



Master's Degree in Library and Information Science (MLIS)



INFORMATION COMMUNICATION AND SOCIETY
PART-II

“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी

“Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances.”

— Indira Gandhi



MLI-101

Information, Communication and Society

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COURSE INTRODUCTION

Information, Communication and Society forms the first course of MLIS Programme of IGNOU. In this course **MLI-101**, aspects of interrelated themes of information and communication are discussed together, considering the symbiotic relationship of those fields and the broader context of information-based society. The entire course is planned to be completed in four blocks.

Block-1 is entitled Information: Nature, Property and Scope and comprises four units. The units are: (i) Data, Information and Knowledge: Intellectual Assets; (ii) Data: Definition, Types, Nature, Properties and Scope; (iii) Information: Definition, Types, Nature, Properties and Scope; and (iv) Knowledge: Definition, Types, Nature, Properties and Scope.

In the first Unit, a clarification of the distinction between data, information and knowledge is presented as a comparative study. In this regard, it has been mentioned that there are numerous definitions of data, information and knowledge in literature. While it is recognised that there are differences between data, information, and knowledge, definitions and the boundaries between them depend on author's perspective. Much confusion can occur by the interchangeable use of these terms. Defining data would appear to be relatively straightforward. According to one author (Haris, 1996), the lowest level of known facts is data; data have no intrinsic meaning, data represent unstructured facts. However, while there is no inherent meaning in data, they are important because they are the raw material for the creation of information. It has been emphasised that when data are sorted, grouped, analysed, and interpreted, they become information. However, rather than reviewing data, information, and indeed knowledge as being discrete, it is perhaps more beneficial to consider a continuum from data through information to knowledge, with the decision as to where a particular item resides being determined both on an individual level, and situationally by its specific context. The Unit emphasises the general meaning, interrelatedness and specific distinctions as these are the tangible forms which can be served in libraries and information centres. The role of libraries and information centres is analysed with reference to four specific situations.

In the second Unit, we learn the meaning and types of data and its pervasive nature throughout human activity, particularly its use in science and technology. It has been stated that data sources form an important part of library resources.

The third Unit presents 'information' from two main perspectives. In the first, 'information' is seen as an element of 'Knowledge Spectrum' with all its implications as a central theme of study. This approach has given rise to the development of a number of disciplines, each of which has a specific focus on 'information'. The definitions of 'information', have a wide ranging variety and no single definition has emerged as common to all disciplines.

In the second perspective, the nature and definition of information, as has been expounded by some of the authorities on the subject is discussed. The study analyses, compares, and critiques a set of writings that have treated and examined the information phenomenon and the way various discourses and understanding of information have been utilised in the field of library and

information studies. The Unit also examines the properties of 'information' in the light of general, scientific and technical and economic and political points of view.

The fourth Unit is concerned with knowledge in all its dimensions. Perhaps the greatest confusion lies in distinguishing between information and knowledge, and some authors use them interchangeably. One view of knowledge, is that it is information combined with context, experience, interpretation, and reflection. However, as knowledge is an interdisciplinary field incorporating many views and definitions. Indeed, there are a number of different types of knowledge discussed in literature. In fact, this Unit captures some of them. It is useful to be able to identify and categories are more amenable to management than others. This Unit briefly discusses the nature of knowledge and its types. It brings out the distinction between personal and public knowledge, and tacit and explicit knowledge rather clearly. It has been emphasised that a key aspect of knowledge is that it is dynamic and thrives on being supplemented, adapted and applied iteratively. Also, it has been pointed out that use and utilisation of knowledge are the final goals of generation of knowledge for the human advancement and this is enhanced by the developments taking place in Information and Communication Technology (ICT). The Unit concludes with a brief discussion on the modes of formation of knowledge. It is hoped that the contents of this block provide useful material to the candidates pursuing the MLIS Programme.

The second block is named Information Generation and Communication. It comprises the following Units: Information, Communication Process, Media and Diffusion (Unit-05), Generation of Information: Models and Forms (Unit-06); Information Theory: Measure and Contents Evaluation (Unit-07); and Digital Information (Unit-08).

Let us try to understand what these units propose to explain us. The first of these Units (Unit-05) Information, Communication Process, Media and Diffusion addresses four important aspects Information, Communication Process, Media and Diffusion of Information.

The concept of information is, without doubt a peculiar one and resisted numerous attempts at both definition and measurement. However, this Unit discusses significant concepts such as information as commodity resource; information as data in the environment; information as representation of knowledge; and information as part of communication process.

The second topic covered in the Unit, is related to the concept of communication. In this regard, attempt has been made to explain the meaning of communication, its forms and channels, and the media of communication in a lucid manner. The third significant aspect described and discussed in the Unit is related to information diffusion. Here again, attempt has been made to draw the attention of the learners to the important features of diffusion process as also to its significance in the design and implementation information systems and services.

The second (Unit-06) unit of this block, presents generation of information in all its ramifications. It has been emphasised that the generation of information follows different paths in different subject areas and is associated with different

modes. To illustrate this point, information generation process in subject areas such as classification, philosophy, and religion has been described and discussed.

Unit-07 entitled Information Theory: Measure and Contents Evaluation, starts emphasising the need for a theory of information by bringing out the importance of information in the present-day society. Different theoretical perspectives of information and different approaches to information theory are then discussed. Syntactic information theory also known as mathematical theory of communication is then taken up for study.

As a first step information is defined and placed in perspective in the context of human thought process. After that, an information measure based on an element of unexpectedness is evolved. Shannons' equation for information measure is derived. The concept of information entropy, and the method of calculating the same has been explained in a simple language. Then the problem associated with efficiency and reliable communication has been addressed. The significance of techniques like source coding and channel coding for improving communication efficiency and reliability have been discussed. Attempt has also been made to explain the basic aspects of semantic information theory. In this regard, semantic-centric, context-dependent and recipient central approaches are discussed. Different approaches to measuring information content are described and explained. It has been stated that Shannon's approach does not concern itself with the semantics of information in messages while semantic information theory places emphasis on substantial information content in messages.

It must be noted here that mathematical theory of communication is the model of communication by Shannon and Weaver. "Through this theory they sought to identify the quickest and most efficient way to get a information transfer from one point to another. Their goal was to discover how communication messages are converted into electronic signals most efficiently and how those signals could be transmitted with a minimum of error. In studying this, Shannon and Weaver developed a mechanism for mathematical model of communication, known as the Shannon Weaver model of communication".

According to the theory, transmission of the message involved sending information. It discusses representation of different kinds of information in digital form. It has been brought out that 'information' is multimedia in nature comprising text, picture, drawings, audio, video, animation and computer graphics. When represented in digital form, information of any kind appears to us as a string of ones and zeros (1s and 0s). This type of representation helps in building systems that are capable of handling ones and zeros only. In fact, this is the underlying principle for adopting digital technology. The Unit also addresses the two distinct aspects of digital fundamentals namely digital coding and binary number system. It also discusses the method of representation of text in digital form as also conversion of textual information in print form, to digital text. Different standards that are currently used for representing multimedia information components along with legal and copyright aspects of digital information are discussed with implementation details. In short, this block contains a lot of useful reading material, which will benefit the learners and forms a programmed text for distance learners.

The third block of the course is named "Information Society". It comprises five units (Units: 9,10,11,12 and 13). The Units are: "Social Implications of Information", "Information as an Economic Resource", "Information Policies: National and International", "Information Infrastructure", and "Information Society", respectively.

The first Unit (i.e. Unit-09) examines the impact of information and knowledge on society in its changing contexts. It may be noted that information and knowledge are deemed to be social wealth and the benefits of this wealth should be available to all the members of the society. The social wealth is available in a variety of physical forms and contents. Improved access to information, through an expanded validity to find and use information effectively and the convergence of technologies, is transforming society. This Unit has addressed several aspects including socio-cultural, political, and technological developments taking place as a result of the impact of information and knowledge in different sectors. The Unit also depicts succinctly the Indian scenario in this regard.

The second Unit (i.e. Unit-10) entitled "Information as an Economic Resource" presents information and knowledge as the key resources for the economic growth and development of the country. The Unit first attempts to differentiate between the two developments of the country. The Unit first attempts to differentiate between the two concepts "Information Economics" and "Economics of Information" and emphasises the fact that Information Economics at the micro level deals with problems of information in terms of uncertainty, asymmetry of information between buyers and sellers, in different types of markets such as products, insurance, and job markets. On the other hand, "Information Economics" perceives information/knowledge resource as a factor of production, growth, and development both at macro and micro level of economics. It is also stated that in non-market situations dealing with public goods and services, information operates as a vital factor. The distinction made in recent years, between information and knowledge economics has also been explained by emphasising the fact that information technology has brought about this transformation. The Unit also discusses the new set of paradigms that are evolving keeping knowledge as a basic economic resource as also the scenario obtained in India in this context.

Unit-11, addresses almost all aspects and issues of national information policy. The need of a national information policy is examined with reference to (a) information and knowledge as sources of economic and political power, (b) diversified groups who have a variety of information needs, (c) organised methods to develop information institutions.

There are many issues that need attention while formulating a national information policy. The issues concern access to information and include policy and ethical concerns to who should have access to what information, who should be responsible for information provision, who should pay for what information and topics like information resources, organisation, and structure, user categories, standardisation and international issues of exchange, transborder flow of information, Intellectual Property Rights (IPR) coordination and cooperation at different levels and particular attention to the widening gap between the information rich and information poor. It may be stated that to

meet these challenges will require strengthening existing and building new partnerships across organisational and institutional boundaries and across national boundaries. The Unit includes a brief account of the efforts made by organisational and professional associations in formulating National Information policy. The two significant events of Freedom of Information Act, 2002, and the Information technology Plan of the Special Task Force, which are expected to have far reaching implications as regards the formulation of future National Information Policy, have been briefly discussed in the Unit.

The Unit-12 of this block is about infrastructure that is required at national and international level to support the emerging Networked Electronic Information Society (NEIS). The Unit starts with a discussion on the emerging NEIS, and explains the five goals of NEIS. The goals are: anyone, anytime, anywhere, any information and any format. The impact of NEIS on various societal concepts like education, work culture and environment are discussed. Different information management aspects like acquisition, storage, dissemination, etc. have been briefly described. The Unit also explains the overall architecture of GII briefly. It is stated that the five key issues of GII are: connectivity, capacity, contents, culture, and cost. Further, the Unit briefly mentions the management components of GII and describes different components like access networks, home networks, office networks. Explanation has also been provided for the three corporate networks such as Intranet, Extranet, and VPN. The Unit concludes with a discussion on GII applications and security aspects. The final Unit of Block-3 is "Information Society".

It must be mentioned here that the "Information Society" is a term often used without adequate definition; politicians, those in the media and (sometimes academics) will use it as a "buzz word" to describe the impact of Information and Communication Technologies (ICT). In reality, the information society is much more than that: it can be a set of theoretical perspectives outlining the recent changes in society, it can be used to analyse different scenarios for current and future developments in society, and it can be used by information professional to understand the impact that these changes are having on their role and the changing needs of their users. The Unit discusses the theoretical perspectives and considers impacts for current and future developments in society. Apart from the above aspects, the Unit touches upon the impact of information society from a government and policy perspective. Finally, the Unit examines the practical consequences of the impact that these changes would have on the role of the information professional.

Block-4 happens to be the last block of course MLI-101. It is named Knowledge and Society and comprises three (14,15,16) Units. The first of these units (i.e. Unit-14) is 'Knowledge Society'; the second (i.e. Unit-15) is 'Knowledge Management: Concept and Tools', and the third (Namely Unit-16) is 'Knowledge Profession'.

The first of the Units (Unit-14) examines the features of emerging "Knowledge Society". It may be stated that the transformation of existing societal structures by knowledge as a core resource for economic growth employment and as a factor of production, constitutes the basis for designating advanced modern society as a "Knowledge Society". In a "Knowledge Society" the older measures

of competitiveness such as labour, costs, resource endowments and infrastructure, get superseded by dimensions such as patents, research and development, availability of (or availability to afford) knowledge workers. In fact, knowledge incubates in the 'human mind' and when applied innovatively becomes a factor of growth and development.

The transformation of global economics to knowledge economics however does not guarantee economic growth with "equity" either within or between nations. This is because knowledge (inspite of its public good characteristics) becomes a much-valued resource to be possessed and harnessed for its economic benefits. Further, the value accrued to individual users through the availability of information is different and this has the potential to further widen the economic and knowledge gap-as people are often not conscious of the global value of what they know or the potential value of absorbing the available information. In other words to create a knowledge society with 'equity' we have to work towards a perfect knowledge society where all forms of knowledge get recognised and valued especially from where they originate, and also end up benefiting that society. In a perfect knowledge society all people have:

- open and timely access to information and knowledge;
- the capacity to absorb and interpret information; and
- avenues and opportunities to use knowledge for informed decision-making and for transformation to higher quality of lives.

The Unit also mentions that Indian economic growth and development derives its strength from the western model adopting ICT as the main operating mechanism. The efforts being made in India are briefly mentioned.

The Second Unit (i.e. Unit-15) is about Knowledge Management: Concepts and Tools. The past decade has been earmarked by a significant transition into the "knowledge era". The knowledge advantage is the only sustainable advantage for organisations in the information age. The increasing competitive pressures in the knowledge era, induced by rapid change, increasing complexity, voluminous information, and increasing uncertainty, compel an organisation's decision-makers to adhere to two imperatives. The first is to learn at rate faster than current and unforeseen competitors and then to capture or incorporate that learned knowledge into the organisation's knowledge bases. The second, to manage the valuable knowledge gleaned from organisational learning into business models, products, services and systems so that the organisation's value propositions are more attractive to customers than the value propositions of competitors. As a consequence, the processes of knowledge creation and knowledge management have become an essential component for organisations competing in to-day's highly competitive environments. Knowledge Management (KM) is defined as "The explicit and systematic management of vital knowledge and its associated processes of creating, gathering organizing, diffusion, use, and exploitation".

However, to fully utilise the KM process requires enabling technologies. These enabling technologies must support knowledge capture, organisation, retrieval, distribution and maintenance. The enabling technologies for KM must also support the various forms (verbal, video, graphic, audio, and even virtual reality)

in which knowledge can be represented and communicated. This Unit discusses some of these aspects in detail.

The last Unit (i.e. Unit-16) relates to “Knowledge Profession”. It starts with the explanation as to what constitutes a profession and its normative principles and goes on to explain the concept of knowledge profession. Knowledge workers are those people in an organisation whose primary work activities include creating using, and distributing information and knowledge. The focus of our attention will be on the worker as also on knowledge profession. KM involves three professional domains: the business domain, the information content domain, and the information technology infrastructure domain. Members of organisation, drawn from each of these domains play different roles in KM. Business experts are those with expert knowledge in the business domain. Their role is knowledge creation, knowledge acquisition and knowledge use to achieve the organisational business objectives. Information content experts are information professionals, records managers, and database managers. They are concerned with acquisition, organisation and transfer of data, information and knowledge themselves if they are experts in business domain, or they may act as intermediaries for others. The role of information technology experts is to provide the technical infrastructure that enables KM processes, which meet the demands of the organisation. All the three types of people are “Knowledge Workers” and therefore belong to “Knowledge Profession”. The Unit deals with the categorisation of knowledge workers and their special characteristics in detail.

To conclude, as we enter into the knowledge era we are witnessing different professions converging on the “Emerging Community of Knowledge Practice” and thus we are seeing the emergence of specialist knowledge professionals with a variety of new titles and job responsibilities appearing in a variety of functions: - knowledge engineer, knowledge editor, knowledge gatekeeper, knowledge brokers, knowledge handyman, knowledge asset manager, knowledge steward, etc. connected with Knowledge Management.

All the three Units of this block (block-4) furnish us with information on the new developments taking place in the information profession and form a helpful text to the learners.



Block 3

INFORMATION AND SOCIETY

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UNIT 9 SOCIAL IMPLICATIONS OF INFORMATION

Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Information /Knowledge as Social Wealth
 - 9.2.1 Diffusion and Dissemination
 - 9.2.2 Means and Mechanisms
- 9.3 Dynamics of Change in Societies
 - 9.3.1 Societal Changes
 - 9.3.2 Rapidity of Change
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- 9.4 Impact of Information/Knowledge on Different Sectors
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 - 9.4.5 Business and Industry
 - 9.4.6 Daily Life of People
- 9.5 Impact of IT on Libraries, Information Systems and Services and their Societal Implications
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 - 9.6.1 Consumerism
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 - 9.6.3 Towards an Information Society
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- 9.8 Summary
- 9.9 Answers to Self Check Exercises
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9.0 OBJECTIVES

After reading this Unit, you will be able to:

- perceive why information and knowledge are considered as social wealth;
- note the impact of information/knowledge on societal changes, particularly the rapidity of changes in the last fifty years, the single agent of change, being the converging technologies;
- observe the impact of information and knowledge in specific sectors;

- grasp the value of information/knowledge in the changing context of library and information systems and services;
- get an insight into the Indian societal changes; and
- note the overall impact on societies.

9.1 INTRODUCTION

Information and knowledge have always been resources for creating material welfare. Even the primitive man, to survive, has instinctively remained in groups and sustained by getting to know about water availability, moving to safer places to avoid attacks from wild animals and where food could be obtained. Endowed with the divine faculty of intellect, brain-power and astute mind, humans continuously worked towards better living conditions and improvement in living standards, by understanding the environment. Initially the progress towards development was slow because creative and inventiveness were more a matter of hit and miss method, of a few individuals and also because of the lack of communication. Although the new ideas, intellectual and creative abilities were confined only to a few, the benefits of their innovation and invention accrued to the welfare of the entire community.

The Industrial Revolution in the 15th century, however, opened up new vistas for creativity, innovation and invention primarily in the western countries. Scientific and industrial research created an environment to further the frontiers of knowledge, innovation and invention. S&T information and knowledge and their dissemination and diffusion helped and accelerated the creation of new knowledge. The benefits of the application of new knowledge were made available to all in the society, although not equitably. Mass production and mass distribution, drastic changes in the workforce and higher standard of living were the remarkable features of this period of change.

The most dramatic changes, however, occurred in the latter half of the twentieth century with the advent of Information technology, which was a converging technology of computers, communication, media and a host of other microelectronic technologies. There have been remarkable changes in the life styles of people since then, with all sorts of comforts and facilities. The advent of Internet and Web technologies has provided great opportunities to interpersonal interactions for different purposes. All these have percolated to all levels of people, particularly in the western societies.

This Unit analyses these aspects in some detail with particular reference to certain sectors wherein information and knowledge are important components, and also the general life of people.

9.2 INFORMATION /KNOWLEDGE AS SOCIAL WEALTH

Information and knowledge are always considered the root cause for the development of any society, primitive, agrarian, industrial or post-industrial society. Although the creativity and intellectual faculty were confined to a few groups of people, the results of the created information and knowledge have

always benefited the society. In this sense, information and knowledge can be deemed to be social wealth.

The individual and corporate knowledge and information have been accumulating throughout the course of human history. The knowledge reservoir created at different periods of time also includes the continuation, addition or modification of already existing knowledge. Therefore, the treasury of human knowledge is in many ways universal, continuous, cumulative, and ever growing. No final word can ever be said on any aspect of knowledge.

9.2.1 Diffusion and Dissemination

We know how knowledge and information have got to be diffused and disseminated for validating them initially for quality assurance and later applying the validated information and knowledge for various developmental purposes. This process of diffusion and dissemination adds value to primary information through critical analysis. This type of quality control has evolved as an established practice in scientific and technological research and development over the last 300 years. This system of information dissemination and communication has been a standard model in almost every discipline in social sciences and humanities also. However, this system of flow of information and knowledge is not a model in other areas of human activities, such as in business and industry, wherein information is seen in the context of competition and profit making. Yet, if information and knowledge is considered a social wealth and public economic goods, it implies that the stock of knowledge as well as its flow will have to be streamlined to be made available to all for use and exploitation.

In fact, the Internet and Web technologies have removed these barriers to a large extent. Now information is accessible to users irrespective of its location with the least cost. However to protect the intellectual property of those who part with their intellectual outputs, laws relating to patents, designs, trade marks, copyright for books and other intellectual property rights are continuously being regulated and enforced at the national and international levels.

9.2.2 Means and Mechanisms

In the academic and research fields, information and knowledge that are generated have both the disseminating means and institutional mechanisms to make them available to those who want to use them. Institutions that are primarily meant to create new knowledge such as R & D establishments, disseminate their research outputs through primary journals, research and technical reports, conference papers, etc.

Learned societies, professional associations and publishers, both commercial and non-commercial, take up the responsibility for journal publication with a peer review system to ensure quality, hold periodic seminars, conferences, symposia, etc. to get ideas and views exchanged and discussed with peers on different aspects. A host of secondary periodicals in the form of abstracts, indexes, annual reviews, progress reports, state-of-the-art-reports, etc. are being turned out to provide access to primary information. All these processes of diffusion and dissemination have been greatly improved and enhanced for instant accessibility and availability by the electronic media, particularly

Internet and Web technologies. CD ROM facilities have contributed in this process of socialisation of information and knowledge.

Thus, we find that the concept of information and knowledge as public goods and social wealth has a general acceptance in the different segments of society, and investment of resources on the creation of this wealth has been on the increase, particularly in developed countries.

What is most striking in recent decades is the fact that information and knowledge have been the chief cause of bringing about drastic changes in practically every activity in society. We shall examine these changes in society in the other sections of this Unit.

Self Check Exercise

- 1) State the reasons for considering knowledge and information as social wealth.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.3 DYNAMICS OF CHANGES IN SOCIETIES

Change is the very essence of a growing society. Changes can be visible in life styles of people, their living environments, mode of production of goods and services, places of work, education and training, culture and in many others. However, changes in society that are drastic and far-reaching have generally been identified with three major periods of history viz. i) the pre-industrial agrarian society, ii) the industrial society and iii) the post-industrial society which is also referred to as an information or knowledge society

9.3.1 Societal Changes

In the pre-industrial agrarian society, most people were engaged in the activities of agriculture, fishing and mining. The social structure was fairly simple. Ownership of land provided the power base. Life for the people centered around cultivation of land for raising crops for food; cultural and social life were confined to the environments in which they flourished. In the competition for scarce resources, the mighty took every thing or a major share of every thing.

The industrial society has been organised around energy as the main source of production of goods and services on mass scale. The majority of the workforce was engaged in the manufacturing activities and distribution of the outputs. There was a dramatic change in the social structure. Power and prestige passed

from the landowners to the industrial class. The principle of economic production was influential in shaping the values and ways of life.

The post-industrial society (Information Society, Knowledge Society) has been emerging in the last three decades. The most prominent representatives of this type of society are the United States, Canada, countries of Western Europe and Japan. The attributes of the post-industrial society are:

- The centrality of theoretical knowledge as the source of innovation and polity formulation;
- Distinct change from a commodity producing to a service economy; and
- The pre-eminence of a managerial, professional, technocratic class and knowledge workers.

9.3.2 Rapidity of Changes

The speed with which changes have taken place is vividly portrayed by McGarry in his book entitled *The Changing Context of Information*.

In order to appreciate the relative rapidity of these changes, he writes, by taking communication as an example "let us use a clock as a model to give ourselves an idea of the relative time span. We shall take an arbitrary date of 30,000 years ago, when man began the series of carvings and paintings that led to the cave art. Starting with approximately 30,000 years before the present, let us take 24 hour period starting from midnight and allowing 1,200 years for each hour of the clock so that five minutes equal to one hundred years.

For thousands of years, progress is at a *glacial* speed. The high period of Paleolithic art coming approximately between 10 a.m., in the morning and 2 O'clock in the afternoon. The following evening we have the beginnings of cuneiform writing in the Mesopotamian valleys and hieroglyphics in the Egyptian temples (about 4000 BC). At 9 p.m. (about 1800 BC) we have the famous code of Hamurabi carved on a *stele* – probably the first example of a mass medium for public information. At 10 p.m., the beginning of Athenian and Greek civilisation with its contribution to art, philosophy and mathematics.

At 10.30 p.m., we note the beginnings of the Judaeo-Christian culture in Europe and for the next hour there is relative stagnation, except for the culture of monastic libraries. It is 11.33 p.m., before the invention of printing and the consequent surge of scientific thinking and at 11.48 p.m., Britain is in the throes of the industrial revolution. The communication revolution has taken in the last five minutes. The computer has gone through several generations in the last five minutes. If we speak of the microcomputer we are dealing with the last few minutes of our time. What will have happened by midnight? Who can predict?"

Changing Trends

The striking changes in the Information Society (Post-industrial Society) are pictured dramatically by Alvin Toffler in his three books, each book appearing in three decades 1971, 1980 and 1991.

The *Future Shock* (1971) portrays the process of change affecting people and organisations. It speaks about disorientation and stress brought about by trying

to cope with too many changes in too short a time. The accelerated speed of history brings consequences of its own, independent of the actual direction of change. The simple speed-up of events and reaction produces its own effects, whether the changes are perceived as good or bad.

The *Third Wave* (1980) places the revolutionary changes in technology and society in a historical perspective and sketches the future they might bring. Terming the agricultural era 10,000 years ago as the First Wave, it describes the major technological and social changes beginning in the mid 1950s as the Third Wave of change – the start of the new, post-smokestack civilisation. Among other things, it points at new industries to come, based on computers, electronics, information and biotechnology, terming these the “new commanding heights” of the economy. It predicts such things as flexible manufacturing, new markets, the spread of part-time work, and the demassification of the media. It describes the new fusion of producer and consumer and introduces the term *prosumer*, talks about new dwellings of electronic cottages. It speaks of office work being operated from homes and other changes in politics and the nation-state system.

Picking from the earlier works, *Power Shift* (1991) focuses on the crucially changed role of knowledge and information in relationship to power. It presents a new theory of social power, and explores the coming shifts in business, economy, politics and global affairs. Toffler argues that while headlines are on the shifts of power in the global context, equally significant shifts are taking place in the everyday world. There is a considerable shifting of power in supermarkets and hospitals, banks and business houses, television and telephones. A subtle revolution in the balance of power is transforming finance, politics, the media and even the nature of power.

While these works of Toffler may sound highly exaggerated bordering almost on science fiction, the importance of knowledge and information is forcefully highlighted. In fact, some of the ideas that Toffler has mentioned such as changes in supermarkets, hospitals, banks, business houses, television and telephones, are appearing to be vastly changing with the power of high-technology.

Self Check Exercise

2) State the attributes of a post-industrial society.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.4 IMPACT OF INFORMATION/KNOWLEDGE ON DIFFERENT SECTORS

We have so far considered the impact of information and knowledge on society in a general way, giving pointed attention to IT as the chief instrument of changes. In this section, we shall discuss the purposive influence of IT on the following few sectors which are deemed to have a strong information/knowledge component.

- Education and Training at all levels
- Research and Development
- Media
- Government in all its functions and activities
- Business and Industry
- Life of People

9.4.1 Education and Training

A society's socio-economic growth and development are entirely dependent on the quality of its members' educational prowess that constitutes the intellectual capital. Education is the process of acquiring general and specialised knowledge by means of study and learning that develop intellectual powers and judgement. It also includes acquisition of skills for executing various professional and vocational functions, development of culture which is an expression of the mode of thought and feeling, help build up an aspiration toward and appreciation of high intellectual and aesthetic ideals.

The type of human educational growth and development is indeed a life-long process and at no point of their age or time in the life of a person, education really terminates. However, formal education and skills commences at the primary age level of people through schools and higher educational institutions at subsequent stages. Concurrently educational processes provide for hands-on experience to get practical knowledge to handle a variety of tasks both professional and vocational. In all countries, the educational infrastructure provides, a range of institutions for different levels to acquire knowledge and skills in academic, professional and other types of occupational fields.

Educational learning components include curriculum design and development for various levels, teaching expertise, teaching methodologies, using a variety of educational aids, tools and apparatus, quality control for turning out the right products from institutions, creation of new knowledge through research and development and production of research and scholarly materials, besides educational materials and similar others.

In all these processes IT has enabled several unprecedented facilities.

E-education, the Integrated Internet Educational System, delivers the required courses to students literally at their doorstep, using various multimedia and virtual reality. The local teachers have to act as mere facilitators. Course materials, prepared by experts in the respective disciplines and fields are

available to students through Internet E-mail, chat sessions, videoconferences and videophones. The student-teacher interactions enable proper guidance to achieve desired success. There are universities adopting distance-education systems, providing students course materials, consultation facilities, and even get the formalities of examinations. Virtual libraries provide at higher levels access to global knowledge almost instantaneously through innumerable internet servers.

Self Check Exercise

5) Describe the facilities of e-education.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.4.2 Research and Development

We have learnt that research is a never-ending activity spiral activity. The inputs as well as the outputs of research are information and knowledge. Today, Research and Development (R&D) are deliberate and planned activities undertaken to create the wealth of knowledge. Both government and private industries are investing in R&D for profit or for the benefit of society. While basic research continues to be the responsibility of academic and learned bodies, applied research, which is oriented towards problem solving of various kinds, is supported by government and private industries.

Research quality has increased phenomenally with the introduction of tested research methodologies, actively supported by IT, access to information and knowledge through Internet and a band of highly motivated and talented researchers with expertise in the areas of their specialisation. Writing about advances in Science and Technology, Daniel Bell observes, "the methodological premise of the second half of the twentieth century is the management of organised complexity; the complexity of theories with a large number of variables and the complexity of large organisations and systems which involve thousands and even millions of persons. Since 1940 there has been a remarkable efflorescence of new fields and methods whose concern is with the problems of organised complexity; information theory, cybernetics, decision theory, game theory, stochastic processes. From these have come specific techniques such as linear programming, statistical decision theory, Markov chain applications. Monte Carlo randomising and minimax strategies, which allow for sampling from large members, alternative optimal outcomes." The methods of this intellectual technology seem "to substitute" an algorithm (i.e. decision rules) for intuitive judgements. These algorithms may be embodied in an automatic machine or computer program, or a set of instructions, a 'formalisation' of judgements and their routine application to many situations. To the extent that

intellectual technology is becoming predominant in the management of organisations and enterprises, one can say that it is as central a feature of post-industrial society as machine technology to industrial society. [Bell, 1979]

Here again we reiterate that a society really progresses only with new knowledge created through R&D appropriate to a country's needs, in particular social needs and their application to the needs.

9.4.3 Media

The news media, the leisure industry and show business are turning to be the most fast developing activities since the beginning of the 20th century and it appears that the 21st century would also be dominated by the media. The newspaper industry, which includes dailies with their various editions (general as well business economics) by-weeklies, monthlies, with their respective supplements, uses all the sophisticated methods of IT for news collection, presentation, editing, production, distribution, etc. They are also available in Internet and in their respective websites. News media seems to be dramatically moving towards a very versatile current awareness service for the masses. Combined with 24 news telecasts channels and broadcasting, the mass media are the most powerful means of political and economic power.

The way cinemas, TV serials and other types of TV programmes and commercial advertisements of all products and services, have a profound influence on every sections of a society in a country.

E-entertainment, e-sports, e-games extend the features that are already available in television shows. Thus the media is creating a new life culture both in developed countries and also in developing countries.

Media being a powerful and influential tool, the western countries dominate the scene with a number of broadcasting and television networks reaching all corners of the world. The developing countries are at a serious disadvantage in this respect. However, in the past few years, Asian and Indian television networks have successfully started serving the Asian and Indian markets with news, views and entertainment and other programs of public interest in regional languages. In a way, these competitive efforts are taking away the monopoly enjoyed by some western mass media. There have been efforts by the developing countries to promote the concept of a New International Information and Communication Order to introduce some balance in the reporting of news and views between mass media.

Self Check Exercise

6) Sketch the impact of media on society with reference to IT.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.4.4 Government

Governments of almost all countries of the world are the largest and biggest generators and producers of information; and at the same time they are the largest consumers of information and knowledge too. The activities of governments span practically every area of human activity. Their commitment to society is to improve the living conditions and create a welfare state for then people.

Governments collect, organise and disseminate statistical data on all activities which constitute the most important and vital information resource for their planning, later, implementation and execution. Volumes of factual and descriptive data constantly released by governments and are published or stored in computer files.

Government must be able to take quick, timely and correct decisions on all issues of governance. IT has provided on-line access to all types of information and data about all matters or events at any time and from any location with government Intranets and Internets. Movements of files that usually create unnecessary delays in decision-making, have literally been eliminated with the files made available online at the same time to all functionaries. This system prevents files getting lost or misplaced. This system makes the whole of Government system transparent. E-government also enables direct participation of a common man in various matters public interest.

Despite the facilities of e-government, government structure and machinery being too slow, the pace of changes is slow. The work culture in most of the government institutions does not change as fast as one would wish. Although the visibility and speed of change is not so striking, particularly in developing countries, changes appear to be inevitable.

9.4.5 Business and Industry

Enterprising industrial and business undertakings show a greater inclination to use tools and techniques to modernise their functions, processes and activities, motivated by either profit or by the desire to be leaders in their fields. Among the various steps to modernise their enterprises business and Industry have adopted the most modern management techniques, applications of IT, and also taking calculated risks in financial investments,

Business and industry were the first to use techniques of management information systems (MIS), to produce and provide access to internally generated information using IT. It is increasingly being recognised today that external information of markets, competitors, customers, social and political environments, government regulations on trade, tariffs, exports, imports are invaluable if an enterprise is to thrive. The concept of knowledge management is new innovative thinking in business and industry. Knowledge is interpreted to include all internal information of the company, in addition to information dealing with competitors, sales, markets, etc. A new workforce referred to as knowledge workers is emerging in business and industry who strategically plan and execute the various functions and activities of the business so that they can be successful in a competitive environment.

9.4.6 Daily Life of People

An ordinary person in his daily life needs to have access to information on many of the daily activities. It may be pertaining to the quality, availability or cost of a number of things like articles of food, health care, education, entertainment, travel, social security, etc. One may need information on cooking, gardening, house decoration and maintenance and a host of other requirements on different subjects. With the advent of IT, access to such information is now provided through Internet and Web pages.

Modern household in the age of IT is a networked house. The unique feature of this network is that everything is available within the premises of the sweet home. Technology has taken away the burden of the routine chores like cooking, washing, traveling for work, shopping, etc. These facilities have created ample time for entertainment. As a result of all these extraordinary and unprecedented conveniences and facilities, life of people in developing countries is totally different compared to what their life was about a generation ago.

The foregoing is rather a cursory account of the impact of IT in some of the areas that have been taken discussion. To have a fuller view of the impact of IT on the areas discussed in the above sections and in addition to other aspects of life, the overviews of IT given every year by Manorama Yearbook is very valuable, particularly because the overviews have an Indian orientation. The pertinent references are given in the section on “References and Further Reading”.

9.5 IMPACT OF IT ON LIBRARIES, INFORMATION SYSTEMS AND SERVICES AND THEIR SOCIETAL IMPLICATIONS

In the foregoing sections of this Unit, we have studied the impact of information and knowledge in a general way and also in relation to a few areas in the context of societal changes due to the application of ICT. As libraries and information systems and services have been an outcome of the social milieu, their existence and ability to adopt to the changes are vital for our profession to survive. Not only are they facing a challenge, a new type professional expertise is also emerging who are in the information field competing with us in professional work. In the following sections, we shall study the changes required in our professional systems and services and the challenges we have to face.

9.5.1 Libraries

Libraries and other information institutions have been responding to the information needs of education, research and development, government activities, business and industry and by the general public for a long time. With their collections, responsive and anticipatory services, libraries were able to meet many of the requests for information for different clients. But these conventional services have remained largely passive and limited. Now ICT has provided a new opportunity for libraries to change their approach and offer a client-based active service to keep our institutions alive. The change is

to be towards electronic libraries whose two main features are library management systems, and online search and retrieval systems CD-ROM and the Internet. This new service environment will lead to changes in the roles of many of the stakeholders to the information market place. Progress towards the information society will be influenced by the way in which issues such as globalisation, standards, intellectual property rights, security and bibliographic control are tackled.

Schools offering professional and training in library and information service, particularly in India, should perceive these changes as new opportunities in the job market and respond to these challenges by developing appropriate curricula and facilities for learning which should result in the quality services are expected. The library and information profession will then have an indispensability and recognition in all developmental activities of a society.

9.5.2 Information Products and Services

Bibliographic activities, providing access to literature in almost all disciplines is a significant feature of information service in the 20th century. Learned societies like the American Chemical Society and publishing houses specialising in secondary services like Wilson and Co., have been pioneers in this type of services.

Today, with the advent of Internet and Web facilities, practically every primary, secondary and tertiary service has been offering access to every requirement at considerable speed and least cost. Libraries and information vendors have been taking advantages of these facilities and concentrating their advantage of these facilities and concentrating their attention on customer-based services. Knowledge management is a newly developing field, particularly in the business context, which is a high-tech based activity. Knowledge workers are the new class of experts who are emerging in this context.

9.5.3 Information Industry and Business

Information industry is defined as a market place marked by the emergence of information content with hardware, software and communication technologies to provide products and services, which enhance the capacity of people, to solve their problems. The Information Industry Association identifies segments of the information industry as given below:

Information Content Business

- Content Services (News, Libraries, Databases, Information Brokers).
- Content Packages (Books, Journals, Newspapers, Films, DVDs, etc.)
- Facilitation Services (Data processing, Time sharing, Networks).

Information Technology Business

- Information Technologies (Computers, Terminals, Office Equipment, Printing, Graphics).
- Integrating Technologies (Packet Switching, Modems, Switch Boards and Digital Switching).

- Communication Technologies (Radio, TV, Telephones and Transmission Systems).
- Communication Channels (Mail, Telephone, Satellites).
- Broadcast Channels (Radio and TV networks, Multipoint Distribution Services).

Information companies can be broadly grouped as follows:

- Primary Information Companies;
- Secondary Information Companies;
- Computer-based Information Providers;
- Information Retailers;
- Seminar and Conference Services; and
- Information Support Services.

Self Check Exercise

7) Name the different segments of information industry and business.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.6 INDIAN SOCIETY

Since independence, over a period of five decades, India has reached the stage of middle-level industrialisation. The developing countries, in general, India in particular, have been forced by history to try to telescope the process of economic development in a few decades that has taken the advanced industrialised countries a few centuries. This is, perhaps, inevitable, otherwise the transition from a dependent to an independent economy could, never be possible. But it is obvious that the socio-economic situation is not the same in developing countries as in the advanced industrialised countries. Our requirements are different and the priorities are also different.

A country's development depends on the combined force of the economic, political, social and cultural systems, which are intimately connected, the economic system being the trigger. It is important to note, however, that the country's transition to an industrialised from a pre-industrialised society does not depend merely on the acquisition of technology but more on the use of technology for industrialisation. The use of industrial technology has to effect

a change in the society towards economic progress in relation to social transformation. Without bringing such a change consciously in the human element, simultaneously with technological and economic structural change, the process of development will only fall very much short of expectations.

Development is the transition from one stage of social progress to another, from a simpler to a complex production, economic and political system and socio-cultural relations. While India is moving towards industrialisation to provide a higher standard of living for her citizens, India is also on the threshold of the information/knowledge society. But the impact of all these developmental processes affects only a segment of the Indian society and not the entire population of the country. But a consumer market has emerged by these processes. Sadly one third of our total population is suffering in abject poverty. All the socio-economic progress taking place currently, do not have any meaning to them as they are totally out of this orbit of progress. Only 40 to 50 percent of the population of our country is reaping the economic and social benefits, which of course, have changed their style of living. We shall discuss some of these changes that we witness today.

9.6.1 Consumerism

Broadly grouping the population who have had the benefits of change, there are the elite super-rich (super-haves), upper middle class, (have-somes), the lower class, (near-haves) and the poverty class, the have-nots. The policy of economic liberalisation of India and the entry of business and industry into global market have brought a number of changes in the economic growth of the country. One striking impact of these, is reflected in the Indian society that it is fast changing into a consumer society. Even the have-nots are getting exposed to affluent life through TV shows and entertainment films which carry a great deal of commercial advertisements, leaving alone the advertisements appearing in Indian language newspapers. These exposures of affluent life have their own negative impact.

The change from the joint family to a nuclear family has now been further strengthened by the double-income (husband and wife working) families. This has caused an increase in incomes and has given some financial strength to go for consumer durables and non-durables. The facility for bank loans, hire purchase systems, bank credit cards, etc. has further temptations for the have-somes, and near-haves, pushing them into the fold of consumer society. Today, most of the middle-income groups do have almost all the kitchenwares and gadgetries, mirco-ovens, refrigerators, washing machines, air-conditioners, and many other consumer durables. The general tendency is to desire more such as seeking exotic food and drink, self-adornment, greater home comforts, fashionable cars for greater mobility and so on. Experts and observers opine, "There is no doubt that the fast development of a consumer society in India, inevitable in the present regime of liberalisation, would determine the investment pattern in the economy, obviously directed towards consumer goods, both durables and non-durables. Given limited resources, a fast developing consumer society in India would also reduce household savings, which have so far been the main source of productive investment. There would be a greater inclination towards increasing the disposable surplus income to satisfy consumption desires, by investing in the share market, either directly or through

the mushrooming mutual funds. In such situation, it would become necessary for the government to discipline the economy and the market in some respects, without going back to the regulatory regime. This would be necessary for the sake of the overall development of the economy in a balanced manner aimed at raising the level of living of the 75 per cent outside the consumer society.”(Banerjee)

9.6.2 Sustainable Development

Social development cannot be measured in terms of economic inputs, which give a superior life style. We should realise that we have a very big gap to be bridged i.e. all the sections of the society should be brought into the fold of living conditions that are much above the poverty line. Attention should be turned to the near-haves and the have-nots and new and innovative strategies would have to be worked out to raise the standards of life to all sections of our society. “Sustainable development” is the goal for the rural and urban poor.

An experiment that Dr. Swaminathan, the renowned agricultural scientist, towards sustainable development in some parts of rural India, is important to be noted in our socialisation process, using information and communication technology. The experiment is designed to provide knowledge to twenty isolated villages in India, on demand to meet local needs using the World Wide Web and it does so through bottom-up process. The programme of providing services include women’s health information, advice on raising local crops and protecting them from diseases, the daily market prices for their crops, local weather forecast and clear information about the plethora of programmes that are provided by the Indian Government to aid poor families. To operate the system, the village provides accommodation. The village gets the needed hardware and maintenance for the ICT system, specially designed websites in the language of the rural folks.

9.6.3 Towards an Information Society

India is slowly drifting into a information society with her industrialised base. A few sample indicators that are characteristic on information society are given below:

India has developed a universally acceptable software industry, which has become the fastest growing sector of our economy. The manpower strength in this sector is such that India is expected to become a software superpower by 2008. The software exports of 50,000 billion US dollars as compared with manufactured and merchandise products of 45 million dollars. It is expected that India’s economic growth will be driven by both the conventional services (Trade, Transport, Tourism, Financial and community Services and IT-related Services.

The manpower force in the Services sector is 52 per cent, as compared to agriculture at 26 per cent and industry at 22 per cent, despite agriculture and industry are also our crucial sectors. This aspect nearly fulfills the attributes of an information/knowledge society that there is a distinct change from a commodity producing to a service economy.

ICT has taken deeper roots in India as is evidenced by its application nearly in all fields. The railway reservations, banks transactions,

e-commerce, e-mail and the increasing use of Internet and Web technologies.

The enterprising business and industry competing in the global business are strengthening themselves with investment in R & D for the creation of new knowledge. E-government is another indicator that the Central and State governments are introducing in governance to make it transparent and for better for interaction with the common people.

These efforts are definite to grow in the future. The 10th Five Year Plan aims at Gross Domestic Product (GDP) growth at 8 per cent, a target ambitious in relation to current trends. Socio-economic observers are, however, hopeful of a steady growth in the country's economy, which will bring about better conditions for social and cultural life of the people.

Self Check Exercise

- 8) Sum up the societal changes happening in India, drifting the Indian society into an information/knowledge society.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

9.7 LARGER IMPLICATIONS OF THE IMPACT OF INFORMATION SOCIETY

We have analysed and discussed some of the specific aspects of information and knowledge in the foregoing sections of this Unit. The larger implications of the impact on all aspects of human life may have far reaching effects. Some of these, as seen by experts, are listed below:

- Information and knowledge become the principal generators of wealth in the form of educational institutions, research and development establishments, scientific and technological centers and other similar knowledge-oriented bodies;
- Information and knowledge will grow in volume and variety. Criticism, dialogue and commentary will add value to them;
- Changes in resource structure will obviously bring changes in the power structure. The natural corollary of this is the evolution of a new power elite, leading to a new power structure at the political level;
- An ever-increasing gap will grow between "information rich" and "information poor" among nations and within a nation;
- The actual decentralisation of production and decision-making may provide the basis for a rich, articulate and participatory social system; or effect purely physical decentralisation, combined with centralised decision-

making and organisation, giving rise to an increasingly rigid and monolithic society;

- Changes may lead to increasingly rewarding, qualified, creative and formative, by eliminating repetitive activities (both physical and mental); or develop highly standardised tailored work, offering only the advantage of lessening the burden of various activities, without any corresponding changes in the social structure;
- A better man-machine relationship by exploiting increased capacities for interaction, dialogue, adaptations and intelligence on the part of machines; or a further alienation of the instrument of work, in terms of both ownership and ability to dominate them;
- Increasingly centralised capitalism with a subordinate peripheral system, or horizontal diffusion of a rich and diversified form of capitalism with growing labour participation and, at the outside, direct management by workers; and
- Possibility of increasingly intense interaction between individuals and groups; or a dramatic deterioration in interpersonal relations.

Self Check Exercise

- 9) What is the total impact of information/knowledge on the society, looking at its impact from a future perspective?

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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9.8 SUMMARY

Information and knowledge are considered social wealth that should benefit all the sections of a society. Information Technology has enabled the wealth of information and knowledge to become much more easily accessible and available to all. In discussing these, the following aspects of the impact of information and knowledge on societal activities with reference to IT have been discussed in this Unit.

Of the three epoch-making revolutions in human society, the post-industrial society (information/knowledge society) seems to have been very significantly affected by information and knowledge. The rapidity with which changes are taking place figuratively minutes as compared to the time taken for changes in the agrarian or in the industrial society.

The agent of change is primarily IT. But it is only a means to change; the real change has to be in the sphere of socio-economic development.

Changes are very significant and far-reaching in many of the sectors such as Education, R & D, Media, Government, Business and Industry, in the life of a citizen of a country and many other activities.

The impact of IT on library and information systems and services and information industry will introduce totally new dimensions in every aspect of their functioning.

Very far-reaching and significant effects can be visualized in the way IT affords new capabilities to manage and serve information and knowledge.

Indian Society is also changing fast but the changes are not with every section of the society. The poor see no changes in their life.

The rich and middle class is becoming a consumer society. To bring in better conditions to all sections of the Indian society, a strategy towards 'Sustainable development' is necessary.

Most importantly the power may change with the emergence of a new power elite.

Centralisation of information may lead to control of many kinds. The gap between information rich and information poor will widen.

While all these effects are possible social hazards, IT will surely provide far more facilities to access information and knowledge as never before at every level of use.

9.9 ANSWERS TO SELF CHECK EXERCISES

- 1) Information and knowledge are generated by individuals and groups in the social environments in which they live. These get disseminated and grow with peer review and criticism to get validated and to ensure quality. These get cumulated to make a reservoir of knowledge. They are available to any member of any society through internet facilities. As the benefits of the application of knowledge to create wealth to the entire community. Thus we can construe that information and knowledge are social wealth
- 2) The attributes of the post-industrial society are:
 - The centrality of theoretical knowledge as the source of innovation and polity formulation;
 - Distinct change from a commodity producing to a service economy; and
 - The pre-eminence of a managerial, professional, technocratic class and knowledge workers.
- 3) IT functions as a powerful means to store large volume of information, store it for instant retrieval, provide ample multiple outputs, transmit information irrespective of geographical distances, etc. But the quality of contents has to be ensured by those who input them. While IT provides very powerful machinery to access information with speed and effectiveness, it cannot do anything in the use of the information. The real potential lies in the man-machine interaction with intelligent

terminals that provide great help in testing alternatives and provide adequate facility for decision support. But the means are also invaluable to the humans in order to make use of information.

- 4) While information is now accessible globally and available without any restrictions, irrespective of their location, Drucker asserts that it is knowledge which is the real change agent and not information. IT, he says, has centered on Data – their collection, storage and transmission, presentation, etc., focusing on the “T” in IT. The focus should be on “I” which should be “Knowledge”, information being the raw material to create knowledge which Drucker says is in the minds of persons.
- 5) E-education, the Integrated Internet Educational System, delivers the required courses to students literally at their doorstep, using various multimedia and virtual reality. The local teachers have to act as mere facilitators. Course materials, prepared by experts in the respective disciplines and fields are available to students through Internet e-mail, chat sessions, video conferences and video-phones. The student-teacher interactions enable proper guidance to achieve desired success. There are universities adopting distance-education systems, providing students course materials, consultation facilities, and even get the formalities of examinations. Virtual libraries provide at higher levels access to global knowledge almost instantaneously through innumerable internet servers.
- 6) Media with the wide ICT applications is introducing a new culture and life in society both in the developed and developing societies. All the features of print media available through Internet and provides access to a variety of information and news. E-entertainment, e-games and e-sports give add to TV shows and other types of shows.

Advertisements (ads) of products and services seen through TV. Cinema and heard in broadcasting have profound influence on people, more particularly children. While advertisements increase sales and marketing, and welcomed by the business community, some of ill effects on youngsters and children are viewed with concern.

In his daily life, an ordinary citizen requires a variety of information on various aspects. No other medium can provide a updated guide to this type of information. Now Internet has successfully filled this gap.

- 7) The different segments of information industry and business are:

Information Content Business

- Content Services (News, Libraries, Databases, Information Brokers).
- Content Packages (Books, Journals, Newspapers, Films, DVDs, etc.).
- Facilitation Services (Data processing, Time sharing, Networks).

Information Technology Business

- Information Technologies (Computers, Terminals, Office Equipment, Printing, Graphics).
- Integrating Technologies (Packet Switching, Modems, Switch Boards and Digital Switching).

- Communication Technologies (Radio, TV, Telephones and Transmission Systems).
 - Communication Channels (Mail, Telephone, Satellites).
 - Broadcast Channels (Radio and TV networks, Multipoint Distribution Services).
- 8) Structural changes in Indian economy has transformed India from a highly regulated and inward looking to an outward looking economy in which the state domination in most spheres of activity is giving way to private enterprise and contribution. Combined with this economic policy, IT promises to afford a new opportunity for India to effect a socio-economic transformation. It is seen in ICT being used in most activities. Economic benefits, however, have come to only a section of the Indian people. While the poorer section (constituting one-third of our population) of our society continues to struggle to sustain themselves with minimal needs, the upper class and middle class are moving towards a consumer society, acquiring all durable and non-durable goods. Only sustainable development could bring some equity in the manner of wealth distribution in the Indian society. The country is, however, acquiring the necessary economic strength and bring about a social transformation towards better conditions for all its people, using fully ICT.
- 9) Information and knowledge which will grow phenomenally would be the principal generators of wealth. This change in the resource structure will effect a change in the power structure. An ever increasing gap will grow between 'information rich' and 'information poor' globally and also within nations. The actual decentralisation of production and decision-making may provide the basis for a rich, articulate and participatory social system or effect a physical decentralisation, combined with centralised decision-making and organisation, giving rise to an increasingly rigid and monolithic society. Possibility of increasingly intense interaction between individuals and groups; or a dramatic deterioration in interpersonal relations is visualised.

9.10 KEYWORDS

Agrarian Society	: A society in which the work-force is predominantly from the agricultural class.
Industrial Society	: A society in which the work-force is predominantly from the manufacturing class.
Information Industry	: A market place marked by the convergence of information content with hardware, software and communication technologies to provide products and services which enhance the capacity of people to solve problems.
Information Technology	: The acquisition, processing, storage, dissemination and use of vocal, pictorial,

textual and numerical information by microelectronics-based combination of computing and communication.

Post-Industrial Society : A society in which the work-force is predominantly from the service class.

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UNIT 10 INFORMATION AS AN ECONOMIC RESOURCE

Structure

- 10.0 Objectives
- 10.1 Introduction
- 10.2 Substance of Economics
- 10.3 Information Economics
 - 10.3.1 Characteristics of Information
 - 10.3.2 Scope and Ramifications of Information Economics
- 10.4 Micro-Economics of Information
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 - 10.4.2 Information and Markets
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 - 10.6.1 New Growth Theory of Knowledge
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- 10.10 Summary
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- 10.12 Keywords
- 10.13 References and Further Reading

10.0 OBJECTIVES

After reading this Unit, you will be able to:

- comprehend the full implications of information and knowledge as key economic resources;
- differentiate information economics and economics of information;
- become familiar with the nature, scope and ramifications of information economics;
- get an insight into the difference between information economy and knowledge economy;
- grasp Indian economy in relation to information and knowledge economies; and
- appreciate the relevance and value of information/knowledge economy to library and information studies.

10.1 INTRODUCTION

In this Unit, we will study information and knowledge as the key resources for the economic growth and development of a country.

The characteristics of information/knowledge are distinctly different from characteristics of other products and services. The distinction poses problems in determining their effects on markets, decision making, and other related issues.

It is useful to differentiate information economics and economics of information which are the two sides of the same coin. Information economics perceives information/knowledge resource as a factor of production, growth and development, both at the micro and macro level economics.

Information Economics at the micro-level deals with problems of information in terms of uncertainty, asymmetry of information between buyers and sellers in different types of markets, such as products, insurance, job markets. In non-market situations dealing with public goods and services, information operates as a vital factor.

These problems are illustrated with examples and analogies.

Generally information/knowledge economy of a country deals with issues of economic growth and development at the national and international levels. But in recent years, a distinction is made between information and knowledge economies. Information technology has been the chief instrument that has transformed all processes that were with all activities in industry, business and others. But the impact has resulted only in routine and has practically no change has been visible in the way major decisions are taken in business or government. Therefore, a new set of paradigms is evolving keeping knowledge as the basic economic resource. This aspect is discussed at some length in this Unit.

Indian economy is said to be moving slowly towards information economy. There are a few indications to support this view. But to rank on par with the western developed countries, there are miles to go. There are serious constraints that slow down the progress of economic growth and development.

Economics of information as distinguished from information economics, deals primarily with the financial management of economic resources in institutions and organisations. Some of the implications of these aspects with reference to library and information systems and services are merely cited in this Unit, as they are dealt with in detail in units on management.

The study of information economics and information/economy is valuable for library and information professionals at least for two reasons: 1) the recognition of information as a key factor for material growth and prosperity of a country, reinforces our faith, efforts, commitments and involvement in all our studies on information and knowledge; and 2) the expansion of job opportunities in other fields for information professionals.

Before we study and analyse these aspects in some detail, let us get a short summary view of what is economics for the benefit of those who do not have a background in the subject of economics.

10.2 SUBSTANCE OF ECONOMICS

Economics deals with human wants and their efforts to get satisfaction from these wants. The core of economics is the study of human behaviour and the allocation of available resources to meet their human wants which invariably involves choice and selection because these wants, needs, desires, demands, etc. are too numerous to have all of them at the same time. They are also varied and constantly changing. Different groups of people perceive their needs, wants, differently. Even in the basic necessities of food, shelter, clothing, health care, education, etc. which are supposed to be common for all, there are variations in getting them fulfilled. The choice or selection of these wants by different groups and individuals depend upon their priorities, ability or affordability to pay for them, social status, and other related aspects. All these wants also change with time. These wants, needs, and such others could satisfy human beings only with the production of goods and services.

A formal definition of economics according to Webster's International Dictionary is that it is a science dealing with the different aspects of production, distribution and consumption of goods and services for the material welfare of mankind. The material welfare of mankind implies the satisfaction of human necessities and wants by obtaining appropriate goods and services with whatever economic resources available.

The economic resources required to produce goods and services are of two kinds viz. human and non-human resources. Human resources constitute knowledge and information, intellectual and intuitive, creative faculties to innovate, know-how skills and other capabilities that transform non-human resources into tangible products and services. Non-human resources generally refer to total surface of the earth, including oceans, rivers, lakes, forests, mountains, mineral wealth, soil fertility, fauna and flora and other similar physical/natural resources. Capital is any resource other than land and human labour that are used in the production and distribution of goods and services. Organisations and institutions that perform various economic functions and activities, providing the necessary mechanisms for production, distribution, etc. are also sometimes included in capital resources.

A number of laws and principles are derived out of studies in human behaviour of consumption, optimum production of goods and services, markets, (demand and supply), competition, cost, price, value, monopolies and oligopolies of production and distribution etc. These laws and principles operate both at the micro and macro level economics in different proportions.

At the macro-level, economics deals with economic issues at the national and international levels to bring about material well being for the people. The government of a country, being the owner of most of its resources, and also having the responsibility for the economic welfare of its people, mobilises the resources, developing an economic system. The economic system could be a free-market economy or a planned economy.

In a free market economy the market conditions will determine most of the economic activities, like demand and supply, production of goods and services, and distribution, cost and price, etc. The actors could be business people and others of various potentialities.

In a planned economy, the resources are allocated usually by a centralised commissioned body of the government of a country with experts drawn from different specialties. Setting economic goals and objectives, this body draws plans for specific periods and set achievable targets in that specific period for the country.

In a mixed economy, the resources are owned partly by private groups and by government. In this system, the resources are allocated partly by means of the price mechanism of markets and partly by the government through the centralised planning body. In actuality the economic systems of most countries have both free market and planned elements in different proportions.

Economic issues like setting goals and targets for national economic growth, priorities for investments, nationalisation and privatisation, means of production and distribution, competition and monopoly, national income, gross domestic products, international trade and balance of payments, etc. constitute concepts that are studied at the macro level. Various policy issues with reference to agriculture, industry, trade, commerce, public finance and taxation, monetary problems, prices and incomes, supply and distribution and a host of other matters of public interest are handled by the government to regulate, and to direct and control the economy to achieve its targeted goals. In all these activities, information and knowledge have a vital role to play. Experts in economics deal with these areas of organised complexities.

Outstanding economists have been giving a great deal of thought and attention to the study of information in economic activities and have generated a body of literature of considerable value, particularly in the last three decades.

Information, and in recent years, knowledge has occupied the center stage, entirely because of the three converging technologies viz. Electronics, Computers and Telecommunications and software as well as the development of a host of media, materials, products and services.

Let us study these aspects in some detail in the following sections.

Self Check Exercise

1) Give the salient features of economics as a discipline.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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10.3 INFORMATION ECONOMICS

Until recently economists had an understandable reluctance to consider information and knowledge as distinct factors of production, deserving a special

treatment. Information and knowledge were, in fact, considered along with overheads for the purpose of accounting and budgets. But on account of the pervasive and influential role of information and knowledge in micro as well as macro economics, economists have developed information economics as a specialty. Lamberton, a specialist in information economics says that the specialty has emerged, "as a response to the deficiencies of economics theory built on unrealistic assumptions about the richness and sureness of information available to decision maker, failures of government and business policies and the spectacular advent of intelligent electronics with its greatly enhanced capacities for communication, computation and control. In fact, he claims, "the emergence of a new paradigm that is transforming economics and probably other social sciences."

10.3.1 Characteristics of Information

Information has a number of characteristics uncommon to other resources. Some of these characteristics are that it is:

- shareable not exchangeable and can be given away and retained at the same time;
- expandable and increase with use;
- compressible, able to be summarised, integrated, etc.
- possessing a definite value, depending upon their use which may be quantified and treated as accountable asset;
- varying in value over time in an entirely unpredictable way; and
- a source of economic and political power;

Blaise Cronin sums up the characteristics of information as follows:

"It is fashionable to speak of information as a commodity, like crude oil or coffee beans. Information differs from oil or coffee, however, in that it cannot be exhausted. Over time certain types of information lose their currency and become obsolete, but equally, certain types of information can have multiple life cycles. Information is not depleted on use, and the same information can be used by me and be of value to an infinite number of consumers. Furthermore, information has the characteristics of a public good, more for me does not necessarily mean less for you."

10.3.2 Scope and Ramifications of Information Economics

Information Economics has been described and reviewed in detail in a publication entitled '*The Economics of Information and Human Capital*', Volume 3 in a Series '*Knowledge: Its Creation, Distribution and Economic Significance*' by Professor Fritz Machlup, an outstanding economist, who has made significant contributions to this new specialty in economics. A brief summary of the contours of information economics is presented below:

Considering information and knowledge as human capital, the significance and effect of this capital are analysed as a factor of economic growth and development. Information problems relating to markets, trading in commodities,

insurance, labour, finance, etc. are examined in relation to buyers and sellers. Knowledge and information are examined with reference to public decisions and public goods, production and distribution of new knowledge, especially technological innovations, dispersed knowledge, central planning etc. Economic agencies that are involved in their respective activities, have an information and knowledge component which constitute another dimension of study and research. Empirical research, theoretical analysis and applied enquiry get special consideration as methodological aspects of the economics of information and knowledge.

Fritz Machlup has also given a classificatory map for information economics. The ramifications of the subject as depicted here consist of groups, divided into 115 subgroups. The seventeen main groups are listed below to get a broad view of the contours of the new specialisation.

- 1) Economics of knowledge and Information: General
- 2) Production and distribution of knowledge; Knowledge industries, Information services, Information machines;
- 3) Ignorance, Chance, Risk, and Uncertainty as factors in the explanation of individual choices and particular economic institutions and phenomena;
- 4) Uncertainty, Risk-aversion, Venue spirit, Innovativeness and alertness as factors in the explanation of entrepreneurship and profit;
- 5) New knowledge (invention, discovery) and its application (innovation, imitation as factors in economic growth);
- 6) Transfer of technology and know-how;
- 7) Economic forecasting;
- 8) Cost and value of information private and social, alternative information systems;
- 9) Decision theory and Game theory;
- 10) Decision making by consumers and incomplete and uncertain knowledge;
- 11) Decision making by workers and job with incomplete and uncertain knowledge;
- 12) Decision making by private firms, in various markets positions, with incomplete and uncertain knowledge;
- 13) Policy making in government and public agencies with incomplete uncertain knowledge;
- 14) Formation of revision of expectations and their role in economic dynamics;
- 15) Role of information, knowledge, expectations, risks and uncertainty in the functioning of markets and the formation of prices;
- 16) Prices as information system for resource allocation and product distribution in market economics and planned economics national programming and planning; and
- 17) Human capital, the accumulation of knowledge and skills.

Self Check Exercises

- 2) Distinguish between information economics and economics of information.
- 3) State the characteristics of information.
- 4) What are the basic contours of information economics

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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10.4 MICRO-ECONOMICS OF INFORMATION

We shall, in this section, deal with some of these micro-aspects of information economics. These are some of the narrow aspects of economics concerned with uncertainty and risks, risk-aversion, information in markets, asymmetry in buyer and seller information, decision making by varied economic agents. All these are considered as aspects of study in micro-economics of information i.e., mainly in the context of individuals, households, firms and institutions.

10.4.1 Uncertainty and Information

Uncertainty is inexorably interwoven into human life. Nobody can with any degree of certainty predict accurately future events and activities of individuals, or groups or nations. As events are concerned with human volition, their behaviour cannot be predicted with accuracy, except in very rare circumstances. Predictions are largely in nature statistical, probability of an occurrence or an event, the aggregate analysis of which may result in the formation of theoretical constructs or models. The phenomenon is very much present in economics, as all investments are risk prone and need an insurance coverage for sustaining losses. Information economists say that this type of uncertainty is reduced to a certain measure by the availability of timely information. "Theoretical economics is changed by the increased emphasis economists place on knowledge, information, ignorance, uncertainty and so forth, and by computerised methods of simulation and hence, of ascertaining the effects of different assumptions, underlying the theoretical models; and empirical economics is changed by the amount of data available and by the speed, and indeed the practical possibility of processing such masses of data." [Machlup, 1983, p.39]

Uncertainty is common both to buyers and sellers; both at the stage of production and at the point of exchange. All markets have informational characteristics. Usually buyers know less about products and services than sellers. This is a common experience of many of us when we go out shopping for house hold appliances, textiles, or even food items. Here there exists an

information asymmetry between buyers and sellers, as the former is not equally informed as the latter. Recent literature in information economics reports that such information asymmetries cause market failures of various kinds. The emerging area of consumer protection is said to rely on the informational structure of markets, since the need for consumer protection usually arises because consumers are not fully informed.

Currently the principal studies in information economics are directed towards finding ways to incorporate information flows and information gaps into models of markets in order to assess rigorously the impact of information or its absence on market performance.

10.4.2 Information and Markets

We shall examine the effects of asymmetry with reference to four different markets with which we are very familiar a) Consumer products, b) Insurance, c) Jobs and d) Financial markets.

Consumer Products Markets

In this market, in particular, in retail markets, buyers (household) are typically less informed than the sellers about aspects of product quality such as invisible defects, risks or malfunction, leakage and decomposition. To build up consumer confidence in the firm that sells the product, sellers resort to the provision of guarantee and liability. Consumer protection is also effected through the imposition of regulatory controls by government. However, one disadvantage of guaranteeing minimum standards of quality is that the variety of products available in the markets may be reduced.

Buyers do have the option for ensuring reliable quality of the product through various kinds of product literature. Two somewhat related activities of market parties are screening and signalling, the former designed to obtain information and the latter to transmit information. Sellers wanting to send messages about themselves and about the quality of their goods and services to potential buyers, engage in signalling. Buyers intent upon learning more about the sellers and the goods and services offered, engage in screening. Trademarks, trade names, brands, besides guarantees and most importantly, the seller's good will earned through a long period of reliable service, give greater credibility to their product. Consumer protection activities ensure a certain standard of assured product quality, prices commensurate with quality and transactions, procedures, etc.

Insurance Markets

In insurance markets, it appears there are several kinds of informational problems such as: i) Adverse selection in which low-risk people leave the pool of those insured; ii) Moral hazard where those who are insured, because they are insured, take actions that increase the risk of the occurrence of the unwanted events; iii) Adverse incentives when the insured tend to over purchase a service such as medical attention as a result of the factor that the insurance pays a percentage of the cost. As we can see, in insurance, it is typically the seller who has lesser information, since the buyer is well informed about the risk class to which he belongs. The seller takes a greater risk in his business and the asymmetrical characteristics in these markets are clearly the opposite of those that are prevalent in a consumer product market. Of course, insurance

companies take several remedial measures to overcome the risk potentials by resorting to differential premia for personal life insurance by the methods of inspection and monitoring of plant, equipment, by observation of safety rules, with surcharges levied for deficiencies.

Job Markets

In job markets, there are problems of information that have a special importance. Searching, signalling and screening are activities affecting the supply and demand for workers, the dispersion of wage rates, and the rate of employment, working age, and such others. The employees and job seekers resort to different methods of informing themselves of the opportunities and markets to meet their particular requirements.

Finance Markets

This financial markets' information, imperfect knowledge, risk and uncertainty play different roles, particularly in different credit and capital markets. The information sought, produced, offered, disseminated and acquired by the parties involved (lenders, borrowers, buyers and brokers in stock and share markets) is usually about quite different matters, so that its not easy to formulate general propositions fitting all financial markets. Some of the kinds of information generally available to financial investors, particularly with reference to the stock market are the financial statements of companies at periodical intervals, the annual statements audited by certified public accountants, balance sheets of companies, annual reports of the managements of companies, prospectus for new issues of equity or debt brokerage firms, write-ups of financial analysts, current news and analysis appearing in newspapers and news magazines, etc.

In all these markets, the Internet with its global spanning technology offers today, remarkable E-Commerce (E-Business) facilities for exchange of information, goods, and payments with speed and efficiency irrespective of location. Benefits to consumers offered by E-biz include:

- Benefits of easy shopping (since most intermediaries are eliminated);
- Buyers can reach out to sellers across the country or even the world;
- Bargaining power shifting from sellers to buyers;
- Product features of different suppliers can be accessed almost instantaneously;
- Getting comforts of shopping (including online payments) while at home.

10.4.3 Information and Non-Markets

There are many contexts and situations in which the market pressures discussed above do not operate. Yet the information problems are very much present. In providing public amenities, government at different levels has to take many vital decisions at different times. These may be social and welfare activities for the communities and hence regarded as public goods and services. With public goods, if one person has more, there is no reduction in the quantity available to others. Provision of streetlights, defence activities for the security of a country, construction of a park are good examples of public goods. In

these types of activities, the peculiar characteristic of information is the presence of externalities. Externality or external economics are defined as favourable effects on one or more persons that come from the action of a different person or firm. Negative externalities occur in the same fashion in that they refer to harm done to others from external source. In the construction of a park, the person living in the surrounding areas gets obviously a definite benefit. But investments by government in higher education may not always result in social benefits to the community. The often discussed example is the problem of brain drain in countries like India which takes the human capital from the country after a good deal of effort and investment in building up this capital. In all these economic activities information plays a role in obtaining data and analysing them to provide appropriate indications for taking appropriate decisions at different levels of government and institutions.

10.4.4 Information and Measurement

A continuing source of weakness in the study of information economics is the absence of reliable measures for such fundamental elements as cost, price and value. These elements are very much interconnected. Cost determines the price at which an information product could be offered. But price cannot be determined only on the basis of cost, as the quality of the product or service is a very crucial factor in fixing the price. Apart from the difficulties of determining the cost of a product or a service in which a number of inputs are involved, other costs such as opportunity costs are to be taken into account as an economist would conceive. Opportunity costs represent the cost of foregone alternatives, the need to satisfy one's want at the sacrifice of another. For example, forgoing the chance of a holiday in order to purchase a car.

Price is usually denoted in monetary terms, as the amount of money that has to be paid for a good or service. But price may have to be according to the different segments of customers to whom the goods or services are offered. This has to be so if a product is to have economic viability.

Determining the value is a complex matter, which lies at the heart of information economics. Value of information is highly subjective as it is to be judged and measured by the person who is seeking the information. But the problem of measurement of information is elusive and evasive, as it is difficult to determine a unit of information. Again attempts at measuring value by means of cost-benefit analysis may also present the problem of assigning a monetary value for the benefits.

Self Check Exercises

- 5) Elucidate the effects of uncertainty in different markets.
- 6) Examine the role of information in non-markets.

Note: i) Write your answers in the space given below.
ii) Check your answers with answers given at the end of the Unit.

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10.5 INFORMATION ECONOMY

Economy refers to the judicious allotment of resources to the different sectors of a country, like agriculture, industry, transport, communication, power, etc. with a view to productivity. This implies that the basic problem of an economy is the prudent management of resources for the optimum production of goods and services, maximum employment, their steady growth over a period with provisions for further development. In the last half a century, information and knowledge have evolved as the key resource for economic development. We shall briefly sketch how this evolution has come about.

Information, knowledge, ideas, skills, etc., have always been at the heart of the growth, progress, and developmental processes of a society. Historically all societies, ancient or medieval, have achieved growth and prosperity on the basis of information and knowledge in their various stages of development. In the past, the creation of new knowledge, innovations and inventions has been the efforts of a small band of individuals with a passion and deep involvement and dedication to such creative activities. Consequently growth of knowledge has been slow. The economic value of information and knowledge has never been regarded as important factors of production of goods and services, as they could not be separately accounted for.

With the advent of industrial revolution in the 18th century, consequent advances in science and technology (S&T) and the resulting economic growth, prosperity and standards of living of people in western countries, S&T have come to be recognised as important contributing factors for economic growth and prosperity. Institutions exclusively for research and development in science were set up to expand the frontiers of knowledge. While science helped to advance the wave front of knowledge, science-based technologies advanced the frontiers of economic wealth.

The burgeoning volume and variety of information and knowledge resulted in the explosion of recorded S&T information. Consequently new and well organized S & T information systems and services began to take shape, providing access and facilitating their use for furthering knowledge.

The arrival of computers with inventions in microelectronics provided new opportunities to develop information systems and services on a massive scale that provided universal access to new information to advance knowledge further.

The Internet and the World Wide Web furnished not only unrestricted low-cost access to information but also facilitated communication among peer groups. Now acquiring and adapting global knowledge and creating new knowledge; investing in human capital to increase the ability to absorb and use knowledge; and investing in technologies to facilitate not only the acquisition and the absorption of knowledge, but also represent the best possible strategy for the overall development of any region, or people. All these have been possible entirely because knowledge generation and information processing are at the root of new productivity.

With all these unprecedented advances in technology providing instant access to a variety of information, information and knowledge have taken the central position and have become key factors for economic growth, productivity and development. Although information and knowledge have been critical for economic accumulation and political power throughout history, it is only under the current technological, social, cultural parameters that they have become directly productive forces and are imparting the societal growth and development in a manner not known earlier.

Self Check Exercises

- 7) What are the salient features of information economy?
- 8) What are the factors that have led to the new growth theory of economics?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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10.6 KNOWLEDGE ECONOMY

We will begin this section with a definition of 'knowledge' for putting our discussion in the right perspective. A definition of knowledge as given by a knowledge management expert is that "Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms." [Davenport, 1998]

While information is now accessible globally and available without any restriction, irrespective of their location, Peter Drucker asserts that "a new Information Evolution (knowledge) is well under way. It has started in business enterprise, and with business information. But it will surely engulf ALL institutions of society. It will radically change the MEANING of information for both enterprises and individuals. It is a revolution in CONCEPTS. ...So far, for fifty years, Information Technology has centered on DATA—their collection, storage, transmission, and presentation. It has focused on the "T" in "IT". The new information revolution focus is on the "T". [Drucker] What is being referred to here is Knowledge as the basis of productivity.

To differentiate information from knowledge for the purpose of our discussion here, although information is said to be the raw material for knowledge, Information is an unreliable and inefficient method for transferring knowledge from person to person because the receivers – not the senders – give the

information its meaning. Information is entropic (chaotic), while knowledge is not entropic.

Another critical observation on information revolution is that “so far IT has only transformed processes that were here all along. In fact, the real impact has not been in the form of “information” at all. Almost none of the efforts of information envisaged forty years ago have actually happened. For instance, there has been practically no change in the way major decisions are made in business or government. But the Information Revolution has routinized traditional processes in an untold number of areas.”

“Some examples of the way computers have routinized processes:

The software for tuning a piano converts a process that traditionally took three hours into one that takes twenty minutes. There is software for payrolls, for inventory control, for delivery schedules, and for all the other routine processes of a business. Drawing the layout of the heating, water supply, sewerages systems in a big building such as an office complex, hotel or a hospital formerly took, several highly skilled draftsmen, several days; now there is a program that enables one draftsman to do the job in a couple of days, at a tiny fraction of the cost. There is software to help people do their tax returns and software that teaches hospital residents how to take out a gall bladder. The people who now speculate in the stock market online do exactly what their predecessors in the 1920s did while spending hours each day in a brokerage office. The processes have not been changed at all. They have been routinized, step-by-step, with a tremendous saving in time and often, in cost.” [Haravu, 2002]

While Internet, web and other ICT facilities have provided instant access and availability of any required information, it has created also an overwhelming problem of information overload. The excess of information is a critical factor in the productivity of the newly emerging knowledge workers. Users are now to contend with the relationship between information and knowledge. This is particularly affecting business which has to be: i) constantly alert to changes in the business environment; ii) ever ready for competition; iii) ability to handle the overload of information and get the best of information accessibility, getting the right information at the right time in right proportion. This had lead business organisations to seek knowledge rather than information.

It is now increasingly realised in business that the key to being innovative is knowledge that is held with the company or country and outside it. “The key is also in ensuring that knowledge is continuously created, accessed, assessed, communicated, sustained, and exploited—in short managed, as a resource as much as other resources like capital and labour.” (Haravu) Peter Drucker argues that in this economy, knowledge is not just another resource alongside the traditional factors of production, viz. land, labour and capital, but the only resource rather than just a resource. To quote the World Bank Development Report 1999, “For countries in the vanguard of world economy, the balance between knowledge and resources has shifted so far towards the former that knowledge has perhaps become the most important factor determining the standard of living – more than land, than tools, than labour. Today’s technologically advanced economics are truly knowledge-based. “[World Bank, 1999].

10.6.1 New Growth Theory of Knowledge

A new growth theory of knowledge is slowly evolving. Paul Romer, Stanford University, Maurice Scott of Oxford, Jacob T Schwartz of New York University are some experts working on the new growth theory of knowledge. The thinking goes as follows:

Knowledge is the basic form of capital. Economic growth is driven by the accumulation of knowledge.

Technological breakthroughs can create technical platforms for further innovations and this platform effect is a key effect of economic growth.

Traditional economics predicts diminishing returns on investment in technology. But the new growth economists argue that the non-rivalry and technical platform effects of new technologies can lead to increasing returns.

Investment can make technology more valuable and vice-versa. According to this new growth theory, the virtuous circle that results can raise a country's growth rate permanently.

Human capital generates the ideas and knowledge that in turn decides how efficiently and effectively traditional inputs of capital (such as plant and equipment) and labour are translated into output.

10.6.2 Some Characteristics of Knowledge Economy

- Knowledge-based economics is characterised by a set of qualitative and quantitative changes in the last 15 years or so that have transformed the structure, functioning and rules of the economy.
- Knowledge has a high rate of obsolescence of goods, services and ideas. This calls for a higher rate of generation of new ideas and their conversion into applications, products and services.
- Knowledge sensitive organisations proactively encourage and enable their workers to take initiatives and to sustain their core competencies to enable the firm to remain competitive in a fast changing world.
- The increased importance of knowledge means that the net stock of intangible capital (e.g. education and research and development) has grown faster than tangible capital (e.g. Buildings, Transportation, Roads, Machinery).
- While the old economy was fundamentally organised around standardised mass production, the new economy is organised around flexible production of goods and services. The new economy is a high-tech, services and office economy.
- In the new economy, where competitive advantage increasingly stems from customisation, design quality and customer service, more of the value-added is produced in office.
- Knowledge-based jobs require post secondary, vocational or higher education.

- A class of knowledge workers is being created although this new class is not the largest now, but likely to increase.

All that have been said above are in the context of advanced countries of the West, which have a very strong high-tech industry and currently dominating global economy.

To sum up the main features of an information and knowledge economy are:

- The centrality of theoretical knowledge and knowledge acquired through accumulated experience, value added, with intuitional enrichment and capacity for wise application, as the key resource in innovation and policy formulation;
- Distinct change from commodity producing to a service economy;
- The pre-eminence of a managerial, professional and technocratic class and emerging knowledge workers.

Let us study now the Indian economy to assess as to what extent these attributes of information or knowledge economy are present.

Self Check Exercises

- 9) What is the New Growth Theory of Economy?
- 10) What are the characteristics features of Knowledge Economy?

Note : i) Write your answers in the space given below.

- ii) Check your answers with the answers given at the end of the Unit.

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10.7 INDIAN ECONOMY

The expert economists' view is that Indian economy is currently being structurally transformed and developing new strengths to become a strong regional economic power in the new millennium. This transformation has begun from 1991 from a highly regulated and inward-oriented to an outward looking economy in which the State dominance in many spheres of economic activity is giving way to private enterprise. This is a far-reaching economic policy shift.

Although India's economic strength is derived from agriculture with food self-sufficiency, industry is no longer shielded from external participation. Beginning from the last decade, industry has been attempting to restructure itself in ways that could help India to compete with the rest of the world. What is of growing significance is the steady rise in the service sector, accounting for 52 per cent of the Gross Domestic Product (GDP), with agriculture 26 per

cent and industry with 22 per cent respectively of GDP. Information Technology (IT) in India has developed a universally acclaimed software industry. This is the fastest growing sector of the economy at 50 billion US dollars, as compared to the current level of merchandise exports at 45 billion US dollars. Future growth of the Indian economy is likely to be driven equally by IT related services as well as by other sectors such as trade, transport, tourism, financial and community services. The services taking a major share of Indian economy is characteristic of information economy wherein the distinct change is from a commodity producing to a service economy.

10.7.1 Workforce in India

In the changing context of sectoral composition of GDP and workforce, although agriculture workforce accounts for 65 per cent, the services sector has assumed a key role and its expansion influences production, employment and exports. The share of agriculture of GDP has declined from 52 per cent in 1950s to 26 per cent at present. This is a clear indication that agrarian economy is shifting towards the services sector where information is at the centre. IT workforce in India is steadily increasing. But one of the problems India is facing is that this force of economic strength is getting depleted because of the brain drain i.e. that the workforce is going out of the country causing serious loss to the country.

Other indicators that India is moving slowly but steadily towards information economy, are seen in many jobs and activities in government, business houses and other agencies and institutions which are more and more computer-based. Distinct changes have taken place that are visible are in railway reservations, post office services, banking and in such other services. Libraries are also switching over to computer-based services.

There are also indications that Indian business to compete with world markets, are trying to invest in knowledge management. Infosys, TVS, Dr. Reddy's Pharmaceutical Labs., Samtel (manufacturing TV picture tubes) are a few industrial enterprises that are looking towards knowledge management for innovations and creating new knowledge to compete in global markets.

A trend is seen in government policy encouraging software development and hardware manufacturing in the country by creating appropriate environment. Government has recommended that each ministry must allocate 3 per cent of its budget on IT promotion, as a move towards integrating it with government functioning and e-governance.

There are a number of programmes of central and state governments which have launched projects on e-governance. To what extent are they operational and what results have been achieved are not very clear. Some of these projects are listed in the References in Sec.10.13

10.7.2 Constraints Towards Progress

While there is a visibility that India is moving towards Information and knowledge economy, its progress is slowed down by a number of massive challenges. Poverty (one-third of the world's poor are in India), full employment, universal literacy, health care, drinking water, quality education, raising the standard of living of people optimally without any discrimination

of caste, creed, gender, heavy import of information and knowledge, corruption at all levels, are formidable tasks to cope up with and achieve any tangible success.

Quality education and training in vocations, research and development appropriate to the country's economic needs and other efforts to create new knowledge and innovations that would give strength to compete with world economies are serious constraints in India that need considerable efforts to overcome.

Critical observers have made well-meaning comments on the vision of India to drift into knowledge economy. Some of these are:

- India's industrial base has to be strengthened before moving towards knowledge-based economy. The developed countries of the West, in fact, had built a strong industrial base before moving towards a knowledge economy. We cannot leap frog to knowledge economy without a strong industrial base.
- Employment in industrial sector and in infra structural facilities like transportation, communication, power grids, etc. will be far more than in the IT sector, despite India becoming a Software power in 2008.
- Literacy as we define now having the ability to read and write simple words in any language is irrelevant in the context of a knowledge economy. High quality education and training in different disciplines at all levels are at the root of building a knowledge-creative manpower force.
- Entering global markets also has its plus and minus points. There is a tendency to protect their business interests by developed countries to the detriment of developing countries.
- IT can be very profitably employed in agriculture and industry to increase productivity qualitatively and quantitatively.

Self Check Exercises

- 11) What is the state of current Indian economy?
- 12) State the constraints of Indian economy.

Note : i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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Constructive Efforts

It is worthwhile here referring to an interesting project launched by Dr. Swaminathan, the renowned agricultural scientist towards 'sustaining

development' in some parts of rural areas in India is worth mentioning here. "The M.S. Swaminathan Foundation has established an experimental network in India that will soon connect more than 20 isolated rural villages to a wireless internet service. About half of the population in most of these villages has a total family income of less than \$25 per month. The project is designed to provide knowledge on demand to meet local needs using the World Wide Web, and it does so through a bottom-up process. The process starts with volunteer teams that help poll the villages to find out what knowledge they want. Particularly popular thus far are women's health-information, advice on growing local crops and protecting them from diseases, the daily market prices for these crops, local weather forecasts, and clear information about the bewildering array of programmes that are provided by the Indian government to aid poor families. To participate, each village must provide a public room for the computer system, as well as the salaries for a set of trained operators. In return, the village receives the needed hardware and maintenance for the communication system, specially designed web sites in the language they convey the requested information, and training programmes for those villages who have been selected to run their local knowledge system. The network will allow them to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insights and needs back to scientists." [Swaminathan, 1999].

10.8 ECONOMICS OF INFORMATION SYSTEMS AND SERVICES

The foregoing account of Indian economy preceded by a general presentation of information and knowledge economy gives an idea of the context Indian library and information systems and services should develop to meet the information needs of users. IT has, as pointed out earlier, provided the necessary tools to develop a system and appropriate services with innovative ideas. Library automation, the development of specialised databases, the opening of online database search services, the development of consortia and library networks, electronic publishing, the development of information retrieval thesauri, and software for one or more of the above mentioned products or services are some of the initiatives taken to provide easy and wide access to information. The arrival of CD-ROM in the 1980s paved the way for the mastering of large databases and their distribution worldwide on stand-alone computers. The Internet and the Web technologies and all other supporting technologies have strengthened the accessibility to worldwide information.

Libraries and information systems and services do not exist in isolation. They are in most cases components of other institutional frameworks. While information and knowledge are fast changing the work environments out of necessity everywhere, libraries and information systems cannot remain unaffected. Here also, innovative thinking to institute new types of services is absolutely essential to meet various requirements. New skills will have to be acquired by constant updating of professional knowledge through continuous learning and training, which are, indeed, lifetime processes. These are challenges, but at the same time opportunities.

10.9 RELEVANCE OF INFORMATION AND KNOWLEDGE ECONOMICS TO LIBRARY AND INFORMATION STUDIES

The specific advantage of the relevance of the study of information and knowledge economies can be summed up as follows:

- The value and importance of information and knowledge are deemed to be the key resources for national growth and development. Library and information professionals having always been associated with information and knowledge services, get further opportunities to commit themselves to develop new and innovative services to stay in the competitive job market;
- The scope and dimension of information economics open up new areas of study and research for us to pursue; and
- A new type of job market is emerging which expands the scope for professional opportunities for employment.

Self Check Exercise

- 13) What is the relevance of information and knowledge economies to the library and information professionals?

- Note:** i) Write your answer in the space given below.
ii) Check your answer with the answers given at the end of the Unit.

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10.10 SUMMARY

This Unit begins with a brief introduction to the substance of economics. Differentiating economics of information and information economics, it deals with the ramification of this specialization, giving some examples of the role of information in typical markets such as products, insurance, jobs, and financial markets. Discussing information economy of a country brings out the effects and changes on the different sectors of economies of a country, the chief instrument of change being ICT. Distinguishing information economics from knowledge economy as a new growth theory of economics, explains the shifting emphasis from information to knowledge. While these changes are very much seen in the economies of developed countries, the Indian economy has its special problems, before India can claim to reach the level of growth and development as the developed countries. The Indian situation is examined

with reference to the constraints India has been facing, although there are attempts to create the necessary conditions for the progress and advancement of its economy. How far this changing context affects professionals in library and Information science is briefly stated. The new skills to be acquired by Indian library and information professionals are indicated.

10.11 ANSWERS TO SELF CHECK EXERCISES

- 1) Economics deals with human wants, needs, demands and desires and the means of obtaining them for fulfilling human satisfaction. Goods and services are the means of achieving this satisfaction. But these are to be produced utilising various resources, both human and non-human. This involves a market wherein the activities of buying and selling are in their place. Markets are conditioned by value, cost and prices, which influence both buyers and sellers. The means of production and distribution are controlled and regulated by governments, which have the responsibility of the welfare of the people. This brings in the concept of planned or mixed systems of economy and many related economic issues.
- 2) Information economics perceives information as a resource of importance in its own right and examine its role in all economic activities, as a factor of production, growth and development. All economic issues are studied with reference to the role of information in markets, decision-making, its cost, price and value, monopoly, competition, etc. At the macro-level, the national economy is viewed as an information economy with a particular reference to the contribution of information to the Gross National Product, with information products and services and Information Technology.
Economics of information is the prudent planning and management of households, institutions and governments in the deployment of resources so as to avoid unnecessary waste or expenditure.
- 3) Some of the characteristics of information are:
 - Shareable not exchangeable and can be given away and retained at the same time;
 - Expandable and increases with use;
 - Compressible, able to be summarised, integrated, etc. possess a definite value, depending upon their use which may be quantified and treated as an accountable asset;
 - May vary in value over a period of time in an entirely unpredictable way; and
 - Is a source of economic and political power.
- 4) The basic contours of information economics are macro-economics of information dealing with the economics problems of individuals, households, firms, etc. Some of these economic issues are indicated below:
 - Information economics;
 - Uncertainties and information;
 - Ignorance, chance, risks as factors in the explanation of individual choices and institutions;

- Cost, price and value;
- Decision making;
- Information markets; and
- Human capital.

- 5) Uncertainties are common both to buyers and sellers, both at the stage of production and at the point of exchange.

In consumer product markets, particularly in retail markets, buyers (household) are typically less informed than the sellers are about aspects of product quality such as invisible defects, risks of malfunction, breakage and decomposition. To build up consumer confidence, sellers resort to the provision of guarantees and liability. Such guarantees are a form of insurance against product failures and serve as signal of reliability. Consumer protection is also effected through imposition of regulatory controls by government. This sort of information flow would reduce the uncertainty of the buyers.

In insurance markets, it is typically the seller who has lesser information, since the buyer is well informed about the risk class to which he belongs. The seller takes a greater risk in his business and the asymmetrical characteristics in those markets are exactly the opposite of those that are prevalent in consumer product markets.

In job markets, the employers and job market seekers resort to different methods for informing themselves of their opportunities and markets to meet their particular requirements.

Internet now provides much better facilities through e-commerce to meet the demands of various market situations.

- 6) In providing amenities, governments have to take many vital decisions at different levels and at different times. These may be social and welfare activities for the communities and hence may be regarded as public goods and services. Provision of streetlights, defence activities for the security of a country, construction of a public park are good examples of public goods. In these types of activities, the peculiar characteristics of information, is the presence of externalities. In the construction of a park, the persons living in the surrounding areas get obviously a definite benefit. But investments by government in higher education may not always result in social benefits to the community. In all these economic activities, information plays a role in obtaining data and analysing them to provide appropriate indicators for taking decisions of different levels of governments and institutions.

- 7) Information as a key economic resource has evolved over a period of time. Industrial revolution, which led to mass production and distribution, started the productivity growth without any precedent. Information revolution with its vital component of IT placed information as the key resource for economic changes. All these present a set of new features of information economy which are:

Higher productivity as information is being made accessible and available irrespective of its location at low cost;

The pre-eminence of a managerial, professional and technocratic class;
Reducing uncertainty and risk factors for buyers and sellers through the facility of e-commerce; and
The centrality of theoretical knowledge as the source of innovative and policy formulation; distinct change from a commodity producing to a service economy.

- 8) A new theory of economic growth due to the following factors:

While the Internet has made it possible to access information globally with speed, it has also created the problem of overload of information;

Information has routinised processes but not effected any radical change in the fundamental concept of growth through innovative ideas and knowledge; and

The information revolution focused only the technological part of IT rather than the need for innovative creation of new knowledge.

- 9) The new growth theory of economics propounds:

Knowledge is the basic form of capital. Economic growth is driven by the accumulation of knowledge.

Technological breakthroughs can create technical platform for further innovations and this platform effect is a key effect of economic growth.

Traditional economics predicts diminishing returns on investment in technology. But the new growth economists argue that the non-rivalry and technical platform effects of new advances can lead to increasing returns.

Investment can make technology more valuable and vice-versa. According to this new growth theory, the virtuous circle that results can raise a country's growth rate permanently.

Human capital generates the ideas and knowledge that in turn decide how efficiently and effectively traditional inputs of capital (such as plant and equipment) and labour are translated into output.

- 10) Knowledge-based economy is characterised by a set of qualitative and quantitative changes in the last 15 years or so that have transformed the structure, functioning and rules of the economy.

Knowledge has a high rate of obsolescence of goods, services and ideas. This calls for a higher rate of generation of new ideas and their conversion into applications, products and services.

Knowledge sensitive organisations proactively encourage and enable their workers to take initiatives and to sustain their core competencies to enable the firm to remain competitive in a fast changing world.

The increased importance of knowledge means that the net stock of intangible capital (e.g. education and research and development) has grown faster than tangible capital e.g. Buildings, Transportation, Roads, and Machinery).

While the old economy was fundamentally organised around standardised mass production, the new economy is organised around flexible production of goods and services. The new economy is a high-tech, services and office economy.

In the New Economy, where competitive advantage increasingly stems from customisation, design quality and customer service, more of the value-added is produced in office.

Knowledge-based jobs require post secondary, vocational or higher education.

A class of knowledge workers is being created. Although this new class is not the largest now, in course it is likely to increase.

11) The current state of Indian economy is as follows:

The Indian economy is structurally transformed, developing new strengths to become a strong regional power in the early years of the new millennium.

Structural changes are that Indian economy has moved from a highly-regulated and inward-oriented to an outward-looking economy in which the state dominance in most spheres of economic activity is giving way to private enterprise.

Sectoral share of GDP are agriculture at 26 per cent, industry at 22 per cent and services sector at 52 per cent.

Fast growing IT industry, the fastest growing sector of the economy being the highest export.

12) The constraints of Indian economy, which contain or delay its growth are:

Poverty, full employment, universal literacy, health care, quality of education, training in vocations, research and development, raising quality of life in all sections of people, heavy impact of information and knowledge, corruption at all levels.

The new situation in India depicts an account of sea changes that have taken place in its economy due to technological advances. All institutions have to adopt themselves to these changing conditions with new approaches and skills. A combination of professional competence and subject knowledge coupled with an ability to adapt to changes, good interpersonal skills and innovation are the prerequisites for succeeding in workplace, working in a more expanded sphere of activities.

13) The specific advantage of the relevance of the study of information and knowledge economies can be summed as follows:

The value and importance of information and knowledge are deemed to be the key resources for national growth and development. Library and Information professionals having always been associated with information and knowledge services, get further opportunities to commit themselves to develop new and innovative services to stay in the competitive job market;

- The scope and dimension of information economics open up new areas of study and research for us to pursue; and
- A new type of job market is emerging which expands the scope for professional opportunities and employment.

10.12 KEYWORDS

Asymmetry	: Imbalance of information between a buyer and a seller.
Externality	: Favourable effects on one or more persons that come from the action of a different person or firm.
Information Industry	: Industries involved in the production and distribution of information.
Information Infrastructure	: Components of information economy.
Information Markets	: Markets trading in information.
Information Workforce	: Occupational force involved in information work.
Obsolete Information	: Outdated information.
Public Good	: Any consumable item meant for public use.
Searching	: Buyers search for reliable quality through various kinds of product literature.
Screening	: Process to obtain information. Buyers are generally engaged in screening sources to get right information.
Shareable Information	: Information can always be shared without any loss in sharing.
Signalling	: Sellers are usually engaged in signalling, wanting to send messages about themselves and about the quality of their goods and services to potential buyers.
Uncertainty	: Inadequate information causing uncertainty in decision making.
Value of Information	: Value of information not always in terms of money but in relation to its use.

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UNIT 11 INFORMATION POLICIES: NATIONAL AND INTERNATIONAL

Structure

- 11.0 Objectives
- 11.1 Introduction
- 11.2 Information Policy
 - 11.2.1 Restricted Meaning of Information
 - 11.2.2 Wider Meaning of Information
 - 11.2.3 Meaning of Policy
 - 11.2.4 Designation of Levels of Hierarchy
 - 11.2.5 Definition of National Information Policy
- 11.3 Need for a National Information Policy
 - 11.3.1 Information as Wealth
 - 11.3.2 Diverse Participants
 - 11.3.3 Use of Information
 - 11.3.4 Organisational Structure
- 11.4 National Information Policy: Aspects and Issues
 - 11.4.1 Some Recent Government Initiatives
 - 11.4.2 Issues and Aspects in the Limited Context of Library and Information Systems and Services
- 11.5 National Information Policy: India
 - 11.5.1 Overview of Efforts towards a National Information Policy
 - 11.5.2 Freedom of Information Act 2002
 - 11.5.3 Information Technology Action Plan
- 11.6 Information Policy: Efforts at International Level
- 11.7 Summary
- 11.8 Answers to Self Check Exercises
- 11.9 Keywords
- 11.10 References and Further Reading

11.0 OBJECTIVES

After reading this Unit, you will be able to:

- get a clear understanding of the concept of information policy;
- recognise the need for and value of a National Information Policy;
- identify and delineate the issues involved in formulating a National Information Policy;
- become familiar with the efforts made for initiating action towards a National Library and Information Policy;
- get an insight into the elements that constitute a National Information Policy;
- absorb the implications of Freedom of Information Act for library and information systems and services;

- grasp the effect of National Informatics Policy and IT Action Plan on library and information systems and services; and
- perceive National Information Policy in global context.

11.1 INTRODUCTION

In this Unit we are dealing with National Information Policies, which have assumed considerable importance with the expanding dimensions of information. As learnt in the earlier Units, the meaning and content of information varies from one context to another with numerous groups involved in information activities. A policy with reference to any activity of a country is usually formulated by the Government and hence a policy statement will have to include all perceptions of information in all its dimensions. So it will not be just a single statement of policy on any particular activity.

A discussion, therefore, on the perception of information, as normally understood in the context of library and information systems and services, is essential to put our study of information policy in right perspective.

The concept of a National Information Policy as defined by UNESCO is “A hierarchy of Levels of Steps” viz. Goals, Strategy and Programme is seen as a series of compatible steps for devising a framework for formulating a National Information Policy for Information.

The need for and purpose of a National Information Policy is studied from the point of view of the value of information and knowledge which are the basic ingredients for transforming natural resources into value added tangible wealth.

The issues relevant to formulating a National Information Policy are: Users and their Information Needs, Information Resources, Information Technology, Human Resources, Finance, International Exchange, Cooperation, and Coordination, etc. The implications of all these issues are studied in some detail.

The efforts by the various professional bodies in India, to draw attention of the government to the formulation of a National Information Policy are discussed.

Some of the efforts of International organisations such as Unesco, IFLA and FID in providing guidance to member countries in formulating national information policy are discussed. A brief summary of a handbook on formulating national information policy brought by Unesco is discussed in this Unit.

11.2 INFORMATION POLICY

Information Policy connotes different meanings to the different groups of persons involved in information activities. The variations of meaning have emerged largely because of the different perceptions these groups have of the meaning and scope of the concept information and policy.

To the library and information professionals, Information Policy deals with issues relating to contents of documents that carry all forms of information, textual, images, sound, microforms, electronic information and digital information, institutional and organisational mechanisms to collect, store, disseminate, provide products and services, according to the needs of users.

To the research and scholarly communities, the perception of information policy relates to the data and information generated, disseminated and communicated by them in different contexts and forms and also the information support facilities they look for pursuing their respective research and development activities.

The computer and telecommunication group would regard information policy as having to deal with the hardware, software developments, and information processing packages, transmission of messages, communication networks and related matters.

Those engaged in mass media would understand information policy to cover the gathering, analysis and dissemination of news, views, and general information to the public, and the freedom to the public at large, and the freedom to access information generated by governments and other agencies without any constraints.

For a common man, information is anything that makes him to decide or act or just to know and be informed. He must have access to the information that he needs without any difficulty and constraint.

The role of Information and Communication Technology (ICT) is pervasive, irrespective of the perceptions of the different groups involved information activities.

The government, while formulating a National Information Policy (Policies) should have to take into consideration all these perceptions and evolve an appropriate policy conducive to the benefit of all.

11.2.1 Restricted Meaning of Information

In this Unit, we are primarily concerned with what information constitutes to the library and information professionals, with respect to making information and knowledge available to users according to their needs. In this sense:

Information is viewed as data processing in the broadest sense, particularly in the collection, storage, processing, servicing organised data and information, that become essential for all economic and social exchanges.

Knowledge is viewed as an organised set of facts or data, derived from information and presenting a judgement or an experimental result, which is transmitted to others through some communication medium in some systematic form. It appears in the form of monographs, treatises, research papers, etc. which are collected by libraries and information centres.

These keywords information and knowledge are quite often used synonymously although their meanings are quite distinct.

In accordance with the definition given in the UNISIST Main Working document, "Information is the symbolic element used for communicating scientific and technical knowledge, irrespective of their nature (numeric, textual, etc.) material content, form of presentation, etc. It refers to both substance or contents of documents and to physical existence; the term is also used to designate both the message (substance and form) and its communication (act)."

Note: Refer to Units 1 and 3 of this course for the definition and scope of information and knowledge.

These definitions of information give appropriate dimension to our initial thinking about the formulation of a National Information Policy as perceived by library and information professionals.

The applications of ICT have given rise to new organisational structures such as Virtual libraries, Electronic libraries. Information professionals also have to operate in the new environments in which information technology predominates.

11.2.2 Wider Meaning of Information

In the present changing context, however, information is comprehended in a much wider sense. Accordingly 'information' encompasses a whole range of activities that include several overlapping elements. Thus a National Information Policy may incorporate a wide range of endeavours such as:

Discovery, Creation, and Collection of Information: This covers work and activities of scientists, scholars, artists, authors, raw data collectors and many others.

Storage, Retrieval, Processing, Disseminating and Duplicating Information: Agencies engaged in these activities are publishing industry, motion films and television industries, data processing organisations, libraries and cognate bodies like bibliographic, indexing, and abstracting databases, reviewing and archives agencies, etc.

Distribution of Information: This category includes broadcasting and television networks, circulation of newspapers, books and journals, film distributors, communication channels like postal, telegraph and telephone services, etc.

Hardware Suppliers: These comprise agencies, which produce goods for hardware industry such as computers and peripherals, telecommunication equipment, printing presses, paper, ink, electronic sensing devices, translating and display of equipment, cameras, projectors, and raw films.

Information Markets: This includes enterprises which use information hardware to support their primary activity not forming a part of the information industry, for example information in education, transportation, business and industry, health care, demography, public safety, national security, etc. both at the institutional and individual levels. A number of business enterprises have sprung up that provide information services through a variety of electronic databases and networks.

This encompassing perspective of information takes into account a number of factors that will not strictly fall within the ambit of policy issues of information as conceived by many other stakeholders or information professionals. These are areas that may pertain business and trade activities, commerce, education and training, mass media, etc.

11.2.3 Meaning of Policy

While the word information has such a wide range of interpretations, the meaning of the term 'Policy' is also often left vague and undefined. However, an examination of some of the existing statements of National Information Policy shows them to be, in many instances, descriptions of structural, functional and/or characteristics of governance. In these statements, Policy means an

instrument seeking to concretise or legalise a system design or a plan. Fundamentally, a policy may be stated to be a statement of guidelines for a course of action.

A course of action is, however, formulated with different levels of generality and specificity. Depending upon these levels, a hierarchy of steps for a course of action may exist. Each level within the hierarchy has to be compatible with the next higher level as components in a system that is interrelated. This system as a whole has to be conducive to the realisation of the overall objectives.

11.2.4 Designation of Levels of Hierarchy

It is useful to designate the components of the levels of hierarchy as series of steps in the formulation of a course of action to formulate a policy. Goal, Policy, Strategy and Program represent the levels of hierarchy with the following characteristics for each of them.

A **Goal** is the ultimate destination to be reached. It is an enduring statement of purpose towards actions over an indefinite period of time. The requisite extent of resources may also be indicated for the realisation of the goal.

A **Policy** is a statement of commitment to a generic course of action, necessary to achieve the goal. It expresses a determination and an agreement to follow the set course in realising the goal. Policies are invariably transitory. In other words, they cannot remain permanent or rigid. To make them realistic, they should be flexible enough to adopt themselves to changing environments of political, economic, social and cultural milieu.

A **Strategy** is a predetermined course of action, usually selected from a number of alternatives or options. Responding to politics, strategies are formulated through a process of planning, which takes into account political, legal, and administrative realities at any point of time.

A **Program** is a scheduled set of activities or tasks taken to implement a strategy in keeping with a predetermined strategy, a program is a set of tactical actions of a goal-seeking process. As such, it requires specific planning, budgeting and organisational attention.

With this backdrop let us try to seek a working definition for a National Information Policy.

Self Check Exercise

- 1) Give at least two reasons for a restricted meaning of information for formulating a National Information Policy.
- 2) Describe the levels of hierarchy of steps to devise a framework for formulating a National Information Policy.

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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11.2.5 Definition of National Information Policy

“A National Information Policy is a set of decisions taken by a government, through appropriate laws and regulations, to orient the harmonious development of information transfer activities in order to satisfy the information needs of the country. A National Information Policy needs provision of necessary means or instruments such as financial, personnel, institutional, for concrete implementation.” UNISIST II – Main Working Document)

To comprehend information in the sense the western writers do, and to formulate a policy therefrom would, perhaps, cut across the policies of the government relating to industry, trade, education, research, and many others. Further, groups involved in activities which are loosely connected with information, may have conflicting or overlapping objectives., each one having its own world view, specific interest and political purpose.

Hence, the definition here is restricted to the sense in which library and information professionals would like to view information policy to meet the challenges of the changing context of information. This changing context is restricted to information systems and services with reference to education, basic and applied research, planning and operating experience in different contexts, use of - information and data relating to commercial and trade activities, social and economic services and programmes and similar others.

Having understood the meanings and interpretations of ‘Information Policy’ a formal definition of National Information Policy, and the levels of hierarchy as useful steps for the formulation of such a policy, let us examine what type of policy is needed, with particular reference to India.

Self Check Exercise

3) Define National Information Policy.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

11.3 NEED FOR A NATIONAL INFORMATION POLICY

Information is for use. This simple statement encompasses a whole range of information transfer processes, stemming from the recognition that information

is a basic resource that transforms natural resources into value added tangible and powerful wealth.

The value and importance of information and knowledge, therefore, demand their care, harnessing, management and exploitation for use.

The ultimate purpose of information and knowledge is to put them to use, and in turn, to provide for a higher quality of life to people. The vital role of information in national development has to be seen in this perspective.

Seen from this angle, the primary objective of a National Information Policy is to achieve a progressive upliftment of the socio-economic development of the country through the provision of access to and availability of information and knowledge with speed and efficiency to all those who are involved in activities for national development. In the context of India, a National Information Policy must necessarily be governed by and from an integrated and harmonious part of the social, economic, educational, research and development and other related policies which get formulated at various stages of our national development. Further, the Information Policy needs to be compatible with the Five-Year National Plan of the country.

11.3.1 Information as Wealth

Generation of new knowledge and putting it to use to create wealth, places a country at a decidedly vantage position in the present context of fierce international struggle for economic and political power. In an information society, knowledge and technical skills become the central base. Education, training and R & D activities contribute to the building up of the central knowledge base.

Table 11.1 illustrates the sociological changes that take place as a society moves from pre-industrial to industrial and post-industrial stages and how the knowledge base evolves into a central force.

Table 11.1: Stratification and Posers

Features	Pre-industrial	Industrial	Post-Industrial
Resources Social Forces	Land Farm, Plantation	Machinery Business Firm	Knowledge University, R&D. Institution
Dominant figure	Land owner, Military	Business persons	Scientists, Researches
Means of power	Direct control by force	Indirect influence based on politics	Balance of technical and political forces, franchise, rights
Class base	Property, Military force	Property, technical skill, political organisation	Technical skill, political organisation
Access to power	Inheritance, Seizure by army	Inheritance patronage, education	Education, Mobilisation, cooperation

Investment in Human Resources Planning

In this era of post-industrial/information society, the industrially advanced countries which are rich in new knowledge and information, have found it highly profitable to invest in human resource planning to deliver the much needed resources of knowledge and information for transforming natural resources into wealth. Private companies in these countries are increasingly dependent on new knowledge and information (patents, processes, management skills, technologies, information about customers, competitors, suppliers, personal experience and expertise, etc.) to stay and flourish in business. In all these activities, research and development in areas appropriate to a business interest or a country's development programmes is considered to be vital to progress. A new subject "Knowledge Management" is fast developing in the corporate sector.

R & D activities, resulting in new knowledge will have to be disseminated for wider perusal for acceptance and validation by the peer community. The diffusion of such knowledge through a variety of primary, secondary and tertiary publications (databases), has become a normal feature today. In this process of transfer of information, a host of institutions of various kinds have sprung up to constitute a total system. If all these efforts to provide the necessary bones and sinews to the process of a country's development are to move in a directed manner to yield right results, it is essential that an appropriate policy for information is formulated.

11.3.2 Diverse Participants

We have learnt that the generation, dissemination, transfer, communication, distribution of knowledge and information take place through diverse channels and media, in a variety of contexts and environments. Many groups of people viz. researchers, practitioners, entrepreneurs, technicians, technologists, shop-floor workers, farmers, traders, health-care specialists, planners, bureaucrats, parliamentarians and legislators, and others operate in an information-communication of their own.

Communication takes place between individuals, from individual to groups and from group to group, person-to-person, dialogue, counselling, demonstrations, exhibitions, get-togethers, open houses and a number of other methods of exchanging and transferring information have become common today.

Apart from conventional paper-print media, audio-visual and electronic, digital forms of communication are becoming common with new advances in Information Technology. e-governance, e-commerce, e-education and other electronic oriented activities in health care and services, consumerism, political sociology, etc. are bringing remarkable changes in society.

Information Revolution

The cause of these rapid changes is the information revolution which is turning out to be as fundamental as the industrial revolution a couple of centuries ago is changing the life-style of people. It is thus seen that the entire range of the information revolution field cannot be easily comprehended by one single group

of people or institutions involved in the production and distribution of knowledge and information, so as to take advantage of the information revolution for securing maximum benefits to all sections of society.

In view of these wide ramifications, information-communication activities call for attention at macro as well micro levels to develop a total information system. These efforts can be guided appropriately only through the instrument of a National Information Policy and Planning.

11.3.3 Use of Information

We have noted that there are several users of information and knowledge to fulfill whatever need they may have. It is only in the field of education, research and a few others that information systems have been developed to disseminate, provide access and availability to information to meet the varying needs of information users. In many other fields wherein information support facilities are needed, there are hardly any organised information systems that have been developed in India. Only a holistic approach on information would ensure the possibility of giving attention to the needs of other categories of users and their needs.

11.3.4 Organisational Structure

When a variety of institutions are to be involved in the entire transfer process of information, it is necessary to create structural links between them to avoid duplication and wastage of efforts and resources. Information institutions have sprung up in most countries according to the exigencies of circumstances and not necessarily base on a systematic plan. Therefore, there has been a haphazard growth of such institutions without proper linkages. It is only through an Information policy and program that unplanned growth of information institution can be checked to enable a harmonious development. Particularly in the present context of Information Technology, it is possible to link all types of information institutions through networks so that the resources of all the different types of institutions could be shared without loss to anyone.

In the light of the discussions above the need for a National Information Policy becomes self-evident. Now let us examine the issues and aspects that are to be tackled while formulating such a policy.

Self Check Exercise

4) Explain the need for a National Information Policy.

Note : i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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11.4 NATIONAL INFORMATION POLICY: ASPECTS AND ISSUES

A few groups that have been concerned with the necessity of formulating a national information policy are:

Scientific, Technical and Societal Information (STSI) for general education, professional and higher education, research and development, industry and business, and socio-economic development;

Mass media dealing with the right to access public information necessity for newspapers, TV, Radio broadcasts, and such others;

Publication and book trade dealing with all publications, including electronic publications;

Information Technology handling hardware and software problems;

General public who need to have freedom of access to government generated information.

UNESCO has been concerned, beginning from the eighties, with some of these groups and have set up different platforms for persuading governments to initiate policy perspectives.

Sean MacBride Report (1980) which came out as a result of a study of an international commission of UNESCO gave recommendations specifically with reference to international information order in the context of mass media.

The other initiative of UNESCO, has been its effort in the preparation of the UNISIST Main Working Document for an intergovernmental conference in 1979 at Nairobi. This Document speaks about Information Policy for socio-economic development involving (STST).

11.4.1 Some Recent Government Initiatives

National Information Policies have come to the fore in many countries in recent years. A research report, funded by Resource, (a UK agency that funds research into a variety of policy-related matters in library and information services, among other areas) sought to identify significant government and government-funded agencies in a number of aspects of National Information Policy in a variety of developed countries. Countries included were Canada, USA, and Member States of the European Union, South Africa, Hong Kong, Australia and New Zealand. The activities of certain international agencies and the European Commission, were also noted which were of particular relevance.

Wide Ranging Topics

The topics covered in the research report were : e-government, Content Creation and Delivery, Heritage/Legacy, Quality of Information, Social Inclusion, Universal Access, e-Commerce, Legal Deposit, Intellectual Property Rights, Freedom of Information, Privacy and Confidentiality, Authenticity/Authorisation, Metadata, Interoperability and Information Literacy.

This Report also referred to a US Government commitment to the concept of the National Information Infrastructure whose primary purposes of this initiative were:

- Reduction of health-care and an increase in quality of health care services using tele-medicine
- Delivery of high quality lower-cost government services to the public;
- Preparation of the nation's children for the twenty-first century;
- Sending educational materials to homes so that students of all ages no longer need to travel to college or school;
- Promotion of technological innovation;
- Development of the electronic information industry;
- Extension of universal access;
- Protection of Intellectual Property Rights (IPR);
- Improvement of Federal Information Resource Management;
- Support to lifelong learning;
- Creation of a more open and participatory democracy at local, State and Federal level.

These refer to a variety of areas, which may or may not fall under the purview of a National Information Policy in all countries of the world.

The references to the above two groups of issues and aspects that could possibly be covered under a National Information Policy are given here only to indicate the wide-ranging number of topics that could be treated under a National Information Policy.

11.4.2 Issues and Aspects in the Limited Context of Library and Information Systems and Services

As we are, in this Unit, studying those aspects that are limited to issues pertaining to library and information systems and services in a country in the growing recognition of the centrality of knowledge and information as primary factors in national development, we shall identify only those aspects that are more relevant to our professional perspectives.

We will, therefore, focus our attention to policy issues and aspects within the framework of our limited library and information area. Broadly they are:

- Users, their identification and information needs;
- Resources: Document and Non-Document, Information and Communication Technology (ICT), Institutional, Human and Financial;
- Organisation and structure;
- Products and services;
- Standardisation;
- Regional and international cooperation.

Users, Their Identification and Information Needs

All activities and programmes of information handling are to be based entirely on the needs of users, as customer needs and behaviour are central to any business activity. Different categories have different information needs, depending upon their functions, responsibilities and duties and the extent of their involvement in their respective nature of their programme of work.

The user groups as has already mentioned include among others:

- government officials in a wide-ranging spectrum from the top-policy and planning levels down to the hierarchy of officials operating at the implementation levels;
- parliamentarians and legislators;
- judges and the judiciary;
- industrial entrepreneurs and business managers and executives;
- R & D persons in science, technology and social sciences;
- specialists in the application of technologies;
- teachers, students and educational administrators;
- practitioners in medicine and health care;
- lawyers and other legal professionals;
- agriculturists and farmers;
- grass root level workers in urban and rural settings; and
- the general public.

Indeed, information needs vary substantially and considerably both in terms of quantity and quality among these categories of users. Timeliness, speed of the supply of information, appropriate to needs, are crucial to the credibility of service.

The matching of information needs with the sources of information, documenting them for accessibility and organising responsive and anticipatory services and all the rest of these are to be based upon a careful assessment of information needs. Hence set policy guidelines, suggesting appropriate user surveys are essential to obtain data and information on user requirements.

User Studies

User studies have so far been confined largely to the assessment of needs in the context of education and research and R & D environments. Very few studies have been made to assess the needs of users in other contexts, particularly in India.

Just as there are agencies for market research and studies for assessing customer preferences and needs in business, institutions specifically devoted to user studies are to be created and developed. Use of information, gaps in gathering information, expressed needs of information, lacunae in information supply, type of information, meeting specific requirements, etc. are some of the studies that may be undertaken by such institutions. Indeed, the entire information

systems and programs are to be designed and organised on the basis of these types of user studies.

Self Check Exercise

- 5) Give reasons for treating information use and users as important issues for formulating a National Information Policy.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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Resources: Documents and Non-Documents

Information resources comprise published and unpublished records of information in all fields of knowledge. They may be textual, numeric, graphic, images, and in any other form, in any physical format, in any language, produced within the country and outside. These types of materials may include know-why, know-how, and show-how information, each having its own set of intrinsic characteristics. Only a part of this information is available in the market place; the rest has to be collected carefully in relation to user needs by the respective information systems in relevant subject areas.

Primary Information

Indigenously published materials like books, journals (the first issues of a title) are deposited in four libraries in the country by the Delivery of Books Act, 1956. For most other items such unpublished research and technical reports, theses and dissertations of universities and other cognate bodies, and other types of special materials, there is no provision of legal deposit. This makes the task of collecting these materials very difficult, if not almost impossible for most institutions that need them. There is, however, an obvious need for a legal provision or executive orders of a competent authority, whereby these resources of national origin are available in the country in a few selected institutions.

Besides these, there are other varieties of primary information, non-bibliographic in character, produced by government departments, public and private bodies, research establishments and many other non-government organisations. Most of these are internally generated data and information, numerical and textual, lying idle and unused in files.

Today, valuable information is also carried through films, videos and audios. These seldom find a place in service libraries, because their existence and availability are very often not known. A large volume of information has also to be imported into the country. Here again, only a part of the information is

obtained through information markets. Acquisition of foreign sources of information is beset with a number of problems because of the numerous complexities of import.

Only through a National Information Policy, which addresses itself to all these problems of information resource building at a national level, it is possible to ensure that the country does not suffer from lack of access to recorded knowledge and information.

Secondary Information

Secondary publications (databases) provide access to primary information in the form of bibliographies, indexes, abstracts, current awareness bulletins and a host of others. For indigenous primary publications, there is at present no adequate bibliographic control for all categories of publications. Secondary publications of foreign origin, almost all of them are available in electronic modes, in addition to paper-print. Agreements on the acquisition of bibliographical databases by some select institutions and making them accessible to others that need them through regular service arrangements would save cost and effort. Established procedures would help resource sharing and optimum use of these data bases with numerous present day telecommunications facilities for transmitting information.

Tertiary Publications

Tertiary sources of information such as referral directories of on-going research, bibliography of bibliographies, guides, etc. are also available in CD-ROMs and other on-line services which can be shared by libraries and information institutions.

Other Sources

Individuals and organisations do serve as good sources of information. Although these sources of information cannot be brought under the formal categories of information sources, they are useful and may indeed be vital in specific situations.

Vendors, suppliers, contractors, customers, consultants, advisors, guides, and such others can be very often as excellent sources of information.

Highly specialised training courses, trade fairs, exhibitions, fashion shows, get-togethers and such other generic information that may not be available anywhere else.

Traditional skills and capabilities available with rural artisans, farmers and others may be invaluable sources of information.

Oral communications in formal meetings, seminars, symposia, etc. are important sources of information. Audio records of contemporary events, activities, personalities, deliberately captured, also constitute useful sources of information.

While all these types of information sources are not very easy to capture and record in a formal way, the very recognition of these types of sources would create awareness among information seekers regarding sources of information.

All these problems of building up national information sources may have to be incorporated in an appropriate form in a formal statement on National Information Policy.

Self Check Exercise

- 6) What resources other than documentary resources, should be considered for formulating a National Information Policy?

Note : i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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Information and Communication Technology

Information and Communication Technology (ICT) holds the key to the success in modernising information services. Not only does ICT introduce new ways of information handling, it also brings about changes in the very structure of information and its communication.

Concepts like universal bibliography, accessibility to and availability of documents, irrespective of location, highly personalised services matching user needs/interests with document databases, full text searches, storage and retrieval with speed and accuracy, etc. have all been accomplished to a great extent.

The Internet, the most important communication tool the world has ever had so far, powerful microprocessors, high-capacity digital services, low-cost memory, digital storage and retrieval and broadband networks are redefining the world, more particularly in information handling.

With the confluence of technologies, more fundamental changes in knowledge exchange systems are expected through research in Artificial Intelligence, Cognitive Sciences, Brain Sciences and a host of new and evolving disciplines to introduce sea changes in human communication.

It is very important to mobilise this rich powerful resource. It is perhaps, only through a National Information Policy that potential use of ICT could be effected.

Institutional Resources

Information institutions in India, today, comprise libraries, documentation centres and information centres, a few information analysis centres, data centres, scientific and economic and social statistics publishing houses and similar others. There are other types of information institutions that are likely to spring up in the future. The existing institutions are also likely to change with the increasing application of ICT and sooner or later emerge as digital libraries or

electronic libraries and cognate bodies. Various types of information systems and services networks are also likely to come up when the Freedom of Information Act 2002, takes concrete shape with new type of information institutions. It is, perhaps, only through a National Information Policy that a proper grid of information institutions could be conceived and effected.

Human Resources

Progress and sophistication in the design, development and operation systems in the country can come about only with a quality manpower, adequate in quantity and capable of achieving targets in the changing context of information and knowledge. The National Information Policy statement must give attention to these resources, focusing attention on the following aspects:

- Assessment of manpower needs in terms of types, quantity, levels, for the next ten years, keeping in view the fast-changing information environment;
- Curriculum development oriented to different types of information and identifying institutions to take up responsibilities and to conduct courses;
- Training a high quality faculty to impart instructions at different levels with library and laboratory facilities for self-development;
- Provision for the preparation and production of quality learning and teaching kits;
- Attracting candidates with fine academic records, interest in information, motivation and aptitude, ensuring good career prospects;
- Continuing education and training programs to keep pace with the advancing knowledge and practices, including programs to absorb existing manpower;
- Instituting award/reward schemes to recognise and patronise professional practice of excellence; and
- Establishing exclusive research programs, both fundamental and applied research, in information handling for innovative systems and services.

Self Check Exercise

- 7) State the future applications of ICT for information handling that might introduce sea changes in society.
- 8) What are the different facets of human resources that need attention in formulating a National Information Policy?

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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Financial resources required to build, develop and operate information systems and services at all levels is a critical issue. It is important that the proportion of investment in the information sector be commensurate with investments in other sectors of national development programmes. Investments in information and new knowledge development should be in correlation with investments in R & D, higher education, industrial and technological development, social services, etc. Without a matching scale of investment in the information sector with a continuous flow of finance, it will not be able to become efficient enough to provide the expected inputs to the national development efforts. A National Information Policy is expected to recognise this aspect and other suitable guidelines to allocate adequate finance to this sector.

Information is no longer available free. Information products have a cost and are available in the market place only at a price. Price is naturally tagged on to value. Quality of information is vital to fetch a competitive price. The trends are to be recognised in the Indian context, in view of the fact that developing countries are heavy importers of information.

Information systems and services are not any more liabilities or not to be considered as overheads, but have every potential to become revenue-generating activities. They do have a significant impact on budgets.

Organisational Structure

Information and knowledge are considered as vital economic inputs and are being constantly talked about in almost every quarter of planning and development. "Despite these vital characteristics of information in relation to development planning, very few national development plans of developing countries in particular have a chapter on information, not even a separate budget line for it. Even within sectoral plans one may not find separate budget line for information. Yet it is often reiterated that information is a national resource, and that national information policy and plan should be coordinated with or be derived from national development policy and programme.

It has been suggested that national development planning should recognise an information sector just as it does other sectors of the economy – agriculture, industry, science and technology, education, culture, etc. This will help integrate plans for information infrastructure development with the national development plans; to contribute to a better understanding of the mutual influences between information and other sectors, to provide firm data for a foundation of the field of information economy, to help formulate guidelines and criteria for apportioning national resources among the elements of the information sector and between its information activities on the one hand and the other sectors of the economy on the other; and to lead to a better perspective of the issue that *the level of information handling capability is a socio-economic indicator.*" [Neelameghan, 1999].

A National Information System for India, should be envisaged as a total information network with a few central bodies at the apex for planning and policy-making, monitoring and coordinating, evolving standards and guidelines for evaluating quality and fine-tuning the system, and a number of second line

centres, national in character but oriented to a discipline/ product/mission/ problem, and a number of local information units, operating to meet the immediate requirements of a particular organisation or group.

There are integrated parts of a network operating, as far as possible independently without any red tape and control from any single top organisation. The national network articulates through a variety of components such as libraries, documentation and information centres, databases, information analysis centres and similar others. The national network should ensure smooth flow of information vertically and horizontally with speed and accuracy.

This type of macro and micro organisational structure could be possible only with a National Information Policy, wherein the interests of all who have a stake would be adequately represented.

Products and Services

In modern information and knowledge organisations, whether they are libraries or variations of them, successful innovation both in information and services is indispensable. Information transmission, dissemination, products and services, are undoubtedly the prime activities of all information institutions. In the changing context of information, ICT makes it possible to generate products and services from national and international databases of information, orienting them to specific requirements of individuals and organisations by the respective local information facilitating units.

Standardisation

Any plan of coordination, system management, networking, etc. will be meaningfully functional only if the constituent parts conform to a certain degree of uniformity in organisation and operation. Compatibility of different approaches can be achieved only through standardisation of techniques, methods, procedures with reference to their application, using different hardware and software. Only through effective implementation of national and international standards, sharing and exchange of resources and facilities can be feasible and be optimally utilised. Standardisation contributes to overall economy of cost, time and effort.

Regional and International Cooperation

Knowledge and information are human social wealth that could permit a fair amount of exchange among countries. In many scientific disciplines information is viewed as an international resource. Most of the national and international science communication and information systems have established free flow of such information. However in areas such as technology, business and industry, trade and commerce, development sciences and such other difficult areas, information flows are never free. Exchange mechanisms are necessary to introduce free flow of information, at least in areas where such flow does not interfere with intellectual property rights.

A second aspect concerns exchange of professional experience, expertise and experts between countries. These exchanges takeplace in several forms. Exchange of products and services, experience in design and modeling of information systems and services, software packages, sharing of expertise in

education and training, document delivery and translation services are some of the areas for possible exchange.

A third level of professional cooperation is involvement in programmes at international non-government organisations.

Self Check Exercise

- 9) Sum up the various issues that call for attention while framing a national information policy.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

11.5 NATIONAL INFORMATION POLICY: INDIA

Though vigorous debates and discussions on the desirability of having a National Information Policy for the country have been going on in India since 1980s, the recognition of the importance of new knowledge was emphasised even as far back as in 1957, when Pandit Jawahar Lal Nehru spelled it out in his Scientific Policy Resolution by the Government of India in 1958.

11.5.1 Overview of Efforts towards a National Information Policy

We are giving below a broad overview of efforts in India towards evolving a National Information Policy. It was largely due to the emphasis on and recognition of a new scientific knowledge and information that the infrastructure for the creation/generation of this wealth in the nature of a complex of research establishments in the sciences and social sciences were set up in the country. A number of related events, such as the establishment of the National Informatics Center (NIC) and the National Information System for Science and Technology (NISSAT), (now extinct) in the seventies were significant. The Planning Commission also set up a Working Group for the Modernisation of Library Services and Informatics in the Seventh Five Year Plan.. The setting up of the Information and Library Network by the University Grants Commission to link up the resources of libraries of universities and R & D institutions in the country to facilitate new library and information services in India. A series of library and information networks like the Delhi Library Network (DELNET) and Calcutta Library Network (CALIBNET), etc. were also sprung up to integrate resources and services of select libraries in major cities of India. All these developments are indeed essential.

Professional Associations like the Indian Library Association (ILA), the Indian Association of Special Libraries and Information Centers (IASLIC), the Society for Information Science (SIS), were urging the government to initiate efforts

towards formulating a National Information Policy, through a number of seminars and conferences. Separate draft policy statements were prepared by ILA and the Raja Rammohun Roy Library Foundation and submitted. These were submitted to the Government of India in 1984. As a consequence, the Department of Culture set up a committee in October 1984 under the chairmanship of Prof. Chattopadhyay for the formulation of a National Policy for a Library and Information System.

After considerable efforts, the Committee submitted a Draft Policy on Library Information System in May 1986. The ten chapters of the document deal with elements such as Preamble, Objectives, Public Library System and the Bibliographical Services, Manpower Development and Professional Status, Modernisation of Library and Information System, Central Professional issues and implementing agencies and financial support. Each chapter makes specific recommendations with reference to upgrading and coordinating the existing library and information systems and initiating new programmes, relevant to our national needs, using information technology.

Two important and significant events of far reaching implications have happened in the last ten years. Although these have not been specifically related to the information policy efforts of our professional interest, they have a great bearing on our professional services and systems. The first is the enactment of the Freedom of Information Act 2002 and the second, was setting up of a high level Task Force for a Information Technology Action Plan in 1998. In the following two sections, the salient features of the Freedom of Information Act 2002 and a summary of the Task Force Action Plan Recommendations are given.

Self Check Exercise

- 10) Sketch briefly the steps taken by L&I community to draw attention of the government to initiate a National Information Policy.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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11.5.2 Freedom of Information Act 2002

Freedom of Information stems from the recognition of the fundamental principle of human rights. This right to information is guaranteed in international law, as part of the guarantee of freedom of expression of the International Covenant on Civil and Political Rights. Many countries around the world are now giving legal effect to the right, both by enshrining access to information in their constitutions and by adopting laws which give practical effect to the right, providing concrete processes for its exercise.

The Indian Freedom of Information Bill, 2002 was passed into a law in December 2002, after many years of public debate and after freedom of information laws had been passed in a number of States.

The Right of Access

The Act provides that every citizen of India shall have the freedom of information, defined as the right to obtain information from public authorities, subject to certain exceptions stated in the Act. The Act extends to the whole of India, except the State of Jammu and Kashmir, for constitutional reasons. As is known, the Constitution of India confers a "special status" on Jammu and Kashmir and Parliament may make laws for it only with the concurrence of the State.

Definitions

The Act defines information as "material in any form relating to the administration, operation or decisions of a public authority". The definition is broad in terms of the type of information but limits the scope of the Act to Information relating to the official work of the public authority in question. The Act also defines a record as any document, microfilm, microfiche or any material or any material reproduced by any device.

The Act defines 'public authority' as any body established under the Constitution or by any law, as well as any body "owned, controlled or substantially financed by funds provided directly or indirectly" by government.

Process

Requests for information by any citizen of the country must be made in writing, wherever individuals have difficulties with this, the Public Information Officer is required to provide "all reasonable assistance" to them. Requests must be dealt with as expeditiously as possible and in any event, within 30 days. Requests may be accepted subject to the payment of a fee for information that could be provided which falls within the ambit of the Act. Where a request for information is rejected, the requester is entitled to be informed of the reasons for the rejection, the period within which an appeal may be lodged with the relevant information about to the appellate authority.

Duty to Publish

The Act requires public bodies to publish, at intervals prescribed by the government, the following information:

- Particulars of its organisation, function and duties;
- Powers and duties of its officers and employees and the procedure followed by them in the decision making process;
- The norms set by the public authority for the discharge of its functions;
- Rules, regulations, instructions, manuals and other categories or records under its control used by its employees for discharging its functions;
- The details of facilities available to citizens for obtaining information; and
- The name, designation and other particulars of the Public Information Officer.

Exceptions

This section sets out exceptions in the Act, most of which are subject to a harm test. There is no general public interest override. Exceptions where the information:

- If disclosed, would prejudicially affect the sovereignty and integrity of the Country, security, strategic, scientific or economic International relations;
- If disclosed, would prejudicially affect public safety and order, the detection and investigation of an offence, or a fair trial;
- If disclosed, would prejudicially affect centre-state relations;
- Relates to Cabinet papers or the deliberations of the Council of Ministers;
- Contains minutes or records of advice made during a decision-making process prior to the actual policy decision;
- Contains trade or commercial secrets protected by law, the disclosure of which would prejudicially affect the legitimate commercial interests of a public authority or which would cause unfair gain or loss to any person; or
- May result in the breach of parliamentary privileges or the contravention of an order of the court.

A requester may make an internal appeal against any decision of a Public Information Officer within 30 days to “such authority as may be prescribed”.

Promotional Measures

Public authorities are required to appoint Public Information Officers who are responsible for dealing with requests, as well as for providing “reasonable assistance” to requesters. Individuals who have acted in good faith pursuant to Law are protected against sanction. In other words, individuals who release information of wrongdoing-whistleblowers must be protected.

E-Governance and Information Freedom

E-governance (E-G) is one the effective means to provide right information to the right people at the right time. “E-G is the application of ICTs to the processes of government functioning to accomplish simple, accountable, speedy, responsive and transparent government. E-G is not merely computerising existing government information, it is, in fact, transforming the existing government. It is the ICT enabled route to achieve good governance. It integrates people, processes, Information and technology for meeting governance goals. E-G represents a journey from passive information -giving to active citizen involvement.” [Vijaya Raghavan and Nair, 2003].

With the recommendations of Information Technology Action Plan when fully implemented, there is a greater possibility of achieving the expected goals of E-governance. The government has already initiated appropriate steps by executive orders to start the process of E-Government. Quite a few state governments have also initiated action in E-governance. Let us hope that in the near future, the results of E-governance would become fully effective.

Central and State Governments are the largest producers of information in a variety of subjects and in many variant forms. As the governments are committed to a welfare state, they deal with almost all areas of public interest. The information generated and disseminated and published in any form, get stocked in a number of libraries and cognate institutions.

Information institutions in our country, therefore, usually stock a variety of documents of governments and other public bodies and serve them on request. With the Freedom of Information Act in force now, information institutions should become fully conversant with the various clauses of the law and provide service.

11.5.3 Information Technology Action Plan

Recognising the potential of ICT for rapid and all-round national development the Government of India has constituted a National Task Force on Information Technology and Software development in May 1988. The Report of the Task Force, the Information Technology Action Plan, contains 108 recommendations covering both bottleneck areas and broad promotional measures that are crucial for boosting ICT in India. Extracts from the Task Force Report on some of the salient points of the recommendations of Task Force are briefly stated below:

The recommendations cover a wide spectrum of issues relating to telecommunications, finance, banking, revenue, commerce, electronics, human resource development, defence, and rural development. They address critical national needs in the areas of information infrastructure, Internet access, software development and exports, hardware manufacture, electronic commerce, R&D in ICT, manpower training and education.

Software exports get special attention, recognising India's competitive advantage in this area. The recommendations aim at enabling Indian exporters to capture a large share of the global software market in a short time.

Recognising Information Technology to be a frontier area of knowledge, and also a critical enabling tool for assimilating, processing and productivising all other spheres of knowledge, the Government shall launch "OPERATION KNOWLEDGE". The aim of this national campaign will be to universalise computer literacy and also to spread the use of computers and ICT in education.

OPERATION KNOWLEDGE shall be developed into a comprehensive policy. An Indian Institute of Information Technology (IIIT) shall be set up and will have the status of a deemed university.

A notable feature of these recommendations is the conscious effort of the Task Force to give information technology a pro-people and pro-development thrust. These recommendations flow from a perspective that India can become a strong IT power only if information technology reaches out to the masses in rural areas and in small towns and if its use in Indian languages can also be given major encouragement.

Taken together, the recommendations in the Information Technology Action Plan significantly broaden and deepen the process of economic reforms by encouraging competition, entrepreneurship and innovation – the three principles which are cardinal for India's progress in the emerging knowledge-driven global society.

A National Informatics Policy would eventually get formulated to deal with all the recommendations of the Task Force.

It could be expected that all the issues and aspects that have been discussed in this Unit with reference to Library and Information Systems and Services would get attention in "Operation Knowledge."

Self Check Exercise

- 11) What are main features of the Freedom of Information Act of 2002?
- 12) State briefly the main points of the Information Technology Action Plan.

Note: i) Write your answers the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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11.6 INFORMATION POLICY: EFFORTS AT INTERNATIONAL LEVEL

UNESCO (an international governmental body), IFLA (International Federation of Library Associations and Institutions) and FID (International Federation of Information and Documentation (the two non-governmental organisations), are the three international bodies that have been actively involved in developing library and information activities in member countries for more than half a century. While UNESCO has been directly guiding, assisting and providing experts to member countries to develop their library and information infrastructures, IFLA and FID have been providing guidance in many forms to build up library and information systems and services.

IFLA initiated the Universal Availability of Publications (UAP) Program, supported by UNESCO with the objective to provide the widest possible availability of published materials in any format to users, as an essential element in their economic, social and educational and personal activities. UAP was also closely linked to the IFLA UBC (Universal Bibliographic Control) that included issues such as metadata and international standards. These efforts had started much before the thinking on providing guidance to member countries for formulating National Information Policy.

Two important and far reaching developments affecting the entire gamut of information systems and services began to take to shape with the advent of ICT and the evolution of Information Society. This necessitated a total reexamination of the structures and functions of information systems and services both at the national and international levels. ICT brought about a sea

change in information systems and services. Internet facilities drastically expanded globally the scope of searching, accessing and making available, information almost instantaneously. The concept of Information Society accentuated the vital force of information and knowledge to bring about material advancement in countries. In this context all countries required proper guidance to formulate their national information policies.

Taking these rapid developments into account, FID prepared a *Handbook on the formulation, approval, implementation and operation of National Information Policies*, for UNESCO in 1990. This document was completely revised and updated in 2000 by Victor Montviloff. This was intended for use as a practical tool for policy level officers of Member States to help them better understand and cope up with the enormous risks and opportunities being presented by the rapidly escalating and closely related ideas of (1) the information Superhighway, (2) Cyberspace and (3) the Information Society. The three paradigms that have been changing every aspect of information and knowledge are briefly explained below.

International Superhighway is the physical and technical network (Internet) of information, connected through millions and millions of personal computers. The content that describes all the information sits somewhere in the memory of computers and provides access through World Wide Web sites.

Cyberspace is a conceptual and virtual area, where files, data, images, text, video clips, music, etc. fly back and forth, computer-to-computer, user-to-user. It is supposed to fill the entire universe through travels of light and other electromagnetic waves. This is a basic infrastructure that supports the cyberspace, consisting of millions of servers, routers, communications satellites, earth stations, telephone lines and cables, and information superhighways.

Information Society is the concept where information is the primary force that activates all other forces in developing all material benefits for human beings.

This detailed and practical handbook, tries to simplify, clarify details and spells out methodically, comprehensively and systematically, step by step, and describes exactly how a government should proceed to cope up with the many aspects of the national information policy challenges.

The handbook is organised into two main sub divisions. Part A –Introduction provides definitions of key terms such as Cyberspace, information infrastructure, policy, information policy, national information policy, etc. It also sets the stage and gives the context for the more detailed methodology in the second part.

Part B deals with methodology that provides the procedural framework for spelling out the steps in details, under each of the four major stages of the processes of national information policy. It explains from the very first steps involved in planning new policies to the very last steps in canceling obsolete policies. Graphic icons are used in these chapters to help readers to place each step at each of the four major stages of the policy processes. These methodologies suggested may not guarantee that good policies could be formulated and framed. It is, in fact, up to the member countries to develop, Promulgate, implement and evaluate her own special and unique set of national

information policies in tune with its own special and exclusive circumstances.

It is also suggested that governments entrust responsibility to expert(s) in their respective countries to lead and coordinate the development of a set of modern national information policies that will enable the country to respond systematically by stages, in the short, mid and long terms, to deal with the many challenges.

Allowing for differences in perspectives in the approach to National Information Policy, today all governments of developed as well as developing countries operate some form of national information systems, either as a matter of policy or on the basis of executive orders. The two major stimuli in the development of these policies or decisions, have been the need to respond to advances in ICT, providing new opportunities for developing information networks and the accompanying political and economic changes. The crucial issues that need attention in this context are: exchange, encompassing a wide variety of resources, legal problems of transborder flows, intellectual property rights, sharing of ICT and related expertise, information markets, all forms of coordination and cooperation and such others.

The future scenario is fairly clear. Information and knowledge will be the key resource for all human material progress. Information-rich countries have grasped the essence of this approach and have been investing heavily in the information sector. New types of information industries are flourishing and are taking a variety of forms. However, the gap between information-rich and information-poor countries is widening. Unless this gap gets reduced, the chances are that the world economic and political conditions will be dominated by countries that advance in information systems and services. The power shift would be entirely based on the strength that a country has, in creating new knowledge and information, and its ability to apply them to all kinds of development processes. In our country "Knowledge Operation" would hopefully alleviate the conditions of the poor people and get them the basic needs of life.

Self Check Exercise

- 13) How do you expect the Act for Information Freedom and the Information Technology Action Plan would contribute to the development of a National library and information grid for the country.?
- 14) Comment briefly on the future scenario for the provision of access and use of information and knowledge.

Note: i) Write your answers in the space given below.

ii) Check your answers with the answer given at the end of the Unit.

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11.7 SUMMARY

In this Unit, we have discussed almost all aspects and issues of National Information Policy, particularly from the point of view of issues relevant to library and information professionals. But a National Information Policy need not necessarily be confined to issues of interest of the library and information community. There are many aspects of information that are of vital interest to other groups who are in one way or the other concerned with activities related to information. However, in this Unit, the discussion has been restricted to the problems and issues of library and information professionals. Hence, the definition of National Information Policy is with reference to the creation, storage, retrieval, dissemination and the institutional mechanisms needed to service-recorded information and knowledge.

The need for a national information policy is examined with reference to (a) information and knowledge as sources of economic and political power, (b) diversified groups who have a variety of information needs, (c) Organised method to develop information institutions.

There are many issues that need attention while formulating a national information policy. These include information resources, organisation and structure, user categories, standardisation and international issues of exchange, transborder flows of information, Intellectual Property Rights, Cooperation and Coordination, etc.

A brief account of the efforts made by organisations and professional associations is given. The two events of the Freedom of Information Act 2002 and the Information Technology Action Plan of the Special Task Force, which have far reaching implication in the next decade, have been briefly described.

While describing the contributions of International bodies like UNESCO, IFLA, and FID, in formulating a National Information Policy in member countries, reference is made to an important Handbook prepared by FID for Unesco. This document spells out in detail the methodology for formulating a national information policy for a country and implementing it.

The future scenario clearly indicates the importance of information and knowledge as vital and key resource of the future material development. A country, which realises this, would hold economic and political power.

11.8 ANSWERS TO SELF CHECK EXERCISES

- 1) Information in its wider sense overlaps with a number of other interests, viz. of ICT, mass media, trade and industry and similar others. Policy statements have already been evolved in many of these areas. The issues relevant to library and information systems and services, their infrastructure and related aspects, would get diluted if they were to become part of policies related to other fields.

To the library and information professionals, information policy deals with issues relating to contents of documents that carry all form of information, organisational mechanisms to collect, store, process, disseminate and serve them to a variety of users according to their

information needs. These issues should get focused in a policy statement on information.

- 2) The levels of hierarchy of steps involved in devising a framework for formulating

National Information Policy are: i) Goal, ii) Policy, iii) Strategy and iv) Program. These four levels have to be mutually compatible, the lower ones get derived from the upper.

Goal spells out the target to be achieved.

Policy is a statement for a commitment to a course of action to achieve the set target.

A strategy is a predetermined course of action, usually selected from a number of alternatives.

A Program is a scheduled set of activities or tasks undertaken to implement a strategy

- 3) A National Information Policy is a set of decisions or tasks by a government appropriate to laws and regulations, to direct the harmonic development of information transfer activities, in order to satisfy the information needs of the country.

A National Information Policy for library and information systems and services needs provisions of necessary means or instruments such as information resources, institutional mechanisms, information products and services, personnel, finance, etc. for implementation.

- 4) Generation of new forms of knowledge and putting them to use to create wealth place a country in decidedly vantage position in the present context fierce competition and struggle for economic and political power.

The diverse participants involved in information and knowledge transfer, the communication that takes place between groups and individuals, the multitypes of information resources, use of information, organisational structure etc. point towards the need for streamlining and rationalization all these components in evolving a National Information Policy.

- 5) Knowledge and information are created and used by human beings. They are created by and for human consumption in the sense of their use as fuel for developing further knowledge. But the user community is so diverse and varied that it calls for special attention to orient library and information services to diverse users. Hence, any policy that makes provision for information systems and services, should give priority and special attention to use and user needs.
- 6) Non-documentary sources of information such as expertise, experience of a variety of persons ranging from farmers, artisans, in villages to professional vendors, suppliers, contractors, customers, consultants, advisors, guides, etc. trade fairs, exhibitions, get-togethers wherein information is available in a variety of ways and other communication processes are valuable sources of information. Many of these types of sources of information are captured in a systematic way by specialists in this business. They could be stocked in libraries and information centers.

The other aspects that should get attention in formulating a National Information Policy are Information and Communication Technology (ICT), institutional, human and financial resources. Organisation and structure, products and services, standardization, regional and international cooperation.

- 7) With the confluence of technologies more fundamental changes in knowledge exchange systems are on the anvil through research in Artificial Intelligence, Cognitive Sciences, Brain Sciences and a host of new and evolving disciplines to introduce sea changes in human communication.
- 8) Assessment of manpower needs in terms of types, quantity and levels for the next decade, keeping in view the fast-changing information environment. Other aspects area education and training including curriculum development, preparation of learning and teaching materials, good career prospects for professionals, award/reward system for good performance, research and development are some of the important facets that need attention in formulating National Information Policy.
- 9) A number of issues are reckoned to be falling within the framework of a National Information Policy. Some of the most important ones are: assessment of information and user information needs in different contexts, multi type documents and their impact on the communication processes, institutional mechanisms and national infrastructure, manpower requirement in all its dimensions, application of ICT, not merely for converting the existing paper-print records in electronic forms, but more fundamentally for changes in the entire process of storage, dissemination, retrieval, etc. and national and international cooperation in the free flow and exchange of information.
- 10) The need to give recognition to the importance of creating new knowledge and scientific and technological information has been stated unequivocally in the Scientific Policy Statement of 1958. With this approach as a guiding principle, many R & D institutions in the scientific and engineering disciplines as well as in the social sciences have been set up. Along with the complex of R&D establishments, several special libraries and information institutions have also been set up to provide information support facilities. Professional associations have drawn attention of the government to provide stable infrastructure facilities to library and information systems and services, through a number of seminars and conferences. A draft policy statement also has been submitted to the Government by the Raja RamMohun Roy Foundation.
- 11) The main features of the Freedom of Information Act of 2002 are as follows:

Every citizen of India have the freedom of information defined in the right to obtain information from public authorities, subject to certain conditions stated in the Act.

The Act defines information as material in any form relating to the administration, operation or decisions of a public authority.

Requests for information have to be made in writing and a fee will be charged for the service.

Public bodies have to publish details about their functions and activities at prescribed intervals.

Exceptions to certain types of information that might harm the interest of the public bodies are to be stated.

Promotional measures including the provision of Information Officers are to be given.

Individuals who release information on wrongdoing-whistleblowers must be protected.

- 12) The 108 recommendations include a wide spectrum of issues relating to telecommunications, finance, banking, revenue, commerce, electronics, human resource development, defence, and rural development. They also address critical national needs in the areas of information Infrastructure, Internet access, software development and exports,

hardware manufacture. electronic commerce R & D in ICT, manpower training and education.

Indian Institute of Information Technology with a deemed university status is to be set up.

A promotional campaign "Operation Knowledge" aiming at universalizing IT and I-based education at all levels of the education pyramid in India needs to be undertaken.

A National Informatics Policy will have to be formulated.

The three principles viz. encouraging competition, entrepreneurship, and Innovation for economic reforms will be broadened and deepened.

- 13) Although the Freedom of Information Act as well as the Information Technology Action Plan does not directly speak about the national system for library and information systems and services directly, they are implied. Any system of information should take into account institutional structures and their activities that would contribute towards the primary goal of information access and use. Therefore one could expect that the Act as well as the IT Action Plan would eventually benefit the Library and Information Community and constitute a tremendous source of economic and political power.

- 14) The future scenario clearly indicates the accent on information and knowledge as key resources for all round national development. The extent of investments on the information sector would determine the strength of economic and political power of a country.

11.9 KEY WORDS

Documentary Resources	: Recorded information irrespective of any physical Medium.
Human Resources	: Human beings as carrier information, Knowledge, skills and expertise and experience.
Information as Wealth	: Knowledge and information as basic

inputs of economic commodities for transforming other resources into wealth.

- Information Institutions** : Institutions that generate and store knowledge and information, service them for those who need them.
- Information Needs** : The requirements of individuals and groups looking for information for their specific work.
- Information Resources** : All types of resources that provide information.
- Information Revolution** : Information as a basic instrument of change bringing about major changes in society
- Information Communication Technology (ICT)** : Convergence of technologies that deal with information processing, storage, retrieval communication.
- Information Transfer** : The process of flow of information from generation to use.
- Information Use** : Applying knowledge and information for accomplishing definite purpose or goal.
- MacBride Report** : A report on the New International Information Order in relation Mass Media. Also known by the name “ Many Voices and One World”
- National Information Policy** : A set of guidelines for directing library and information activities with a proper infrastructure .
- Non-documentary Resources** : Information not recorded in conventional forms.
- Products and Services** : Information packed as products and services offering access to information from any source.

11.10 REFERENCES AND FURTHER READING

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UNIT 12 INFORMATION INFRASTRUCTURE: NATIONAL AND GLOBAL

Structure

- 12.0 Objectives
- 12.1 Introduction
- 12.2 Information Society
 - 12.2.1 NEIS Goals
 - 12.2.2 Societal Impact
- 12.3 Information Management Functions
- 12.4 Infrastructure Overview: GII and NII
 - 12.4.1 Overall Configuration
 - 12.4.2 Key Issues
 - 12.4.3 Management
- 12.5 Network Access
 - 12.5.1 Access Links
 - 12.5.2 Access Devices
- 12.6 Home Networks
- 12.7 Office Networks
- 12.8 Corporate Networks
- 12.9 GII Applications
- 12.10 Security Issues
- 12.11 Summary
- 12.12 Answers to Self Check Exercises
- 12.13 Keywords
- 12.14 References and Further Reading

12.0 OBJECTIVES

After reading this Unit, you will be able to understand and appreciate:

- Networked Electronic Information Society (NEIS);
- the five different goals of NEIS;
- impact of NEIS on various societal aspects;
- different functions of information management;
- structure of global information infrastructure (GII);
- the five key issues in GII;
- management aspects of GII;
- how GII is accessed;
- different types of access links and the access devices;
- emerging home networks and trends in office networks;

- Intranet and Extranet;
- difference between private and virtual private networks;
- different categories of GII applications;
- E-commerce; and
- security aspects of GII.

12.1 INTRODUCTION

Quest for new knowledge is the central theme of human existence. All of us, whether we realise or not, are in the process of acquiring new knowledge all the time. When we ask a question, we are seeking knowledge. When we answer to a query, we give information to the person posing the question. When a person assimilates the given information, we say that the person has acquired knowledge. Knowledge is spread via information that is communicated from one person to another in some form, oral, writing etc. Thus, knowledge, information and information communication are three entities that are closely inter-related. Research and development on information and its communication has led to a new branch of study called *Information and Communication Technology* (ICT). ICT comprises two major technologies: computers and communications. In Unit 8, we learnt about digital information and its pre-eminence in today's society. Computer technology is the tool for storing and processing information in digital form. Communication technology helps us transfer and disseminate digital information.

Developments in ICT are bringing about profound changes in our life-style. The coming together of computers and communications has led to the emergence of a worldwide computer network, now known as **Internet**. Internet is a **network of networks**. Today, Internet has around 120,000 computer networks interconnected. With the evolution of such networks, our life-style is changing. A number of our day-to-day activities are being carried out on the networks. ICT plays an important role in almost all areas of our activities. The society is evolving towards a networked community with electronic information as the central commodity. One might term the society of the 21st century as the **Networked Electronic Information Society** (NEIS). It is a society in which activities are centred around networks and the main commodity on the networks is electronic information in digital form.

What we witness as Internet today is only a minuscule of a network that is envisioned for NEIS. Today's Internet services are predominantly text and data oriented with only sprinkles of graphics still pictures and slow motion video. About one-sixth of the world population is connected to the Internet. Even with this level of service and connectivity, Internet is having serious problems of address space and bandwidth capacity. Experience shows that Internet is slow for many network applications and the quality of services is far from acceptable level in many cases. Internet is designed for data transport, and real time services like voice and video transmissions have serious quality problems. Internet is predominantly built over voice grade telecommunication infrastructure, its protocols have heavy overheads, and there are too many ad hoc solutions for problems encountered during operations. All these compound

to almost insurmountable difficulties in bringing up Internet to any meaningful level of performance. The vision of NEIS calls for transportation of high quality audio including high fidelity music and high quality motion video apart from high-resolution graphics. With the present level of development and trend, support of such services on the Internet is almost impossible. The key to the evolution of NEIS lies in building **global information infrastructure** that would have adequate capacity and efficiency to support full-scale services envisioned for NEIS. **Information infrastructure is the backbone for NEIS.** Much as the road infrastructure on which vehicles run, information centred services and applications run on the information infrastructure. In this Unit, we discuss the evolving NEIS and the various aspects of information infrastructure.

12.2 INFORMATION SOCIETY

Advances in ICT are bringing about new perceptions in our ways of living. The way in which we do our work, the way we produce goods, the way we trade, the way we manage our wealth, and our entertainment pattern are all undergoing major changes. In this section, we present a visionary scenario for various aspects of our life in the context of evolving NEIS. Before that, we state and discuss a set of goals for NEIS.

12.2.1 NEIS Goals

The goals of NEIS may be stated as five A's:

- Anyone
- Anytime
- Anywhere
- Any information
- Any format

The goal *anyone* implies the existence of a full-fledged networked society in which every human being on the planet has access to the global network either from home, office or from a service outlet like a cyber cafe. In NEIS, connecting homes on the network becomes an essential infrastructural service much as electricity or water supply connection. When fully developed, it should be possible for a man from the poorest of the villages in the world to access resources in the richest of the cities in the world.

The goal *anytime* implies that network infrastructure is expected to operate 24 hours a day and 365 days a year without any failure. It is the same case with services on the network. In this context, time zones and holiday patterns may become unimportant in the life style of people. Further, persons should be able to access the network '*on demand*' providing greater flexibility to individuals and communities.

The goal *anywhere* has implication for persons who are accessing information as well as for the information resources being accessed. For persons, it implies access from anywhere in the world irrespective of the person's normal place of residence. For information resources, the implication is that the resources

should be accessible at any place irrespective of where the resources are located on the planet. To enable persons to access from anywhere, the concept of location independent access needs to be supported by the network infrastructure. This calls for a universal identification of individuals, which remains permanent for the lifetime of the individual. In fact, a child may be assigned a universal code as soon as he/she is born and is identified by that code throughout his/her life on the planet.

The modern communication systems are slowly moving towards concept of location independent access. In 1996, the United States of America introduced legislation called *Local Number Portability (LNP) bill* that permits telecom users to retain their identification numbers irrespective of the network provider they are attached to. Where there are multiple network operators, they are identified by a prefix to the telecom identification number (telephone number). In India, Mahanagar Telephone Nigam Limited (MTNL) or Bharat Sanchar Nigam Limited (BSNL) is identified by the prefix '2', Reliance Infocomm by '3' and Tata Indicom by '5'. If one changes the service provider, the telephone number changes even though the person has not shifted his/her residence. The U.S LNP legislation allows the user to retain the same telephone number and only change the prefix. In about a decade from now, it is expected that a person may be able to retain the same telecom identification within a city irrespective of where he/she lives in the city. Readers may appreciate that this is not the case at present. If a person moves residence from one locality to another that is within the same city, but not in the same telephone exchange area, then the telephone number changes. This, however, is not the case with mobile or wireless access systems. The problem does not exist in the case of generic Internet domain addresses. As long as your domain name belongs to one of the generic domains, it remains the same even if you change your country of residence. For example, .com, .org and .net addresses are location independent.

The goal *any information* is closely associated with the democratic concept of *right to access of information* to every citizen of the planet. Such a right can only be applicable to public information. What information is considered public and what is not is for the governments of different nations to decide. Information policies of different nations address this issue. But the emphasis in NEIS is that any public domain information should be accessible to anyone in the world. Access to some information may be priced whereas access to some others may be free of charge. The emphasis is also to make more and more information available in the public domain either for priced or free access.

The global nature of the information society makes the goal of *any format* important. A networked society cuts across transborder barriers of nations, as the access is worldwide. Considering that many hundreds of languages are in use throughout the world, access to information is facilitated by a translation mechanism. In this context, real time machine translation assumes significance. Ideally, a text stored in one language should be readable in any other language. Or, what is spoken in one language should be heard in any other language. For example, a person accessing a Japanese database from USA may see the information presented in English. Or, a Russian may converse with an Indian, both using their respective native languages. Of the 5 A's, *any format* requirement is the most difficult one to be met. Machine translation being

important in the context of NEIS, we look at certain aspects of machine translation in the following.

Machine translation is better done using an intermediate language than directly from one language to another. For translation of 500 languages directly from one another, we require 500×499 translation programs. For each language, we need 499 conversion programs. With intermediate language, this number reduces to 1000. We need only two programs for each language. One program is required to translate from the native language to the intermediate language (IL) and the other for translating from IL to the native language. A machine translation model based on IL is depicted in Fig. 12.1. If we have to translate Japanese into English, first we translate Japanese into IL and then from IL to English. The question then arises as to what should be the characteristics of such an intermediate language. In an article in AI (Artificial Intelligence) magazine in 1984, Briggs, a NASA scientist, states that Sanskrit is better suited as an IL for machine translation than English or many other Western languages.

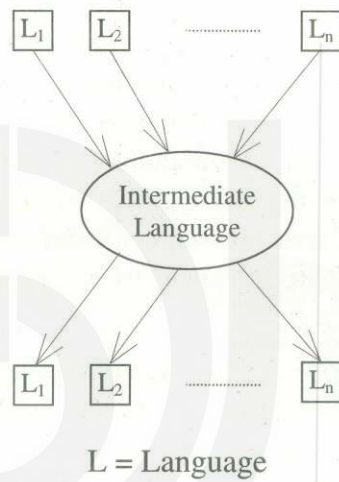


Fig. 12.1: Intermediate Language Based Translation Model

When compared to English, Sanskrit has many advantages. For example, Sanskrit is free from word ordering whereas English is not. The following Sanskrit sentences mean only one thing irrespective of the order in which the words appear:

Lisa pustakam pattati
Pustakam Lisa pattati
Pustakam pattati Lisa
Pattati pustakam Lisa
Pattathi Lisa pustakam
Lisa pattati pustakam

The above sentence in English is *Lisa reads a book*. The meaning of the sentence changes completely if the word order is changed in English. For example, *A book reads Lisa!* This one property of Sanskrit alone leads to significant simplification in language processing on the computer. There are also other properties of Sanskrit that make it suitable for computer processing. Sanskrit words are self-expressive as they all are derived by combining two or more of about 4000 basic roots. Once the meanings of the roots are known and a word

is split into its basic roots the meaning of the word becomes derivable and thus is self-expressive. In effect, this amounts to saying that the dictionary of Sanskrit can be limited to 4000 words as long as the rules for combining roots and splitting words are unambiguous which, in fact, is the case. In contrast, a dictionary for English language may contain as many as 200,000 words or more.

Clearly, there is a need to search for or design a suitable intermediate language for machine translation. English does not appear to be the ideal language. The structural, grammatical and semantic properties of Sanskrit make it a better candidate than English for machine communication.

12.2.2 Societal Impact

Advances in information technology are changing and shaping the basic structure of our societal life. New perceptions are placing knowledge, information and connectivity at the centre-stage of human endeavour. What would life be like in the networked society? What occupations will people pursue? Will there be offices for people to go and work? Will there be schools for children to gather and learn? Will the networked society automatically solve some of the problems of environment such as pollution that threaten the very existence of humanity at the present time? What will be the impact of the networked information society on the culture of people all over the world? With the networks spanning the entire globe, will the concept of border-less nations become a reality? These are major societal issues to be addressed and debated, but certain macro shifts appear to be visible. We discuss some of these in the following paragraphs.

In the networked society, homes rather than offices are likely to be the activity centres. The NEIS is expected to bring about radical changes in the work culture. Persons may be able to receive or render services on the network without having to attend office everyday. Such of those persons are termed *telecommuters*. The trend of telecommuting is already visible in countries like the United States where about 40% of the corporate workers are estimated to be telecommuters as on year 2004. Telecommuting tends to promote home-centred activities. In telecommuting environment, the physical location is unimportant to receive or render services. A direct result of networking and telecommuting is the emergence of a **less-travel** society if not a **travel-less** society. It is estimated that, on an average, working persons in the world spend over 20% of the active time in a day on travel. With travel time saved, home-centred activities would lead to better creativity, innovation and productivity. Home centred activities can be carried out in a relaxed atmosphere in the absence of the stress of daily travel and strict timing constraints. Flexible hours of working coupled with innovative management of resources and manpower promise to enhance productivity. Telecommuting culture with home-centred activities would eventually lead to a home-centred economy.

The very concept of education as understood today may change. From the institution-based education, the emphasis may shift to home-based education with every home connected to a variety of educational resources, libraries and teachers. In other words, distance education via the network may become a way of life rather than commuting to colleges and schools. For example, you may pursue MLIS course via a network from the Indira Gandhi National Open

University in New Delhi irrespective of where you are located physically in the world. True education as a personalised process of gaining knowledge in the area of direct interest may become a reality.

Let us now turn our attention to environment. The direct impact of less-travel society is less polluted cities in the world. In major cities of the world, about two-third of the atmospheric pollution comes from vehicular traffic. If there were a reduction of 25-30% in vehicular traffic on account of telecommuting, the people in the major cities of the world would breathe much cleaner air. Home-centred occupation would leave much time for the people to turn their attention to plantation, gardening and environment. A natural concern for environmental protection may re-emerge and the environmental problems addressed through more efficient use of resources and energies. Sustainable human development while preserving the Ecosystems may become a way of life. Telecommuting also opens up the much-desired possibility of women being able to contribute to national development without having to sacrifice family responsibilities.

The present society is characterised by community formation based on work centres. Persons who work in the same office or factory tend to form a bond such as an association, a union or a club. Social activities are usually centred on such formations. In a home-centred environment, the communities will comprise groups from among people pursuing different vocations and professions in life. Under those circumstances, a true social community is likely to emerge.

The last few centuries have been characterised by mass production with large industrial houses being set up. This has led to power brokering between work force and the management characterised by strikes, lock outs etc. In NEIS, small community dwellings that are self-contained may emerge. The community needs may be met locally from products available in its natural surroundings. The concept of associations and unions may vanish in the networked society. This would also imply that production would take place locally with a large number of persons engaged in producing goods that are required. This is an interesting scenario for large-scale employment and for overcoming the present problems of unemployment.

There is a variety of other perceptible macro shifts that may be discussed at length. We, however, list only some of these and leave the discussions to the readers:

- Centralised to Distributed
- Driven Society to Driving Society
- Competition to Co-operation
- World as a Corporate
- Libraries as Electronic Knowledge Storehouses
- Broadcast to Interactive

Readers are advised to exercise their minds about possible scenario in the areas listed above.

12.3 INFORMATION MANAGEMENT FUNCTIONS

With electronic information being the central commodity in NEIS, information management functions become the core of technological capability in networks. There are seven functions of information management that are important:

- 1) Generation
- 2) Acquisition
- 3) Storage
- 4) Retrieval
- 5) Processing
- 6) Transmission
- 7) Distribution

In general, information is generated by human thought process, human acts and by happenings in nature. Whether technology generates information is a debatable point. When data is processed in a computer, the output is considered as information. In that sense, it may be said that computers generate information. But the basic data comes from nature or human activity. **Information acquisition** is done by instruments, sensors and transducers. Instruments measure quantities like temperature, wind speed and voltage and current. Sensors record as well as detect variations in quantities such as temperature exceeding a certain threshold value. Transducers are used for conversion of energy from one form to another for certain purpose. For example, microphone, which is a transducer, converts speech energy to electrical energy for transmission over a communication system. A major class of sensors is *remote sensing* satellites, also known as *earth observation* satellites. Remote sensing satellites are a major source information. The quantum of data collected by remote sensing satellites in a day runs into terabytes (10^{12} bytes). This is roughly equivalent to 300 million pages of printed information.

Storage, retrieval and processing functions are well known. In ICT, current storage devices are capable of storing tens of gigabytes of information in a small disc using blue laser optical technology. A new storage device based on a technology called *electronic beam technology* is capable of storing 800 GB of information on CD-ROM like disc. The transmission and distribution functions may be collectively called as information *dissemination*. Transmission refers to bulk transfer between two main points. Distribution refers to transfer to end points like user terminals.

12.4 INFRASTRUCTURE OVERVIEW: GII AND NII

Information infrastructures are evolving at three different levels:

- National
- Regional
- Global

networks. In NEIS, we may have many more such application infrastructures. The telecommunication infrastructure is in the form of four major networks:

- 1) Public Switched Telephone Network (PSTN)
- 2) Packet Switched Data Network (PSDN)
- 3) Mobile Network
- 4) Integrate Services Digital Network (ISDN)

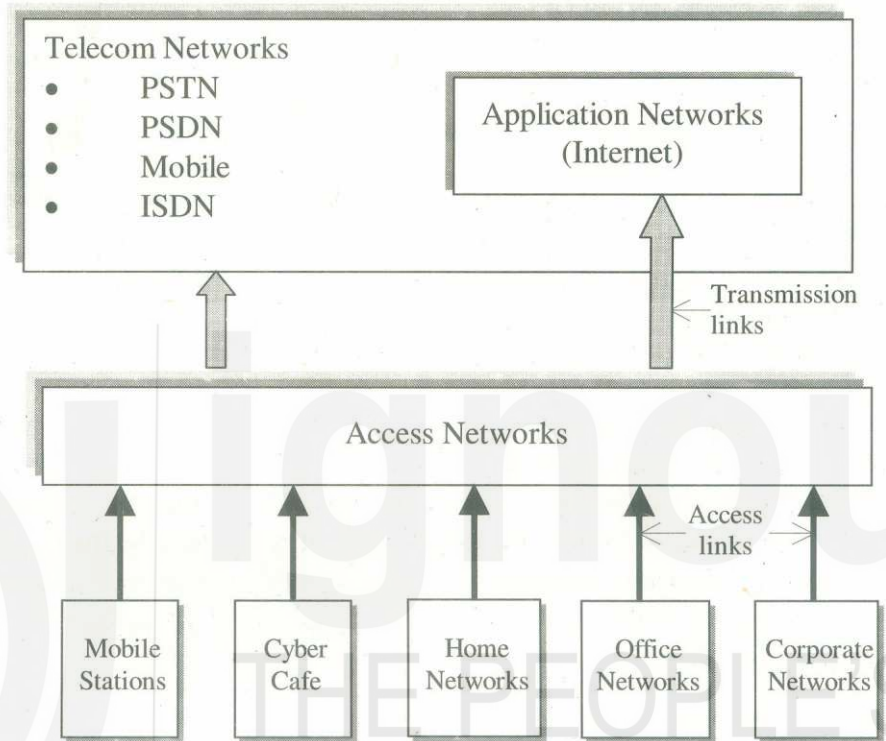


Fig. 12.1: Configuration of Information Infrastructure

The most stupendous telecommunications network in existence today is the public switched telephone network (PSTN) or sometimes known as Plain Old Telephone System (POTS). In standards documents, PSTN is often referred to as General Switched Telephone Network (GSTN). PSTN has evolved over a period of 120 years since the beginning of telephony in 1879. There are over a billion telephones in the world connected via landlines (copper cables) to the network as of year 2004. The length of wiring in the telephone network is estimated to be over 12 times the distance between the earth and the sun. In other words, the world is estimated to have buried about 1.8 billion kilometres of copper cable in the earth since the beginning of telephony in 1879.

The principle of switching is central to all telecommunications networks. Switching signifies the fact that a connection is established between two chosen ends by turning on one or more switches. Telephone networks use the technique of **circuit switching** where a communication path is established between the source and destination before the actual information transfer takes place. This path and the associated resources remain dedicated between the source and destination for the entire duration of information transfer. When one of the two communicating entities initiates a disconnection, the information transfer ends.

Packet Switched Data Networks (PSDN) are sometimes referred to as Public Switched Data Networks. They are also known as **computer networks**. They are relatively of recent origin (45 – 50 years old) and have emerged as a result of coming together of computer and communication technologies. These networks enable sharing of hardware, software and data resources of computer systems. Data networks may be viewed as telephone networks where telephone instruments are replaced by computers that are then made to communicate with each other. However, making computers communicate demands much more than mere physical connection. It needs a set of protocols and software mechanisms to exchange data, files and programs and to route data traffic. Switching technique used by data networks is different from the one used by telephone networks. Circuit switching is designed for continuous traffic. Data traffic is generally bursty in nature. To suit this traffic pattern, data networks adopt another switching technique, known as **packet switching**.

At this point, a few words about Internet are in order. Internet is an application-oriented network built over the infrastructure of data networks. It is conceived to be a network of all data networks scattered all around the globe. The rapid growth of Internet was made possible because of the massive telecommunication infrastructure that existed when Internet was conceived and Internet was built over it. Rapid expansion in Internet introduced problems of scale unanticipated in the original design. In particular, management of names and unique addresses of all computers connected to the Internet turned out to be a serious problem. New protocols were developed and a naming system, known as *Domain Name System* (DNS) was put in place to enable any user to resolve the name of a remote machine automatically. DNS runs on machines called *name servers* located in various parts of the world. The current Internet addresses are part of the definition of version 4 of the Internet Protocol (IPv4) which uses a 32-bit address providing for four billion Internet host computers. This was considered a large number when IPv4 was defined about 20 years ago. But the way in which address space is structured has resulted in serious wastage of address space. Today, Internet is running out of address space. The latest version of IP, Version 6, (IPv6) provides for an address space of 128 bits. IPv6 is likely to replace IPv4 all over the world in the next one or two decades.

Mobile communications have emerged in a big way in the 1990s. The first thing to recognise about mobile communication is that the concept of mobility is applicable only to the end segments of the telecommunication infrastructure. Beyond the end segment, the communication takes place via the normal terrestrial telecommunication infrastructure. Mobile networks are based on the principle of *cellular communication*. Here, a geographical region is divided into smaller areas called *cells*. Each cell has a radio station called *base station* through which users are connected to the telecommunication infrastructure.

Over a period of time, it became clear that management and maintenance of separate telephone and data networks were turning out to be expensive. Out of this experience, arose a natural question: Is it possible to design a single switched network that can carry many services? The current trend in telecommunications is to design multi services networks. The core idea in multi services networks is the digital representation of information signals, be it voice, video or data. If all the signals are in digital form, a network capable

of transporting digital signals can carry a multitude of services. This approach is leading to the evolution of the Integrated Services Digital Network (ISDN) which is the first major multi services network being planned and implemented all over the world. ISDN is capable of carrying multi media services like voice, data, video and facsimile. ISDN is pioneered and guided by International Telecommunications Union (ITU). ISDN as envisioned in 1984 provides for a digital pipe at the customer premises with a minimum capacity of 144 kbps and a maximum of 2048 kbps. The realisation of the inadequacy of these rates in the context of NEIS soon led to the definition of broadband ISDN (B-ISDN). Although ISDN is just moving from planning stage to prototype and implementation, ITU's vision of the networked society has resulted in much of the present planning and design being directed towards broadband ISDN. It appears that some parts of the world may skip the implementation of ISDN and move directly to B-ISDN. The switching technique used in B-ISDN is known as **cell switching**. B-ISDN also uses an information transfer mode, known as **Asynchronous Transfer Mode (ATM)** that is well suited for a variety of services including real time audio and video transmissions. It is important to recognise that cell switching in B-ISDN, and cellular communication in mobile systems are very different.

Managing multiple services on a single network calls for sophisticated signalling facilities. The **common channel signalling** proposed in mid 1970s has now grown into a full-fledged signalling network. The large scale use of computers in B-ISDN coupled with a powerful signalling network is leading to the concept of **intelligent networks** which are pre-programmed to be adaptive, algorithmic, resourceful, responsive and intelligent. As an example of the possible capabilities of such intelligent networks, one may cite real time machine translation. A telephone conversation originating in German may be heard in French at the receiver end and vice versa. A telex sent in Hindi in Delhi may be delivered in Kannada in Bangalore. Such examples, although somewhat far fetched now, may become a reality in the coming decades. The switching techniques, telecommunication networks and Internet are discussed in detail in Units 5 and 6, Block 2 of MLII-103.

Self Check Exercise

- 1) Present a layered architecture for GII and discuss the different layers functionality.

Note: i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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Global Information Infrastructure

What does this expression Global Information Infrastructure (GII) connote? Let us try to understand its meaning and significance.

The presence of a global information infrastructure is that government; business, communities, and individuals can cooperate to link the world's telecommunication and computer networks together into a vast constellation capable of carrying digital and analog signals in support of every conceivable information and communication application. The premise is that this constellation of networks will promote an information society that benefits all: peace, friendship, and cooperation through interpersonal communications; empowerment through access to information for education, business and social good; more productive labour through technology-enriched environments; and stronger economics through open competition in global markets.

Of course, the premise is exciting and appears somewhat rational. Information technologies are advancing at a very rapid rate and ubiquitous. Many scholars, policy makers, technologists, business people contend that these changes caused by these new technologies are revolutionary and will result in profound transformations of society. It is stated that physical location will cease to matter. More and more human activities in learning, conducting commerce, and communicating will take place via information technologies. Online access to information resources will provide a depth and breadth of resources never before possible. Most print publications will cease; electronic publication and distribution will become the norm. Libraries, archives, museums, publishers, bookstores, schools, universities, and other institutions that they rely on artefacts in physical form will be transformed radically or will cease to exist. Fundamental changes are predicted in the relationship between these institutions, with authors less dependent on publishers, information seekers less dependent on libraries, and universities less dependent on traditional models of publication to evaluate scholarship. Networks will grease the wheels of commerce, improve education, increase the amount of interpersonal communication, provide unprecedented access to information resources and to human experience, and lead to greater economic equity.

It must be mentioned here that the scenario described above is vehemently contested by many who argue that we are in the process of evolutionary, not revolutionary, social change towards an information-oriented society. People make social changes, which lead to the development of desired technologies. They contend that computer networks are continuation of earlier communication technologies such as telegraph, telephone, radio and television and similar devices that rely on networked infrastructures. All are dependent on institutions, and these evolve much more slowly than do technologies. Digitised and digital media are extensions of earlier media, and institutions that manage them will adapt them to their practices as they have adapted many media before them. They agree that electronic publishing will become more important, but only for certain materials that serve certain purposes. Print publishing will co-exist with other forms of distribution. Although relationships between institutions will evolve, publishers, libraries and universities serve gate-keeping functions that will continue to be essential in future. More activities will be conducted online, with the result that face-to-face relationships will become more valued and precious. The new ICTs will supplement but not supplant the traditional way of conducting all activities. It is felt that communication technologies increase, rather than decrease, inequalities, and we should be wary of the economic processes of a global information infrastructure. Which of the two

scenarios depicted above is more likely to occur? It must be emphasised that the arguments for these scenarios, the underlying assumptions, and the evidence offered must be examined. Upon close examination, it will be found that strong claims about the effects of information technologies on society, and vice-versa are based on simplistic assumptions about technology, behaviour, organisations, and economics. None of these factors exist in a vacuum; they often interact in complex and often unpredictable ways. In fact, it is stated that the future scenario lies somewhere between the two scenarios. People select and implement technologies that are available and suit their practices and goals. As they use them, they adapt them to suit their needs, often in ways not anticipated by their designers.

In summary access is among the primary arguments for constructing a global information infrastructure. Information resources are essential for manner of human affairs, including commerce, education, research, participatory democracy, and government policy and leisure activities. Access to information for all these purposes is at the centre of the global information infrastructure. An information infrastructure is built upon an installed base of telecommunication lines, electrical power grids, and computing technology, as well as available information resources, organisational arrangements, and people's practices in using all these aspects. When information infrastructure works well, people depend on it for critical work, education, and leisure tasks, taking its reliability for granted. When it breaks down, then people may resort to alternative means to complete the task, if those means exist.

National Information Infrastructure

In recent years the subject of National Information Infrastructure (NII) has been receiving greater attention in both scholarly and trade publications. The issue is expected to have significant implications for the use of electronic communication in education, business, industry, and government. The NII is expected to provide for "the integration of software, hardware and skills that will make it easy and affordable to connect people with each other, with computers, and with a vast array of services and information resources" (from Information Infrastructure Executive Order 1993). It is anticipated to be "seamless web of communication networks, computer databases, and consumer electronics that will put vast amounts of information at users' fingertips." (Information Infrastructure Task Force, 1993). This seamless web of "communication networks including computers, televisions, telephones and satellites" is expected to forever alter the way people "live, learn, work and communicate with each other both within the country and around the world". The U.S. administration has indicated its commitment to build NII to meet the information needs of its citizens. This infrastructure is expected to expand the level of interactivity, enhance communication and allow access to various kinds of services. It is expected to accelerate the transformation of this society to the Information Age, and provide increased accessibility to a vast array of electronic information resource and services.

12.4.2 Key Issues

Whenever a major development takes place, a number of issues crop up. NEIS is no exception. The main issues concerning NEIS may be characterised by five 'Cs':

- Connectivity;
- Capacity;
- Content;
- Culture; and
- Cost.

At present, less than one-sixth of the world population is connected to telecommunication infrastructure for some service or the other. The connection may be for a simple service like telephone, dial-up Internet access or a multitude of services offered by ISDN. A parameter called *teledensity* is used to express the connectivity level in a country. Teledensity is the number of teleconnections per hundred in the population. It is not the percentage of the population that has connectivity. It is because one person may have more than one connection or one connection may be shared by more than one person. The connectivity level is fairly high in developed countries and it is very low in developing and under-developed countries. For example, in the United Kingdom, the teledensity is 143 whereas in India it is 6.6 as of year 2003. How do we then increase the connectivity level? Laying cables to every village, home and office in the world is a formidable task and it may take many centuries if this were to be achieved. Clearly, it is not the approach to achieving connectivity in a short time frame. There are two communication technologies that offer solution to the connectivity problem: short-haul radio for urban areas and satellite communication for rural areas.

Mobile communication is the forerunner of short-haul radio technology. Since the introduction of mobile telephony in 1992, over one billion mobile subscriptions have been registered as of 2004. There is a discernible trend that indicates that new users prefer mobile connectivity to landline connectivity. Today over 90% of the countries in the world have mobile networks and over 100 countries have more mobile subscriptions than fixed landline subscriptions. Three reasons may be identified for the rapid growth of short-haul technology. First, the radio links are fairly reliable. Second, once the radio network is in place, adding a new subscriber involves very little installation effort and time. The third reason is commercial. The availability of prepaid card facility without having to be a regular subscriber is extremely attractive to small time users or masses. Thus, clearly, short-haul radio technology is raising access to telecommunication networks significantly. It must, however, be remembered that mobile or short-haul radio connectivity is feasible only if there is a radio network in place. At present, radio networks are being installed only in urban areas where there is a concentration of population. Habitation in rural areas is spread out with thin population. Radio networks are not suitable for rural areas for two reasons. First, they have a limited range, typically a radius of 50 km. Second, they depend on landline infrastructure for interconnecting base stations.

In the context of remote area connectivity, ITU had suggested that every village in the world be brought on to the connectivity map by the end of year 2003. This has not happened. Satellite communication presents a practical solution for connecting remote areas. Establishing connectivity via satellite links is by far the quickest. Even remotest areas can be brought on to the world network map in a matter of a few hours by installing a satellite terminal. Local cabling

may distribute information from the satellite terminal to houses in the village. Satellite links do not need any landline infrastructure. At present, efforts are on to develop *satellite mobile systems* wherein a hand-held device may connect to a satellite directly without the help of a terminal. This also offers an elegant solution to rural area connectivity even though the capacity of the hand-held terminals may be very limited.

Let us now turn our attention to capacity issue. We have seen that satellite communication provides quick remote area connectivity and short haul radio instant connectivity in urban areas. But, are these technologies capable of providing the required bandwidth? A typical present day communication satellite offers a bandwidth of about 800 - 1000 MHz. Similarly, a commercial short haul radio link may offer data rates of the order of a few Mbps. The actual bandwidth required is dependent on the services that are to be supported on the network. The services envisaged for the NEIS are placed under two categories: interactive and distributive. They demand transmission and distribution of high fidelity voice, high quality video and other forms of information on interactive basis. This calls for a broadband communication pipe supporting data rates of the order of 100 Mbps or more to be extended to the customer premises. Only high speed copper cables and optical fibres can offer such high bandwidths. The bandwidth capacity of optical fibres is, of course, orders of magnitude higher than that of copper cables.

We now have a paradoxical situation. Short-haul radio and satellite communication enhance connectivity but have limited bandwidth capabilities. High speed copper cables and optical fibres can offer very high bandwidth but have serious connectivity limitations. Hopefully, these technologies are poised to play complementary roles in shaping the networked information society of tomorrow. Clearly, the goal of telecommunications in the years to come is to establish a wide band multi-services network reaching out to as large a population of the world as possible.

There is no use having a large infrastructure without applications to run on it. Content, applications and services creation is an area that is receiving wide attention at present. Standardisation in media coding is an important requirement for content development. With the likelihood of transborder barriers being broken in NEIS, serious concern is being expressed about the cultural impact on the nations. In particular, some nations are worried about their tradition and culture being swarmed by that of other powerful nations. The cost aspect of GII has two aspects: capital cost and operating cost. Realisation of GII requires large capital investment. The cost of services on the GII must be affordable by a large section of the population.

Self Check Exercise

- 2) Given the population of India as 1024 million, calculate the number of teleconnections in India.
- 3) Given the population of France as 59.7 million and the number of teleconnections as 75.2 million, calculate the teledensity of France.

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

12.4.3 Management

The global and national information infrastructure is being conceived as a massive network with very high capacity and capability. Evolution of such a massive infrastructure calls for important managerial processes that must be set in motion. For ICT based systems, some important components of management process have been identified:

- 1) System availability
- 2) Performance and tuning
- 3) Change management
- 4) Network management
- 5) Configuration management
- 6) Capacity planning
- 7) Strategic security
- 8) Disaster management
- 9) Facility management

System availability is a critical parameter in GII. Reliability and availability of GII systems are highly demanding. As a matter of routine, people would expect the GII systems to work, much as the way they expect a bulb to light up when they turn on the switch. They would also expect the systems to work year after year for many decades. To meet this requirement, GII systems are designed as *high availability* systems with an availability figure of over 99.99% and a life span of about 30 years. The availability figure of 99.99% means that the system may be down for 36 seconds in a week.

12.5 NETWORK ACCESS

In GII, network access is expected to be in digital form. A basic assumption is that all devices at the subscriber end are digital devices. However, the access networks may be analog. Access to GII is obtained via any of the telecommunication networks, viz. landline telephone network, landline packet switched data network, mobile telephone network or ISDN. In many parts of the world, the traditional telephone network has been changed to digital mode of operation with the installation of digital exchanges. However, the subscriber end may not be digital. The Subscriber Line Interface Card (SLIC) at the exchange may be still designed for receiving analog signals.

Mobile networks have undergone two generations of development and the third generation is evolving. The first generation mobile systems are analog

systems and are already being phased out. The most commonly used mobile communication system today is the second-generation system that follows a standard called Global System for Mobile communications (GSM). These systems are inherently digital cellular systems. An integrated system of personal communication via satellites and mobile networks supporting subscriber access both via satellites and base stations would result in a truly universal communication facility. Such systems are categorised as *third generation mobile systems* and are currently being studied and standardised.

Connectivity to data network is usually via dedicated lines, as the data switches operate in store and forward mode and not in connection-oriented mode. There is nothing like direct dial up access with data switches. If there is a dial-up access, it goes via a conventional telephone exchange. ISDN, as the name implies, is a digital network end-to-end. Subscriber end equipments are digital, access to ISDN exchange is digital, transmission throughout the network is digital and signalling is also digital. Thus ISDN is an out and out digital network. Access to any of the above said four-telecommunication networks is via access links, which we discuss next.

12.5.1 Access Links

Access links are those communication lines between the subscriber premises and the nearest point of telecommunication infrastructure. The nearest point is called the *Point-Of-Presence* (POP). The POP may be an analog or a digital telephone exchange, a data switch, a mobile base station or an ISDN exchange. It may be remembered that a basic assumption in GII is that subscriber end equipments are digital and as such generate digital data. A variety of access links are available for connecting subscriber premises to the POP:

- 1) Analog lines with modems
- 2) Leased lines
- 3) Digital subscriber lines (DSL)
- 4) Asymmetric DSL (ADSL)
- 5) High speed DSL (HDSL)
- 6) Cable modem

Analog lines are used for connecting customer premises with analog telephone exchanges. Digital transmission via analog lines calls for the use of modems at both ends. At the subscriber end, digital to analog conversion is done for transmission and analog to digital conversion for reception. Inverse functions are performed at the exchange end. Since the cable infrastructure is available throughout the telecommunication infrastructure a user may obtain on lease between two end points a **dedicated** or **private** line on which point-to-point information transfer can be organised. These lines are non-exchange lines and are permanently available for the user. **Leased lines** can be obtained for different speeds of operation and charges vary accordingly. A user may also obtain a leased line between his premises and POP. Such lines are generally used for connection to data switches that operate in packet switched mode without establishing source-destination connection.

In the last couple of decades, signal processing techniques have been developed by which it is now possible to send high speed digital data over voice grade lines that are normally available between the subscriber premises and POP. Such lines are called digital subscriber lines (DSL). The standard interface in the case of ISDN is DSL. In a variety of applications on the GII, the data rate from the user to the application server is much lower than the data rate between the server and the user. Taking this fact into account, technology has been developed to provide an economical solution that offers high download speeds up to 2 Mbps but limited upload speeds, typically 64 or 128 Kbps. Lines used for this purpose are known as **Asymmetric DSL (ADSL)** lines. **High Speed Digital Subscriber Lines (HDSL)** are symmetric ones supporting high bit rate data transmission both ways.

Yet another way of accessing GII is via the television cable infrastructure. A device called **cable modem** connects a personal computer to the television cable. This connectivity offers very high speeds. Once again asymmetrical configuration can also be obtained on television cables. Such a configuration typically offers upload speeds up to 256 kbps and download speeds up to 10 Mbps.

12.5.2 Access Devices

Access devices are the devices that need to be installed at user premises in order to access POP. These devices are different for different types of POP. In the case of a data switch POP, the access device comprises two components: **Channel Service Unit (CSU)** and **Data Service Unit (DSU)**. Channel service unit protects the POP from improper voltages and signals that a subscriber might accidentally transfer. The data service unit interfaces with the user system and formats the user data to suit the type of line (line speed, asymmetric transmission, etc.).

In the case of ISDN, access devices are of two types: network termination Type1 (NT1) and network termination Type 2 (NT2). NT1 performs the functions similar to that of CSU and DSU. NT2 device additionally handles errors and also performs certain routing functions. This is useful for connecting a LAN to the POP. Non-ISDN devices may be connected to NT2 interface via devices known as **Terminal Adapters (TA)**.

12.6 HOME NETWORKS

Traditionally, we are used to different levels of telecommunication facilities at home and in the office. While the house has a simple telephone, the office has a PABX, a fax machine, an e-mail facility and so on. In the last few years, we have seen computers entering homes and many households have Internet connection these days. Some have fax machines too. Slowly, telecommunication facilities are being added to homes. This has led to the idea of **home networks**. Home networks are a vision at this time and it would be a couple of decades before they become a reality in a big way.

The central idea behind home networks is that all electrically operated devices at home can be networked and made accessible on the data network infrastructure. They can then be controlled remotely. Home networks open up

very interesting possibilities in our life-style. For example, a person on way to home can turn on the air conditioner from his car. A baby left alone at home may be monitored via cameras by parents in an adult party. Burglar alarms may alert a nearby police station in case any part of the house is break opened. To realise home networks, it is predicted that most homes in future will be built with networking infrastructure. Home appliances will be designed with networking interfaces.

Significant enhancements to home telecommunication facilities come with ISDN. Usually, the minimum configuration of network termination units (NTU) of ISDN allows eight devices to be connected to it. The minimum data rate is 144 kbps configured as two basic channels of 64 kbps each and one signalling channel of 16 kbps. The basic channel is called **B-Channel** and the signalling channel as **D-Channel** and the configuration itself as **2B + D** basic rate interface (BRI). The B-channels can be dynamically configured to operate as circuit switched or packet switched channels. Circuit switched channels may be used for real time services like voice and slow motion video and packet switched channels for data services. If there is spare capacity in D-channel, the same may be used for data transfer. A variety of interesting combinations of services are possible. Two telephone conversations and many data transfer applications may be active simultaneously. A telephone conversation, a fax transmission, and two Internet connections can co-exist. One telephone and many Internet connections may be active. More than one telephone can be connected to the NTU with each having different access permissions. For example, a teenager's phone may be barred for STD and may be set for a maximum phone amount per month. Telephone instruments may come with magnetic card facility to accept credit or debit cards so that payments can be effected from home. Truly, ISDN introduces the concept of home networks. Home networks may also be configured as local area data networks.

There are certain characteristics that are essential for home networks:

- 1) **Easy installation:** Home networks must be such that a householder can easily install new appliances on the network. Plug-and-play approach is essential for network connectivity. It must be as easy as plugging in an electrical appliance.
- 2) **Reliability:** Once installed, the network and the associated devices must operate without failure for many years. The level of reliability must be the same as one gets from general household appliances. Only then, the concept of networks at home will be acceptable by householders.
- 3) **Affordability:** The cost networking must be at an affordable level for the average householder.
- 4) **Durability:** The network standards and interfaces must be durable over long years. For an average householder, investments in home appliances are one-time or at best two-time investments in lifetime. Hence, home networks must remain stable for 20-30 years.
- 5) **Multimedia support:** The most likely application at home is multimedia entertainment in addition to day-to-day activities like utility bills payment etc. Hence, good quality multimedia support is called for.

- 6) **Security:** People need safe and secure homes. Privacy at home is also important. It should not be possible for intruders to interfere with the operation of networked devices. Home networks must be designed taking these factors into account.

Home networks may be **wired** or **wireless**. Wireless networks are less secure than wired networks. It is fairly easy to jam or to eavesdrop on a wireless communication. Frequency allocation without interference between adjacent residential buildings is also a problem of management. As it is, the frequency band is a scarce resource. While future homes may be wired for networking, the existing ones may go in for wireless networks.

12.7 OFFICE NETWORKS

At present, office networks are predominantly Local Area Networks (LAN). A LAN is distinguished from other data networks in three aspects. LAN communication is usually confined to a moderate-sized geographic area such as a single office building, a warehouse, or a campus. Data communication is via physical or wireless communication channels that can support moderate to high data rates. The communication channels must have consistently low error rates.

The most popular LAN configuration used in offices is Ethernet that comes in three speeds: 10 Mbps, 100 Mbps and 1 Gbps. There are many options with regard to medium of transmission and modulation techniques. The most widely used transmission medium is Unshielded Twisted Pair (UTP) cables. They are cheap and come in different categories to support different speeds. Category (Cat) 3 cables are used for 10 Mbps rate, Cat 5 for 100 Mbps and Cat 6 for 1 Gbps.

Office networks are characterised by three features:

- Distributed computing
- Server environment
- Managed devices

Distributed computing emerged in a big way with the advent of personal computers (PCs) in early 1980s. PCs brought computing power to the desks of office workers. An office functions in a co-ordinated manner. Therefore, soon after the PCs arrived on the desks, a need was felt for interconnecting them. Thus was born office networks. There are many centralised functions in an office. This led to the idea of servers on the office networks. Adding managed devices to office networks is a recent development and is yet to catch on in a big way. Managed devices are items like air conditioning units, water coolers, Xerox machines etc. which are connected to the network and managed via the network. Typical servers in an office include the following:

- Printer server (laser)
- Printer server (colour)
- E-mail server

- File server
- Database server
- Fax server
- Directory server
- Internet Access server
- Web server

The functions of the above servers are self-explanatory. Servers are centralised resources and, in general, are accessible to everyone on the network. Access to server resources may, however, be restricted under certain access permission policy put in place by the management. Whenever an expensive resource is added to the network, a server is associated with it either to make the resource sharable or to control the access to it. Access to servers is done normally using **client-server architecture**. Servers may be implemented using a personal computer, a workstation or a mainframe. Mainframe based servers are sometimes called **enterprise servers**.

12.8 CORPORATE NETWORKS

A Corporate body is different from an office. It is a group of offices that are geographically far apart. It has a head office and a number of regional or branch offices. Each office has a LAN. A corporate network is a set of interconnected LANs, all belonging to the same management and working to meet a set of corporate objectives. There are three types of corporate networks:

- Intranet
- Extranet
- Virtual Private Network

All the above three corporate networks are **community networks** in the sense they serve a particular user group. Security is an important consideration in all these networks. As a result the community is often called **closed user group**. The word “closed” implies a secure network that is not open to persons outside the group.

In Intranet, a corporate uses Internet technology including transmission standards and applications to interconnect the LANs at different corporate sites. The corporate sites are geographically far apart. In this case, the corporate staff and the employees of the company at different locations form the community. Persons from outside the corporate community cannot access the Intranet. Intranets may also include a web server. However, for security reasons the corporate may have a separate web server that is not part of the Intranet.

Extranet is an extension of Intranet. Here the community not only includes the employees of the corporate but also suppliers and distributors of the corporate. Extranet involves multiple companies that have some business association under a set of rules or a contract. This network is also secure and serves a closed user group.

Prior to the emergence of Intranet, corporate bodies used leased lines to interconnect their sites. These networks were known as **private networks**. Private networks were very secure, as the physical access was totally restricted to authorised corporate users only. But the cost of leased lines turned out to be too expensive for corporate bodies to afford. Intranet uses Internet instead of leased lines for interconnecting different corporate sites. Intranet solution is very cheap, as the Internet communication costs are low. But the problem is that Internet is a public network that could be accessed by anyone and hence, on Intranet, the corporate faces information security risks. Risk avoidance has come in the form of **Virtual Private Network (VPN)**. The term 'virtual' implies that the network uses shared public infrastructure and yet acts like a private network.

VPNs are either Intranets or Extranets with additional security mechanisms. Intranets and Extranets have security built in them by way of access permission or access denial policy. But, when the data moves on the Internet there is no security. Anyone can easily intercept the data on the Internet. VPN ensures that the data that moves amongst corporate sites on the Internet is also secure. A process called **tunnelling** that is implemented in secure Internet Protocol (IPsec) accomplishes the required security level. In tunnelling, the data delivered to the Internet at one corporate site is encapsulated with additional header and some form of encryption. Such encapsulated data is then moved on the Internet without access to the original packet and using only the additional header information. This is like using two envelopes while communicating confidential information. Only the outer envelope is used for address processing. At the receiving end, the data is de-capsulated.

Self Check Exercises

- 4) Define Internet, Intranet and Extranet.
- 5) Distinguish between private networks and VPNs.
- 6) What is tunnelling?

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of the Unit.

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12.9 GII APPLICATIONS

GII applications may be placed in the following categories:

- Entertainment
- Information Repository
- Trading and Commerce
- Information Distribution

Video on demand and music on demand are examples of entertainment applications on GII. Quality services in this regard can only come when the information pipes have very high capacity. In this context, B-ISDN infrastructure is very important. Information repository involves both information storage and retrieval. This is broadly achieved by World Wide Web type technology. High capacity is required to support multimedia information services. Electronic commerce (e-commerce) is a major commercial and trading application envisaged on GII. We present more details of e-commerce in the following paragraphs.

Electronic commerce may be defined as a mode of business in which business transactions like selling and buying, and commercial activities like advertising and marketing take place via telecommunication networks. It must be possible to carry out the complete range of business activities on the network. These include:

- Advertising
- Marketing
- Sales
- Buying
- Delivery
- Payment
- After sales service

Business on the GII may deal with tangible products, information products or services. Tangible products can not be delivered on the network. Similarly, purchase of certain items may require a visit to the concerned showroom. Taking such factors into account, the products may be placed under four categories. Table 12.2 summarises these categories with example products.

Table 12.2: Product Categories on GII

Product Category	Examples
Online advertising and marketing only	Cars, Furniture, etc.
Online advertising, marketing, sales and payments, but physical delivery	Books, CD-ROMs, music & video CDs, branded items, etc.
Online advertising, marketing, sales, payments and delivery	Electronic products like music, e-journals, software, etc.

Benefits of e-commerce are many in number and include the following:

- Reduced cost;
- Reduced cycle time;
- Increased revenues;
- Elimination of intermediaries;
- New sources of revenue;

- Large customer base;
- New and innovative products and services; and
- Improved customer satisfaction.

Four types of e-commerce have been identified and each one of them has some special requirements. The types of e-commerce businesses are summarised in Table 12.3. B-to-B e-commerce is built around Extranets. The business details are determined in advance and the business represents an ongoing relationship involving multiple transactions.

Table 12.3: E-commerce Business Types

Notation	Business Type
B2B or B-to-B	Business to Business
B2C or B-to-C	Business to Consumer
C2C or C-to-C	Consumer to Consumer
C2B or C-to-B	Consumer to Business

B-to-C type is based on electronic market infrastructure built around public access networks. There is no fixed or long-term relationship between the business and the customer. The number of business transactions is limited to one or a few. C-to-C type is carried out on market makers infrastructure such as online service providers. The infrastructure may be an auction site or product-advertising site. C-to-B type is a new business type envisaged in e-commerce. Here, a consumer advertises his requirements and business houses respond to the requirements by making offers.

Self Check Exercise

7) Give an example of C-to-B type of e-commerce.

Note: i) Write your answers in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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12.10 SECURITY ISSUES

Security in GII concerns **physical resources** like network devices, network nodes, computers and communication systems and **intellectual resources** like software, knowledge, data and information bases. It also concerns **communication security**, i.e. protection of data while being transferred from one place to another. The main aspects of security may be listed as:

- User authentication;
- Message authentication;
- Communication security;

- Storage security;
- Access security;
- Application security; and
- Protection from malicious contents like viruses.

User authentication is done via **information keys** like password and personal questionnaire, **physical keys** like magnetic cards and smart cards, and **biometric keys** like voiceprints and fingerprints. A variety of user authentication protocols have been developed for this purpose. Some among them are **challenge handshake authentication protocol** (CHAP) of Microsoft and **Kerberos** of MIT. While CHAP authentication takes place directly from the server that the user wishes to access, Kerberos authentication takes place via a central Kerberos server.

Message authentication is done via **digital signatures**. Digital signature is a technique for digitally signing a digital document much as the way a conventional document is affixed with a signature. The contents of the digital document are in plain text and can be read by anyone. The document contains an encrypted signature that authenticates the signer, the contents and a proof of dispatch by the signer.

Communication security deals with protection of data while in transit. Secure communication systems use cryptology for ensuring confidentiality of messages transported through them. Cryptology or cryptography involves three aspects: **encryption, decryption and crypt analysis**. Encryption is a form of coding that transforms the original understandable message into a bit string that does not make any sense. The encrypted bit string is transmitted over the communication system. Decryption is the inverse process of encryption, which extracts the original message from the encrypted bit string. Crypt analysis is used to study the efficacy of the encryption scheme and by intruders to decipher the encrypted message. Both encryption and decryption processes use a key along with their respective algorithms. If the encryption and decryption keys are identical, the cryptosystem is said to be **symmetric**. If the keys are not the same, the system is **asymmetric**. Symmetric crypto systems are also known as *private key cryptography* systems, and the asymmetric ones as *public key cryptography* systems. A widely used symmetric system is *Data Encryption Standard* (DES) and asymmetric system is RSA algorithm. The asymmetric system is named after its inventors Rivest, Shamir and Adleman. Storage security also uses cryptography. In fact, many encryption/decryption algorithms have been developed and they are used in a wide variety of applications like secure e-mail etc.

Access security is applicable to databases and networks. Databases are protected by **access control mechanisms** and networks by **firewalls**. A firewall sits between a public access network and a private protected network. It examines the incoming messages, permits legal messages to enter the protected network, and discards suspicious or illegal ones. Application security is enforced by using application firewalls that are also known as **proxies**.

Malicious contents enter networks in three forms: **viruses, worms and Trojan horses**. Viruses infect programs and files. Worms creep across systems. Trojan

horses are programs that promise to do one thing, like a new game, but actually execute undesirable functions on the victim system. Finally, there is **spam** that arrives as email containing unsolicited commercial information. Malicious contents are rejected by using suitable inspection and screening programs like anti-virus and anti-worm programs.

Self Check Exercise

8) Name any two biometric keys other than fingerprint and voiceprint.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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12.11 SUMMARY

This Unit is about the information infrastructure that is required at the national and global level to support the emerging electronic networked information society (NEIS). First, the emerging NEIS is placed in perspective. The five goals of NEIS, viz. anyone, anytime, anywhere, any information and any format are discussed. Possible impact of NEIS on various societal aspects like education, work culture and environment are discussed. Different information management aspects like acquisition, storage, dissemination etc. are enumerated. The overall architecture of the GII is then presented. The five key issues of GII like connectivity, capacity, contents etc. are brought out. Management components of GII are then enumerated. Different components of GII like access networks, home networks, office networks are discussed. The three types of corporate networks, viz. Intranet, Extranet and VPN are placed in perspective. GII applications, in particular e-commerce, are then discussed. The Unit closes with a discussion on the security aspects of GII.

12.12 ANSWERS TO SELF CHECK EXERCISES

1) GII architecture has four layers as shown below:

Layer 4	User infrastructure
Layer 3	Access infrastructure
Layer 2	Application infrastructure
Layer 1	Telecommunication infrastructure

Discussions as in Section 12.4.1

2) Teledensity of India is 6.6 as given in Section 12.5. Population is given as 1024 million.

Therefore, the number of teleconnections = $1024 \times 6.6/100 = 67.58$ million.

- 3) Teledensity of France = $75.2/59.7 \times 100 = 126$
- 4) Internet is a network of networks. Intranet is a corporate network interconnecting networks at different corporate sites via Internet. Intranet serves a closed user group and is not open to outsiders. Access to Intranet resources is governed by the security policy of the corporate. Extranet is an extension of Intranet, which includes the Intranets of the business associates of the corporate. Access by business associates is governed by a set of business rules.
- 5) Private networks use leased lines for interconnecting different sites. PVNs use Internet infrastructure instead of leased lines.
- 6) Tunnelling is the process by which corporate information is whisked through Internet in a secure manner.
- 7) A consumer states his holiday tour requirements and tours & travels companies respond.
- 8) Palm structure and eye features.

12.13 KEYWORDS

Access Devices	: Devices used at user premises to access GII
Access Infrastructure	: Comprising access links, access devices and networks through which users access GII
Access Links	: Communication lines used between subscriber and telecommunication point-of-presence.
Closed User Group	: Community of users whose network is not accessible to others.
Cryptography	: The art and technique of transforming a legible message to a meaningless binary string.
Digital Subscriber Line	: An access link in which information is transferred in digital form.
Intermediate Language	: A language used in machine translation, which acts as an intermediary.
Leased Line	: A dedicated or private line hired by a user from a network provider.
Machine Translation	: Translation from one language to another using computers.
Malicious Contents	: Program code or data that enter computers or networks and affect the normal operations.

Media Coding	: Representation of multimedia information in electronic form.
Point-of-Presence (POP)	: The nearest point on the telecommunication infrastructure to which a user is connected.
Remote Sensing	: A technique of information acquisition using satellites.
Telecom Infrastructure	: Infrastructure provided by telecom networks.
Telecommuting	: Rendering and receiving services on the networks without having to attend offices.
Teledensity	: Number of teleconnections per hundred persons in the population of a country.
Tunnelling	: The process of transporting information on Internet in a secure manner.
User Infrastructure	: Mobile stations or networks at homes and offices

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UNIT 13 INFORMATION SOCIETY

Structure

- 13.0 Objectives
- 13.1 Introduction
- 13.2 Information Society Concept: Evolution
 - 13.2.1 Definition and Meaning of Information Society
 - 13.2.2 Different Perceptions of Information Society
 - 13.2.3 Factors Determining the Arrival of Information Society
- 13.3 Economic Structure and Information Society
 - 13.3.1 Measurement of Economic Value of Information
 - 13.3.2 Information Economy
- 13.4 Impact of Information Society on Information Profession
 - 13.4.1 Technological Absorption and Determinism
 - 13.4.2 Social, Cultural and Educational Mission
 - 13.4.3 Information Mediation and User Empowerment
 - 13.4.4 Information Literacy and IT Literacy
- 13.5 Information Society: Developing Countries
 - 13.5.1 Brazil
 - 13.5.2 India
- 13.6 Information Society and Public Policy
- 13.7 Summary
- 13.8 Answers to Self Check Exercises
- 13.9 Keywords
- 13.10 References and Further Reading

13.0 OBJECTIVES

After reading this Unit you will be able to:

- identify the origins of the concept “Information Society”, understand its definition and meaning;
- determine the main factors for its arrival;
- distinguish different perceptions associated with the concept “Information Society”;
- explain if the concept has some economic connotation as an ‘Information Economy’ or ‘Information Sector’;
- examine the impact of “Information Society” on Information Profession; and
- discuss the impact of this concept on transformation of Indian Society into an Information Conscious Society.

13.1 INTRODUCTION

Society is not static. In the language of general systems theory, it is an open system, a dynamic set of interrelated social systems, institutions and individuals

that act upon and react to the various aspects of the world around it. Open systems exist in a state of flux, continually reacting and adjusting to changing conditions and developments from both within and outside the system. Generally these changes are evolutionary. But, at times factors or influences may arise whose impact is truly revolutionary, forcing a more abrupt and drastic modification in the social system, resulting in wholesale transformations in social institutions and relationships.

Scholars, philosophers and scientists have been predicting such a revolutionary transformation of modern industrial society almost since the Industrial Revolution was accepted as an example of revolutionary social transformation [Matchlup, 1962]. There have been hundreds of predictions and discussions about the implications of such a transition in a number of articles across different disciplines. Despite the popularity of such concerns about the next stage of societal evolution, there has been little consensus as to the causes and results of the predicted social revolution. Hence, there are almost as many levels for the resulting society as there have been treatments. Though, different causes have been identified as transformations, most of the authors agree that the driving force behind the social transformation as being the result of or related to, rapid development and diffusion of information technologies. Information technology, as many researchers have stated, is in the process of evoking fundamental change in the character of our society. After a period of uncertainty, during which it was perceived that the shift was taking place from 'industrial' to 'post-industrial' society, the nature of the society has become apparent. The basic aspect that has been emphasised is that since information is rapidly becoming the driving force behind the industrial development of nations, the most appropriate characterisation to depict that process in the community is by the expression 'Information Society'. However, a careful examination of literature concerned with emerging forms of social organisations reveals considerable debate on the precise nature of 'Information Society'. Although, most people concede that Western industrial nations and Japan have experienced dramatic social, economic, and technological changes, there is little consensus on the nature and direction of the change.

"While people all over the world continue to talk about the 'Information Society', and some would even claim to be living in it, there seems to have been little, if any, real progress made in establishing either some form of metrics for this 'phenomenon' or in marshalling the kind of evidence that would result in credibility". Indeed, the absence of such criteria, might lead to doubts about its status. In fact, some question what it is? Is it a useful social analytical tool, merely utopian forecast or what? There are some who believe that the 'Information Society' concept at present provides neither a coherent tool for social analysis, nor an adequate set of social goals [David Lyon]. There was always an element of symbolism about the term, with information serving as a talisman for a new kind of society, a society in which *reason* and *consensus* set the tone rather than raw power and materialism.

In this Unit, it is proposed to discuss the 'Information Society' concept, its origin, the main factors determining its arrival, the question whether the concept has some basic economic connotation as an information economy or information sector, and its impact on public policy and information profession. Since the term has been used to describe socio-economic systems that exhibit

high employment of information-related occupations and wide diffusion of information technologies, the Unit also presents some data on the size and internal structure of work-force in developing countries like India, and includes a brief discussion on the transformation of Indian Society into an information conscious society.

13.2 INFORMATION SOCIETY CONCEPT: EVOLUTION

The concept of 'Information Society' emerged during the 1970s and through out the 1980s and rapidly gained popularity and currency, its proponents ranging from scholars and academic authors to popular writers. Prominent among the first group of writers were Masuda, who in the Japanese context, perceived an eventual transition of the society to the point at which the *production of information values* became the driving force for the development of the society. The second writer belonging to this group was Tom Stonier, who perceived *the dawning of a new age* for Western Society. He draws explicit parallels and contrasts between industrial and information societies. Although not very comfortable with the term 'Information Society', Daniel Bell did much to sustain it through his work on post-industrial society. Daniel Bell, the classical exponent of post-industrialism, also theorised the 'Information Society' [Bell, 1980].

In 'The Coming of Post-industrial Society' (1972), Bell argued that the increased part played by science in the productive process, the rise to prominence of professional, scientific and technical groups and the introduction of computer technology, are all evidence of a new '*axial principle*' at the core of socio economic system, namely, the centrality of theoretical knowledge. The emerging social frame work of 'Information Society' builds upon this base. Information increasingly becomes a source of added value and thus of wealth. A growing portion of workers is employed in the 'information' sphere. The important factor, enabling discourse to shift from post industrialism to Information Society is the massive growth in the economic significance of Information Technology.

Although, in its current form it is something of a novelty, it would be a mistake to think that the idea of information society is entirely of recent origin. Alongside the analytical strands of thought about social change, we also find another theme, technological utopianism. In fact, the writings of Masuda, Stonier and Naisbitt depict a new kind of society which on one hand, to empirical analysis but, on the other, is full of *good society imagery*. Technological utopianism is especially powerful in the U.S.A. It was felt that the USA would realise through a marriage of nature and mechanics, an unprecedented solution to the problem of industrialisation, allowing us to transcend the typical evils of industrial society. The ideals of decentralised democracy, community participation, an end to hierarchy and class, and of plenty for all, which inspired an earlier generation of technological utopianism, re appear in the literature of information society.

Alvin Toffler and John Naisbitt have done much to popularise the concept of 'Information Society'. Naisbitt contended that the United States made the

transition from an industrial to an information society as early as 1960s and 1970s, and that in this process the computer played a significant role. On the other hand, Toffler talked of an *information bomb* exploding in our midst and a *power shift* in society, which will make it dependent on knowledge.

The newness and attraction of these ideas and the vigour with which they were expressed, fired the public imagination and helped to sustain the interest in the concept of the information society and its literature.

13.2.1 Definition and Meaning of Information Society

'Information Society' is a much used expression. The term has been characterised by various dimensions. Several authors have tried to define and interpret this term according to their own perceptions. What strikes one in reading the voluminous literature on the information society is that "so many writers operate with underdeveloped definitions on their subject. They write copiously about particular features of the 'Information Society', but are *vague* about their *operational criteria*. Eager to make sense of changes in information, they rush to interpret these in terms of different forms of economic production, new form of social interaction, innovative process of production, or whatever. As they do so, they very often fail to set out clearly *in what ways* and *why* information is becoming *more central today*, so critical indeed that it is ushering in a new type of society". One wonders just what is about information that makes so many scholars to think that it is at the core of modern age! Let us try to examine some of the significant definitions provided for the term Information Society in the literature and analyse their main attributes.

Blaise Cronin

Blaise Cronin defines information society as "one in which labour has been intellectualised; one in which the expression 'to earn one's daily bread by the sweat of one's brow' sounds decidedly anachronistic". He further observes that "what began life as a sociological construct and then became a feature of futurologists' clumsy jargon before degenerating into a media cliché, has finally achieved respectability through endorsement by economic and political analysts".

Manfred Kochen

Manfred Kochen writes that the simple notion of a society in which information rather than material flows constitute most of its 'communication and control' exchanges is extended to stress that:

- i) most members generate knowledge by knowledge-based procedures that are knowledge-intensive;
- ii) information consistently reflects social invariants; and
- iii) reason and human values rather than strength and expediency manage conflicts between pressures to conserve invariants and pressures for adoptive change.

Having stated all this, Manfred Kochen goes on to say that "an Information Society is a stage in the evolution of *"community brains"*, towards a *'world brain'*. This is probably most likely to be the essence of the 'great transition'

that futurists seem to agree on. When enough people begin to believe it as likely to happen if it is a stage in natural cultural evolution, then this belief may contribute to its self fulfilment ... It will take some decades before this idea is sufficiently wide spread and the first information society appears”.

Martin .

On the other hand according to Martin, information society “is a society in which the quality of life, as well as prospects for social change and economic development, depends increasingly upon information and its exploitation. In such a society, living standards, patterns of work and leisure, the education system and market place are all influenced by advances in information and knowledge. This is evidenced by an increasing array of information-intensive products and services, communicated through a wide range of media, many of them are electronic in nature”. In this definition, the intention of the author was to *broaden the focus* from the *merely technological or economic*, and to portray the Information Society *as a society*. In other words, the term has come to represent *societies at an advanced post-industrial stage*, characterised by a high degree of computerisation, large volumes of electronic data transmission and *an economic profile* heavily influenced by the market and employment possibilities of information technology.

Branscomb

According to Branscomb information society is “a society where the majority of people are engaged in creating, gathering, storage, processing or distribution of information”.

13.2.2 Different Perceptions of Information Society

Frank Webster

Frank Webster in his “Theories of Information Society” distinguishes at least five different definitions of an Information Society, each of which presents criteria for identifying the new. These criteria are: technological, economic, occupational, spatial, and cultural. Let us try to examine each in turn.

Technological Perception

The most common definition of the Information Society lays emphasis upon spectacular technological innovation. The key idea is that breakthroughs in information processing, storage, and transmission have led to the application of Information Technology (IT) in virtually all areas of society. The major concern here is the astonishing reduction of the cost in computers, their prodigious increase in power, and their consequent application every where. Although Information Technology occupies a central role in all literature on Information Society, this perspective emphasises the technological infrastructure to the exclusion of other social, economic and political attributes. Martin provided a number of scenarios detailing life in the Information Society specially the spread of *digital networks* as the key element.

The convergence of computing and telecommunications resulted in the linking of computers enabling the establishment of global networks. The development of ISDN (Integrated Services Digital Network) will provide the infrastructure

supporting *the key ingredient* of post-industrial society-information. The rapid growth of Internet appears to bring about precisely this change. In other words, the technological perspective of information society effectively draws attention to the potential benefits of information technologies for the society. However, with such weighty emphasis on technology, generally removed from a social, cultural and political context, it is unable to provide adequate foundation for defining the attributes of information society. Also, the problem of measurement and the associated difficulty of stipulating the point on technological scale, at which a society is judged to have entered an information age, is surely central to any acceptable definition of distinctively new type of society. It is ignored by popular futurists. The authors of this school of thought are content to describe in general terms, technological innovations, presuming that this is enough to distinguish the new society. "There are some serious scholars who encounter two problems. First, how does one come to measure the rate of technological diffusion, and second, *when does a society cease to being 'industrial' and enter into the "Information" category?*" These objections have not been convincingly answered.

Economic Perception

Some of the authors who write about information society point to the growth of service sector in the industrialised nations and to the decline of employment in manufacturing. For some, the dominant characteristic of an information society *is the nature of its economy*. Machlup (1962) initiated this research perspective by analysing the growth of the 'knowledge sector' in the U.S. economy. In Machlup's analysis, industries primarily concerned with production and distribution of knowledge (Knowledge Industries) were examined separately, rather than as a part of the overall service sector. The knowledge industries included such areas as the *educational system, the media* and other *communication activities, libraries* and other *information activities* and research institutes. The contribution of this sector to the Gross National Product (GNP) was found to be significant (estimated at about 40% for the early 1960s) and growing at a rate considerably higher than the industrial sector. Machlup concluded that knowledge industries would soon *outpace* the industrial sector, leading to the rise of a '*Knowledge Society*'. A similar conclusion was reached at about the same time in Japan, as Umaseo (1963) predicted the rise of the *spiritual industries* over material and agricultural sectors in economies that were more developed. These earlier studies distinguished knowledge or information from other economic sectors.

The best known and often cited study on the emergence of an *information economy* conceived on these lines is the report from Marc Porat (1977). Porat (1977) initiated much of this work, by broadening the view of information work to apply to more than those jobs falling within the information or knowledge sector as defined by Machlup. Porat began by defining information activities as including *all resources consumed in producing, processing and distributing information goods and services*. He defined primary information sector as including all those businesses involved in the exchange of information goods and services in the market place. In addition, however, Porat noted that a great many jobs in other sectors of economy can be thought of as information work. Nearly, every organisation produces, processes and distributes information for its own internal consumption. Thus, a *secondary information*

sector includes these information activities. Porat estimated that overall information activities amounted for 45% of the gross national product in 1967, and that half of the labour force was employed in information-related work. This study has been used to justify references to *United States as an Information Society*. Several authors have attempted to refine Porat's analysis and apply it in other contexts [Komatsujaki, 1986, Schement, Lievrouw, and Dordick, 1983]. This perspective focuses on the *economy as the primary attribute* of the Information society. It may be stated that examining the economic structure alone provided a *limited view* of the social and cultural implications associated with information societies. Also, several critics contend that Porat's classification of information workers is too broad to be meaningful, and does little to suggest *social implications of the shift to Information Society* [Bates, 1985, Wizard, 1984]. Bates, for example, has noted that according to Porat, factory workers assembling information transmission equipment are considered information workers; just as are university researchers. This does not appear to be logical. He felt that such a categorisation may weaken the *social distinctiveness* of the information sector. There are other types of objections and criticisms on Porat's analysis. However, such objections may not entirely invalidate the findings of Porat and are not intended to that. But they are the reminder of the unavoidable intrusion of value judgements in the construction of their statistical tables. As such, they lend support to a healthy scepticism towards ideas of an emergent information economy. Marc Porat has been able to distinguish two information sectors: primary and secondary, then to consolidate them, separate out the non-informational elements of the economy. Porat, by re-aggregating national economic statistics, is able to conclude that 46% of the U.S. GNP is accounted for by the information sector. "The United States is now an Information based economy". As such, it is an 'Information Society (where) the major arenas of economic activity are information goods and service producers, and the public and private (secondary information sector) bureaucracies.

It may be mentioned at this stage that the search to differentiate between quantitative and qualitative indices of an information society is not pursued by Machlup and Porat. It is distinction that suggests the possibility that we could have a society in which, as measured by GNP, information activity is of great weight, but that in terms of springs of economic, social and political life, *is of little consequence*. Of course, the economists are concerned solely with developing quantitative measurements of the information sector, so the issue of qualitative worth of information would be of limited relevance to them. However, even on their own terms there are problems. For example, the question "at which point on the economic graph does one enter the information society?" when 50% of GNP is dedicated to information activities? This may seem to be a reasonable point, one at which, in straightforward quantitative terms, information begins to predominate. Often, even this point is not taken into consideration. In a large scale update of Machlup's study Rubin and Huber concluded that, in the United States, the contribution of 'knowledge industries' to GNP increased from 28.6% to 34.3% between 1958 and 1980, with virtually no change since 1970, this constituting an "extremely modest rate of growth relative to the average rate of growth of other components of total GNP". If we take these economic studies into account – these studies do not prompt us to conclude that the U.S. has entered into the information society.

"A popular measure of the emergence of an information society *is the one that focuses on occupational change*. In other words, the contention that we have achieved an information society when the predominant occupations are found in information or information related activities. That is to say, that in Information Society, the number of people employed in occupations such as teaching, research and development and activities associated with creative industries (media, design, arts, etc.) out number those employed in factories and other industries. The intellectual ground work for this conception of information society was done by Daniel Bell during 1960s. However, it may be pointed out that this definition is presently enjoying much popularity because concern has shifted from a *technological measure towards an occupational notion*. The emphasis here is on a specific group of people called "*symbolic analysts*" – people who do the thinking, planning, innovation and organisation of the 'new economy'. They may be employed in "creative industries" (media, design, arts), consultancy or general management, but a popular idea is that such information workers are the key to future prosperity. The occupational definition of the information society is often combined with an economic measure. Porat for example, calculated that by the late 1960s, a little less than half the U.S. labour force was to be found in the information sector. Porat connects the growth in economic significance of information with changing occupational patterns.

It must be mentioned here that the shift in the distribution of occupations is at the heart of the most influential theory of the Information Society. This aspect has been emphasised by Daniel Bell. But, some authors (Robins and others) have criticised Bell. However, it is appropriate to raise some general objections to occupational measures of information society. For example, one of the important aspects relates to the methodology for allocating workers to specific categories. The end product—mere statistical figure giving a precise percentage of information workers hides the complex processes by which researchers construct their categories and allocates people to one another. Porat for instance develops a typology to locate occupations that are primarily engaged in the production, processing or distribution of information. His scheme encompasses over 400 occupational types and has been published by the U.S. Census Bureau of Labour Statistics. It is interesting to note that Gouldner (1979) identifies a new type of employee that has expanded in the twentieth century, a new class that is "composed of intellectuals and technical intelligentsia" who, while in part self seeking and often subordinate to powerful groups. According to Gouldner, the new class can provide us with vocabularies to discuss and debate the direction of social change.

In conclusion, it may be stated that the challenge to definitions of an information society on the basis of a count of raw numbers of information workers should be clear. The quantitative change is not the main issue. Indeed, as the proportion of population, the groups they lay emphasis upon, while they have expanded, remain distinct minorities, at best ranging 20-25% of the workforce. Therefore, the measure of workforce as criterion for judging the arrival of the information society is liable to be questioned.

Spatial Perception

This conception of the information society though draws on sociology and economics, *has at its core* the distinctive *stress on space*. Here, the major emphasis is on the information networks that connect locations and, in consequence, have dramatic effects on the organisation of *time and space*. This aspect has become the most popular index of the information society in recent years. It is largely because of the impact of the work by Manuel Cartells entitled the Information Age (1996-1998) in which he describes a 'network society'. In addition to above mentioned influence, Goddard (1991) identified many interrelated elements in transition to an information society. Some of these are:

- information is coming to occupy centre stage as the 'key strategic resource' on which the organisation of *World economy is dependent*;
- computer and communication technologies provide the infrastructure that enables the information to be processed and distributed, these technologies allow information to be processed and distributed. These technologies allow information to be handled on an unprecedented scale, to facilitate instantaneous and real time trading, and to monitor economic, social and political affairs on a global stage;
- there has been an exceptionally rapid growth of the 'tradable information sector' of the economy, by which one can highlight the explosive growth of services such as new media (Satellite broadcasting, cable, video) and online databases providing information on a host of subjects ranging from stock market dealings, commodity prices, patent listings, currency fluctuations, to scientific and technological journal abstracts.

Complimenting to these developments has been the radical reorganisation of the World's financial system which led to the collapse of traditional boundaries that once separated banking, brokerage, financial services, credit agencies, and the like. In fact, immediate and effective information processing and exchange economics has become truly global, and with this has come about a *reduction in the constraints of space*. Companies now can develop global strategies for production, storage and distribution of goods and services; financial interests operate continuously, respond immediately, and traverse the globe. In other words, *the boundaries erected by geographical locations are being pushed further and further back* – and with them too the *limitations once imposed by time*. Developments of this nature emphasise *the centrality of information networks* linking together locations within and between towns, regions, nations, continents, and indeed, the entire world.

In many writings, emphasis is put on the technological bases of the information network. With the accounts of an emerging network society, considerable attention is given to advances in and obstacles to the development of an ISDN infrastructure. Most of the thinkers are concerned with the emergence of a 'network market place' emphasise on ways in which networks underline the significance of flow of information. The basic idea here is of information circulating along electronic '*high ways*'. In fact, no one has been able to quantify how much and at what rate information must flow along these routes to constitute an information society. Interestingly no one has produced reliable figures capable of giving us an overall understanding of information traffic.

Though no one could deny the fact that information networks are a significant feature of modern societies and facilitate instantaneous communications around the globe and enable databases to be accessed from any place to any place, still some would ask “why should the presence of networks lead analysts to categorise societies as Information economies?” It may be stated that the question what actually constitutes a network is a serious one and it raises problems not only of how to distinguish between the levels of networking but also how we stipulate a point at which we have entered a network / information society.

Cultural Perception

Of all the criteria employed in the description of the information society, those which entail changes in *cultural values and mores* are the most difficult to identify and measure. Each of us is aware, from the pattern of our everyday lives, that there has been an extraordinary increase in the information in social circulation.

Developments such as invention of radio, television, and computers coupled with the recent advances in telecommunication networks and media technologies are having great impact on the life styles of people as a whole. All this testifies to the fact that we inhabit a *media-laden* society, but the informational features of our world are more thoroughly penetrative than a short list of television, radio, and other media systems suggests. The new media surround us, presenting us with messages to which we may or may not respond. But, in fact, the informational environment is a great deal more intimate, more constitutive of us, than this suggests. For example the informational dimensions of the clothes we wear, the styling of our hair and faces, the ways in which we work at our image (from body shape to speech, people are intensely aware of the messages they may be projecting and how they feel themselves in certain type of clothes, with a particular hair style, etc.).

This intrusion of information into the most intimate realms of our personal lives is complimented by the growth of institutions dedicated to investigating everyday life with symbolic significance. According to Webster, “contemporary culture is manifested more heavily information laden than its predecessors. We exist in a media-saturated environment that means that life is quintessentially about symbolisation, about exchanging and receiving – or trying to exchange and resisting reception – messages about us and others. It is acknowledgement of this explosion of signification that many writers conceive of our having entered an information society”. But, no writer attempted to measure this development in quantitative terms but only described our living in a sea of signs, one fuller than at any earlier epoch”. In other words, “we are surrounded by more and more information and less and less meaning”.

It may be observed that reviewing these varying definitions of information society, makes us feel that these definitions are either or both underdeveloped or imprecise. Whether it is a technological, economic, occupational, spatial, or cultural conception, we are left with highly problematical notions of what constitutes, and how to distinguish, an information society. It is essential that we be aware of these difficulties. Though, as a heuristic device, the term information society might have some value in helping us to explore the features

of the contemporary world, it can not be accepted by all '*as a definitive*'. In other words, though one may acknowledge that information plays a vital role in the contemporary society, one has to remain cautious as regards the information society scenarios and in asserting that information has become the chief distinguishing feature of modern times.

13.2.3 Factors Determining the Arrival of Information Society

When we use the phrase information society, we usually mean *society as a whole*. The problem is how to distinguish an information society and know whether it has arrived? For this, we have, but to listen to the commentators and leaders to perceive the signs all around us. The information society is a direct consequence of:

- the data explosion;
- the growing information consciousness and information dependence of society at large; and
- accelerating developments in computing and communication technologies.

However, Cawkell opines that "the pre-requisite for an Information Society is a telecommunication based information service infrastructure, which gradually builds up until at some point a critical mass of terminal users will be connected to a more or less universal network". According to Daniel Bell "the term refers mainly to the social structure of the post-industrial society. It describes the characteristics and the structure of a society of which the driving force will be the production of *information values* and *not material values*. In considering when it will be realised it is necessary to look at the four stages of technological development which have to be achieved:

- Science-based computerisation, where computer is used extensively in national-scale projects;
- Management-based computerisation in both government and business;
- Society-based computerisation in which computer will be used for the benefit of the society as a whole
- Individual-based computerisation where each individual will have access to the terminal and computer information to solve problems, creativity will flourish in this high mass knowledge creation society.

In other words, the most advanced stage of information society appears to be high mass knowledge creation society. From the above discussion, it may be inferred that a high degree of computerisation, large volumes of electronic data processing and employment of information technology with telecommunication-based information infrastructure are considered to be the main criteria, which signifies whether a society or a nation has entered into Information Society or not. It is also stressed that "*an Information Society is one in which the use of information is central to social development and organisational management. Strictly speaking the absence or presence of a high degree of automation is not the determining criterion, though in practice there tends to be a strong positive correlation between the amount of information in use and the degree of technology penetration.*"

Self Check Exercise

- 1) Identify the essence of an 'Information Society' as can be gleaned from the conceptual analysis.

Note : i) Write your answer in the space given below.

- ii) Check your answer with the answers given at the end of the Unit.

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13.3 ECONOMIC STRUCTURE AND INFORMATION SOCIETY

For nearly three decades, the popular theme in social sciences has been that technologically advanced economies are in the process of moving beyond industrial capitalism to *information-based economies* that will bring profound changes in the form and structure of economic system.

The growing awareness that information behaves as an active economic resource, like capital, plant, or human resources, has focussed attention on shifts in occupational activity within developed nations. The state of information in economy has pervasive effects on the working of the economy generally. It has intensified impacts on those sectors that provide information products or services, such as press, television, radio, film, mail, libraries, banks, and other information providers. The establishment of information markets brings about changing conceptions of public and private information as well as the property rights associated with marketable information.

13.3.1 Measurement of Economic Value of Information

In 1983, Jonscher examined the causes of growth of information sector. He argued that the increased complexity of the production process and the increased output from it, required rapid growth of information sector. The number of information workers grew much more rapidly than the number of production workers.

Attempts to measure the information sector in terms of economic value were made by a few economists like Matchlup (1962) and Porat (1977). Matchlup estimated that in the U.S.A. 136.436 billion dollars or 29% of U.S. Gross National Product (GNP) was spent on knowledge production, processing and distribution. He also found that 29% of adjusted GNP consisted of the output of the knowledge industries. Matchlup estimated that knowledge production has been increasing at an annual rate of 8.8 to 10.6 percent more than thrice the rate of production of other goods and services.

Marc Porat attempted to break down the National Income Accounts for the year 1967 in order to observe that portions may be attributed directly or indirectly to information activities. In doing this he used three measures to

compute the GNP. One is *final demand*, which estimates the intermediate transactions that would add up double counting; the second is *value added* which is the actual value added by a specific industry or component of an industry to the product; and the third is the *income or compensation* received by those who create these goods and services. Porat's conclusion was that in 1967, 21.1 percent of the USA's GNP originated with the production, processing and distribution of information goods and services sold in the markets. In addition, the purely informational requirements of planning, coordinating and managing the rest of the economy generated 21.1 percent of GNP. These information activities engaged more than 46 percent of work-force, which earned over 53 percent of all labour income.

13.3.2 Information Economy

Researchers seem to indicate that the information economy can be defined as *the total value occurring from information activities through the production, processing and distribution of information goods and services that are sold by markets* and consumed internally by organisations. A research perspective that places its focus on the information economy as the primary attribute of the information society has both *conceptual appeal* and *empirical support*. Examining the economic structure alone provides only a limited view of the social and cultural implications associated with "Information Societies". More over, the concept and methods employed by these researchers has received substantial criticism. For example, several critics contend that Porat's classification of information workers is far too broad-based to be meaningful, and does little to suggest social implications of the shift to an "Information Society". We have discussed the significance of Machlup and Porat's seminal analyses in the section relating to the economic perception of Information Society.

In concluding this section it may be emphasised that "the contribution of information to successful economic functioning is beyond question, but that is not quite the same as saying that information has become the primary output of developed economies. We are moving towards information based economies, but are a long way from being wholly dependent on the production, sale and exportation of information goods and services for the preservation of our economic well being'[Cronin]. At the same time, we must remember that we are about to embark on a new economic order – the knowledge based economies, playing by a new set of rules.

Self Check Exercise

- 2) Tabulate the different definitions given for an Information Society by different authors cited in this section. Bring out the similarities and differences in their approach.
- 3) State the attributes of information society.

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of the Unit.

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13.4 IMPACT OF INFORMATION SOCIETY ON INFORMATION PROFESSION

The information profession is the body of people engaged in the generation, collection, codification, storage, retrieval, manipulation, management, dissemination, packaging, evaluation and marketing of information. The primary function of the information profession is to ensure that society will have the information it needs to function. This information should be available to all, to guarantee an equitable distribution of power and the autonomy of individuals.

Perhaps nowhere else, the impact of Information Society more acutely felt than in the information profession. Until recently, the profession's strength came from the fact that it is operated as society's institutionalised information retailer. The universal non-availability of information allowed the profession to play a useful role at *societal*, *organisational*, and *individual* levels. In many cases, access to information *was and is via* designated institutions, such as information centres and/or libraries. This pattern has begun to change as a result of fast developments in computing and communication technologies. Technology appears capable of deinstitutionalising information and handing over access to individuals, thus *cracking the mould of the library*. This situation led to what is known as "*information business*". As a result the new information-related industries commonly referred to as *Quaternary industries* came into being. An idea of the work-force employed in these industries could be obtained from studies conducted by Marc Porat and others.

The many challenges facing the information profession in information society can be divided into two main categories:

- technological absorption and determinism; and
- social, cultural and educational mission.

Self Check Exercise

4) What are the economic implications of the information society?

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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13.4.1 Technological Absorption and Determinism

Technological absorption and determinism refer to the tendency to assume that the shape of the things to come will be inexorably conditioned by the pace of the technological innovation. The *fundamentalists' view* is that the rate of development in computer and communication technology will soon make the traditional librarian / information worker *obsolete*. The most important action that the members of the profession need to take now is to ensure the human face of technology, and to give their profession *the value, form, status and identity* it needs to meet the challenge asserting that human beings come *first*, and technology comes *second*. In other words, whenever a new technology is introduced into the society, there must be *a counter balancing* human response. In fact, this has to surface in a greater measure to avert the misuse of technology.

13.4.2 Social, Cultural and Educational Mission

The societal role of the information profession in Information Society is being challenged. How can the profession meet this challenge? What should be its strategy? One of the important roles that the profession might take up is to aid a massive expansion of *updated education system* to provide new, mainly information skills, which will be useful in a smooth transition from an industrial to information economy. That is to shift the labour from manufacturing to knowledge industries.

In today's information society, the citizens might face a variety of challenges to make the most of their role in the knowledge economy. The role of information as *knowledge capital* means that there is a danger of inappropriate commercialisation of information, which can militate against the *optimal social use* of this resource. Also, low levels of *information literacy* can exclude the individual from full membership of and participation in the Information Society. Information professionals are in a prime position to address these problems.

In Information Society, it is stated that information and communications technologies are of increasing importance in many aspects of our lives, and the *ability to access* and to comprehend information are *valuable skills*. Particularly the growth of Internet and the *World Wide Web* is a significant feature of the information society. It acts as a *microcosm* of information society trends, influences, and issues. Its main purpose as a medium of electronic communication was appropriated by various interest groups, personal, professional, community, government and business. The potential of the web seemed limitless and many *Utopian Information Society visions* seem to have grown from this sense of raw potentiality. However, the commercial sector has been quick to harness the potential of the medium. This resulted in commercialisation of information. The information seeker is forced to enter into a *Faustian bargain with information provider*.

In other words, to access the required information, the information seeker must handover his / her personal details which might be misused. Also, the ubiquitous use of the Internet in study and work creates new areas of concern to information professionals. The proliferation of content across many areas namely the *sheer volume of information* creates *information anxiety* in the minds of information seekers. This bewilderment is doubled when the user encounters large arrays

of electronic sources of information. Of course, for the user the use and the immediacy of retrieval becomes as important as the quality of the resource retrieved. This poses most significant challenge to the information profession in the information society, *to map and signpost the information landscape*. This has been traditionally the responsibility of the librarian and whilst the information domain is changing the core principles of the profession remain *as important to the society*. Therefore, there is a need for information mediation and user empowerment.

13.4.3 Information Mediation and User Empowerment

There are different ways in which the information profession may carry out the process of mediation. One way is creating databases and systems which use technology *to assist the user in searching*, for example, by providing appropriate *metadata* for electronic resources to ensure that they are retrievable, or by using technology to group information of different types and different locations.

Despite advances in technology, this mediating role seems important. Machines cannot understand the semantic complexities and subtleties of language which may be vitally important in retrieving appropriate resources, therefore, humans have to play a significant role in this process. Alternately, the information profession can mediate by providing access to resources which are *free of a commercial hook*. The mediation role in this context involves carrying out financial negotiations with publishers and other electronic information providers, and in ensuring that appropriate technology *is in place* to allow seamless access to resources.

One more area in which the process of mediation would be required is working towards the use of agreed upon standards in content and information formats for the digital environment. There is growing *digital divide* between the information rich (with access to technology, information networks and appropriate skills to manipulate them) and the information poor (locked out of the digital environment through lack of skills and access points). This divide exists at local, regional and international levels. At all levels, this divide becomes more and more significant as the ability to manipulate information becomes increasingly important in an economic context. As the government and other public sector organisations race to deliver services online, there is a danger of increased social exclusion unless there are agents operating within communities who can offer not only access to the digital environment but also the skill in information literacy required to benefit from them. The information profession can contribute some sort of solution to this problem: that is "the information and library community can challenge the inequalities, injustices and chaos of post modern capitalism by building new path ways to knowledge based on values of social justice, universal literacy and the right to know." [Muddiman, 2003].

13.4.4 Information Literacy and IT Literacy

One of the steps towards Information literacy and IT literacy is to understand the difference between *information skills* and *technical skills*. Information skills are the skills required to *evaluate the quality and relevance of information on*

the other hand, technical skills are those *skills required to work with the computer and access electronic information resources*. In a knowledge economy both sets of skills are essential. Acquisition of one skill does not guarantee the acquisition of the other. Perhaps, in some sense, due to a *pervasive utopian vision* of technology as a symbol of social progress, information obtained through a computer seems to acquire validity simply from the medium of its delivery. As an example of this one may cite the content of chain of e-mails, which is of *dubious informational* value, yet is consumed by some *as if it were* a public statement of the same reliability as a newspaper article.

The speed of communication flows enabled by constant developments in technology demands *information literacy* rather than simply a narrower set of IT skills, in order to process volumes of information that we receive. The role of information mediation is as important now as it ever has been, if we are to avoid becoming “an information-saturated and simultaneously ignorant society, a scenario that would be not only educationally undesirable but also socially disastrous”.

Self Check Exercise

5) Examine the impact of the information society on information profession.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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13.5 INFORMATION SOCIETY: DEVELOPING COUNTRIES

The term information society has been used to describe socio-economic systems that exhibit high employment in information related occupations and a wide diffusion of information technologies.

Many of the developing countries are also starting to show, if only partially, some of the traits of information society. Even so, research on analysis and explanation of this trend among developing countries, is rather scarce. In one such study Katz observes the information work-force in developing countries is driven by the combined impact of three factors:

- the expansion of the government;
- the over supply of educated labour; and
- the managerial complexity.

As per the above observation, expansion of information sector in developing countries is mainly driven by demand function integrated with supply function.

In the following paragraphs let us study the situation prevailing in some of the developing countries.

13.5.1 Brazil

In the group of countries, which are advancing towards the information society Taiwan, Singapore and Brazil merit mention. While Taiwan and Singapore are Asian countries Brazil happens to be Latin (South) American Country.

From the point of view of development, Brazil presents a contrasting picture. Although an educated, well-to-do and predominantly white population is actively involved in the consumption and production of high-tech goods and services, a great portion of the population lives below poverty-line and has no access to basic living conditions, not to mention Information and Communication Technologies (ICT).

Internet statistics highlight such disparity. The Internet Software consortium shows that the *top-level domain name* for Brazil ranked 9th in *host count* in January 2003 with a total number of 2,237,527 hosts which are well above some of the developed countries. On the other hand, the figures for access are considerably less. The United Nations Statistics estimate that 14.3million people were online in Brazil in the year 2002, indicating that only 8.22% of the population were Internet users [ITU estimates].

It may be stated that the socially and economically backward communities are alienated from the benefit of digital revolution. With a view to reducing the magnitude of the *digital gap* and to avoid intensifying the *social gap*, national, regional and local governments are proposing and implementing projects for '*digital inclusion*' of the less favoured communities. In the year 1999, the *Brazilian Information Society Program*, sponsored by the Ministry of Science and Technology was launched. The Program envisages the following:

- "construction of more just society, where principles and goals are observed for the preservation of Brazilian cultural identity, based on wealth of diversity;
- sustainability of standard of development that respects differences and pursues regional equality; and
- effective participation of society, the corner stone of political democracy".

All this is to be achieved through actions for integrating, coordinating and fostering in the use of ICT. However, not many concrete steps were taken towards the *implementation of the Information Society* in Brazil. It was left to the Ministry of Science and Technology which took office in Jan.2003, to take steps towards the reorganisation of '*digital inclusion programs*'. 'Digital Inclusion' is not only about access to ICT, although ICT happens to be an important concern. 'Digital Inclusion' is about skills necessary to communicate and collaborate with other people over the network in order to make sense of the World around and possess the knowledge generated in the process. The document produced by the participants of the International Workshop on 'Digital Inclusion' in its preamble states:

- "to all the population should be guaranteed the *right of access to digital World*, both in its technical / physical extent (sensitisation, contact and basic use) and in its intellectual extent (education, training, generation of knowledge, participation and creation)".

Telecentre Concept

In Latin America, an important movement has been promoting ways of applying ICT in the region. *Somos@Telecentros* is a regional network whose objective is to strengthen the *digital inclusion initiatives* in Latin America. In a recent document that reports the *state-of-the-art* of telecentres in the region, the network supplies a definition for *telecentre*. This definition encompasses the community aspect in addition to considering the economic marginalisation of the communities and the power of the technology to reduce the *digital divide*. Delagadillo (2000) defines it as “a space where people have access to make use of ICTs as means to impact the development of their communities, improving the quality of their lives and influencing public policies in telecommunication access. Telecentres are places that offer public access to the Internet and try to accelerate this process to reach people that do not have resources to buy a telephone line or a personal computer. Facilitating access to the Internet is sought to reduce the enormous technological gap of many third-world countries”.

In case of Brazil the understanding is that a *telecentre* should provide more than just training, which is often the *first and main activity*. A definition for telecentre proposed by the International Workshop on ‘Digital Inclusion’ is that “telecentres are initiatives that make use of ICT, connected to the Internet, to guarantee public and universal access in order to promote acquisition, generation, mining and distribution of knowledge, aiming at facilitating and stimulating community participation”. Knowledge exists when individuals are able to appropriate information and transform it into experience. In order to accomplish it, the individual must be able to find the information needed, *evaluate it and use it effectively*. *Access to and training in, ICT skills are essential* to achieve this goal. However, *unless they develop information skills to the point of becoming information literate*, people may not be able to grasp *anything but data*”.

The government of Brazil is alive to the fact that the idea of access to information via *ICT is a new social right* and undeniably necessary to the *realisation of the citizenship*. Hence, the state has an obligation to develop public policies to accomplish this social right. To fulfil this obligation, it initiated the *community telecentre project*. It is characterised by:

- a bond with a city neighbourhood where the population clearly suffers from the consequences of social exclusion;
- the identification in communities of leadership and a degree of social organisation;
- the community autonomy to decide about the technology applications required and the services offered;
- the responsibility of the community involved to attain sustainability of a telecentre;
- an educational program aimed at empowering telecentre *monitors* to fully exploit the potential of the medium for social inclusion; and
- a management committee representative of the local community, the municipality, and partners.

A community centre includes a *room* in a public and easily accessible place, equipped with 12 microcomputers connected to the Internet, fax and copy machines, printer and scanner. The acquisition and installation of equipment plus the connection charges to the Internet are funded by the municipality. In addition, the local government pays the staff that could consist of an administrative coordinator and a number of *monitors*, all members of local community. The local community is to meet other operational costs. The first community centre has been established in Port Alegre.

One of the problems faced in the implementation of community telecentre is provision of appropriate *monitors* with necessary skills. For this purpose, the partnership of the Federal University of Rio Grande do sul was sought and the Faculty of Library Science and Communications has been entrusted with the task of developing suitable manpower. In fact, training was provided to the first group of *monitors* comprising 20 persons. This program has been ranked by the participants as successful and highly rewarding for allowing the interchange of *academic knowledge* and *practicing knowledge*. However, *evaluation of telecentres project as a whole* has not yet been undertaken by the government.

At the World Summit on Information Society, Brazil succeeded in pushing progressive solutions for the realisation of the Information Society. One of the significant suggestions was that "the construction of an Inclusive Information Society requires the consolidation of *broad and flexible concept* of *intellectual property* that takes into account not only of *the need for protection*, but also, *the imperative of universal access*, so that we avoid condemning the developing countries to backwardness and their population to ignorance." In other words, Brazil advocated development of solutions based on *free software*.

In conclusion, it must be emphasised that Brazil is taking *decisive steps* to ensure that its people will be able to fully participate in the benefits of new technologies. The government has established a *bold and wide-ranging* programme called "Information Society" aimed at putting all Brazilians in touch with new developments in information technology.

13.5.2 India

After achieving independence in 1947, India has embarked on industrialisation. However, the industrialisation has not been accompanied by a structural shift of labour force from the traditional occupational categories. Industrialisation has been grafted on to a society that continues to function to a large extent in its traditional mode. As a result, many occupational roles in services sector that could be contributing to the efficiency and productivity of the primary and secondary sectors have not been created. Also, the significance of information technology (IT) as an important contributor to the achievement of national developmental goals did not receive adequate attention of the government. As a consequence, there has been low level of information consciousness in the people compared to the people of developed countries.

It may be stated that in India, only 10% of the work-force constitute white collar workers, and approximately 60% are farmers. An estimated 65% of the population are illiterate and their lack of education prevents them from widely sharing the benefit of information sector in society. Even so, within the huge

population exceeding over 800million citizens, several million urban educated individuals are there whose life-styles are similar to those of the information workers in developed countries. Information workers in India, while still a small percentage of the population, are steadily growing in numbers and importance. The reason for this is the government's policies towards IT. The use of IT increasingly being seen as a powerful agent for economic development through products and service industries generated directly or indirectly. Also, the government feels that use of IT can help enhance the working of markets and reduce transaction and coordination costs within and across firms and institutions, and this is of particular relevance to developing countries which are characterised by very high transaction costs and slow moving logistics. Further applications involving IT have also been considered a source of productivity gains and quality improvements in areas as varied as agriculture, manufacturing, infrastructure, public administration and services such as finance, trade, distribution, marketing, education and health. In other words, IT has become a critical infrastructure for competing in an information-intensive global economy.

Government policy has played a significant role in the creation and development of India's IT industry. Policies based on the economic philosophy of import substitution during the seventies and eighties have given way to those aimed at liberalising and globalising the economy in the 1990s. The criticism against India's IT policies is that "in general, policies have tended to ignore IT consumption and diffusion issues as well as the need for domestic orientation in software. To fully exploit the developmental potential inherent in IT, both the government and industry need to pursue strategies that rapidly develop the domestic market for IT and emphasise IT consumption and diffusion, as against mere production or exports." [Harindranath, 1995].

The salient features of developments taking place in Information and Communications Technology (ICT) sector in India are briefly discussed in the following paragraphs of this section.

During the last one decade or so good progress has been made on many dimensions relating to the ICT sector in the country. For example, the IT market as share of GDP (Gross Domestic Product) has increased from 1.22% in 1997 to an estimated 3.15% in 2003. The size of IT market has increased from US \$ 5billion to US \$ 16.4billion over the same period. The success of Indian ICT sector has also enhanced India's export performance. While the software exports accounted for 5% of the country's total exports in 1997, this share has grown to more than 20% in 2003. In other words, the ICT sector has made significant progress in establishing a global reputation for itself.

During the period 1970-1980, the Indian ICT sector thrived by selling its abundant supply of low cost skilled programmers to firms in developed nations. Much of the work was done at customer's sites and the tasks largely involved programming legacy applications. However, during 1990s the focus in the ICT sector shifted to *software quality and project management*. Indian ICT companies invested in creating high quality software processes and in pioneering a model of reliable global delivery. Firms embraced innovating quality techniques such as the *Capability Maturity Model (CMM)*.

The shift from being seen as a low cost provider of routine programming skills

to a high quality supplier of advanced applications was really a great shift. Though ICT revenues have fallen globally during 2002-2003, the Indian market indicated a growth of 25% (i.e. the domestic market recorded a 13% and export revenues 30%). Much of this growth has been attributed to the increase in the export of IT-enabled services such as *Business Process Outsourcing (BPO)*. *Business pressures for increased productivity are facing global firms to outsource many of their business processes* and India has benefited from this ongoing shift. At the same time Indian firms are engaging with customers in more complex projects and are in many cases moving up the *value chain* by Providing IT consulting and *value-adding domain knowledge*.

The development of Indian ICT sector is unbalanced across major lines IT services. From a global perspective "India has a significant presence in only two of the ten major IT services – *custom application development* and *outsourcing*. In 2001, India had a global market share of around 14-16% in these two service lines account for only around 10% Of the global IT services market. In other major IT services lines, such as *system integration* (accounts for 22% of the global services market), IT outsourcing (18%), packaged software installations and support (13%) and hardware support and installation (13%), the Indian market share is less than 1 %' (NASSCOM Strategic Review, 2003, p.34).

It must be mentioned here that while most leading Indian ICT companies are poised for rapid growth, few have invested in creating their own intellectual property (IP). The revenue potential of native IP is usually illustrated by comparing the revenues / employee. Microsoft (approximately US \$ 560,000) and Infosys (approximately US \$ 59,000). In the absence of home-grown IP, the fundamental business model of revenue growth remains the function of the total number of employees. Given the growth targets set by NASSCOM (US \$ 77billion in revenues by 2008) the Indian ICT sector *will face a short fall of more than 250,000 knowledge workers in five years' time*. Tight labour markets will accentuate the annual increase in the ICT employee salaries and decrease the competitiveness and margins of Indian firms.

It is of interest to note that the domestic investment in ICT has been stunted. India currently spends a small fraction of its GDP on IT- about 1.1% when compared to US which spends about 5% of its GDP on IT. As per NASSCOM estimates, it was mentioned that the domestic software market might decline to around 13% in 2002-2003 from about 18% of the previous year. Other interesting points that emerge are: in India, the penetration of PCs (9 per 1000) and the Internet (about 16.5million subscribers) is very low even when compared with the other developing nations such as China (PCs 36 per 1000 and Internet users 68million). One of the reasons for this appears to be the high hardware costs. It is stated that India has one of the highest tariffs rates for PCs. It is interesting to note that while it would take about *12 days of per capita income* to buy a PC in USA; it would take four months per capita income in China, and two years worth of per capita income to buy a similar PC in India! The low level of PC and Internet penetration in Indian society combined with low investments in domestic ICT by Indian companies has retarded the growth of electronic commerce in India.

The authors of “India’s Information Revolution”, Singhal and Rogers having analysed and interpreted the factors leading to information revolution observe that “whether the information workers will ever out number farmers and other industrial workers is a problematic, as it will depend on government policies, world-wide competition in microelectronics and other unpredictable factors... as India moves towards becoming an Information Society”. On the face of it, this observation may sound to be a tall claim, but, on closer examination of India’s ICT base, and the progress it has made during the last decade, it may not far from truth to believe that india is on its way to becoming an information conscious society and Indian Economy might exhibit some traits of *information based economies*, at least by the second decade of 21st century.

Self Check Exercise

- 6) Briefly describe the traits of the Information Society as reflected in the developing countries like India.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

13.6 INFORMATION SOCIETY AND PUBLIC POLICY

The claim that we are entering the Information Society has some important policy implications. If that claim is mistaken or incorrect, it is surely the task of social analysts to draw attention to this and to suggest modifications or alternatives.

In his book ‘*Social Science and Public Policy*’, (1976), *Martin Rein* observes that *Social Science* is a form of ‘story telling’ dependent upon analogy, metaphor, and so on. The ‘Information Society’ concept is part of such story. It depends up on analogy (with the familiar image of industrial society) and metaphor (social activities being predominantly bound up with information and its technological objects like computers). However, in this story what is observable appears as more or less inevitable trends which are also desirable.

The validity of the received ‘Information Society Story’ has been tested in several ways and found wanting. Nonetheless, as problematic which alerts us to crucial social trends (and may be transformations) it may still have a significant policy related role. This aspect is clearly revealed from the following actions of different governments. The British Department of Trade and Industry, for instance, uses a booklet entitled ‘*Information Technology : The Age of Electronic Information*’ to encourage firms in their use of microelectronic –

based technologies. It will, they say 'revolutionise' the handling, 'storing and processing of information'. It will also transform our way of living.

This conviction about the social transformation is at the back of the other policy background documents as well. The Science Council of Canada produced a report for the Ministry of Supply for Science and Technology, entitled "*Planning Now for Information Society: Tomorrow is too late*", (1982). More recently the same body issued "*The Uneasy Eighties : The Transition to an Information Society*", [Cordell, 1985]. Microelectronics advances are causing a world wide technological revolution which all societies must accommodate; [Science Council of Canada, 1982, p.10]. In Canada's case the ability to make a successful transition to an efficient, integrated Information Society depends on the strength of telecommunications infrastructure.

Many similar reports (including the Canadian) quote the well known French study by Simon Nora and Alain Mins "The Computerisation of Society", (1980). Interestingly, this report, while stressing the revolutionary nature of new technologies, along with their social and political impacts, also calls for a more cautious and measured approach: 'In order to make the Information Society possible, it is not only necessary to have knowledge but also to have time. The reciprocal learning process of the disciplines and aspirations takes place slowly...' [Nora and Minz, 1980].

Japan was probably the first to use the term Information Society in the context of technological change and policy formulation. In the 1970's several commentators wrote about Johoka (Information Society) as the social equivalent of biological evolution. Yoneji Masuda wrote '*The Plan for Information Society : A National Goal towards the Year 2000*' and many of the ideas / it contains have been adopted by the Ministry of International Trade and Industry (MITI) in Japan. Masuda sees his work on Information Society as both an analysis of what is happening, and a 'blue print' for policy information.

As a conclusion to this section it may be stated that a number of different observers – analysts and policy makers – insist that the diffusion of information technologies will bring about an Information Society. The production, processing and distribution of information is becoming a central activity of the society. Thus, it is not surprising to hear the claim that 'the concept of the Information Society' proposed in the works of such American writers as Machlup, Bell and Porat is providing the foundation for a new paradigm for policy research and analysis [Edgar and Rahim, 1983].

Self Check Exercise

7) State the policy implications of an information society.

Note: i) Write your answer in the space given below.

ii) Check your answer with the answers given at the end of the Unit.

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13.7 SUMMARY

From the detailed discussion contained in this Unit of Information Society, we can draw some general conclusions. Though many scholars agree that we are in the process of transformation to an 'Information Society', there appears too little consensus on the inherent nature of such society. The writings certainly reveal some dimensions of 'Information Society'. The degree of emphasis given to these dimensions, the context in which they are used, and values given to them may differ. It is unlikely that any single perceptive of 'Information Society' may accurately represent the many manifestations to be found in the advanced nations of the World, which are *alluded to as Information Societies*. However, the following aspects may be considered:

- The 'Information Society' theory emerged as a *social forecast* or as a *model of social possibilities* and that these have *somehow been translated* into *views of reality* and *perceptions of actual societies*, measured against conditions in the real world.
- Most of the authors who have written about the Information Society, have projected *the growth of service sector* in the industrial nations and the decline of employment in manufacturing, highlighting the fact that the dominant characteristic of an 'Information Society' is *its nature of economy*, which is rapidly transforming from an industrial based economy to an information based economy. It may, however, be stated that economic structure alone provides only a limited view of the social and cultural implications.
- A second perspective of *Information Societies* that emerges out of the literature is concerned with the consumption of information goods and services rather than their production. This research perspective is primarily concerned with the *behavioural patterns of consumption of information goods and services*.
- The third perspective emphasises diffusion of Information and Communications Technologies (ICT) *as the defining characteristic of an Information Society*. In other words, this approach emphasises the technological infrastructure almost to the exclusion of other social, economic and political attributes.
- Some authors recognise that technologies are a political and cultural product and that their implementation and use *will serve the interests of those in power*. The Information Society in the view of these authors, is characterised by *economic and information inequities, unemployment among masses, deskilling of jobs to weaken the power of workers and domination of governments by large multinational organisations*.
- 'Bangemann Report' pictures a particular perception of Information Society – an *information market-based society* in which the competitive survive and the consumer pays, if one is unable to pay or to operate effectively with in the system, then *social Darwinism takes its course* and one joins the *underclass*.
- In the final analysis, acceptance of the idea of society as Information Society is still largely *a matter of faith, or at least of perception*. Proponents

of the concept appear to have taken the *sheer volume information* in circulation and its undoubted worth in economic terms, as evidence of Information Society. Hence, says Webster, “we have an assessment of information in *non-social terms* – *it just is* – but we must adjust to the social consequences. Therefore, if we are to understand the nature of Information Society and what makes it different from previous social systems, we need a much deeper understanding of the *qualitative dimensions of information*. We also need the *ability to recognise Information Society when we see it!* For the foreseeable future therefore, it seems advisable to treat the Information Society *as a concept* rather than *an actuality*. It serves a useful purpose both by helping us focus attention on the nature of *social change* and *as a device* by which change can be assessed. It remains on the horizon, rather *more idea* than *entity* but with these qualifications, it is none – the less valuable for all that”.

In conclusion, the idea of Society as ‘Information Society’ continues to exercise certain amount of appeal. It somehow captures *the feel of modernity* and of society *moving along exciting technological trajectories* which are freeing mankind from the tyranny of *time and distance!*

13.8 ANSWERS TO SELF CHECK EXERCISES

- 1) A number of scholars, scientists and philosophers have been predicting a revolutionary transformation of modern industrial society. Many causes have been identified and attributed as forming the driving force behind such a transformation. However, most people opine that “information” is the defining feature of modern world. We are told that we have entered an information age and are rapidly moving towards “global information economy”. Many writers identify an entirely new phenomenon called Information Societies – the examples of which are found in the United States, Britain, Japan and Germany.

“Information Society” is a concept which sees the transition of an Industrialized Society into one in which information – in its broadest and most diverse forms – is the key driving force.

Two major factors underline the Information Society claims. Firstly, that the society is becoming increasingly centered on information handling, processing, storage and dissemination using micro – electronics – based technologies, made available through the convergence of computer with telecommunications, namely ICT. And secondly, that this shift is reflected in an emerging occupational structure, in which the category of “information workers” has become predominant. In other words, the Information Society appears as an out come of technological and economic changes.

- 2) Different definitions of information society and their approaches:

Blaise Cronin

- Labour has been intellectualised

Martin

- Represents societies at an advanced post-industrial stage

Manfred Kochen

- Information rather than material flows constitute most of its communication and control exchanges;

- to earn one's daily bread by the sweat of one's brow sounds anachronistic;
- started as a social construct and became a feature of the futurologists and now gained respectability from economic and political analysts.
- Information consistently reflects basic societal invariants;
- reason and human values rather than strength and expediency manage conflicts;
- high degree of computerisation, large volumes of electronic data transmission;
- an economic profile heavily influenced by market and employment possibilities of IT.
- a stage in the evolution of community brains towards a world brain.

3) Attributes of an information society are:

- i) shift from an industrial economy to an information economy.
That is to say that in industrial economy *capital* is the strategic resource, while in Information Economy information becomes the strategic resource;
- ii) a telecommunication based information service infrastructure;
- iii) a high degree computerization, large volumes of electronic data transmission and employment of IT;
- iv) characterised by the fact that the rapid and convenient delivery of needed information is the ordinary state of affairs.

4) Economic Implications of information society are:

Information Society might be characterised by different dimensions. One of these relates to the economic structure. We come across several references in literature of the economic implications of the Information Society.

The state of information in the economy has pervasive effects on the working of the economy generally. It has great impacts on those sectors that provide information products and services such as press, television, radio, film libraries and other information providers.

Matchlup initiated studies analyzing the growth of "knowledge Sector" in the US economy. The knowledge industry included such areas as the educational system, the media, and other communication activities, libraries and other information activities and research institutions. Machlup's finding was that the contribution of this sector to the Gross National Product (GNP) was 40% for early 1960s and is growing at a rate which is higher than the industrial sector.

Marc Porat, who continued the research in this direction, enlarged the scope of information work to include all the jobs falling within the information or knowledge sector as defined by Matchlup. According to Porat information activities included all resources consumed in producing, processing and distributing information goods and services. Porat estimated that these activities amounted for 45 % of the GNP in 1967.

In conclusion, it may be emphasized that the contribution of information to successful economic function is beyond doubt. However, it is not quite the same as saying that information has become a primary output of all developed economies. We may say that we are moving towards Information – based Economies, but not wholly dependent on the production, sale and exportation of information goods and services for the preservation of our economic well being.

- 5) The information profession is the body of people engaged in the generation, collection, codification, storage, retrieval, manipulation, management, dissemination, packaging, evaluation and marketing of information. The primary function of the information profession is to ensure that society will have the information it needs to function. This information should be available to all, to guarantee an equitable distribution of power and the autonomy of individuals.

Perhaps nowhere else, the impact of Information Society more acutely felt than in the information profession. Until recently, the profession's strength came from the fact that it is operated as society's institutionalised information retailer. The universal non-availability of information allowed the profession to play a useful role at *societal, organisational, and individual* levels. In many cases, access to information *was and is via* designated institutions, such as information centres and/or libraries. This pattern has begun to change as a result of fast developments in computing and communication technologies. Technology appears capable of deinstitutionalising information and handing over access to individuals, thus *cracking the mould of the library*. It is also being stated that the rate of development in ICT might make the information workers obsolete. The social role of information profession in the Information Society is thus being challenged. In view of such challenges, the information profession has to reformulate its strategies and programmes giving *value, form, status and identity* to the profession. One of the important roles that the profession might take up to aid a massive expansion of *updated education system* to provide *new information skills*, which will be useful in a smooth transition of the society from an industrial to information economy. That is provision of skill-oriented education enabling the labour to shift from manufacturing to knowledge industries.

In today's Information Society, the citizens might face a variety of challenges to make the most of their role in the *knowledge economy*. The role of information as *knowledge capital* means that there is a danger of inappropriate commercialisation of information, which can militate against the *optimal social use* of this resource. Also, low levels of *information literacy* can exclude the individual from full membership of and participation in the Information Society. Information professionals must address these problems. In Information Society, it is stated that information and communications technologies (ICT) are of increasing importance in many aspects of our lives, and the *ability to access and to comprehend information* are *valuable skills*. The growth of Internet and its use by many people in study and work creates new areas of concern to information professionals. The proliferation of content across many areas, namely *the sheer volume of information* creates *information anxiety* in the minds of

information seekers. This bewilderment is doubled when the user encounters large arrays of electronic sources of information. For the user, *the use and the immediacy of retrieval becomes as important as the quality of resource retrieved*. This poses most significant challenge to the information profession in the Information Society, *to map and signpost the information landscape*.

To overcome the above mentioned problems, and to help the information seekers, the information profession must engage itself in *Information Mediation and User Empowerment*. There are different ways in which the profession may carry out the process of mediation. One way is *creating databases and systems that use technology to assist the user* in searching, for example, for providing appropriate *metadata* for electronic resources to ensure that they are retrievable, or by using technology to group information of *different types and different locations*.

The second type of activity that the information profession might engage in is *Information Literacy and IT Literacy*. In fact, this involves distinguishing between *information skills* and *technical skills*. Information skills are the skills required to *evaluate the quality and relevance of information*, on the other hand, *technical skills are those skills required to work with computer and access electronic information resources*. In a knowledge economy, both sets of skills are essential. The information profession should not only specialise in these skills and also impart these to people at large.

In conclusion, it may be emphasised that the above discussed aspects are *the impact of the Information Society* on the information profession.

- 6) The term Information Society has been used to describe socio-economic systems that exhibit high employment in information related occupations and wide diffusion of information and communication technologies (ICT).

Many of the developing countries are starting to show partially some of the traits of the Information Society. Let us briefly discuss the situation obtained in developing nations like India.

India

Though India has embarked on industrialisation after its independence in 1947, the industrialisation has not been accompanied by a structural shift of labour force from the traditional occupational categories. Also, the significance of IT as an important contributor to the achievement of national developmental goals did not receive adequate attention of the government in the beginning. As result, there has been low level information consciousness in the people of the country compared to the developed countries.

But in recent years, the government realised the fact that *IT has become a critical infrastructure for competing in an information-intensive global economy*. In fact the government has adopted a proactive policy, which played a major role in the creation and development of IT industry in India. During the last decade or so good progress has been made on many dimensions relating to ICT sector in the country. The IT market share of GDP (Gross Domestic Product) has increased and the ICT sector made

significant progress in establishing a global reputation for itself. Even though, the information sector in India forms a small portion of the total work-force, it is steadily growing in importance, and started to contribute to the growth of GDP in a small measure. It must be mentioned that the IT policies of the country tended to ignore IT consumption and diffusion issues as well as the need for domestic orientation in software. To fully exploit the development potential inherent in IT, both the government and the industry need to pursue strategies that rapidly develop the domestic market for IT and emphasise IT consumption and diffusion, as against mere production or exports.

When this happens, the IT infrastructure will certainly improve and the employment in information related occupations will record an upward rise. This will surely pave the way to the transition of Indian Society towards the Information Society. These developments are the indicators or traits of India moving though partially, towards the achievement of information-based economy.

- 7) Despite various national and cultural variations, the idea that the advanced societies are entering a new phase of history is a common theme of economic and political discourse. The concept of Information Society is intended to evoke a new image, contrasting with the old image of industrial society.

There are many hints in policy of out comes this revolution is expected to bring forth. The validity of Information Society has been tested in many ways and has been found wanting. However, as a problematic which alerts us to crucial social trends, it may have a significant policy related role. This aspect is clearly revealed from the actions of different governments. The British Department of Trade and Industry, for instance, uses a booklet entitled '*Information Technology : The Age of Electronic Information to Encourage Firms in their Use of Microelectronics-based Technologies.*' "It will, they say, revolutionise the handling, storing and processing of information. It will also transform our way of living."

The conviction about social information is at the back of other policy background documents as well. The Science Council of Canada produced a report of the Ministry of Supply which advocates the use of microelectronics, and emphasises the significance of the strength of telecommunications infrastructure in transforming Canadian Society into an Information Society.

The well-known French study by Nora and Minz, while stressing the revolutionary nature of the new technologies along with their social and political impacts, also calls for a more cautious approach. In order to make the Information Society possible, the report maintains that it is necessary to have knowledge but also to have time. Japan was probably the first to use the term Information Society in the context of technological change and policy formulation. '*The Plan for Information Society : A National Goal towards the Year 2000*' by Masuda has been adopted by the Ministry of International Trade and Industry (MITI) in Japan. Masuda sees his work on Information Society as both an analysis of what is happening, and a 'blue print' for policy information.

Thus, it is not surprising to hear the claim that ‘the concept of the Information Society’ proposed in the works of such American writers as Machlup, Bell and Porat is providing the foundation for a new paradigm for policy research and analysis.

13.9 KEYWORDS

- Information Economy** : The total value of accruing from information activities through the production, processing and distribution of goods and services that are sold by markets and consumed internally by organisations, is defined as Information Economy. Advanced countries are evolving as information economies in which information is the key factor in the economic growth of the nation. The major components of such an economy are: i) information work-force; ii) information goods and services; iii) emergence of Information Industry and markets; and information infra structure.
- Information Profession** : The Information Profession is the body of people engaged in the generation, collection, codification, storage, retrieval, manipulation, management, dissemination, pack-aging, evaluation and marketing of information. OECD categorised information professionals as: i) information producers; ii) information processors; iii) information distributors; and information infrastructure.
- Information Ratio** : Based on the work of Machlup and Emaseo, the Japanese initiated a series of studies attempting to measure the degree of **Johoka** in Japanese Society. One of the indices developed for this purpose by RITE was Information Ratio; which was defined as the ratio of household expenditures for various information-related activities to total household expenditure.
- Information Work-force** : The term Information work-force has acquired a wider connotation and includes many groups who are involved in a variety of information-related occupations. The OECD categorisation includes: Information producers, Information processors, Information distributors and

Information Infrastructure occupations under this category, while Marc Porat defined three sub-sectors of the work-force as: i) Workers whose final product is information; ii) Workers whose main activity is informational in nature:

- Information creators;
- Information transmitters;
- Information processors; iii) Workers who operate Information Technologies. Generally the OECD categorization is considered more helpful and acceptable in professional parlance.

Post-industrial Society

- : The concept emphasises the centrality of theoretical knowledge as the axis around which new technology, economic growth and the ramification of the society will be organised. Empirically, one can try to show that this axial principle is becoming more and more predominant in advanced industrial societies. In the writings of Masuda, Stonier and Naisbitt we come across a dreamy picture of a new kind of society, which on the one hand, appeals to empirical analysis and on the other, projects 'good society' imagery. For example, in the US history it was felt that the US would realise through a marriage of nature and machines, an unprecedented solution to the problems of industrialisation... the ideals of decentralised democracy, community participation, an end to hierarchy and class, etc.

13.10 REFERENCES AND FURTHER READING

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