figure 3.1. In the first phase high import duties were imposed on IT industry and execution of lower end services by a few number of players. In this phase we also see a modest beginning in software exports. In the second phase import duties were gradually reduced leading to growth in exports and formulation of Software Technology Parks (STPs) gave another milestone for growth of IT in India. Third phase is characterised by offshore provisioning of services and formulation of Overseas Development Companies by Multi National Companies. In the fourth phase Indian firms established their credibility all over the world and led to steadily Indian ITES-BPO sector maturing.



[Source : D & B Industry Research Service]

Figure 3.1 : Evolution of Indian IT-ITeS Industry

#### 3.2 INDIA'S GDP AND IT SECTOR

The IT industry in India plays an important part in the country's economy and has played a key role in putting India on the global map. This can be gauged from the fact that its contribution to national gross domestic product (GDP) has increased by many fold form 1.2% in 1997-98 to 6.1% in 2009-10 shown in the following table 3.1.

Years	GDP Growth	IT Growth	%age share of IT
	(USD Billion)	(USD Billion)	Industry in GDP
1997-98	411.570	5.0	1.2
1998-99	440.597	6.0	1.4
1999-00	461.914	8.2	1.8
2000-01	473.050	12.1	2.6
2001-02	494.997	13.4	2.7
2002-03	573.167	16.1	2.8

Table 3.1 : Growth of India's GDP and Information Technology Industry

2003-04	669.442	21.5	3.2
2004-05	783.141	28.2	3.6
2005-06	877.224	37.4	4.3
2006-07	1098.945	47.8	4.3
2007-08	1232.946	64.0	5.2
2008-09	1150.0	69.4	6.0
2009-10	1198.36	73.1	6.1

Source: (i) www.adb.org.,

(ii) www.nasscom.org.

The table shows that in year 1997-98, India's GDP was US \$ 411.570 billion, the growth of IT sector was US \$ 5.0 billion, and the percentage share of IT industry in national GDP was 1.2 %. After thirteen years it is seen that its contribution to national GDP has increased to 6.1 billion.

This tremendous growth has been facilitated by the number of factors such as

- ✤ Abundant human capital
- Relatively low cost of technical labour
- Contribution of IITs and other leading engineering colleges in India
- Creation of global household brands
- Special attention to technology based industries and R&D by government
- Foreign Investment in information technology industry
- Entrepreneurial culture
- \* The legal system in India is relatively simple and clear procedure
- Reverse brain drain
- Reasonable technical innovations
- Strong tertiary education

- Government support and policies
- The quality inherent in the Indian information technology and business process industry is excellent. Various quality control and process management tools are used to improve the quality and to establish credibility.
- Familiarity with English language (India has the second largest pool of English speaking scientific professionals in the world. It is second only to the USA).

(Source : www.nasscom.org).

#### 3.3 COMPOSITION OF INDIAN IT INDUSTRY

The Indian IT industry is broadly categorised into four segments- IT Services and software, ITFS-BPO, Software Product and Engineering Services and Hardware segments. The following table 3.2 shows the percentage share of these four segments of IT industry into the national GDP. It has been seen from the table that IT services and software continues to remain the key contributor to the IT sector's revenues during the period. Although IT services and software generates more revenue than the other two segments, the ITES-BPO is emerging as the fastest growing segment which is also shown in the given table. Again in the FY 2013, the market size of IT Services and Software segment accounted for US \$ 56.3 billion, followed by ITES-BPO, (US \$ 20.9 billion) and Software Products and Engineering Services (US &17.9 billion). The market size for Hardware segment was US \$ 13.3 billion during FY 20012.

USD BILLION	2003	Total %	2004	Total % age	2005	Total % age share	2006	Total % age	2007	Total %	2008	Total % age	2009 (E)	Total % age share
		age share		share				share		age share		share		C
IT	<b>9.9</b> 7	.1 <b>61.6</b>	10.4	48.2	13.5	<b>48.1</b> 35.6	17.8	47.6	23.3	48.7	31.0	48.4	<b>35.2</b> 26.9	<b>49.1</b> 37.5
Services &	(71.7) 2	.8 44.1	7.3	33.8	10.0	12.5	13.3	35.6	17.8	37.2	23.1	36.1	(76.4) 8.3	11.6
Products -	(28.2)	17.5	(70.2)	14.4	(74.1)		(74.7)	12.0	(76.4)	11.5	(74.5)	12.3	(23.6)	
Exports -			3.1		3.5		4.5		5.5		7.9			
Domestic			(29.8)		(25.9)		(25.3)		(23.6)		25.5			
ITES-	<b>2.7</b> 2	.5 <b>16.8</b>	3.4	15.8	<b>5.2</b> 4.6	<b>18.5</b> 16.4	<b>7.2</b> 6.3	19.3	9.5	19.9	12.5	19.5	<b>14.8</b> 12.8	<b>20.5</b> 17.9
BPO -	(92.6) 0	.2 15.5	3.1	14.4 1.4	(88.5)	2.1	(87.5)	16.8 2.4	8.4	17.6	10.9	17.0	(86.5) 1.9	2.6
Exports -	(7.41)	1.3	(91.2)		0.6		0.9 12.5		(88.4)	2.3	(87.2)	2.5	(12.8)	
Domestic			0.3		(11.5)				1.1		1.6			
			(8.8)						(11.6)		(12.8)			
Engineeri	NA N	A NA	2.9	13.4	<b>3.9</b> 3.2	<b>13.9</b> 11.4	<b>5.3</b> 4.0	14.2	6.5	13.6	8.6	13.4	<b>9.5</b> 7.3 (76.8)	<b>13.4</b> 10.2
ng	NA	NA	2.5	11.6 1.9	(82.1)	2.5	(75.5)	10.7 3.5	4.9	10.3	6.4	10 3.4	2.3 (24.2)	3.2
services		NA	(86.2)		0.7		1.3		(75.4)	3.3	(74.4)			
and R&D,			0.4		(17.9)		(24.5)		1.6		2.2			
software			(13.8)						(24.6)		(25.4)			
products -														

## Table (3.2): COMPOSITION OF INDIAN IT INDUSTRY

Exports -														
Domestic														
Total	<b>12.6</b> 9.6	78.3	16.7	<b>77.6</b> 60	22.5	<b>80.1</b> 63.0	30.3	81.0	39.3	82.2	52.0	81.2	<b>59.6</b> 47	0 <b>83.2</b> 65.6
software	(76.2) 3.0	59.7	12.9	17.6	17.7	17.1	23.3	63.1	31.1	65.1	40.4	63.1	(78.9) 12	6 17.6
& services	(23.8)	18.6	(77.2)		(78.8)		(77.9)	17.9	(79.1)	17.2	(77.7)	18.1	(21.1)	
-Exports -			3.8		4.8		6.7		8.2		11.6			
Domestic			(22.8)		(21.3)		(22.1)		(20.9)		(22.3)			
Hardware	<b>3.6</b> 0.3	22.3	4.9	<b>22.7</b> 2.3	<b>5.6</b> 0.5	<b>19.9</b> 1.8	<b>7.1</b> 0.6	<b>19.0</b> 1.6	8.5	17.7	12.0	18.7	<b>12.1</b> 0.3 (2.1	5) <b>16.9</b> 0.4
-Exports -	(8.3) 3.3	1.8	0.5	20.4	(8.9)	18.1	(8.5) 6.5	17.4	0.5	1.0	0.5	0.7 18	11.8 (97.5)	16.5
Domestic	(91.7)	20.5	(10.2)		5.1		(91.5)		(5.9)	16.7	(4.2)			
			4.4		(91.1)				8.0		11.5			
			(89.8)						(94.1)		(95.8)			
Total IT Inc	dustry	16.1	1	1	21.6	1	28.1		1	37.4	1	1	47.8	64.0

Source: (i) www.nasscom.org., 2009

(ii) Figures in brackets show percentage share

(iii) NA – Not Available

(iv) E – Estimated

The service and software segment of IT industry in India is more robust than its hardware counterpart. India has become one of the most favoured destinations for sourcing software and ITeS because of the factors such as quality control. In addition, India is able to offer a 24x7 service and reduction in turnaround times by leveraging time zone differences. India's unique geographic positioning makes this possible. But the hardware segment of the IT industry in India has not shown the same level of progress. Insufficient government support, complications in the local indirect tax structure and high rates of excise and sale taxes are the main factors for the failure of hardware segment of the IT industry.

However the hardware design could be a promising area for the Indian IT sector as the design of hardware typically involves the development and use of appropriate software code. For the development of this segment, it will still require significant improvement in infrastructure, broader labour law reform, and careful assessment of market demand. (by- Sanjoy k Singh)

#### **3.4 REVENUE GENERATED BY IT INDUSTRY**

In the FY, 2009-10 Indian IT-ITES Industry generated revenue USD 68.0 billion. After 5 years the industry has been able to generate revenue at USD 118 billion. Revenue generated by IT industry over the last 5 years is given in the table 3.3 below.

 Table 3.3 : IT-ITES Industry Revenue Trend (in USD billion)

IT –ITES Industry Revenue Trend (in USD billion)									
Year/	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15			
Description									
Export	47.7	59.0	68.8	76.1	76.0	86.0			
Domestic	20.3	17.3	19.0	19.2	32.0	32.0			
Total	68.0	76.3	87.8	95.2	105.0	118.8			

Source: NASSCOM

## **3.5 EXPORT BY IT INDUSTRY**

The performance and contribution towards exports by IT-ITES industry in India is quite significant. This is shown in the following table 3.4.

Table	3.4:The	performance	and	contribution	towards	exports	by	IT-ITES
indust	ry							

YEAR/SEGMENT	2012-13	2013-14	2014-15	2015-16	2016-17 (E)	CAGR % 2012-17
IT SERVICE	42.9	49.2	53.3	61.0	66.0	10.59
ITES- BPO	18.3	20.4	22.5	24.4	26.0	10.34
SOFTWARE PRODUCTS, ENGINEERING SERVICES, Research and development	15.3	17.7	20.0	22.4	25.0	13.97
TOTAL IT-ITES	76.5	87.3	97.8	107.8	117.0	11.20

Source : Ministry of Electronics and Information Technology

From the table it has been seen that in the FY 2016-17, exports of IT-ITES industry is estimated at US \$ 117.0 billion, growing by 8.5% over FY2015-16. This is mainly driven by a combination of solution, around disruptive technologies such as SMAC ( social media, mobility, analytics and cloud), artificial intelligence, embedded system etc.

Amongst the three segments, IT services is the fastest growing segment and it is estimated to generate export revenues at US \$ 66.0 billion in the year 2016-17 as compared to US \$ 61.0 billion in the year 2015-16. ITES/BPO segment of Indian IT – ITES industry has been reinventing itself in the last few years and it is estimated to generate export revenue at US \$ 26.0 billion in the year 2016-17 compared to US\$ 24.4 billion in the year 2015-16.

Third segment ie engineering and R&D and Product Development has registered a growth of about 11.6% in the exports and is expected to reach US \$ 25.0 billion in the year 2016-17 from the level of US \$22.4 billion in the year 2015-16.

#### 3.6 IT INDUSTRY AND EMPLOYMENT

India's IT sector is the largest private sector employer and currently 3.5 million people are employed in this sector. Employment is this industry was 2.30 million in the F Y 2009-10. The overall growth of Employment in this sector over the last six years is given in the table 3.5 below.

Employment in IT- ITES Industry(in million)									
Year/segment	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15			
ITservice and	10	1.15	1.29	1.4	1.5	1.6			
Export									
BPO Export	0.77	0.83	0.88	0.92	0.95	1.1			
Domestic	0.53	0.56	0.60	0.64	0.68	0.80			
market									
Total	2.30	2.54	2.77	2.96	3.13	3.50			
Employment									

Table 3.5 : IT professional Employed by India

Source: NASSCOM Strategic Review 2015

# 3.7: Size and Location Distribution of Information Technology Companies in India

In respect of location distribution of IT companies in India it has been seen that majority of IT companies are located in only 5 major cities such as Delhi (19.1), Mumbai (16.2), Bangalore (12.6), Hyderabad (10.7), and Chennai (9.2). It shows that there is high concentration of IT companies in certain regions and hence need to diversify of IT industry for its proper explosion in future.

Region firms	Location of top	Location of ITES firms			
	600 firms (%)	Number	%		
National Capital Region	18.5	53	19.1		
Mumbai	21.8	45	16.2		
Bangalore	20.3	35	12.6		
Chennai	9.2	35	12.6		
Kolkata	4.2	29	10.4		
Hyderabad	10.7	24	8.6		
Kochi	NA	10	3.6		
Trivandrum	2.3	NA	NA		
Ahmedabad	NA	9	3.2		
Pune	3.8	6	2.2		
Others	9.2	32	11.5		
Total	100.0	278	100.00		

Table 3.6 : Location Distribution of IT industry

Source: www. nascom.org
# 3.8 INDIRECT IMPACT OF IT/ITES INDUSTRY ON INDIAN ECONOMY

NASSCOM and Deloitt jointly conducted a study on "Indian IT and ITES Industry: Impacting economy and society (2007 -08)". In this study they came up with findings of indirect impact of IT-ITES on Indian economy. These findings are shown in the following figure.



Figure 3.2 : Indirect contribution of IT and ITES to the Indian Economy

The figure shows that the growth of the IT/ITES sector and its resultant contribution to the economic growth and development has made great impacts. In many cases these impacts have had a rub-off effect and set benchmarks for other sectors of the economy while boosting the image of India in the global market.

- Additional employment generation: The IT/ITES sector plays a key role in creating indirect employment generation in the economy. It has been noticed that 4 additional jobs are created in the economy for every one job created in the IT sector. This is socially relevant as nearly 75 percent of the workforce employed in those additional jobs are SSC/HSC or less educated.
- Driving growth of other sectors of the economy: Apart from its chief contribution to growth, the IT/ITES industry has a multiplier effect on other sectors of the economy with an output multiplier of almost 2 through its non-

wage operating expenses, capital expenditure and consumption spending by professionals.

- Encouraging balanced regional development: The IT sector plays an important role in encouraging balance regional development by gradually spreading their business operations to smaller Tier II/III cities. This sector can also assist in improving the supply of talent pool and development of physical and social infrastructure, either directly by themselves or by spurring the Government to action.
- Fuelling the growth of Private Equity (PE) /Venture Capital (VC) funding: The growth in the IT sector along with worldwide dot com boom initiated VC activity in India which led to the creation of first generation of centric VC funds. From this phenomenon other sectors, such as health care, manufacturing and financial services have also benefited as these sectors are now also being able to access this source of funding, while IT/ITES continues to be the favourite sector with the largest share (28%) of PE/VC funding.
- Spurring first generation entrepreneurship: The development of IT/ITES industry has led to the shift of focus from physical capital to intellectual capital and the advent of the PE/VC funding enabled a large number of first generation entrepreneurs to start new enterprises. The demonstrated success of these entrepreneurs is spurring the middle class to exploit their potential to become an entrepreneur with confidence. As per information available with Software Technology Parks of India (STPI), 1,905 new units were registered during the period financial year 2001 to financial year 2005, most of which are likely to be set up by first generation entrepreneurs.

- Improving the product/service quality level: With the advent of IT/ITES industry the level of quality of product and services has improved, making Indian products and services capable of competing and wining against global competitors on quality parameters. For some of the large IT/ITES companies in the world, India is now also emerging as a research and development centre once again demonstrating that India now stands for quality.
- Front runner in practicing good corporate governance: The industry has been a front runner in practicing good corporate governance which have created a positive pressure within the industry, as well as in other industries. In recent times major IT/ITES companies in India have received national and international recognition for their corporate governance initiatives.

### **3.9 GOVERNMENT INITIATIVES**

Government sector is a key catalyst for increased IT adoption – through sector reforms that encourage IT acceptance, National eGovernance Programmes (NeGP), and the Unique Identification Development Authority of India (UIDAI) programme that creates large scale IT infrastructure and promotes corporate participation Certain crucial steps taken by the Indian Government to propel the sector's growth are:

 Constitution of the Technical Advisory Group for Unique Projects (TAGUP) under the chairmanship of Nandan Nilekani. The Group develops IT infrastructure in five key areas which includes the New Pension System (NPS) and the Goods and Services Tax (GST).

- Setting up the National Taskforce on Information Technology and Software Development with the objective of framing a long term National IT Policy for the country.
- Enactment of the Information Technology Act, which provides a legal framework to facilitate electronic commerce and electronic transactions.
- Setting up of Software Technology Parks of India (STPIs) in 1991 for the promotion of software exports from the country. There are currently 51 STPI centres where apart from exemption from customs duty available for capital goods, there are also exemptions from service tax, excise duty and rebate for payment of Central Sales Tax.
- Plans to formulate Information Technology Investment Regions (ITIRs). These regions are endowed with excellent infrastructure and are likely to reap the benefits of co-sitting, networking, and greater efficiency through use of common infrastructure and support services.

# 3.10 INFORMATION TECHNOLOGY IN ASSAM

In comparison to other states of India, IT industry in Assam is in a nascent stage. Proliferation of IT related works were centred on research and development activities and industries dealing with petroleum and natural gas till the early nineties in the state. In this period we also see the introduction of computers in selected schools, in the tea industry and in selected government departments for data processing. However, the IT industry got a much needed impetus towards the late nineties, when Internet was introduced in the State in few selected towns and cities. In that period, the government was the main user of IT technology and tools, and the IT industry in the State remained dependent on the inputs of services and support from the rest of India.

# 3.11 COMPETITIVE ADVANTAGES OF IT IN ASSAM

There are several reasons which make Assam have a competitive advantage in IT industry compared to other regions. Some of them are-

- The establishment of Software Technology Park of India in Assam is one of the main factors for a vibrant Micro Small Medium Enterprise (MSME) ecosystem in the IT sector in Assam.
- 2. The second enabler of IT growth in Assam is the presence of skilled manpower. Compared to the Indian average, literacy rate of Assam is high at 74 percent as against 73.18 percent, according to 2011 census. Assam also has a large English speaking younger workforce with computer literacy in the major towns. With regard to technical education, the state has one Indian Institute of Technology (IIT), One Indian Institute of Information Technology (IIIT), Nineteen Engineering Colleges/Universities (Govt. & Private Sector including NIT) offering twenty one graduate courses with an intake capacity of more than 3500 students per annum .The State has eight polytechnics and twenty three industrial training institutes (ITI).
- 3. The telecommunication network is one of the fastest growing sectors in the state which is another factor for the growth of IT in Assam. Central and State Government have given all efforts to improve connectivity in the State and as such, citizens and businesses now have access to good telecom facilities in most of the areas.
- 4. The fourth factor is the establishment of North East BPO Promotion Scheme (NEBPS) under the Digital India Programme for securing balanced regional

growth. The NEBPS aims to incentivize establishment of 5000 seats in respects of BPO/ ITES operations in the states of Assam, Manipur, Mizoram Meghalaya, Nagaland, Sikkim, and Tripura .The scheme provides capital support in the form of Viability Gap Funding (VGF) to eligible companies. Now three hundred seats have been allotted at Guwahati, Shillong, and Itanagar, hundred at each place.

5. The newly established ten Gbps international internet gateway at Agartala (India's third IIG after Mumbai and Chennai) linked to Cox's Bazar in South East Bangladesh, has the potential to boost the region's economy.

# 3.12 THE BASIC ICT INFRASTRUCTURE IN ASSAM

The basic ICT infrastructure in Assam includes a mini State Data Center with cloud computing facilities, Assam State Wide Area Network with POPs, State Portal & State Service Delivery Gateway (SP-SSDG), the 4000 Arunodoy Kendras (CSCs), where the emphasis is on bridging the digital divide through e-literacy programs and Capacity Building initiatives, Guwahati Metropolitan Area Network, etc. For Human Resource Development initiatives, Rajiv Gandhi Computer Literacy Programme, District Computer Center Scheme for HS school and Anunda Ram Borooah Award Scheme has been set up (Assam IT Policy, 2016).

# 3.13 INVESTMENT IN IT IN ASSAM

The government of India has made investment to improve telecom and IT infrastructure in Assam and the North East. In the year 2010, BSNL has invested Rs 384 crores to set up nearly 850 new towers in the region. In addition, Rs 4.16 lakh crores has been sanctioned to BSNL for additional capacity building in the North East.

Central Government invested Rs 250 crores for laying an optical fibre cable network, of 800 Kms in length. These networks would connect Guwahati with all districts and

Panchayats in Assam. National Budget 2014-15 has allocated Rs.537 billion for infrastructure and telecom projects for the North-eastern region.

The roll out of 3G services in Assam is largely limited to district headquarters. In the year 2012-13, Bharti Airtel had launched its 3G services in Assam telecom circle. Again Aircel, Airtel (Bharti Hexacom) BSNL and Reliance Telecom Limited (RTL) launched 3G spectrum in Assam, which gives fast and speedy internet access through mobile phone, video calling, social networking, etc. Reliance Jio Infocomm Ltd. has installed about 800 mobile towers across the state of Assam. In 2013, for rolling out 4G network services in two telecom services of Assam and North-East region, the company has started laying down optical fibre network.

For the development of these sectors, the government of Assam has given suitable tax and investment benefits. These include sales tax exemption, Transport subsidy, Capital investment subsidy, Central government funds for infrastructure development for IT etc. With an aim to draw more investment to the sector, the government of Assam approved a new IT policy in 2017. Under this policy, financial support will be provided to companies setting up BPOs, developing software and carrying out research among others.

**For call centres** with minimum intake of 100 employees, the government will provide Rs.1.2 lakhs one–time incentive per employee.

For software development units, the one-time support will be 1.5 lakh per employee.

**For research and development centres** having minimum 50 seats, the government will provide Rs.2.5 lakh as one-time support against every employee.

The investment scenario in the sector is quite promising after the Assam Global Investor's Summit- "Advantage Assam" Feb.2018. "Advantage Assam" witnessed a

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signing of 176 MoUs with 160 companies accounting to Rs. 64,386 crores. Through this summit Assam got Rs.65,186 crores investment commitment. All these things have brought new hope towards the development of IT sector in Assam as many new IT companies are coming up in the state. Moreover, since FDI up to 100 percent is permitted for IT activities, it also encourages inward FDI into the state through IT industry.

# 3.14 IT POLICY OF ASSAM

Recognizing the need and importance of IT in every spheres of life, Government of Assam has formulated a number of policies for the growth and development of this sector. The first of its policy came in year 2000. Thereafter the policy was revised in the year 2008 and 2009; the government updated it with the changed scenario and keeping in mind the priorities of the government and the possibilities that exist in the IT world for achieving those priorities. Today, Assam is poised on the threshold of becoming a valued destination of IT Industry, and acknowledging this aspect, the State has launched another IT policy in the year 2016.

With an aim to draw more investment to this sector, in October 2017 the government of Assam passed a new IT policy which provides financial support to companies setting up BPOs, developing software units and research and development centres. The financial incentive would be provided at the time of setting up of industries.

The government also approved a Digital Start-up Policy under which an Incubation Centre will be set up at Ambari in Guwahati and it will be open for all departments.

Though IT in Assam is still in its nascent stage of development, a number of IT and ITES companies have been set up in the state very recently. Presently 89 IT units are registered under Industry Department, Government of Assam and 26 units got

registered under STPI. Apart from these registered IT units there are few other IT firms not registered with the department that is productively engaged in business.

# **3.15 CONCLUSION**

Thus from the above discussion it has been found that India's IT industry has became a growth engine for the economy, contributing highest relative share in national GDP, i.e 9.3 percent, largest share in total services exports i.e 45 percent and highest FDI investment sector (USD>7 billion includes USD 5 billion start up investment). On the other hand, in spite of having potentialities and offering incentives by the government for the growth of IT industry in Assam, the contribution of IT industry in Assam is not very significant. But due to the large expansion of mobile phones in the rural areas of Assam and the introduction of various ICT based service delivery by the initiative of both government and private bodies, IT is now gradually entering in to the rural areas of Assam.

Therefore it is necessary to examine whether the rural community of Assam has been able to reap the benefit from this new technology to improve their standard of living through increased income. The impact of IT in the lives of rural people is studied through the use of IT in the agriculture and banking sector. The next chapter describes the impact of IT on agriculture in Assam.

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# CHAPTER-4 IMPACT OF INFORMATION TECHNOLOGY ON AGRICULTURE

# 4.1 INTRODUCTION

The agricultural sector of Assam exhibits characteristics of underdeveloped/ backward agriculture. Despite the major impact of green revolution in the other parts of the country, modernisation of agriculture has not taken place in this region as evidenced by widespread practice of traditional farming techniques and correspondingly a low usage of modern farm inputs, low consumption of fertilisers, poor/ inadequate agricultural infrastructure and other indicators of slow growth. Inadequate extension services and lack of access to information further widen the gap in the adoption of technology and lead to poor productivity level. To achieve a higher agricultural growth, Assam must make progress in technological and infrastructural development related to agriculture.

For increasing efficiency in all spheres of agricultural activities, diffusion of and access to information plays a major role. Information Communication Technology (ICT) has the ability to deliver accurate, complete and concise information to all the stake holders of agriculture.

Most farmers in Assam are small and marginal farmers, who are often unable to access information that could increase yields and lead to better prices for their crops. Agricultural productivity can be increased with access to proper information at the proper time. Today, various ICTs like computers, internet, mobile phone, traditional media (radio, television and newspaper) and mobile-enabled agricultural services in rural India, help in reducing information asymmetry and complement the role of extension services. But, unlike the other states of India, there has been no significant ICT initiatives for rural and agricultural development in Assam. No village in Assam have access to ICT rural Kiosk programmers or mobile services targeting farmers like IFFCO Kisan Sancher Limited (IKSL), Reuters Market Light (RML) etc like the rest of India. The only initiatives taken by government has been ASHA web portal and Community Information Centres (CICs) which have given internet support to the farmers. However, with the increasing penetration of mobile phones in the rural areas of Assam, internet accessibility, government telephoning helpline along with radio, television and newspaper, help to the farmers to some extent in accessing agri-related information is there.

# **4.2 ROLE OF INFORMATION TECHNOLOGY IN AGRICULTURE**

Adoption of ICT in disseminating agriculture information viz, cropping pattern, use of high yielding seeds, fertilizer application, pest management, marketing etc, play a crucial role (Meera et al ,2004, shalendra et al.,2011; Gandhi,2011: Ali,2011; Lio and Liu,2006; Nazari and Hasbullah,2008; Segrave,2004; Mittal et al,2010 ) in the domain of agriculture.

In the broader context of agriculture, the role of IT in agriculture can be studied under two heads:

a) IT can be used in agriculture as a tool for direct contribution to agricultural productivity. Through extensive use of IT such as GIS, agronomy and soil sciences, techniques of remote sensing, which is known as precision farming,

popularly used in developed countries in large land size, can make direct contribution to agricultural productivity.

b) Secondly, IT can also be used as an indirect tool for empowering farmers. With the help of various types of ICTs such as mobile phone, internet, radio, television, newspaper, farmers can take informed and quality decision which will have positive effect on the way agriculture and allied activities are conducted. For Indian farmers this indirect role of IT is significant, as they urgently require timely and reliable sources of information inputs for taking quality decision. Because, at present most of the Indian farmers access information from conventional sources, such as inputs dealers, extension workers, which are slow and unreliable (Mittal, 2013).

Three important roles that ICT can play in agriculture are:

# Enhanced agricultural productivity:

Farmers often face many risks and threats from poor soil condition, droughts, erosion and pests. In such cases ICT can help farmers by providing up-to-date information about pest and disease control, early warning systems, new varieties of seeds, new ways to optimize production and regulation for quality control.

# ✤ Increasing access to market:

ICT can also provide up to date information on the market prices of commodities, inputs and consumer trends. This information will help farmers to negotiate in the market and enable them to make better decisions about future crops and commodities and best time and place to sell and buy goods.

# **Capacity building and economic empowerment:**

ICT can be utilized for capacity building and empowerment of rural communities and also to strengthen farmer organizations. The use of ICT can also reduce social isolation of the rural communities

New ICT have some special features which will help to improve quality of life in rural areas by developing agricultural research, education and extension.

As farming is becoming highly knowledge intensive, commercialized, competitive and globalized against traditional resource based approach, the adoption of ICT in farming has paramount importance. For example, ICT has wider reach out and neutrality to social and gender bias. So it can offer a communication platform circumventing all traditional and physical barriers and backwardness. Moreover its inclusive nature of public and private sectors and its innate strength of offering a reliable, good and cost effective communication platform will definitely help in bridging rural economy with globalized markets.

# 4.3 ICT INITIATIVES FOR AGRICULTURE AND RURAL DEVELOPMENT IN INDIA

In India from mid 1980s, along with government agencies, several cooperatives, NGOs and private business houses have started disseminating agricultural information. In recent years the use of ICT tools in disseminating information has also entered into the agricultural sector, because these technologies has raised the expectation that they (ICT) would deliver fast, reliable and accurate information in a user friendly manner (Shalendraetal.2011).

Several ICT initiatives for agriculture and rural development have been taken up in the country under government, private cooperative and NGOs level.

# In government sector, the major ICT based service delivery initiatives include :

- (i) ASHA (www.assamgribusiness.nic.in) an initiative of Government of Assam (SFAC) with its networking with Community Information Centres(CICs) has spread all over the state.
- (ii) Recently Kerala government is planning two different initiatives kisan kerala
   (www.krissankerala.net) and e-Krishi (www.e-krishi.org/web/main/).
- (iii) The Andhra Pradesh Government is offering agribusiness services through Rajiv Gandhi Internet Village Centres in partnership with ikisan. IIIT Hyderabad is experimenting with e-Sagu (http://agriculture.iiit.net/esagu/ esagu2004).
- (iv) While Haryana state recently inaugurated its first Agribusiness Information Centre, the Uttaranchal state is planning for Kisan Soochna Kendras in private partnership.
- (v) Several state agricultural universities have launched telephonic help lines with Tamil Nadu and Maharashtra implementing a comprehensive Agrisnet.
- (vi) The Bhoomi Project of Karnataka state has been one of the highly successful public sector initiatives in the country related to land records. It has a direct impact in improving health of agriculture sector and is being used in several other states.

### **Private and NGO levels** ICT initiatives consist of the following:

- 1. Gyandoot project (Madhya Pradesh);
- 2. WaranaWired Village project (Maharashtra);
- Information Village project of the M S Swaminathan Research Foundation (MSSRF) (Pondicherry);
- 4. iKisanproject of the Nagarjuna group of companies(Andhra Pradesh);

- Automated Milk Collection Centres of Amul dairy cooperatives (Gujarat);
- Computer-Aided Online Registration Department (Andhra Pradesh);
- 7. Online Marketing and CAD in Northern Karnataka(Karnataka);
- Knowledge Network for Grass Root Innovations –Society for Research and Initiatives (SRISTI) (Gujarat);
- 9. Application of Satellite Communication for Training Field Extension Workers in Rural Areas (Indian Space Research Organisation);

In addition to the above, a few **non-governmental organisations** (NGOs) have initiated ICT projects such as:

- Tarahaat.com by Development Alternatives (UttarPradesh and Punjab);
- Mahitiz-samuha(Karnataka);
- VOICES Madhyam Communications (Karnataka);
- Centre for Alternative Agriculture Media (CAAM);

# 4.4 DATA PRESENTATION AND ANALYSIS

In this section an attempt has been made to study the impact of IT on different stakeholders of agriculture. For this, we have designed this section into seven parts:

- Categories of information user farmer
- Type of information required by the farmers
- Information accessed through ICT
- Impact of ICT on different stakeholders of agriculture Small and Medium farmers, large farmers and Traders.

- Identifying factors which motivate farmers to use ICT as a source of agricultural information
- Association between adoption of ICT as a source of agricultural information and different socio-economic factors of the study area
- Correlation between various socio-economic variables and use of ICT as a source of agricultural information

### 4.4.1 Categories of information user farmer

In our study area, to analyse the use of ICT by the farmers to access agricultural information, we have considered four categories of information user farmers:

- Farmer who use only non-ICT sources
- Farmer who use only old ICT sources
- ✤ Farmer who use only new ICT sources
- ✤ Farmer who use only both old and new sources.

A farmer is considered to be **old ICTs** user if he uses at least any one of the three sources, namely, radio, television or newspaper. **New ICT** user is one who uses mobile phone, internet and telephone helpline services provided by the government for agriculture related information. **Non ICT** source user (farmers) is one who collect information through training programmers, extension workers, Krishivigyan Kendra, Village fairs, Government Demonstration, Input Dealers other Progressive Farmers, Primary Cooperative Society and others. The fourth category ie, **both old and new ICT** user is one who used at least one old ICT source and one new ICT source.

in the following table. Here the data is collected from 200 sample farmers.

Type of ICT	Number of farmers	Percent
Non ICT	30	15.0
Old ICT	100	50.0
New ICT	22	11.0
Both old & New ICT	48	24.0
Total	200	100.0

Table 4.1: Number of farmers using different ICT as a source of information;

Source: Field data

Data collected from the study area shows that majority of farmers use old ICT tools as a source of agriculture information. This is supported by Ali et (2011) who stated that old ICTs like Radio, Television, Newspaper, etc can play an important role in awareness generation about new agricultural technologies in the farming communities across the world.

During survey, it was observed that among the old ICTs, radio is preferred by most of the farmers in accessing information because of their familiarity to radio. It may be because they have been using it for a number of years. However some farmers also watch "Krishi Darshan" programme broadcast by Doordarshan Kendra Guwahati and Dibrugarh and also take part in 'Live in Phone" programme in Doordarshan and AIR anchored by departmental officers. They also read local newspapers, where measures to be taken of agricultural losses during flood, drought and pest attack etc.are published.

Regarding the use of new ICT sources, it is observed that only 11 percent of farmers use it for accessing information and 24 percent farmers used both old and new ICT sources. They use mobile phone to make calls or send short message (sms) to input dealers, extension workers and other agricultural stakeholders. All of them use Kisan Call Centre (KCC) and internet for production and marketing related queries. During the survey it was discovered that Community Information Centre (CIC) of the two blocks that is Demoria and Rani was not functioning and has remained closed for last 5 years. ASHA web portal, which was launched by the government of Assam in 2005, for giving internet support to farmers through CICs, is also not functional now. In a group discussion with the farmers in Mallobari village of Dimoraic block on 15<sup>th</sup> May 2017, it was observed that they had benefitted from the services provided by these centres. Thus among the government initiatives only the Kisan Call Centre serve the farmers to their needs. The progress of KCC in Assam is given in the table (4.2) below.

**Table 4.2: Progress of KISAN CALL CENTRE** 

Progress of KISAN CALL CENTRE during 2010-11 & 2011-12			
Year	No. of successful calls		
2010-11	10358		
2011-12(till oct,2011)	5686		

Source: Economic survey, Assam 2011-12

However, it is observed that 15 percent farmers do not use any type of ICT sources. They depend on NON ICT sources like extension workers, Krishi Vigyan Kendra, other progressive farmers etc. for collecting agriculture related information.

# **4.4.2 Type of information required by the farmers:**

During the survey period in the study area it was noticed that farmers had a range of information needs. This information varied through the growing season. However, the broad groups of information needed were common to all the farmers, irrespective of their place and crops. These groups were production- related, market-related and others.

The **production–related** information include information on agricultural inputs, for example high yielding variety seeds, fertilizers, pesticides and farm machinery.

The market related information include information on harvesting and marketing.

3<sup>rd</sup> category included **other information** on cultivation such as weather, methods of preserving agricultural produces, livestock care, vaccine, environmental conservation etc.

This information can be explained by the following figure (4.1).





# 4.4.3: Information accessed through ICT

After knowing the type of information needed by the farmers in the study area, we now analyse from which source (non ICT, old ICT, new ICT and both old and new ICT) these required information is accessed. This is shown in the following table (4.3).

Type of information									
		Produ	ction	Market	t related	0	ther	To	otal
		rela	ted						
ICT	Non ICT	F	%	F	%	F	%	F	%
source		23	18.	1	2.0	6	22.2	30	15.0
	Old ICT	87	70.7	6	12.0	7	25.9	100	50.0
	New ICT	0	.0	18	36.0	4	14.8	22	11.0
	Both old &	13	10.6	25	50.0	10	37.0	48	24.0
	New ICT								
Total		123	100.0	50	100.0	27	100.0	200	100.0

 Table 4.3: Type of information accessed through ICT

Source: Primary Data

From the table 4.3 it is seen that majority of the farmers 70.7 percent received production related information by using old ICT source. Old ICT source user farmer for collecting Market related information and Others information is 12 percent and 25.9 percent respectively. On the other hand, it is seen that new ICT tools user farmers use these sources for Market related information and Other information on cultivation. 36 percent farmers use this source (new ICT) for Market related and 14.8% farmers use it for Other information on cultivation. The new ICT tools user farmers do not use these tools to access Production related information.

# 4.4.4 Impact of ICT on different stakeholders of agriculture – Small and Medium farmers, Large farmers and Traders :

Adoptions of ICT in accessing agricultural information accelerate agricultural development through increased production and improved marketing and distribution

(Bertolini, 2004). Introduction of internet, increasing penetration of mobile phone and mobile-enabled agricultural information service in rural India and the rural ICT initiatives (along with old ICT sources like radio, T.V, news papers) have reduced information search costs and information asymmetries and has increased market efficiencies.

To analyse the impact of ICT on agriculture, we comprised a series of Focus Group Discussions (FGD) and individual interviews with farmers, from the selected sample size of 200 farmers of the Dimoria and Rani block of Kamrup Metro. The agricultural labours, traders, commission agents and business involved in the agricultural sector are also included. The researcher conducted 6 focus group discussions and 121 individuals were interviewed in the 4 villages of two blocks. Out of them, two focus group discussion were conducted in Maloibari and Dharapur villages with new ICT user farmers (as new ICT user farmers are available only in these two villages) and single focus group discussion were conducted in all villages respectively with old ICT user farmers.

Our focus group discussions and individuals' interviews covered both farmers who used old ICT and new ICT as a source of agricultural information. FGD conducted with new ICT user farmers in Maloibari village involved 7 farmers and in Dharapur village involved 8 farmers, while in single FGD conducted in all villages such as Maloibari, Tetelia, Dharapur and Khena alibari involved 10, 8, 10 and 7 farmers respectively. This is shown in the following table (4.4).

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Surveyed	Surveyed		ICT users farmers				Total
Block	village	New ICT Old ICT		Old ICT			
		Focus	individual	Focus	individual	Focus	individual
		group		group		group	
Demoria	Malaibari	7	8	10	30	17	38
	Tetelia	0	2	8	20	8	22
Rani	Dharapur	8	7	10	40	18	47
	Khena	0	1	7	13	7	14
	Alibari						
		15	18	35	103	50	121

 Table 4.4: Distribution of the sample used during survey

Source: Field Study

Now we analyze the impact of ICT on different stakeholders of agriculture:

- > Small and Medium farmers
- Traders and Commission Agents
- ➢ Large farmers

# Here impact is studied through improved productivity and profitability.

**Productivity** is measured in terms of increased returns- through changes in cropping pattern, increased access to information on prices (inputs and output) and also information on some non-price factors such as availability of inputs, seed quality and application of modern techniques, and a reduced wastage/ spoilage through which yield increases and leads to a better price realization for farmers.

**Profitability** is measured by a reduction in transaction costs with respect to both inputs and outputs, information search costs by saving on time and travel costs.

### **4.4.4.1 Impact on small and medium farmers:**

In our sample size of 200 farmers, the number of small and medium farmers in our study area is 116. Among these farmers, 81.1 percent used old ICT and 33.8 percent used new ICT source for accessing information. One important observation found during the survey period is that only small and medium farmers used new ICT source for collecting agricultural information. This is because these tools user farmers are young farmers having small and medium land holding size. They are adopting more to the SMS system of mobile phone and consults Krishi Vigyan Kendra and Kisan Call Centre for advice from time to time.

Thus the new ICT tools are found popular among the age groups of 18-30 years 60 percent (shown in table 4.5) followed by age group of 31-50 year. No farmers above age of 50 used new ICT source for gathering information.

Age group (years)	Percentage of user
18-30	60
31-50	8.2
Above 50	0
	Source: Field study

Table 4.5 Distribution of and New ICT User Farmers according to age

Our study found that almost all small and medium farmers are benefited from using old and new ICT source for accessing agricultural information. The new ICT user farmers reported market prices, information on diseases/ plant protection, pesticides and seed information as their top priorities. Nearly 13 percent farmers cited that they obtain market information by using mobile phone (call or SMS to traders or brokers). With that information they are able to decide where and when to sell and also decide the cropping pattern. In our study area, as most of the small and medium farmers are constrained by transportation bottlenecks and bonded primarily by credit indebtedness forcing them to sell their crops at a lower price in a fixed market. But using their mobile phone as basic communication devices to check on market prices, they reported some increase in convenience in terms of cost and time savings. On the other hand, 10 percent farmers reported that their bargaining power with traders improved when they have access with market price information. All these lead to increase in their profitability. Again 5percent farmers revealed that by calling KCC, they receive correct information on how to diagnose and treat disease/ plant protection when working on the farm and 3.3 percent farmers obtain information about the amount of pesticides and type of seed used in their field. This made them more capable of crop management, fertiliser dosage and disease management, which has led to increased revenue from higher yield.

Again some farmers said that sometimes extension workers do not give information about government schemes and subsides. They provide only to large farmers. In such cases, new ICT tools viz internet, provide information and awareness about government schemes.

These impacts of new ICT on small and medium farmers can be explained with the help of following figure 4.2.



# Figure 4.2: Impacts of New ICT on Small & Medium Farmers

The figure shows that increase in convenience and cost and time saving 13 percent is the largest impact of using new ICT on small & medium farmers. On the other hand about 10 percent farmers have been able to improve their bargaining with traders through mobile phones and 5 percent and 3.3 percent acknowledge that calling to KCC and using internet have made them more capable of better plant protection and better crop choice respectively. Lastly 2% of the respondents reported better information dissemination of government scheme, leading to increase benefits from various government schemes and programmes for agricultural development.

The respondents also mentioned that information received through these sources was also shared with their friends and fellow farmers. They discussed the trend of prices and about future demand for crops in the market. In this way, they created a network of their friends through exchange of information. All these have increased social networking and have helped them to take collective decisions. Following figure 4.3 summarises the findings in of the impact of New ICT on agricultural activates of Small and Medium Farmers in the study area.

# Figure 4.3: Framework of the impact of New ICT on Agricultural activities of Small and Medium Farmers



# **STAGES OF AGRICULTURAL ACTIVITIES**

The following are some case stories of the study area to explain the impact of new ICT on small and medium farmers.

# **Box1: Impact of price information**

Impact of mobile phone: Use of mobile phone helps take correct decision and increase earnings.

Mr. Bipin Das, 40 years old, HS passed, a small farmer of Dharapur village of Rani community development block, while going to sell his peddy to a local maruwari business man (owner of a Rice mill), received a call in his mobile phone from a local trader. When informed by the local trader of a rise in market price of paddy from Rs.1500 per quintel to Rs. 1640 per quintel, decided to sell directly in the market instead of selling at a lower price to the maruwari rice mill owner. As a result, he earned additional Rs 1400 by selling 10 quintals of rice in the market.

# Impact of internet: Increased revenue from higher yield

Mukut Das, 42 years old, graduate, a medium farmer of Maloibari village of Demoria Community Development Block, made use of information accessed from internet regarding potato planting techniques and diseases control. He described that after getting information he shifted from 'guess-based' traditional method to following modern scientific cultivation techniques. This has led to higher yield; consequently his annual income increased by 10%, from Rs 100000 to Rs 110,000 per annum.

The areas where farmers benefitted from using old ICT sources included protection from weather related damage, seed variety selection, best cultivation practices.

# **4.4.4.2: Impact on traders and commission agent**:

In traditional Indian market, traders and commission agents plays a critical role in market transaction and are the major price setters. This is because a large part of agricultural produce goes through them at government regulated markets. Their role is to arrange the buying and selling of goods through either auction or private sale. But in some cases they only arrange the sale and take a commission or they can buy directly and resell the goods in the markets. Most farmers depend on them for information.

In this study the researcher spoke to 10 traders in the study block to investigate how ICT tools particularly new ICT was impacting their business. They reported that mobile phones and internet are a critical infrastructure in their business. In order to observe current market information and to collect produce for sale around 77 percent traders using mobile phone to contact a host of market players (farmers, traders, employers/ partners posted at other market).

Apart from this primary function, 84 percent traders cited some other issues like dealing with breakdown of truck or other good carriers, shifting crops en route according to the demand and supply condition, interaction with their both local and distant market staff etc. where mobile telephone made an impact in their business.

It is found that most of the traders and commission agents interviewed in the study area reported that they served the small farmers as advisors and intermediaries via the mobile phone.

The impact of new ICT particularly mobile phone on traders and commission agents can be depicted in the following figure 4.3.

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# Figure 4.3: The impact of new ICT (mobile phone) on Traders and Commission Agents

The figure shows that 77 percent traders revealed that they have been able to made better communication to the market players when using mobile phone. On the other hand, 26 percent traders cited that mobile phone gives real time information while in transport and 58 percent reported as an increase in efficient movement of truck and goods carrier. Again 88 percent traders act as information intermediaries via the mobile phone between farmers and various information sources.

# 4.4.4.3: Impact on large farmers:

In our study area, only 16 farmers are large farmers and among them 15 farmers use old ICT and only one farmer use new ICT tools for accessing agricultural information. This small sample of large farmers reported that when they use these ICT sources they derive greater value from their access to information on market prices and in dealing with input and disease problem. However, although not directly mentioned, none of the large farmers depend on these ICT sources for increase in agricultural productivity. As these farmers are experienced farmers, they are able to overcome any possible constraint related to agriculture. Apart from being to geting information, many large farmers' reported, input dealers and many extension workers visit them to give information regarding recent schemes. Thus it is observed that unlike small farmers, ICT made a little impact on the large farmers. Here we cite a case story of the study area of how ICT does not have any impact on the large farmers also.

Box 3: Increase earning without using ICT

Sonadhar Konwar, an award winning large and establish farmers having a land holding of 40 bighas with income 10 lakhs per annum is found not to be using ICTs for his agricultural activities and productivity yield. However, he does use traditional media tools as a source of information (Radio, T.V., newspapers) for improved farm productivity. A book titled '*Takoria matit sarah sayasha*' has been his guide book. Inspite of not being an ICT user his farm yield and productivity has not suffered which may be due to large holding and increased resources.

# 4.4.5: Identifying factors which motivate farmers to use ICT as a source of agricultural information:

In this section we study the factors which has motivated farmers to adopt ICTs as a source of agricultural information. Here adoption of ICT is the dependent variable which depends on nine variables such as Education, Age, Household type, Household size, Training, Income, Land holdings, Caste and type of crops. Here data for studying adoption of ICT as a source of agriculture information is taken from the same sample size of 200 farmers involved in agricultural activities form Demoria and Rani block of Kamrup Metro.

Following table shows the different factors with their frequencies which motivate farmers to use ICT as sources of agricultural information

 Table 4.6: Factors motivating farmers to use ICT and their Frequencies

n=200

Sl. No	Variables and categories		Frequencies (No)
1	Age	Young (18-30 years)	20
		Middle (31-50 years)	122
		Old (above 50)	58
2	Education	Illiterate	10
		Functionally literate	10
		Primary school	20
		Middle school	80
		High school	40
		College education & above	40
3	Training	No training	20
		One training	40
		Two training	140
4	Caste	SC	40
		ST	40
		OBC	80
		General	40
5	Land holding size	Marginal farmer	68
		Small farmer	47

Big farmer246House holding sizeUp to 5 member132Above 5 member687IncomeUp to RS. 11,000 per year40Rs. 11001-22,000 per year100			Medium Farmer	61
6House holding sizeUp to 5 member132Above 5 member687IncomeUp to RS. 11,000 per year40Rs. 11001-22,000 per year100			Big farmer	24
Above 5 member         68           7         Income         Up to RS. 11,000 per year         40           Rs. 11001-22,000 per year         100	6	House holding size	Up to 5 member	132
7         Income         Up to RS. 11,000 per year         40           Rs. 11001-22,000 per year         100			Above 5 member	68
Rs. 11001-22,000 per year 100	7	Income	Up to RS. 11,000 per year	40
			Rs. 11001-22,000 per year	100
Rs. 22001-33,000 per year 53			Rs. 22001-33,000 per year	53
Above Rs 33,000 per year 7			Above Rs 33,000 per year	7
8 Type of House hold Agriculture labour 22	8	Type of House hold	Agriculture labour	22
Cultivator 178			Cultivator	178
9 Type of Crops Rice 60	9	Type of Crops	Rice	60
Oil-seed and spice 20			Oil-seed and spice	20
Vegetable and fruit 20			Vegetable and fruit	20
All 100			All	100

**Source: Field Study** 

It is found that 71 percent of the respondents belong to the working age group. However, level of education is not satisfactory. Only 20 percent farmers have college education and above. A majority of the respondent (around 90 percent) has undergone training on agriculture organized by various government departments and N.G.Os. Large land holding size farmer is very small (only 12 percent) and majority of the farmers belong to marginal farmers. Half of the respondents were found to fall in the semi-medium (Rs 11,001-22,000 per year) income group whereas only 7 of the total respondents fall in the high income group.

Most of the respondents were self-employed in agriculture (89 percent) as cultivators and only 11 percent were engaged as agriculture labour. Regarding crops, it was found that half of the respondents cultivate all crops (rice, spices, vegetable, fruits) and among these crops, around 60 percent farmers choose rice for cultivation.

**4.4.6:** Association between adoption of ICT as a source of agricultural information and different socio-economic factors (age, education, training, caste, land holding, household size, income, type of household and type of crops) of the study area:

We now make an analysis of the relationship between ICT as a source of agricultural information and the different socio-economic factors (age, education, training, caste, land holding, household size, income, type of household and type of crops). These factors are defined as follows:

**Age:** Age here is referred to the chronological age of the respondents in completed years at the time of the investigation.

The age of the respondents are categorized into three groups as followed by Prita (2001).

Category	Age(years)	Score
Young age	18-30	0
Middle Age	31-50	1
Old Age	Above 50	2

**Education:** The variable education has been used as the number of years of formal education acquired by the rural farmers. The education of the respondents were grouped into the following categories as followed by Venkataramaiah (1983)

Category	Score
Illiterate	0
Functionally Literate	1
Primary School	2
Middle School	3
High School	4
College Education	5

**Training undergone:** It is operationally defined as the number of trainings received on agricultural activities by the respondents. In our study it was classified as the following.

Category	Score
No training	0
One Training	1
More than One Trainings	2

**Caste:** Castes have been grouped in accordance with the socio-economic status scale developed by Venkataramaiah (1983) and the farmers were grouped into the following categories.

Category	Score
Schedule caste	1
Schedule Tribe	2
Other Backward Caste	3
General Caste	4

**Land holding size:** It is the amount of land possessed by family of the respondent. Here, the landholders were classified into five categories as followed by Arulprakash (2004).

Category	Landholding(acres)	Score
Marginal farmer	Up to 2.5 acres	0
Small Farmer	2.5-5.00 acres	1
Semi-Medium Farmer	5.01 – 10.0 acres	2
Medium Farmer	10.01 – 25 acres	3
Big Farmer	Above 25.00 acres	4

**Household size:** Household size is the number of persons living together in a single household with a common kitchen. It is measured as the absolute number of members in the household sharing the same economic unit. In our study families were classified into two categories as followed by Usharani (1999).

House hold size	Number	Score
Small Household	5 and below	0
Large Household	Above 5	1

**Income of the family:** It is the annual income of the respondent's family. It has been calculated by taking into account the income from agriculture as well as from other sources during the previous year. Here the respondents were grouped into four types according to the classification suggested by Ministry of Rural Development, Government of India and Procedure Followed by Hanchinal (1999).
Category	Family income per Year	Score
Low Income	Up to RS 11,000	0
Semi Medium Income	Rs.11,001-Rs.22,000	1
Medium Income	Rs. 22,001 – Rs. 33,000	2
High Income	Above Rs 33,000	3

**Type of Household:** Type of household indicates whether the household is engaged in farming as cultivator or agricultural labour. Household self- employed in agriculture is counted as cultivator and others are considered agricultural labourers. Thus type of household was divided into two groups.

Category	Score
Agriculture labourers	0
Cultivator	1

**Type of crops:** Crops which are cultivated by the farmers in the study area are grouped as follows :

Category	Score
Rice	0
Oil Seeds and Spices	1
Vegetables and Fruits	2
All	3

In order to find out the association between ICT as a source of information with different variables such as- Education, Training, Type of Household, Household size, Income, Caste, Age, Land holding size and Type of crops, a Statistical measure

Chi-square test has been applied and the frequency distribution with result of the chisquare test are shown separately in the following tables.

The null hypothesis for chi-square test is-

- Null hypothesis (H<sub>o</sub>)= There is no significant association between ICT sources with some other variables of respondent such as- Education, Training, Type of household, Household size, Income, Caste, Age, Land holding size and Type of crops.
- ii Alternative hypothesis (H<sub>1</sub>)= There is a significant association between ICT sources with some other variables of respondent such as Education, Training, Type of household, Household size, Income, Caste, Age, Land holding size and crops.

						]	Educa	tion						То	otal
												C	ollege		
				Func	tionally	Pri	mary	Mi	iddle	Н	igh	Edu	ucation		
ICT	source	Illi	terate	Lit	terate	Scl	hool)	Sc	hool	Sc	hool	&	Above		
		F	%	F	%	F	%	F	%	F	%	F	%	F	%
ICT	Non ICT	10	100.0	10	100.0	8	40.0	2	2.5	0	.0	0	.0	30	15.0
Source	Old ICT	0	.0	0	.0	12	60.0	78	97.5	8	20.0	2	5.0	100	50.0
	New ICT	0	.0	0	.0	0	.0	0	.0	12	30.0	10	25.0	22	11.0
	Both old														
	& New	0	.0	0	.0	0	.0	0	.0	20	50.0	28	70.0	48	24.0
	ICT														
Total		10	100.0	10	100.0	20	100.0	80	100.0	40	100.0	40	100.0	200	100.0
		Chi	=303.68	df=15	sig(p)=.0	01									

Table 4.7: Association between use of ICT and Education of farmers.

The distribution of ICT sources with education level are shown in the above table 4.7. It is observed that 100 percent illiterate and functionally literate respondents have chosen non ICT as a source of information. But when education level increases, it depicts higher inclination to choose ICT as a source of information. Primary school level (60 percent) and middle school level (97.5 percent) respondents adopt old ICT and high school level and college educated respondent are interested to use either new ICT or both old and new ICT as a source of information. It is because education brings in awareness and decision making power, better knowledge and skill to use and operating ICT tools on agricultural activities.

				Train	ing				
				0	Ine	T	'wo		
		No ti	raining	Tra	ining	Tra	ining	То	otal
		F	%	F	%	F	%	F	%
ICT	Non ICT	20	100.0	8	20.0	2	1.4	30	15.0
Source	Old ICT	0	.0	32	80.0	68	48.6	100	50.0
	New ICT	0	.0	0	.0	22	15.7	22	11.0
	Both old & New ICT	0	.0	0	.0	48	34.3	48	24.0
Total		20	100.0	40	100.0	140	100.0	200	100.0
		Chi=	161.44	df=6	sig(p)=.	001	-		

Table 4.8 : Association between use of ICT and training.

Table 4.8 shows that if a farmer had received any kind of formal training in agriculture, then the adoption of ICT as a sources of information increases. The study shows that the farmers having no formal training use only non ICT sources.

		Ту	pes of Ho	ousehold			
		Agricultu	re labour	Culti	vator	Te	otal
ICT		F	%	F	%	F	%
Source	Non ICT	22	100.0	8	4.5	30	15.0
	Old ICT	0	.0	100	56.2	100	50.0
	New ICT	0	.0	22	12.4	22	11.0
	Both old & New ICT	0	.0	48	27.0	48	24.0
Total		22	100.0	178	100.0	200	100.0
		Chi= 140	).07 df=:	3 sig(p)=.	001		·

Table 4.9: Association between use of ICT and types of households

Table 4.9 shows a significant association between use of ICT and types household. Most of the respondent who were self employed in agriculture rather than working as a form labourer or employed in some other activities use old, new on or both old and new ICT as a sources of information, since they need more information on cultivation.

			Househo	old size					
		Upto 5 i	nember	Above 5	5 Member	Te	otal		
ICT		F	%	F	%	F	%		
Source	Non ICT	10	7.6	20	29.4	30	15.0		
	Old ICT	60	45.5	40	58.8	100	50.0		
	New ICT	22	16.7	0	.0	22	11.0		
	Both old & New ICT	40	30.3	8	11.8	48	24.0		
Total	1	132	100.0	68	100.0	200	100.0		
		Chi= 33.63 df=3 sig(p)=.001							

Table 4.10: Association between use of ICT and household size:

Similarly, there exist a positive association between ICT use and household size as shown in table 4.10.

					Incom	ne					
		Upto	Rs.	Rs. 11	001	Rs, 2	2001-	abo	ve Rs		
		11000 pa		22,00	22,000 pa		)0 pa	330	00 pa	To	otal
		F	%	F	%	F	%	F	%	F	%
ICT	Non ICT	28	70.0	2	2.0	0	.0	0	.0	30	15.0
Source	Old ICT	12	30.0	48	48.0	33	62.3	7	100.0	100	50.0
	New ICT	0	.0	12	12.0	10	18.9	0	.0	22	11.0
	Both old &	0	0	20	28.0	10	19.0	0	0	40	24.0
	New ICT	0	.0	38	38.0	10	18.9	0	.0	48	24.0
Total	•	40	100.0	100	100.0	53	100.0	7	100.0	200	100.0
		Chi= 13	37.58 di	f=9 sig(p	p)=.001						

Table 4.11: Association between use of ICT and income of the farmer.

Table 4.11 shows a significant association between use of ICT and income of the farmers. It shows that farmers in low income category (70.0 percent) mostly adopt non ICT source for collecting agricultural information. Higher income category farmers chose old, new and both old and new ICT sources for information. However, it is observed that all the high income category farmers that is, 100 use only old ICT for accessing agricultural information.

					Caste	•					
		SC		ST		OBC		Ge	neral	Т	otal
		F	%	F	%	F	%	F	%	F	%
ICT	Non ICT	16	40.0	14	35.0	0	.0	0	.0	30	15.0
Source	Old ICT	24	60.0	20	50.0	54	67.5	2	5.0	100	50.0
	New ICT	0	.0	6	15.0	14	17.5	2	5.0	22	11.0
	Both old & New ICT	0	.0	0	.0	12	15.0	36	90.0	48	24.0
Total		40	100.0	40	100.0	80	100.0	40	100.0	200	100.0
		Chi=	171.09	) df	=9 sig(	p)=.00	1				

Table 4.12: Association between use of ICT and social category

Table 4.12 shows a significant association between ICT adoption and social category. It shows that farmers belonging to higher classes are more prone to accessing ICT as a source of information.

				Age					
		Y	oung	Mi	ddle	Old (A	bove 50		
		(18 - 3	0 Years)	(31 - 50	) Years)	Ye	ears)	То	otal
		F	%	F	%	F	%	F	%
ICT	Non ICT	0	.0	12	9.8	18	31.0	30	15.0
Source	Old ICT	0	.0	60	49.2	40	69.0	100	50.0
	New ICT	12	60.0	10	8.2	0	.0	22	11.0
	Both old & New ICT	8	40.0	40	32.8	0	.0	48	24.0
Total	·	20	100.0	122	100.0	58	100.0	200	100.0
		Chi=	100.18	df=6	sig(p)=	.001			

Table 4.13: Association between use of ICT and age.

In case of age and ICT use, there is a significant association, which is shown in the above table. All the young respondent farmers are interested to use either new or both old and new ICT as a source of information as they are educated and have own mobile phone. But majority of the old farmers (69.0 percent) use only old ICT source for accessing information due to the familiarity of radio for long time and not comfortable to use new ICT tools. However, most of the middle age farmers use old, new and both old and new ICT source for collecting agricultural information.

				Land	Holding	size					
		Mar	ginal	Sr	nall	Me	edium	La	rge	Т	otal
		F	%	F	%	F	%	F	%	F	%
ICT	Non ICT	28	41.2	2	4.3	0	.0	0	.0	30	15.0
Source	Old ICT	40	58.8	23	48.9	22	36.1	15	62.5	100	50.0
	New ICT	0	.0	0	.0	13	21.3	9	37.5	22	11.0
	Both old & New ICT	0	.0	22	46.8	26	42.6	0	.0	48	24.0
Total		68	100.0	47	100.0	61	100.0	24	100.0	200	100.0
		Chi=	126.56	df=9	sig(p)	=.001					

Table 4.14: Association between ICT use and land holdings.

As shown in table 4.14 there exist a highly significant association between use of ICT and land holdings of the farmers. The results of the land holdings size shows that medium and large farmers use old, new and both old and new ICT source for accessing information. It is due to fact that large land holding size farmers do not confine to the cultivation of only one crop, they cultivate multiple crops and hence need information at regular intervals.

					Crop	S					
		Rice S		S	pice	Veg	& Fruit	All		T	'otal
		F	%	F	%	F	%	F	%	F	%
ICT	Non ICT	30	50.0	0	.0	0	.0	0	.0	30	15.0
Source	Old ICT	30	50.0	0	.0	20	100.0	50	50.0	100	50.0
	New ICT	0	.0	0	.0	0	.0	22	22.0	22	11.0
	Both old & New ICT	0	.0	20	100.0	0	.0	28	28.0	48	24.0
Total		60	100.0	20	100.0	20	100.0	100	100.0	200	100.0
		Chi=	= 180.00	) d	lf=9 sig	g(p)=.0	001				

 Table 4.15:
 Association between ICT use and Type of crops.

Table 4.15 shows a significant association between use of ICT and type of crops. It is seen that farmers cultivating all the crops use old (50 percent), new (22 percent) and both old and new (28 percent) ICT, as a source of information. In case of vegetable and fruit and oilseeds of spices cultivation 100 percent farmers depends on old ICT and both old and new ICT respectively as a source of information. However, Rice is the only crops where 50 percent farmers depend on non ICT source for collecting information.

# 4.4.7. Correlation Between various socio –economic variables and use of ICT as a source of agricultural information:

In this section, effort has been made to know about the characteristics and nature of the factors considered for using ICT as a source of agricultural information by the farmers of the study area. To explain the relationship among different pairs of variables considered for study, the method of product moment correlation analysis is used.

								Land		
			Types of	Household				Holding	ICT	Type of
	Education	Training	Household	size	Income	Caste	Age	size	Source	Crops
Education		.812	.707	382	.489	.702	488	.569	.836	.534
	1		(steale)		( ) ( )			(steste)		
		(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)
Training			.800	426	.697	.739	264	.698	.619	.750
e e		1								
			(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)
Tymes of				255	521	205	271	407	500	177
I ypes of			1	355	.321	.393	3/1	.407	.500	.4//
Household			-	(**)	(**)	(**)	(**)	(**)	(**)	(**)

Table 4.16Correlation between various socio-economic variables and use ofICT.

Household			195	422	.161(	446	353	337
size		1	(**)	(**)	*)	(**)	(**)	(**)
Income			1	.440	.262	.649	.297	.710
			1	(**)	(**)	(**)	(**)	(**)
Caste				1	188	.643	.722	.606
				1	(**)	(**)	(**)	(**)
Age					1	070	520	052
					1	079	(**)	055
Land							441	765
Holding						1		.705
size							(**)	(**)
LOT								120
ICT							1	.430
Source								(**)
Type of								1
Crops								1

\*\* Correlation is significant at the 0.01 level

\*Correlation is significant at the 0.05 level

Table 4.16 shows the product moment correlation analysis to study the relationship between use of ICT as a source of agricultural information and socio-economic variables. As can be seen from the table, use of ICT as a source of agricultural information by the farmers is positively correlated with Education, Training, Type of household, Income, caste, land holding size and type of crops and negatively correlated with age and house hold size.

## 4.5 CONCLUSION:

Thus the above discussion shows the picture of farmer's access to ICT and how ICT facilitate the dissemination of agricultural information. It also shows that ICT has a

great impact on small and medium farmers through better crop management, fertilizer dosage, and diseases management, which lead to increased return from higher yield and thereby improves agricultural productivity. Again the study shows that the factors like Education, Training, Type of household, Household size, Age, Income, Caste, Land holding size and Type of crops motivate farmers to use ICT as a source for accessing agricultural information.

Since the factors "Education" and "Training" have a positive bearing on the adoption of ICTs as a source of information, it highlights the relevance of capacity building initiatives for enhancing the use of ICTs in the study area.

In the next chapter, we have discussed how IT innovation in banks helps the customers to avail different services easily and conveniently.

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## CHAPTER - 5 IMPACT OF INFORMATION TECHNOLOGY ON BANKING

## **5.1 INTRODUCTION**

Over the last 20 years, the Indian Banking industries has undergone a total transformation, which is the result of various factors, one of the most important being the implementation of information communication technology (ICT) in banks.

The major phases of development that has been taking place in the banking sector in the post reform period are:

**Introduction of licensing norms**: With ease of licensing norms, new private and foreign banks emerged-equipped with latest technology.

**Deregulation**: Deregulation has open up new opportunities for banks to increase revenues by diversifying into investment banking, insurance, credit cards, mortgage financing, depository services, securitization etc.

Adoption of information technology: The latest development that the banking industry has faced is the adoption of IT in banking which has redefined the role of banking from a mere financial intermediary to a service provider of various financial services under one roof.

For creating an efficient banking system, technology has a key role to play. The significance of technology is greatly felt in the banking sector on account of the "competitive advantage" for banks. Banking sector is tending to use IT in their

operation process to improve the quality of their services, increase efficiency and customer satisfaction, and provide greater choices with lower cost to the customer. By implementing new technology, banks are no longer restricted to traditional banking activities only but exploring newer opportunities to increase business and create new markets. The impact of technology implementation has resulted in the introduction of new products and services by banking institution. Electronic delivery channels, ATM, variety of cards, net banking, ECS, RTGS etc. are a few products which has come with the adoption of IT in the banking sector. This has led to a change in the banking landscape in the country. This chapter studies the implementation of IT in Indian banking sector and its impact on customer service accessibility in the study area.

### **5.2 INFORMATION TECHNOLOGY IN BANKING**

There has been a paradigm shift in the banking industry after the entry of ICT into the banking operation of the banks. Today it has been seen that ICT has become the heart of banking sector and banks have invested heavily in ICT, and have widely adopted ICT networks for delivering a wide range of value added products and services. Over the past few years, importance of IT within a business environment has increased significantly (Joseph et al ,1999; Ryssel et al ,2004 Kim and Davidson , 2004). In any business or industry, customer services, product and marketing strategies and distribution channels of services and product are heavily dependent on IT. Though IT is the 'lifeblood' of any business or organization but banking and financial services are among the industries where IT has the most significant impact. Kim and Davidson (2004) have emphasized that the environment of banking industry has become IT intensive. Like newspaper and airlines, the banking industry has a high IT content in

both product and process as compared with other industries such as 'oil refining and cement'. (Porter and Miller, 1985). This is shown in the following figure-

the	Information content of the product								
y of		Low	High						
ensit	High	Oil Refining	Banking						
inte ue ch			Newspaper						
ation valı			Airlines						
orm	Low	Cement							
Inf									

**Fig 5.1 : Information Intensity Metrix** 

Source: Porter and Miller (1985:15)

## 5.3 WHY BANKING INDUSTRY IS CHOSEN FOR STUDY

The possession and the management of information is one of the basic activity in banking. IT can influence the process of re-engineering and innovation and it is likely to be bigger in banking than in other industries (David –West. 2005)

The NE Region of India is one of the most strategic regions for trade and commerce as almost 98% of the North Eastern borders are international ones. Despite huge potential and prospect for growing a strategic business hub for international cross border trade, the region remains as the most economically backward regions of India. Against this onset, it is essential to know how technology development is affecting across industries of the region. As the banking sector is necessary for development of any type of business, this study analyses the banking sector in order to measure the impact of technological innovation in banking within Guwahati city. In this study the analysis has been made from customer's point of view.

## 5.4: TECHNOLOGY BANKING AND REASONS FOR ITS ADOPTION BY CUSTOMERS

According to Sathye (1999) technology banking is defined as the automated delivery of new and traditional banking products directly to customer through electronic interactive communication channels. It includes all the system that enable financial institution and customers to access accounts, transact business, obtain information on financial products and services by means of technology. Technology banking makes it simpler for customers to compare banks` services and products. Before adoption of IT in banking sector, the most common problems faced by bank customers are:

- 1. Long times
- 2. Limited time for customer service
- 3. Transaction errors due to the banks
- 4. Excessive bureaucracy.

But with the increasing use of IT in banking transaction, (for example increase of internet services availability of cash machines in various locations) the above mentioned problems have been mitigated to a large extent and in some cases, solved. This has led to increased services provided by the banking sector and some of these can be accessed from the comfort of homes. This has been supported by Agboola (2001) that IT application in banks has improved customer services, facilitated accurate records, ensures convenient business hour, prompt and fair attention, and enhances faster services. It is also noticeable that technology banking offers services to customers not only in branches and other dedicated servicing sites, but also in domiciles, work places and stop and shop stores, as well as in a myriad of other

channels (Al – Hawari et al, 2005). Thus from the above discussion the major factors that have been motivated customers to adopt IT based banking services include,

- 1. Ease of use .
- 2. Saving time
- 3. Convenience and flexibility
- 4. Prompt and fair attention
- 5. Faster services and customer satisfaction
- 6. Privacy
- 7. Accuracy

## 5.5 TECHNOLOGICAL DEVELOPMENTS IN INDIAN BANKS

Till the early 1980s no major breakthrough in technology implementation was achieved by the Indian banking sector. Only some working groups and committees made stray references to the need for mechanization and computerization of some banking processes. However, this period was identified as the critical period acting as the icebreaker, as it led to the slow and steady move towards the path of large scale adoption of technology in the banking industry. The important events in evolution of IT in Indian banking industry are given below:

During the years 1986-88, Magnetic Ink Character Recognition (MICR), a paper based clearing system was introduced. It overcomes the limitation of clearing the cheques within banking hours.

- In late 1980's and 1990's card based payments- Debit / credit card in the banking industry was introduced.
- In 1995, Electronic Clearing Services (ECS) was introduced by RBI, which was the first version of "Electronic Payment" in India. It is a mode of electronic funds transfer from one bank account to another bank account using the mechanism of clearing house.
- A committee for technical upgradation of bank was constituted by RBI in 1994, which recommended for the establishment of the Institute for Development and Research in Banking Technology (IDRBT) in 1996.
- With the introduction of Indian Financial Net 1999, IT revolution actually appeared in the Indian banking sector. It was set up by RBI jointly with Institute for Development and Research in Banking Technology.
- Electronic Fund Transfer (EFT) was introduced in early 2000 in Indian banks covering 15 centres.
- Real Time Gross Settlement (RTGS) was introduced by RBI in 2004 where transfer of money takes place from one bank to another on a "real time" and on "gross basis". RTGS is the fastest possible money transfer system through banking channel.
- Core Banking Solution (CBS) is the another most important recent IT trends of Indian banks. With the help of CBS, customers are able to operate their accounts from any bank branch, regardless of the branch in which the account is opened with the aid of internet and mobile banking.
- In 2005/2006 National Electronic Fund Transfer (NEFT) as a replacement to EFT was introduced so as to broad base the facilities of EFT

- In 2008, for faster clearing of cheques, RBI launched a cheques Transaction system (CTS) or Image –base clearing System (ICS).
- Development of Distribution Channels: Besides branches, the major distribution channels in the Indian banking industry are ATM's, internet banking, mobile and telephone banking and card based delivery system.
- Automated Teller machine (ATM): In early 1990's ATM's were introduced to the Indian banking industry.

Number of ATM's of scheduled commercial bank as on Dec 2014 is shown in the following table.

Branches and AT	M's of scheduled	commercial ban	k as on Dec 2014	
Bank type	No. of	On Site	OFF Site ATMS	Total
	Branches	ATMS		ATMS
Nationalized	33,627	38,606	22,265	60,871
Banks				
State Bank of	13,661	28,926	22,827	51,753
India				
Old Private	4,511	4,761	4,624	9,385
Sector Banks				
New Private	1,685	12,546	26,839	39,385
Sector Banks				
Foreign Banks	242	295	854	1,149
Total	53,726	85,134	77,409	162,543

Table 5.1 : No. of ATM's of scheduled commercial bank as on Dec 2014

SOURCE: WIKIPEDIA

- Internet banking- In this channel of distribution customers do banking transaction through the bank's website on the internet.
- ✤ Mobile banking- It is an extension of internet banking.

## **5.6 DATA PRESENTATION**

In this section an attempt has been made to study the impact of IT on banking from the customer side. To do this, we have divided this section into four sub sections which consists of-

- 1. Demographic profile of the customer:
- 2. An association between demographic profile of the customer and the type of banking service (internet banking, mobile banking and branch visit) and frequency of use these services.
- Factors influencing service accessibility of customers with the adoption of IT enabled system in the banks.
- 4. Benefits of IT services to customers.

### 5.6.1 Demographic Profile of the customer:

To study the demographic profile of the bank customers a questionnaire survey is conducted. The demographic profile of the account holder's (250) of the two selected branches of SBI, namely Noonmati and Gauhati University branch are given in the following table.

Profile / Variable	Distribution	Frequency	Percentage
	Male	169	67.6
Gender	Female	81	32.4
Age	18-30	70	28.0

 Table 5.2 : Demographic Profile of Respondents

	30-60	139	55.6
	Above 60	41	16.4
Level of	Up to HS	27	10.8
Education	Diploma/ Under graduate	108	43.2
	P.G/ Professional	115	46.0
Monthly Income	Less than 15, 000	84	33.6
	15,001-35,000	46	18.4
	35,001-50,000	45	18.0
	Above 50,000	75	30.0
Marital Status	Married	190	76.0
	Unmarried	60	24.0
Occupation	House wife/ Retired	40	16.0
	Employed	108	43.2
	Business/ Profession	52	20.8
	Agriculture	22	8.8
	Student	28	11.2
Type of service	Internet Banking	78	31.2
	Mobile Banking	35	14.0
	Direct branch visit	137	54.8
Frequency of use	Daily	20	8.0
	Weekly	45	18.0
	Monthly	60	24.0
	As and when	125	50.0

Source: Field Study

In this table, the gender level shows that about 67 percentages are male respondent while the rest 32 percentage female respondent. Again 55 percent of respondents fall in the age group 30- 60, whereas 28 percent are students and young customers and the remaining 16.4 percent are old customers who use banking facilities. Among the customers, 46 percent obtained PG/ Professional degrees. 43.2 percent of them diploma/ Under Graduate degrees and rest 10.8 percent have upto HS level degrees. Monthly income of the 30 percent respondents are above Rs 50,000/- whereas 30.6 percent are below Rs 15,000/-. Almost 18 percent are fall in the Rs 15,000-35,000/- income level. Marital Status shows 76 percent are employed person, 20 percent are in business, 8 percent are in agriculture and rest 11 percent are students.

The table also depicts that 31 percent use internet banking service, 14 percent use mobile banking service and a large percentage of customers ie 54 percent are still visit banks directly. It implies that internet banking facilities is popular than mobile banking facilities and traditional banking method is preferred among customers. Frequency of use reveals that almost 50 percent of the respondents visit bank as and when their required and 8 percent are regular bank visitors.

## 5.6.2 An association between demographic profile of the customer and the type of banking services and frequency of use:

To show how adoption of IT enable system in bank affects customers, we try to make an association between bank and customer. For this, we take two variables- type of service and frequency of use from bank side and five variables i.e. age, gender, occupation, income, education from customer side. The percentage distributions of these variables are shown in table 5.2. Now we use chi square( $X^2$ ) test to determine

- A. the association between demographic profile of the customers and type of service and
- **B.** the association between demographic profile of the customers and frequency of use of banking services.
- A. Association between demographic profile of the customers and type of service (mobile banking, internet banking and branch visit). In this connection one null hypothesis and other alternative hypothesis are considered, which are

$$H_0$$
 = There is no relationship between demographic profile of customers and type of service

 $H_a$  = There is relationship between demographic profile of customers and type of service.

	Type of Service										
		Internet		M	Mobile		ranch				
		Bank	ing	Banking		visit		Total			
		Fre.	%	Fre.	%	Fre.	%	Fre.	%		
Gender	Male	52	30.8	25	14.8	92	54.4	169	100.0		
	Female	26	32.1	10	12.3	45	55.6	81	100.0		
Total		78	31.2	35	14.0	137	54.8	250	100.0		
	Chi Square=.278 df=2 sig=.870										

Table: 5.3 Gender and Type of Service

In case of gender and type of service, there is no significant association, which is shown in the table 5.4. It means that gender does not affect the type of service used by the customers in the study area

	Type of Service											
		Inter	rnet	Mol	bile	Di	rect					
		Banking		Banking		branch visit		Total				
		F	%	F	%	F	%	F	%			
Age	18-25 Years	29	41.4	20	28.6	21	30.0	70	100.0			
	26-40 Years	46	33.1	15	10.8	78	56.1	139	100.0			
	41-59 Years	3	7.3	0	.0	38	92.7	41	100.0			
Total		78	31.2	35	14.0	137	54.8	250	100.0			
		Chi Squar	e=46.01	df=4	s	ig=.871			•			

Table: 5.4: Age and Type of Services

The table 5.5 shows a significant association between age and type of service. The distribution of type of service and ages shows that internet banking is used by all the age group but it is more popular among young generation. It has been observed that not a single customer of age group above 60 use mobile banking. Among the 41 customer of this group, apart from three customers, rest of the 38 customers visit direct branch for their day to .day activities.

	Type of Service									
		Internet		Mo	bile	Di	rect			
		Banking		Banking		branch visit		Total		
		F	%	F	%	F	%	F	%	
Education	Upto HSC	5	18.5	2	7.4	20	74.1	27	100.0	
	Diploma/UG	45	41.7	15	13.9	48	44.4	108	100.0	
	PG/ Professional	28	24.3	18	15.7	69	60.0	115	100.0	
Total		78	31.2	35	14.0	137	54.8	250	100.0	
	Chi Square=12.49 df=4 sig=.014									

**Table: 5.5 Education and Type of Service** 

The above table 5.6 indicates that, there is no significant association between education and type of service as shown by the chi-square value. It means that education has no bearings with use of technology services of banks in the study area.

Type of S	Service								
		Interne	et	Mobil	e	Direct	t		
			Banking		Banking		branch visit		
		F	%	F	%	F	%	F	%
Income	Less than Rs. 15000	26	31.0	26	31.0	32	38.1	84	100.0
	Rs. 15001- 35000	5	10.9	5	10.9	36	78.3	46	100.0
	Rs. 35001- 50000	17	37.8	4	8.9	24	53.3	45	100.0
	Above 50000	30	40.0	0	.0	45	60.0	75	100.0
Total		78	31.2	35	14.0	137	54.8	250	100.0
		Chi Squ	are=46.	77 df	=6 si	g=.001			

Table: 5.6: Income and Type of Service

As shown in table 5.7, there exist a highly significant association between income and type of service. It has been seen that majority of the bank customers, whatever be their income level have higher inclination to choose internet banking compare to mobile banking in their day to day transaction.

			Туре	of Servic	e				
		Inte	ernet	Mol	bile	D	irect		
		Ban	Banking		Banking		ch visit	Total	
		F	%	F	%	F	%	F	%
Occupation	Housewife/ Retired	0	.0	0	.0	40	100.0	40	100.0
	Employed	38	35.2	5	4.6	65	60.2	108	100.0
	Business/ Professional	27	51.9	11	21.2	14	26.9	52	100.0
	Agriculture	10	45.5	2	9.1	10	45.5	22	100.0
	Student	3	10.7	17	60.7	8	28.6	28	100.0
Total		78	31.2	35	14.0	137	54.8	250	100.0
		Chi Squ	are=110.	40 df=8	sig=	.001			

Table: 5.7: Occupation and Type of Service

Similarly, there exist a highly significant association between occupation and type of service. The table shows that all the customers who are either house wife or retired person use only direct branch visit. They don't use internet banking or mobile banking. Though internet banking is popular among the customers (employee, professionals, agriculturists) but in case of student customers, mobile banking is the most preferable type of service amongst the banking activities.

- B. Association between demographic profile of the customers and frequency of use (banking services). Here also we considered one null hypothesis and other alternative hypothesis which are as follows:
  - $H_0$  = There is no relationship between demographic profile of customers and frequency of use of banking services
  - $H_a$  = There is relationship between demographic profile of customers and frequency of use of banking services

			Frequencies of Use										
		Da	Daily Weekly Monthly As and When							Т	otal		
		F	F % F % F % F %										
Gender	Male	17 10.1 33 19.5 4					26.6	74	43.8	169	100.0		
	Female	3	3.7	12	14.8	15	18.5	51	63.0	81	100.0		
Total		20	20         8.0         45         18.0         60         24.0         125         50.0         25										
		(	Chi Squ	are=8.	97 df	=3 s	sig=.03	0					

Table: 5.8 Gender and Frequency of use

The table 5.9 revealed that there is no significant association between gender and frequency of use

			Frequencies of Use								
		Da	uly	Wee	ekly	Mon	thly	As and	When	Т	otal
		F	%	F	%	F	%	F	%	F	%
Age	18-25 Years	5	7.1	17	24.3	12	17.1	36	51.4	70	100.
	26-40 Years	12	8.6	26	18.7	15	10.8	86	61.9	139	100.0
	41-59 Years	3	7.3	2	4.9	33	80.5	3	7.3	41	100.0
Total		20	8.0	45	18.0	60	24.0	125	50.0	250	100.0
	Chi Square=90.52 df=6 sig=.001										

 Table: 5.9 Age and Frequency of use

In case of age and frequency of use the table 5.10 shows a significant association. Majority of the customers of age group above 60 (i.e 80.5%) go to the bank monthly whereas middle age customers prefer to use bank services according to requirement and young customers prefer to visit bank weekly or monthly.

			Frequencies of Use								
		Daily		Weekly		Monthly		As and When		Total	
		F	%	F	%	F	%	F	%	F	%
Education	Upto HSC	2	7.4	9	33.3	7	25.9	9	33.3	27	100.0
	Diploma/UG	15	13.9	19	17.6	34	31.5	40	37.0	108	100.0
	PG/Professional	3	2.6	17	14.8	19	16.5	76	66.1	115	100.0
Total		20	8.0	45	18.0	60	24.0	125	50.0	250	100.0
		Chi Sc	quare=2	9.39 d	lf=6	sig=.0	01				

 Table:
 5.10:
 Education and Frequency of use

Table 5.11 shows a significant association between education and frequency of use. All the customers, whatever be their education level prefer to use bank service as and when they require. It has also been noticed that the customers of middle level education have a tendency to visit bank daily compare to less and more educated customers

			Frequencies of Use									
			Daily		Weekly		Monthly		As and When		Total	
		F	%	F	%	F	%	F	%	F	%	
Income	Less than Rs. 15000	2	2.4	21	25.0	14	16.7	47	56.0	84	100.0	
	Rs. 15001- 35000	9	19.6	4	8.7	22	47.8	11	23.9	46	100.0	
	Rs. 35001- 50000	9	20.0	6	13.3	18	40.0	12	26.7	45	100.0	
	Above 50000	0	.0	14	18.7	6	8.0	55	73.3	75	100.0	
Total		20	8.0	45	18.0	60	24.0	125	50.0	250	100.0	
		Chi S	quare=7	5.65	df=9	sig=	.001				·	

 Table 5.11: Income and Frequency of use

There is also a significant association between income and frequency of use as shown in the above table. It is observed that customers having income less than Rs 15000 and above Rs 50,000 prefer to visit bank daily. On the other hand, customer having income of Rs 15001- 35000 and Rs35001- 50,000 prefer to go bank monthly for their banking activities.

		Frequencies of Use									
									As and		
		Daily		Weekly		Monthly		When		Total	
		F	%	F	%	F	%	F	%	F	%
Occupation	Housewife/ Retired	0	0	0	0	26	65.0	14	35.0	40	100.0
	Employed	0	0	15	13.9	32	29.6	61	56.5	108	100.0
	Business/ Professional	20	38.5	8	15.4	2	3.8	22	42.3	52	100.0
	Agriculture	0	0	18	81.8	0	0	4	18.2	22	100.0
	Student	0	0	4	14.3	0	0	24	85.7	28	100.0
Total		20	8.0	45	18.0	60	24.0	125	50.0	250	100.0
		Chi Sq	uare=1	99.72	df=1	2 sig	g=.001				

 Table 5.12:
 Occupation and Frequency of use

Occupation is seen to have a significant association with frequency of use which is seen in the above Table 5.13. Apart from business and professional, no customers of any occupation visit bank daily for their banking activities. The customers who are retired person or house wife visit bank either monthly or as and when their require. But it is observed that the agriculturists prefer to visit bank weekly and student customers use banking services as and when their require.

To put all these things in a nut shell we conclude that-

Among the demographic factors income, age and occupation has a significant association between type of service.

No association is found between gender and education with type of service.

There is a significant association between age, income, education, and occupation with frequency of use.

No association is found between gender and frequency of use. These are shown in the following table

Association between	Degrees	Calculated	Table	Results
	freedom	value	value	
Age and Type of Service	4	46.01	13.27	Accepted
Income and Type of Service	6	46.77	16.812	Accepted
Occupation and Type of Service	9	75.65	21.66	Accepted
Age and frequency of use	6	90.53	16.812	Accepted
Income and frequency of use	9	75.65	21.66	Accepted
Education and frequency of use	6	29.39	16.812	Accepted
Occupation and frequency of use	12	199.72	26.217	Accepted

 Table 5.13: Chi- square Test (significant at 5% level)

No Association between				
Gender and Type of Service	2	.278	9.210	Rejected
Education and Type of Service	4	12.49	13.277	Rejected
Gender and Frequency of Use	3	8.97	11.345	Rejected

## **5.6.3** Factors influencing service accessibility of customers with the adoption of it enabled system in the banks in the study area

To study the Factors influencing on service accessibility of customers with the adoption of information technology enabled system, a questionnaires survey has been done among the customers of the selected branches of SBI. Some questionnaires are also issued to the IT officers of the selected bank branches in order to get information of what types of IT enabled services were available in their branches. The customer's responses are measured with a five-point rating scale where (SA)=4 strongly agree, (A)=3 Agree, (N)=2 Neither agree nor disagree, (D)=1 disagree, (SD)=0 strongly disagree. The information will then be analyzed and interpreted with the help of linear regression method. Factors influencing on service accessibility of customers with the adoption of information technology enabled system, are divided into five parts such as banking services, delivery and add-on services, front office services, safety and security services and accuracy and reliability services. All these services have sub services (component) which are shown in the following.



Serial No	Main services	Sub service
1.	Banking Service	Core banking solutions
		ATM facility
		Debit and credit cards
		Internet banking
		Mobile Banking
		Electronic fund Transfer
		Electronic cheque clearance system
		Right time gross settlement
		(RTGS)/National
		Electronic fund Transfer (NEFT)
		Point of sale(POS) machine.
		SBI Buddy( mobile app)
2.	Delivery and add on service	24*7 access to services and information
		Online balance enquiry/account
		statement/cheque book request/ account
		opening- closing/ standing instruction/ loan
		application/ dematservice, etc
		Online availability of information relating to
		scheme/ interest rate
3.	Front office service	Token vending machine
		Cash deposit machine
		Pass book printing (self)
		Green channel (paper less banking)
		Grahakmitra service

4.	safety and security service	'SMS' warning before payment of cheque
		over clearing
		Warning against every access in to the
		"profile" section of "INB"
		Telephonic confirmation/ concurrence for
		payment of "high value" cheques provides
		the safety and security
		24x7 availability of "Helpline" services on
		"tollfree" call numbers
5.	Accuracy and reliability	Adequate prompting to lessen the chance of
	service	data entry error
		Nearing zero error data transmission
		Menu driven software facilities

Now the information obtained from the customers are analysed with the help of frequency distribution table (simple % method) as shown below.

 Banking services: From the frequency distribution of banking services table, it is observed that around 99% of customers are comfortable to avail IT enable system adopted in banks. In this regard only 1 percent customer is in neutral state. Banking services is the important influencing factor to the customers because of most popular item such as, ATM facility, mobile banking, internet banking, debit and credit card, core-banking etc are present in this category. No customers disagreed to avail this service.

		Frequency	Percent
Valid	Neither agree / Nor disagree	3	1.2
	Agree	150	60.0
	Strongly agree	97	38.8
	Total	250	100.0

Table 5.14:Frequency distribution of banking service total

2. Delivery and add on service: Regarding the opinion about delivery and add on service it is seen that 64 percent people agreed on these services and 30.4 percent people highly appreciate it. Only 5 percent people were neutral. Here also no customer disagreed on availing these services.

Table 5.15: Frequency distribution of Delivery and add on service Total

		Frequency	Percent
Valid	Neither agree / Nor disagree	14	5.6
	Agree	160	64.0
	Strongly agree	76	30.4
	Total	250	100.0

3. **Front office service**: Frequency distribution of front office services shows that 77.2 percent people agreed to use front office related IT enabled services applied in banks. A very little customer only remained neutral.

		Frequency	Percent
Valid	Neither agree / Nor disagree	2	.8
	Agree	193	77.2
	Strongly agree	55	22.0
	Total	250	100.0

**Table 5.16: Frequency distribution of Front office total** 

4. **Safety and security service**: With regard to Safety and Security services, frequency distribution shows a similar picture to the above services where 36 percent strongly agreed followed by 62.4 percent agreed and only 1.6 percent shows neither agree nor disagree.

 Table 5.17:Frequency distribution of Safety and Security

		Frequency	Percent
Valid	Neither agree /	4	1.6
	Agree	156	62.4
	Strongly agree	90	36.0
	Total	250	100.0

5. Accuracy and reliability services: From the following frequency distribution table it is seen that accuracy and reliability services are an influencing factor to motivate customers to adopt IT enabled system adopted in banks. However, it is observed that 8 percent customers disagree to access these services.

		Frequency	Percent
Valid	Disagree	2	.8
	Neither agree / Nor disagree	13	5.2
	Agree	189	75.6
	Strongly agree	46	18.4
	Total	250	100.0

Table 5.18: Frequency distribution of Accuracy and reliability Total

In order to determine that the above explained five factors have a statistically significant relationship to service accessibility of customers with the adoption of IT enable system, regression analysis is done.

In the Regression model, service accessibility is the dependent variable and Banking Services, Delivery and Add-on services, Front Office Service, Safety and Security of assets, Accuracy and Reliability Services are independent variables. The necessary data are analyzed with the help of SPSS (ver21) and following results are obtained from the regression.

 Table 5.19: Model Summary

			Adjusted	Std. Error of
Model	R	R Square	R Square	the Estimate
	.802	.643	.613	.54067
a Predictors: (Constant), Service Total, Front office total, Accuracy and reliability Total, Delivery and add-on service Total, Safety and security Total

The table Model summary shows the correlation between the variables(R), coefficient of determination ( $R^2$ ), adjusted R square and Standard Error. It is observed that R=.802 which mean that there is strong positive linear relation between service accessibility with Banking Services, Front office Service, Safety and Security of assets, Accuracy and Reliability Services and Deliver and Add on services. Again coefficient of determinant i.e ( $R^2$ ) =.643 indicate that about 64.3 percent variation of service accessibility can be predicted by the independent variable.

		Sum of		Mean		
Model		Squares	Df	Square	F	Sig.
1	Regression	16.709	5	3.342	11.432	.001
	Residual	71.327	244	.292		
	Total	88.036	249			

Table 5.20: ANOVA

a Predictors: (Constant), Service Total, Front office total, Accuracy and reliability Total, Delivery and add on service Total, Safety and security Total

b Dependent Variable: Service Accessibility

ANOVA table shows the F statistic calculated value to be 11.432 with significant level at .001, which implies that the use of information technology on banking services has a significant effect on the service accessibility of the customers of SBI.

So we may conclude that the regression model is good predictor of the dependent variable with the help of independent variable.

							Collinearity Statistics		
		Unstan	dardized	Standardized			Tolerance	VIF	
	Dependent variable	B	Std. Error	Beta	t	Sig.		(Variance influence factor)	
Constant		.399	.422		.946	. 002			
Delivery and add on service Total	Service	.106	.064	.098	1.653	.043	.944	1.059	
Front office total	accessibility	.149	.080	.107	1.847	.026	.986	1.014	
Safety and security Total		.085	.076	.073	1.131	.004	.795	1.258	
Accuracy and reliability Total		.222	.073	.189	3.046	.003	.863	1.159	
Service Total		.330	.071	.283	4.633	.001	.890	1.124	

 Table 5.21:Coefficients

In order to find out is there any multicolinearity among the independent variables, multicoliniarity test is done which is shown in the co-efficient table. Since the value of VIF nearing to 1 and the Tolerance value nearing to .1, it indicates there is no multicoliniarity among the independent variables.

Coefficient table shows the coefficient of constant and different services with t value and significant level.

It is observed that Banking services is the highest beta co-efficent factor (.330) and its t value is statistically significant at 5 percent level. Thus it has considerable influence on the service accessibility of SBI. Similarly other services are also significantly correlated with the service accessibility in bank and statistically significant at 5 percent level. Hence we conclude that dependent variable (i.e. service accessibility) is significantly related with independent variable. (i.e. banking services, delivery and add-on services, front office services, safety and security of assets, accuracy and reliability services)

Regression Equation is shown as follows:

$$Y = a + b_1 X_1 + b_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5$$

Service accessibility=  $.399+(.106) X_1+(.149)X_2+(.085)X_3+(.222)X_4+(.330)X_5$ 

Thus from the results of the regression analysis, it is concluded that all five factors are having significant influence in the service accessibility of IT banking services offer by SBI in the study area.

#### 5.6.4: Benefits of IT Services to Customers.

From the previous section we see that customers are highly appreciated the adoption of IT enabled system in bank, therefore in this section an attempt has been made to find out what benefits they derived from using IT services of bank. Followings are identified from pilot survey as the benefits of IT services to the bank customers. They were asked to rate the most important benefits that they have derived from the adoption of IT enabled system in bank.

- 1. Ensuring security
- 2. Easy deposite, withdrawl and transfer of fund
- 3. Customer relationship management
- 4. Fast, quick transaction with accuracy
- 5. Time saving in banking activities
- 6. Convenience and flexibility

## Table 5.22: Benefit of IT Services of Bank to the customers of SBI.

Sl.	Description	Rating												
NT			1		2		3		4		5			
No.		No	%	No	%	No	%	No	%	No	%			
1	Ensuring security	42	30	69	49.28	09	6.4	12	8.57	08	5.7			
2	Easy deposit, with-drawl and transfer of fund	16	11.42	24	17.14	10	7.14	60	42.85	30	21.42			
3	Customers relationship management	40	28.57	36	25.71	04	2.85	39	27.85	21	15			
4	Fast, quick transaction with accuracy	20	14.28	34	24.28	10	7.14	40	28.57	36	25.71			
5	Time saving in banking activities	48	34.28	50	35.71	09	6.4	21	15	11	7.85			
6	Convenience and Flexibility	34	24.28	72	51.42	14	10	08	5.7	12	8.57			

The table reveals that 79.84 percent respondents strongly agreed and agreed for the benefits of ensuring security, 75 percent for the benefits of convenience and flexibility and 70 percent for the benefits of time saving in banking activities followed by a total of 54 percent for customer relationship management. On the other hand, 64 percent of the respondents disagreeing the benefits of easy deposite, withdrawl and transfer of fund (only 29 percent agreeing) and 54 percent customers disagree for fast, quick transaction with accuracy. Thus from the results it is seen that customers are enjoying the benefits of IT services provided by bank.

#### **5.7 CONCLUSION**

Based on the results of the analysis, it can be concluded that information technology has massive influence on the use of banking services and gives utmost satisfaction to the customers of SBI in Guwahati city. Now customers are fulfilling their lifestyle aspiration at right times with right kind of technology for deposite, withdrawl and transfer of fund. However, though the customers appreciate the IT innovation in bank, but a large number of customers still prefer to use traditional banking services due to certain difficulties.

In the next chapter we try to identify the problems faced by people while adopting IT tools and services in agriculture and banking in the study area.

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# CHAPTER - 6 PROBLEMS OF INFORMATION TECHNOLOGY IN ASSAM

#### **6.1 INTRODUCTION**

IT industry in Assam, in comparison to other states of the country is in a nascent stage. In Assam the proliferation of IT related activities centred on research and developmental works till the early nineties. But it was in the late nineties, the state IT industry got much needed impetus when internet was introduced in a few cities and towns of Assam. However it has been observed that despite best of efforts by all concerned, the IT industry in Assam is not very encouraging. The state has not been able to attract investment and entrepreneurship for the growth and development of this industry. Though the government of Assam introduced several IT policies for promoting growth of this sector, (these policies have been mentioned in the chapter 3) but in reality this sector cannot give a visible footprint in the IT map of India. No IT giant of India like, TCS, Infosys etc. are willing to open their branch in Assam till now. Inspite of having potentialities like availability of a large English speaking human resources and a technically talent pool, high literacy rate of 73.18 percent against the national average of 74 percent as per 2011 census, incentivizing the investors by giving suitable tax reduction, the state IT industry has not been able to grow. Therefore in this chapter an attempt has been made to analyze the constraints faced by IT industry in Assam. Here we also study the problems associated with IT application in agriculture and banking by the farmers and the customers of bank respectively in the study area. The main problems faced by IT industry in Assam are discussed in the following section.

#### 6.2 MAJOR PROBLEMS FACED BY IT INDUSTRY IN ASSAM

Lack of physical and social infrastructure: Amongst the physical infrastructure required by IT industry, proper telecommunication facility is the most important one. Although various efforts have been made from time to time in order to improve telecom connectivity and tele-density in the state, the results of these efforts have not been very promising so far (Malaker, 2015). The overall tele-density in Assam is only 10.65% compared to the national average of 20%, as estimated by the Department for Development of the North Eastern Region (DONER). It indicates an uneven distribution of telecommunication access in the country. According to TRAI, 2013, in the North East, mobile phone services were introduced after a delay of eight years. Again it has been seen that mobile service providers also face various problems in mobile expansion network in Assam. Some of them are in getting permission to lay cables and land for installing base trans-receiver station, electricity supply and its quality, condition of the roads that hampers transportation of materials etc. Moreover at the state capital and district head quarters, the tele-density and the quality of existing transmission bandwidth is low and poor. Existing telecommunication infrastructure in the north eastern region could not even support the basic 2G mobile coverage. Absence of adequate connectivity from transmission media (OFC, microwave and satellite) lead to inadequate bandwidth for high speed broadband capable transmission of data which largely affected the functioning of IT industry in the state.

Another physical infrastructure that retards the growth of IT in Assam is power supply. By the end of the 12<sup>th</sup> Five Year Plan, average peak demand for electricity in the state was 2293 MW. However, the total availability of power was around 1200 MW. The own generation of the Assam Power Generation Company Ltd (APGCL) generates around 320 MW and the total import is around 750MW. Thus total supply of electricity is only 1070 MW, which indicates a huge gap between energy demand and supply. Again in 2012, Assam shows the lowest per-capita electricity consumption which is 209.20 kwh compared to the national average per-capita electricity consumption of 778.63 kwh.

Social infrastructure of a city plays a crucial role in emergence of an IT destination. Whereas in our state, insufficient availability of high and quality social infrastructures such as world class super- speciality hospitality, global residential school/technical institutions/universities, five star hotels, international quality airport, multiplex cum entertainment zones and a rapid transportation systems eg. metros, high speed corridor etc impedes the emergence of Guwahati as a global IT hotspot.

The other essential infrastructure for IT Industry is availability of the IT Park. Till now Assam has only one IT park located at Borjur. Whereas states like West Bangle and Odissa has IT parks which stands at 18 and 4 respectively.

Moreover the existing IT infrastructure of Assam for e.g Community Information Centres (CICs) in 219 Community Developments Block of the states are not functioning well and some of CICs are closed for several years. Again ICT based Agribusiness Services ASHA- hope for farm prosperity, a government of Assam initiative introduced in 2005, is closed now. All these factors have led to the slow growth of IT in Assam. Thus we see that in respect of social indicator such as on literacy, the NE region score shows above national average. But NER falls behind in case of infrastructure development, road density and per capita electricity consumption.

Lack of Training and Development Infrastructure: The importance of quality Training Institutes cannot be overstated in the field of ICT development. But our region lacks adequate number of high end quality skill training institutions for information technology, though there are mushrooming of many training centres running software and hardware courses without proper validation and benchmarking and poor quality trainers. Also the technical institutions of higher learning eg. State and Private Engineering Colleges, NIT, are hit by shortage of quality faculties and associated infrastructure facilities like labs, hardware etc. Therefore engineering graduates students of Assam often goes to other place for skill development or take admissions to finishing schools which are not available in our state.

**Industry- Academia Linkup:** The premier institutes of higher learning like state engineering colleges, NITs, deemed universities have very less interaction with the industries/ Companies of the region whether in the field of ICT or otherwise. This linkage serves as a crucial catalyst for the growth and development of the IT companies towards the higher value chain.

Less attractive destination for investment: For a long period of time, Assam has not been considered as an attractive destination for investment. After partition of the country, industrialization process in Assam received a serious setback. Narrow corridor of North Bengal remained the only link of the region which hindered economic integration of the state with other parts of the country. This in turn has reduced the attractiveness of the region as destination of investment. Apart from this, frequent bandhs and road blockades also lead to time overrun and cost escalation for any type of project to be completed. So no private investors come to the state

Lacuna of government policies: For promoting the growth of IT sector in Assam, central and state govt. announced various policy measures from time to time. But it is observed that these policies did not intervene for addressing the fundamental constraints on IT growth in the region. These policy measures arrived mostly in the form of offering of subsidies and concession. Again no proper incentives have been given (like incentives for support of capital investments, tax holidays and employment generation based subsidies) by the government which are likely to attract IT companies to work in Guwahati/Assam.

# 6.3 PROBLEMS ASSOCIATED WITH ICT APPLICATION IN AGRICULTURE IN THE STUDY AREA

In this section, we will study the problems which are responsible for farmers not using IT in agriculture.

From the previous chapter i.e impact of IT on agriculture, it has been observed that in the study area only 11 percent farmers use new ICT i.e mobile phone, internet, Kisan Call Centre etc to access agricultural information and majority of farmers still depend on non ICT and old ICT sources for agricultural information. Therefore an effort has been made to know about the factors that prevent from using new ICT tools in agriculture. To identify the problems associated with new ICT application in agriculture, a pilot survey was conducted and ten factors selected from the survey which hinder the farmers to use ICT as a source of agricultural information: Henry E Garret (1961), in 'STATISTICS IN PSYCHOLOGY and EDUCATION,' describes a technique which is appropriate in our case to rank the problems associated with ICT application in agriculture and banking in the study area. As per this method, at the first step the respondents are asked to rank the enlisted factors according to their importance in the study area. Enlisted factors are those 10 factors which are identified in a pilot survey. In the second step, the order of merit assigned by the respondents will then be converted in to percentage position by using the following Garrett's formula:

Percentage position =  $100x (R_{ij}-0.5)/N_{j}$ , where  $R_{ij}$  is the rank given for the i<sup>th</sup> factor by j<sup>th</sup> individual;  $N_j$  is the number of factors ranked by the j<sup>th</sup> individual.

In the third step, the percentage position of each rank will then be converted into scores referring to the table given by Garret and Woodworth (1969). For each factor, the scores of individual's respondents are added and then mean score for all the factors is calculated. These mean scores for all the factors will be arranged in descending order, revealing that the factor having highest mean is considered to be the most important factor.

Applying the above percentage position formula, the percentile position is calculated as follows in table 6.1. Here  $N_i=10$ 

Rank	Percentile position
1	100(1-0.5)/10=5
2	100(2-0.5)/10=15
3	100(3-0.5)/10=25

<b>Table 6.1 :</b>	Percentile	position
--------------------	------------	----------

4	100(4-0.5)/10=35
5	100(5-0.5)/10=45
6	100(6-0.5)/10=55
7	100(7-0.5)/10=65
8	100(8-0.5)/10=75
9	100(9-0.5)/10=85
10	100(10-0.5)/10=95

For each percentile position shown in the above, Garret's table gives the scores that represent the equivalent rank on a scale of 100 points which are given in the following table 6.2

Rank	Percentile position	Garrett's score
1	5	81
2	15	70
3	25	63
4	35	58
5	45	52
6	55	48
7	65	42
8	75	37
9	85	29
10	95	13

 Table 6.2 : Garrett's score according to Percentile position

The following are the factors (found from pilot survey) which are responsible for farmers not using ICT as a source for agricultural information.

- 1. Tendency of following traditional method of cultivation
- 2. Difficulties in understanding language of ICT tools
- 3. Characteristics like age and motivation to access ICT
- 4. Lack of education of farmers.
- 5. Lack of government machinery to enlarge ICT application to rural areas.
- 6. Inadequate availability of ICT services to rural farmers.
- 7. Lack of awareness towards ICT application on agriculture
- 8. Too small firm size
- 9. Infrastructure deficiencies (e.g lack of electricity to charge electronic gadgets.)
- 10. Poor rainfall and irrigation facilities

We now calculate the total score value and total mean value of each factor which is shown in the following table 6.3.

Serial				Rank					Total no. of	Garrat's	Total	mean	Rank			
no	Factor	1	2	3	4	5	6	7	8	9	10	respondents	score	score	score	
1	Tendency of following traditional method	152	30	7	3	3	5	0	0	0	0	200	81	15434	77.11	1
2	Difficulty in understanding language of ICT tools	130	11	9	10	4	6	3	7	6	14	200	70	13684	68.42	4
3	Characteristics like age and motivation to access ICT	108	3	3	4	12	6	4	24	20	25	200	63	12252	61.26	9
4	Lack of education of farmer	123	5	12	4	5	17	6	9	12	7	200	58	13401	67.005	6
5	Lack of govt. Machinery	140	23	7	3	4	3	10	12	8	10	200	52	15143	75.715	2
6	Inadequate availability of ICT services to rural farmers	60	50	40	20	12	3	4	4	2	5	200	48	13247	66.235	7
7	Lack of awareness	120	20	12	14	11	3	5	3	4	8	200	42	13945	69.735	3
8	Too small farm size	50	32	23	27	11	14	3	20	10	10	200	37	11835	59.175	10
9	Infrastructure deficiencies	105	15	35	5	7	13	7	3	2	8	200	29	13605	68.025	5
10	Poor rainfall and irrigation facilities	62	18	34	26	14	11	17	13	1	4	200	13	12464	62.32	8

# Table (6.3): Total score and Total mean value of factors associated with Agriculture

Following table 6.4 shows the constraints based on ranks.

# Table (6.4): Ranking of problems associated with farmers while using ICT in agriculture

Serial No	Problems	Rank
1	Tendency of following traditional method	1
2	Lack of govt. Machinery	2
3	Lack of awareness	3
4	Difficulty in understanding language of ICT tools	4
5	Infrastructure deficiencies	5
6	Lack of education of farmer	6
7	Inadequate availability of ICT services to rural farmers	7
8	Poor rainfall and irrigation facilities	8
9	Characteristics like age and motivation to access ICT	9
10	Too small farm size	10

The table 6.4 indicates that among the different problems faced by the farmers while using ICT as a source of agricultural information, tendency of following traditional method of cultivation has got the topmost rank, since the mean score value is the highest ie 77.11. Lack of government machinery, lack of awareness and difficulty in understanding of ICT tools is another problem associated with availing ICT application in agriculture and it is ranked in second, third and fourth position and its mean score values are 75.71, 69.73 and 68.43 respectively. Similarly, the problem such as infrastructure deficiency, followed by lack of education of farmer and inadequate availability of ICT service to rural farmers are also of the problems in accessing ICT as a source of agriculture information and it is ranked in fifth, sixth and seventh respectively and its mean value shows 68.02, 67.00 and 66.23 respectively. Further the problem such as poor rainfall and irrigation facilities, characteristics like age and motivation to access ICT and small farm size also affect the accessing of ICT in agriculture. These are ranked from eight to ten position and its mean score value are 62.32, 61.26 and 59.17 respectively.

# 6.4 PROBLEMS ASSOCIATED WITH ICT APPLICATION IN BANKING IN THE STUDY AREA

According to a report "Trends and Progress of Banking in India", published by RBI, technology based service banking has failed due to a number of reasons such as socio economic, technological, legal, infrastructural, and psychological factors. Similar result has been found in our study also. In our study area, though a large percentage of customers using technology banking in their day to day transaction, but there are some problems associated with customers while using IT enable banking services. Here also the problems were identified in the pilot survey and given to 200 samples bank customers. They were asked to rank these according to their importance.

- 1. Lack of security
- 2. Lack of privacy
- 3 Website distruption

- 4. Lack of stable and fast internet connection at home
- 5. Difficulty in using e-banking services
- 6. Tendency to visit branch
- 7. Site Navigation
- 8. Fear / distrust of technology
- 9. Frequent link failure
- 10. Non availability of cash in ATM

We now identify the most important factors influencing the customers of bank not to use IT enabled banking services in the study area by using Garrett ranking technique. The percentage position and Garrett scores are same as in the case of agriculture, since the number of respondents here also same i.e. 200.

Serial						Rar	ık				Total no. of	Garrat's	Total	Mean	Rank	
No.	Factor	1	2	3	4	5	6	7	8	9	10	respondents	score	score	score	
1	Lack of security	150	30	3	6	1	3	3	4	0	0	200	81	15257	76.28	2
2	Lack of privacy	164	14	7	3	6	2	3	0	0	0	200	70	15413	77.06	1
3	Website distruption	111	9	10	4	6	13	7	9	12	9	200	63	12511	62.55	6
4	Lack of stable and fast	108	3	3	4	12	6	4	24	20	25	200	58	12252	61.26	8
	internet connection at															
	home															
5	Difficulty in using e-	130	21	6	3	11	9	5	5	6	4	200	52	14177	70.0-8	3
	banking services															
6	Tendency to visit	70	28	12	13	17	15	9	11	8	7	200	48	12433	62.16	7
	branch															
7	Site Navigation	120	20	12	14	11	3	5	3	4	8	200	42	13945	69.72	4
8	Fear / distrust of	45	12	3	5	15	20	30	24	36	10	200	37	10026	50.13	10
	technology															
9	Frequent link failure	100	20	12	8	14	16	9	8	12	1	200	29	13251	66.25	5
10	Non availability of cash	54	16	27	3	27	12	11	34	25	1	200	13	11807	59.03	9
	in ATM															

Table (6.5): Total score and Total mean value of factors associated with Banking

The ranking of the problems applying Garrett technique are shown in the following table 6.6

 Table (6.6): Ranking of problems associated with bank customers while using technology banking.

Serial No.	Problems	Rank
1	Lack of privacy	1
2	Lack of security	2
3	Difficulty to use e-banking services	3
4	Site Navigation	4
5	Frequent link failure	5
6	Website disruption	6
7	Tendency to visit branch	7
8	Lack of stable and fast internet connection at home	8
9	Non availability of cash in ATM	9
10	Fear / distrust of technology	10

From the above table we have seen that among the different problems associated with bank customers while using technology banking, lack of privacy and lack of security has got the first and second topmost rank as its mean value is highest ie 77.16 and 76.28 respectively. Again difficulty to use e-banking services, site navigation and frequent link failure fall in the third, fourth and fifth position respectively and its mean score values are 70.08, 69.72 and 66.25 respectively. Similarly website disruption, tendency to visit branch, lack of stable and fast internet connection at home, non availability of cash in ATM and fear/ distrust of technology are ranked from sixth to ten position and mean score value shows 62.55, 62.16, 61.26, 59.03 and 50.13 respectively. All these problems hinder the use of IT banking services in the study area

#### **6.5 CONCLUSION**

From the above discussion, it may be concluded that inspite of having potentialities of IT in Assam, the state IT industry has remained in a nascent stage due to several reasons. The most important are lack of social and physical infrastructure, lack of training and development, less attractive destination for investment, less industry-academia interaction and lacuna of government policies. To overcome these constraints the state government should play a vital role, so that Assam can also reap the benefit of this new technology.

Besides these limitations, the study has also identified the problems which limit the adoption of ICT in agriculture and banking by the farmers and bank customers respectively. Among the problems in agriculture, lack of government machinery, lack of awareness towards ICT application on agriculture, lack of education of farmers, infrastructure deficiency etc. can be mitigated by the central and state government support. To change the low rate of ICT adoption and its effectiveness, IT literacy is understood to be the main remedial factor along with electricity, hardware, appropriate software, network connectivity etc to be considered for rural ICTs initiatives. To address these issues government should come up with a policy frame work for the nascent Agricultural Information Technology sector. Last but not least, as in the study area no mobile enabled agricultural service provider is found, so there is an urgent need to start up these services which disseminate agricultural information to the farmers in a cost effective way.

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Similarly in the banking sector, while using e- banking services of SBI in the study area, privacy and security are the most important concerns of the customers. Fast, quick and stable internet connection is the pre-requisite for technology banking. But absence of this factor creates problem among the customers of SBI in the study area in their banking activities. In this regard government has to play a vital role to improve telecommunication infrastructure with adequate bandwidth. The newly establish 10 Gbps international internet gateway at Agartala (India's third IIG after Mumbai and Chennai ) linked to Cox's Bazar in south east Bangladesh, has the potential to boost banking sector in Assam.

Further, difficulty to use e-banking services, tendency of branch visit, fear/distrust of technology are other problems associated with customers while adopting IT services of bank. In this regard bank has to play an important role to motivate customers by giving training to them about their IT product and services so that customers are attracted towards IT enabled system in bank and can avail these services easily and conveniently.

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#### CHAPTER - 7

# FINDINGS, CONCLUSION AND POLICY IMPLICATON

#### 7.1 MAJOR FINDINGS

The Major findings of the study have been grouped under three heads -

- a) Agriculture
- b) Banking
- c) Problems associated with ICT application in agriculture and in banking

#### 7.1.1 Agriculture

IT plays an important role in the domain of agriculture. By giving relevant and quality information on time and in time regarding pre sowing, pre harvest, post harvest and market information, IT can help an average Indian farmers. This study clearly shows that use of IT in agriculture make impact on different stakeholders of agriculture through improving productivity and profitability. It also shows the relationship between use of ICT as a source of agriculture information and nine different factors which motivated farmers to use ICT in agricultural activities in the study area. The important findings from the study, with respect to agriculture is designed into following sub sections:

- Categories of information user farmer
- Type of information required by the farmers
- Information accessed through ICT

- Impact of ICT on different stakeholders of agriculture-small and medium farmers, large farmers and traders
- Identifying factors which motivate farmers to use ICT as a source of agricultural information

#### IN CASE OF INFORMATION USER FARMERS

- > Four categories of Information User farmers are found
  - a. Farmer who use only non-ICT sources
  - b. Farmer who use only old ICT s sources
  - c. Farmer who use only new ICT s sources
  - d. Farmer who use both old and new ICT sources.

## IN CASE OF ICT USER

- ▶ 61 percent of farmers use ICT to access agricultural information
- Out of these, 50 percent use old whereas only 11 percent use new ICT source and 24 percent use both old and new ICT sources
- > 15 percent of farmers still depend only on non ICT sources.
- > Any web based personalized agricultural advisory system (e-choupal,

ASHA) are not found in the study area.

#### Type of information required by farmers for cultivation

- Production related
- Market related
- ➢ Others

#### Type of information accessed though ICT

- ➢ 70 percent of old ICT user farmer use these tools for production related information
- ➢ 36 percent of new ICT user farmer use these tools for market related information.
- > 14.8 percent of new ICT user farmer use these tools for other information.

#### Impact (Small and medium farmer using new ICT source)

- 13 percent farmer benefited in terms of greater convenience such as cost and time saving
- 5 percent farmers obtained benefits of better plant protection from being able to make and receive calls while working on the farm
- > 3.3 percent farmers got benefits of better crop choice.
- 10 percent farmers have been able to improve their bargaining power with traders.
- 2 percent benefited by receiving information about Government schemes and programmes.
- Farmers benefitted from using old ICT sources include protection from weather related damage, seed variety selection and best cultivation practices.

#### Impact (large farmer)

None of the large farmers depend on new ICT sources for increase in agricultural productivity

 ICT (old) make impact on market price, disease control and dealing with input in case of large farmer.

#### **Impact (Traders)**

- 77 percent traders have been able to make better communication to market players
- 58 percent traders benefited in terms of an increase in efficient movement of truck and goods carriers
- > 26 percent traders obtain benefits of real time information while in transport
- > 88 percent traders act as an information intermediaries

#### Factors

- The factors like Education, Training, Type of household, Household size, Age, Income, Caste, Land holding size and Type of crops motivating farmers to use ICT as a source for accessing agricultural information.
- Use of ICT as a source of agricultural information by the farmers is positively correlated with Education, Training, Type of household, Income, Caste, Land holding size and Type of crops.
- Age and Household size are negatively correlated with the farmers accessing ICT as a source of information.

#### CONCLUSION

It is seen from the above discussion that farmers in the study area use ICT for accessing agriculture related information and it leads to agricultural productivity improvement. Education, training, household size, income, age, landholding size, caste, and type of crops are the motivating factors for accessing ICT as a source of information.

#### Hence it proves our research questions related to agriculture.

#### 7.1.2 Banking

The introduction of IT in bank has transformed the traditional banking system, resulting in speed, accuracy and efficiency of conducting business. It has been proved by many studies that the banks that are using IT products like ATM, mobile banking, internet banking, RTGS, EFT, etc showing good quality of customer service delivery. In the study area, SBI has been able to increase service accessibility of the customers with the adoption of IT enable system in bank. Following are the important major findings with respect to banking:

- With the introduction of IT in banks, the following services were made available to customers.
  - Banking Services (includes 10 sub services)
  - Delivery and Add on services (includes 3 sub services)
  - Front Office Services (includes 5 sub services)
  - Safety and Security Services (includes 5 sub services)
  - Accuracy and reliability services (includes 3 sub services)

SI.	Description		Rating									
No			1	, ,	2		3		4	5	;	
		No	%	No	%	No	%	No	%	No	%	
1	Banking Services (includes 10 sub services)	97	38.8	150	60	3	1.2	-	-	-	-	
2	Delivery and Add on services (includes 3 sub services)	76	30.4	160	64.0	14	5.6	-	-	-	-	
3	Front Office Services (includes 5 sub services)	55	22.0	193	77.2	2	8	-	-	-	-	
4	Safety and Security Services (includes 5 sub services)	90	36.0	156	62.4	4	1.6	-	-	-	-	
5	Accuracy and reliability services (includes 3 sub services)	46	18.4	189	75.6	13	5.2	2	8	-	-	

# **TABLE 7.1: IT in Banking Services**

(Source : Field Study)

(Note: 1-Strongly agree, 2 – Agree, 3 – Neutral, 4 – Disagree, 5- Strongly Disagree)

- All the services mentioned above have significant influence on the service accessibility of the customers.
- Among these five factors banking services are most popular factors as around 99% of customers are comfortable to avail these services because it contains most popular services such as ATM facilities, mobile banking, debit and credit cards, core banking etc.
- The relationship between service accessibility and customer satisfaction is further reinforced by results of regression analysis which are shown in the following tables.

			Adjusted R	Std. Error of
Model	R	R Square	Square	the Estimate
	.802	.643	.613	.54067

## Table 7.3 ANOVA

	Sum of		Mean		
	Squares	df	Square	F	Sig.
Regression	16.709	5	3.342	11.432	.001
Residual	71.327	244	.292		
Total	88.036	249			

#### Table 7.4 COEFFICIENT

				Standard			Collinearity Statistics	
				ized			Tolerance	VIF
		Unstanda	rdized	Coeffici				(Variance
		Coeffic	ients	ents	t	Sig.		influence
	Dependent		Std.					factor)
	variable	В	Error	Beta				
Constant	Service	.399	.422		.946	. 002		
Delivery and	accessibility						.944	1.059
add on service		.106	.064	.098	1.653	.043		
Total								
Front office		.149	.080	.107	1.847	.026	.986	1.014
total								
Safty and		095	076	072	1 121	004	.795	1.258
security Total		.085	.070	.075	1.131	.004		
Accuracy and		222	072	190	2.046	002	.863	1.159
reliability Total		.222	.073	.189	3.040	.003		
Service Total		.330	.071	.283	4.633	.001	.890	1.124

#### In case of Association between demographic profile and Type of service and

#### frequency of use

- Among the demographic factors income, age, and occupation has a significant association between type of service
- > No association is found between gender and education with type of service.
- There is a significant association between age, income, education, and occupation with frequency of use and
- > No association is found between gender and frequency of use.

Association between	Degrees Calculated		Table	Results
	freedom	value	value	
Age and Type of Service	4	46.01	13.27	Accepted
Income and Type of Service	6	46.77	16.812	Accepted
Occupation and Type of Service	9	75.65	21.66	Accepted
Age and frequency of use	6	90.53	16.812	Accepted
Income and frequency of use	9	75.65	21.66	Accepted
Education and frequency of use	6	29.39	16.812	Accepted
Occupation and frequency of use	12	199.72	26.217	Accepted
No Association between				
Gender and Type of Service	2	.278	9.210	Rejected
Education and Type of Service	4	12.49	13.277	Rejected
Gender and Frequency of use	3	8.97	11.345	Rejected

Table 7.5 Chi – Square Test

 Irrespective of Age, Income, education and occupation, internet banking is more popular among all the customers of SBI.

- ✤ There is no reduction of visit to bank branches.
- 138 customers out of 250 that is 54 percent still prefer to visit branch for their banking activities.

#### **Benefits of IT services to customers**

With the introduction of IT in banks, following benefits are enjoyed by the customers of SBI in the study area.

S1.	Description	Rating									
No.		1			2		3		4		5
		No	%	No	%	No	%	No	%	No	%
1	Ensuring security	42	30	69	49.28	09	6.4	12	8.57	08	5.7
2	Easy deposit, with-drawl and transfer of fund	16	11.42	24	17.14	10	7.14	60	42.85	30	21.42
3	Customers relationship management	40	28.57	36	25.71	04	2.85	39	27.85	21	15
4	Fast, quick transaction with accuracy	20	14.28	34	24.28	10	7.14	40	28.57	36	25.71
5	Time saving in banking activities	48	34.28	50	35.71	09	6.4	21	15	11	7.85
6	Convenience and Flexibility	34	24.28	72	51.42	14	10	08	5.7	12	8.57

Table 7.6: Benefits of IT services of bank to the customers of SBI

Source: Survey Data

(Note: 1-Strongly agree, 2 – Agree, 3 – Neutral, 4 – Disagree, 5- Strongly Disagree)

- 82 percent respondents Strongly Agreed and Agreed for the benefits of ensuring security.
- ♦ More than 60 percent for the benefits of convenience and flexibility
- ✤ 75 percent for customer relationship management.
- ✤ 72 percent agreeing on the benefits of time saving in banking activities.

#### On the other hand:

- ✤ 60 percent of the customers disagree on the benefits of easy deposit, withdrawal and transfer of funds (only 30 percent agreeing).
- ✤ 42 percent disagree for fast, quick transaction with accuracy.

Thus the results of work reveal that IT has massive influence on the use of banking services and affords utmost satisfaction to the consumer.

#### Hence it proves our research question related to banking..

#### 7.1.3 Problems associated with ICT application in agriculture and in banking

Adoption of ICT in agriculture has huge potential to improve agriculture and rural development. In this regard newly evolved various modes of communication such as internet, mobile phone, websites, and on-line communication have a vital role. In this study it is seen that there are some problems which retard the farmers to use ICT in agriculture. Similarly in the banking sector also though ICT create unprecedented opportunities for the bank's customers but due to certain problems, customers of bank, hesitated to use IT enabled product and services offer by bank. Following are the important findings:

Using Garret ranking technique the problems associated with farmers while using ICT in agriculture are ranked as follows

Serial No	Problems	Rank
1	Tendency of following traditional method	1
2	Lack of govt. machinery	2
3	Lack of awareness towards ICT application on agriculture	3
4	Language of data	4
5	Infrastructure deficiencies	5
6	Lack of education of farmer	6
7	Inadequate availability of ICT services to rural farmers	7
8	Poor rainfall and irrigation facilities	8
9	Personal impediments	9
10	Too small firm size	10

# Table 7.7 Ranking of Problems faced by farmers

> Problems experienced by the customers of banks while using e- banking

service are ranked as following.

Table	78	Ranking	of Pro	hlems	faced	hv	customers	of ł	hanks
Lanc	1.0	Nanking	01110	DICHIS	laccu	D y	customers	UL I	Janns

Serial No	Problems	Rank
1	Lack of privacy	1
2	Lack of security	2
3	Difficulty to use e-banking services	3
4	Site Navigation	4
5	Frequent link failure	5
6	Website disruption	6
7	Tendency of branch visit	7
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8	Lack of stable & fast internet connection at home	8
9	Non availability of cash in ATM	9
10	Fear / distrust of technology	10

#### 7.2 CONCLUSIONS

Today, information technology has become a major driving force in most of the sectors. Agriculture is not exceptional. The adoption of information and communication technology (ICT) and mobile-enabled agricultural services to farmers and agricultural traders has helped them reduce their transaction costs, information search costs and travel costs and increased access to information on prices and reduced wastage / spoilage. This leads to farm productivity and profitability.

This study proves that IT makes much impact on small and medium farmers by providing greater convenience such as cost and time saving, better plant protection and crop choice and improve their bargaining power. Similarly traders and commission agents are also benefited while using mobile phone in their business. Majority have reported that in order to gauge current pricing information, market supply and demand condition and to obtain produce for sale, mobile phones are critical infrastructure in their business.

However, this study shows that unlike small and medium farmers and traders, ICT made little impact on large farmers. Thus we have been seen that though ICT can bring change in the life of small and medium farmers by improving farm productivity and profitability but a very negligible number of small and medium farmers (11 percent) use these new ICT tools i.e. mobile phone, internet, Kisan Call Centre etc to access agricultural information. In the study area majority of farmers still depend on non ICT and old ICT sources for accessing agricultural information. Again the chi-square test indicated that the factors 'education' and 'training' have a positive association with the adoption of ICTs as a source of information highlighting the relevance of capacity building initiatives for enhancing the use of ICTs in agriculture in the study area.

The sector that has been most radically affected by the development of information technology is the banking sector. Information technology has enabled banks in meeting customer's satisfaction by providing instant, anytime and anywhere banking facilities. This research establishes five factors that influence service accessibility of the customers towards IT enabled system in SBI in the study area. These are banking services, delivery and add on services, front office services, safety and security services and accuracy and reliability services.

The study also identify certain benefits of IT services to customers of SBI such as ensuring security, convenience and flexibility, customers relationship management, easy deposit, with-drawl and transfer of fund, fast, quick transaction with accuracy and time saving in banking activities. Though adoption of IT in bank has been appreciated by customers of SBI in the study area, but there is no reduction of visit to bank branch. 138 customers out of 250 that is 54 % still prefer to visit their branch for their banking activities.

Again it has been observed that in the study area only a very small number of farmers use new ICT to access agricultural information and majority of farmers still depend

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on non ICT and old ICT sources for agricultural information Similarly though customers of bank in the study area are using technology banking in their day to day transaction, but a large percentage of customers (54 percent) still prefer traditional banking method This is because of a large number of problems are associated with respondents while using ICT tools and services in agriculture and banking respectively .In this study, with the help of Garret Ranking Technique, the problems are ranked. Tendency of following traditional method of cultivation, lack of government machinery, lack of awareness towards ICT application on agriculture etc are the most important ones associated with the farmers.

Therefore it can be concluded that to increase the numbers of ICT user farmers in agriculture, government intervention is necessary to start more ICT centers and to make aware and inform farmers about the needs and importance of ICT application in agriculture. Similarly the most important problems experienced by the customers of bank while using e-banking services are lack of security and privacy and difficulty to use e-banking services. In this regard, there is a need to build the trust among the customers and provide technological training to them to use ebanking services so that customers are attracted and avail these services easily.

#### 7.3. SUGGESTIONS AND POLICY IMPLICATIONS

#### AGRICULTURE

It is found in the study that though ICT facilitate dissemination of agricultural information, but number of ICT user farmers specially new ICT in agriculture are limited. Again it is also known from the secondary source that government machinery

to support ICT in agriculture is not adequate. Hence to increase agricultural productivity through using ICT, the study comes up with following suggestion.

- There is a positive correlation between the use of ICT as a source of agricultural information and socio economic variables like education, land holdings, income of the family and trainings undertaken by respondents in activities related to agriculture in the study area .Therefore emphasis on improving the access to these factors is likely to facilitate the use of ICTs for agricultural development.
- Again the study shows that extent of adoption of ICT is confined only to farmers with literacy, formal training and large holding, which has widen the knowledge gap. To reduce and finally to remove this gap information dissemination agencies should come with broad perspective to facilitate necessary services to farmers. As no mobile enabled service provider were found in rendering agricultural services, it calls for an urgent need of involvement of those agencies like their counter part in other states.

### BANKING

In this study, it is found that IT has created immense opportunities for customers of banks by providing various IT products and services but could not reduce the pressure of customers in the banking hall. Thus regarding impact of IT on banking, the study comes up with the following suggestions.

□ There should be periodic educational campaigns about the IT banking services and their usage by the bank to promote customer patronage. This help

customer to know all the technological services provided by bank, how it is used, and familiarized themselves with it.

- Again the technological transformation has also created a fear factor among customers due to security. Such type of campaigns will help erode some of the fear that customers have concerning IT enabled system in bank.
- It has been observed from the study that senior customers have lagged behind in accepting IT adoption in bank. So banks need to consider the ways in which they specifically reach out to seniors with their transformation strategies. eg. Bank should make mobile banking more senior friendly by embedding easy-to-use communication features, such as clicks to call services when they need it.
- As ATM machines are more popular among customers and are accustomed to it, additional services should be added into the ATM machines (eg. dropping cheques, deposit cash etc). This will help ease queues and pressure in the banking hall if such services can be received via ATM machines.

#### **PROBLEMS:**

In this study we have found that a large number of farmers face different problems in accessing ICT application in agriculture and running their agriculture activities. Similarly customers of banks also experienced certain difficulties while using e-banking services. To remove these problems, following steps are suggested.

#### AGRICULTURE

As tendency of following traditional method, lack of government machinery to enlarge ICT, lack of awareness are the most important factors limiting ICT adoption in agriculture, therefore the government should take necessary steps to start more ICT information centers with adequate facilities. So that farmers are aware and informed about the needs and importance of ICT adoption in agriculture.

- The organizations and departments concerned with agricultural development need to realize the potential of ICT for the speedy dissemination of information to farmers.
- It is known from the secondary sources that CICs of the two community development blocks are not functioning well and the ASHA web portal which was launched in 2005 also remained closed. So state government should reopen these services to help farmers in ICT adoption for increased productivity.
- Since most of the farmers have access to FM radio programs, private cable TV programmes, etc., specially designed topics like how ICT helps in increasing farm productivity, is the most effective way to spread awareness about the use of ICT in agriculture.

#### **BANKING SECTOR**

- In the banking sector the study shows that security and privacy and difficulty to use IT services are the most important factors limiting the adoption of IT enabled services in the bank. So there is a need to build the trust among the customers regarding the security and privacy matter. This can be done by making internet banking security features more stringent and informing the customers about these advanced security measures.
- Banks need to pay more to educating their customers in the use of IT banking services. Providing technological training to customers or even showing them

how to use IT banking services in practice has attracted customers towards the adoption of these services.

For popularizing mobile banking, banks need to design mobile application for all age group, from young to old, which make banking activities easy and comfortable.

The study conducted in the two dominant sectors of Assam's economy – namely the agricultural and banking sectors, looks into the acceptability of the IT tools and services by the people of the state. The study also sees whether productivity increase takes place by use of IT. Information technology has been an enabler of growth in many regions of India. Uttar Pradesh, Maharashtra, Rajasthan, Karnataka, Kerala etc. are examples of such growth in the agricultural sector with the adoption of e-choupal, IFFCO Kisan Sanchar Limited (IKSL), Reuters Market Light (RML).

There are examples of states like Andhra Pradesh and Karnataka where the banking sector has made great strides. But our state has lacked behind. This is mainly because of people in the state not using the services available. In the agricultural sector, a very negligible number of farmers (11 percent) use new ICT tools ie., mobile phones, internet, Kisan Call Centre, etc. to access agricultural information. Most farmers still depend on non- ICT and old ICT (radio, T.V., newspapers) tools. Tendency of following traditional method of cultivation, lack of awareness towards ICT application on agriculture, lack of education of farmers, etc. hinders them from accessing the agricultural information through these new ICT sources. Similarly in the banking sector also due to several reasons customers are not using IT enabled systems in banks. Some of them are lack of privacy and security, incompetence in using the internet, etc. To mitigate these above mentioned problems, if the government, NGOs

and various private bodies come up with the proper policy framework as mentioned before, then Assam too will be able to derive the benefits of IT and thereby progress faster in the growth and developmental path.

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## APPENDIX

# **QUESTIONNAIRE 1**

### **For Farmers**

## Part A

Sl. No	Basic information	Response of the respondent
1	Name of the respondent	
2	Village	
3	Block	
4	Age (in complete years)	

Sl. No	Education	Response of the respondent
	Illiterate	
	Functionally literate	
5	Primary school	
	Middle school	
	High school	
	College education and above	

Sl. No	Caste	Response of the respondent
	ST	
6	SC	
	OBC	
	FC	

Sl. No	Family Size	Response of the respondent
7	Big	
	Small	

Sl. No	Family land holding	Response of the respondent
8	Land in possession	
	Landless	

Sl. No	Income of the family	Response of the respondent	
		Monthly income (Rs.)	Yearly income (Rs.)
	Main		
9	Subsidiary		
	Total		

Sl. No	Training undergone	Response of the respondent	
10	Have you undergone any training on sericulture?	Yes	No
	If any, mention		

Sl. No	Types of households	Response of the respondent
11	Cultivator	
	Agriculture labour	

Sl. No	Cultivating crops	Response of the respondent
	Rice	
12	Oil seed and spices	
	Vegetables and fruits	
	All	

Sl. No	Where from you access agricultural	Response of the respondent
	information	
	Non ICT sources	
	Old ICT sources	
13	New ICT sources	
	Both old and new ICT sources	

Sl. No	Mobile enabled agricultural service	Response of the respondent	
	provider		
14	Are you accessing any mobile enabled	Yes	No
	agricultural service provider?		
	If yes, mention		

Sl. No	Types of information required	Response of the respondent
	Production related	
15	Market related	
	Other related	

Sl. No	From which source required informations	Response of the respondent
	accessed	
	Non ICT	
16	Old ICT	
	New ICT	
	Both old and new	

17. Has new ICT source helped you to:

a) get connected to markets

b) to apply better agricultural practices

c)Influenced your cropping pattern decision

d)reduced wastage

e)increased revenue

18. Has your income increased (or losses reduced) as a result of using this source?

19. Do you ever share the information you receive with other fellow farmers who are not users of this source?

## Part B

Problems associated with the people while using ICT in agriculture

Sl. No	Questions	Response of the respondent
1	Tendency of following method of production	
2	Difficulty in understanding language of ICT	
	tools	
3	Characteristics like age and motivation to	
	access ICT about agriculture	
4	Lack of education	
5	Lack of government machinery	
6	Inadequate availability of ICT services to	
	rural farmers	
7	Lack of awareness of ICT application in	
	agriculture.	
8	Too small farm size	
9	Infrastructural deficiencies	
10	Poor rainfall and irrigation facilities	

## **Questionnaire 2**

# For bank customers

## Part A

Demographic profile of the respondent				
Profile	Distribution	Tick whichever applicable		
Gender	Male			
	Female			
	18-30			
Age	30-50			
	50-60			
	60 & above			
	Illiterate			
Academic Qualification	Upto HSC			
	Diploma/UG			
	PG/Professional			
	Less than 15000			
Monthly	15001-35000			
Income	35001-50000			
	Above 50000			
Marital status	Married			
	Housewife/Retired			
	Employed			
Occupation	Business/Profession			
	Agriculture			
	Student			
	Internet banking			
Tyes of service	Mobile banking			
	Direct branch visit			
	Daily			
Frequency of	Weekly			
uses	Monthly			
	As and when			
Part B

Factors influencing service accessibility						
	Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
	1.Core banking solutions make					
	banking easy, simple,					
	convenient and time saving.					
	2. ATM facility is a simple and					
	convenient way of banking					
	3.Payment made via debit and					
	credit cards is convenient aand					
Services	time saving					
	4.Payment made via internet					
	banking is easy, convenient and					
	time saving					
	5.Payment made via mobile					
	banking is easy, convenient and					
	time saving					
	6.Electronic fund transfer make					
	banking operations easy and					
	convenient					
	7.Electronic cheque clearance					
	system make banking					
	operations time saving and					
	convenient					
	8.RTGS(Right Time Gross					
	Settlement)/NEFT(National					
	Electronic Fund Transfer)has					
	greatly increased the					
	convenience of fund transfer in					
	banking operations					
	9. POS(Point of Sale) machine					
	make banking more convenient					

	10. SBI Budd (mobile app)			
	gives you simple banking			
	solution			
Delivery	1 24*7 access services and			
and add	information has improved			
on	banking accessibility			
services	significantly			
	2. Online balance			
	enquiry/account			
	statement/chequebookrrequest/a			
	ccount opening-closing/standing			
	instruction/loan application			
	/demat services, etc. makes your			
	banking activities easy and			
	convenient			
	3. Online availability of			
	information relating to			
	schemes/interest rate helps to			
	select schemes			
	1.Token vending machine make			
	your banking operation easy			
Front	2.Cash deposit machine			
office	provides convenience in your			
services	banking operations			
	3.Passbook printing(self)make			
	your banking operations easy			
	and convenient			
	4.Green channel(paperless			
	banking)make your banking			
	operations easy and time saving			
	5.Grahak Mitra service provides			
	you guidance on service access			

	1.ATM on convenient locations			
	make your banking transactions			
	safe and secure			
	2.Access to account by self			
Safety	through password make your			
and	banking transaction easy, safe			
security	and secure			
of assets	3. "SMS service" on each			
	transaction gives you a sense of			
	safety and security			
	4. "SMS" warning before			
	payment of cheque over			
	"clearing" gives you a sense of			
	safety and security			
	5.Warning against every access			
	into the "profile" section of			
	"INB" provides safety and			
	security			
	6.Telephonic			
	confirmation/concurrence for			
	payment of "high value" cheque			
	provides the safety and security			
	of your assets			
	7. 24*7 availability of			
	"Helpline" services on			
	"tollfree" call numbers provides			
	you safety and security			
Accuracy	1.IT based banking services			
and	gives adequate prompting to			
reliability	lessen the chance of data entry			
	error			
	2.IT based banking services			
	provides nearing zero error data			
	transmission			
	3. Menu driven software			
	facilitates the ease to adopt the			
	banking services			

## Part C

S1.	Statement	Strongly	Agree	Neither	Disagree	Strongly
No		agree		agree nor		disagree
110.				disagree		
1	Ensuring security					
2	Easy deposit, with-drawl					
	and transfer of fund					
3	Customers relationship					
	management					
4	Fast, quick transaction					
	with accuracy					
5	Time saving in banking					
	activities					
6	Convenience and					
	Flexibility					

## Benefit of IT Services of Bank to the customers of SBI

## Part D

## Problems associated with the people while using e-banking services

Sl. No	Questions	Response of the respondent
1	Lack of privacy	
2	Lack of security	
3	Difficulty in using e-banking services	
4	Website distruption	
5	Lack of stable and fast internet connection at home	
6	Tendency to visit branch	
7	Site navigation	
8	Frequent link failure	
9	Fear/distrust of technology	
10	Non availability of cash in ATM	