Unit 24
Dimensions of Knowledge Society: Issues of Access and Equity

Contents

Learning Objectives:

This unit will enable you to understand and analyse:

- the emergence of knowledge society in the age of ICT;
- the distinctive features of knowledge society, knowledge economy and knowledge workers;
- skill acquisition and knowledge dissemination in knowledge society;
- dimensions of work participation in knowledge economy; and
- the role of knowledge and ICTs in empowering communities.

24.1 Introduction

Through the units of Block VI we have already seen how the forces of globalisation redefined the economic, social, political, cultural, etc. arena of contemporary human life. Revolutionising developments in Information Technologies (ITs) which occurred during post World War II or more specifically in 1970s and afterwords was an integral part of globalisation process that picked up increased momentum during this period. The rapid interaction and interconnectedness between and among societies created by the current phase of globalisation left Information and Communication Technologies (ICTs) to become dominant in every aspect of social system where technologies of information processing and communication became the core of productivity. Initiation in the processes of information handling, transmission, storage and retrieval become the key to human programmes and development and qualitatively different ways of life. In the emerging society — the information/knowledge society — knowledge and information; and the application of knowledge and information to knowledge generation and information processing/communication became the basic constituents of human progress. It paved the way for the emergence of a global knowledge economy – a networked society with a varied kind of economic and educational requirements and principles of organising the society, its moral values and identity. The World Development Report 1998/99 states that "today's' most technologically advanced economies are truly knowledge based creating millions of knowledge related jobs in an array of disciplines that are emerged overnight" (World Bank, 1999).

The World Employment Report, 2001 predicts that ICTs will have a major impact on the global employment in the future. It is restructuring the global social and economic equation — shifting from income divide to knowledge divide. In the developed countries ICTs have been the drivers of knowledge society.

As evident from the above discussion the information age knowledge becomes the basic form of capital, and the economic growth is driven by the accumulation of knowledge. Here the product with high knowledge component generates higher returns and a higher growth potential. In the knowledge economy, as distinct from peasant and industrial economy where economic wealth was produced by using human manual labour and machines respectively, the process of generation, dissemination and exploitation of knowledge produce economic wealth predominantly. Thus in the emerging knowledge society is one in which productivity is based on acquisition or generation, dissemination and application of knowledge or information. The main objective of this unit is to try and know more about knowledge society or information society. We will also try to trace its emergence and list its characteristics here. How and why the generation, dissemination and application of knowledge become integral part of knowledge society and dimensions of work participation in knowledge society also will be analysed in this unit.

24.2 Technological Transformation and Human Progress

Technological transformation has always played a crucial role in the progression of human societies from one stage to another. This transformation has widely influenced the economic, social, cultural and political institutional arrangements of the society by introducing changes in the nature of work participation in the organisation of production. The transformation of human societies from pre-industrial/agrarian to industrial and then again to post-industrial has widely been shaped by the innovation of new technologies. At the beginning of the 19th century, far-reaching changes in the social and economic lives of mankind were ushered by science, engineering and technology. The changes of that era were marked by the concerted efforts to abolish slavery and large-scale expansion of centralised factory production and the creation of industrial classes — workers and capitalists. This was characterised by production of manufactured goods, and acquisition of new skills required for industrial manufacturing. The latter half of the 20th century witnessed the advent of Information and Communication Technologies (ICTs), which heralds a new phase in the history and the changes brought about by it in the social and economic fabric are effectively unique. During this period there was a phenomenal expansion of computer communication, electronic technology and service economy (Bell 1976).

Table 24.1 Economic Indicators of Some selected Countries

Country	Popu lation Below line	Income share in %		GDP in %					
		Lowest 20 %	Highest 20%	Agricultural		Industries		Service	
				1990	2003	1990	2003	1990	2003
Australia	–	5.9	41.3	3	4	29	26	67	71
Canada	-	7.0	40.4	3	-	33	-	64	-
Netherlands	-	7.3	40.1	4	3	29	26	67	71
U.S.	-	5.4	45.8	2	2	28	23	70	75
U.K.	-	6.1	44.0	2	1	35	26	63	73
China	4.6	4.7	50.0	27	15	42	53	31	32

Sri Lanka	25.0	8.0	42.8	26	20	26	26	48	54
India	28.6	8.9	41.6	31	23	27	26	42	52
Bhutan	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bangladesh	49.8	9.0	41.3	28	22	24	27	48	52
Nepal	42.0	7.6	44.8	52	40	16	21	32	39
Pakistan	32.6	8.8	42.3	26	23	25	23	49	53

Source: World Bank 2005, UNDP 2004

Along the time, change has also been marked in the pattern of work participation. In the wake of industrialisation and rapid urbanisation there has been shift in the pattern of work participation from agricultural to non-agricultural economy not only in the developed but also in the developing parts of the world. However this shift has taken a new turn in the wake of the emergence of the postindustrial society whereby work participation increased in the service economy including those in the telecommunications, transport and marketing. It is significant that till the early decades of the last century a large segment of the workers of the industrialised nations like those of France, United Kingdom, America, Belgium, Japan etc. were in agriculture. Presently though agriculture accommodates substantive proportion of workforce, there has been increasing contribution of service sector to the GDP both in developed and developing countries (see Table 24.1). The blue-collar worker emerged very fast from the last quarter of the 19th century and then growth become very fast till the second half of the 20th century. Indeed the industrial workers grew phenomenally in the first half of this century in factories, mines, and transportation and by 1950s they emerged to be the actual majority of the working population in the industrialised countries. However in last 40 years they have declined equally rapidly first as proportion of the total and since the early 1980s, even in absolute numbers. The emergence of service sector (we will learn more about this in the later part of this unit) as a potential avenue for employment and earning has paved the way for the emergence of knowledge economy both in developing and developed countries. Agricultural wave, industrial wave and information age are the three stages of economic evolution of humanity according to Alvin Toffler. Presently the human society is undergoing the third wave i.e. the information wave, which is markted among others by explosure developments in information technologies and predominance of service employment (Toffler 1980).

Box 24.1: Toffler's First, Second and Third Wave

In his book The Third Wave Toffler describes three types of societies, based on the concept of 'waves' - each wave pushes the older societies and cultures aside.

- First Wave is the society after agrarian revolution and replaced the first hunter-gatherer cultures.
- The main components of the Second Wave society are nuclear family, factory-type education system and the corporation. Toffler writes: "The Second Wave Society is industrial and based on mass production, mass distribution, mass consumption, mass education, mass media, mass recreation, mass entertainment, and weapons of mass destruction. You combine those things with standardisation, centralisation, concentration, and synchronisation, and you wind up with a style of organisation we call bureaucracy."
- Third Wave is the post-industrial society. Toffler would also add that since late 1950s most countries are moving away from a Second Wave Society into what he would call a Third Wave Society. He coined lots of words to describe it and mentions names invented by other people, like the Information Age.

Source: *The Third Wave 1980*

24.3 The Emergence of Information and Knowledge Society

The roots of information society idea are closely associated with the idea of post-industrialism. Although the scientific and industrial predecessors of electronics based information technologies can be found in late 19th and early 20th centuries, it was during the second World War and its aftermath that the major technological break through in electronics took place: the first programmable computer, the transistor, source of microelectronics — the true core of Information Technology Revolution (see Box 24.3) (Castells 1996). Manuel Castells contends that the new information technologies, which include microelectronics, computers, and tele-communications diffused widely in 1970s accelerating their synergistic development and converging into a new paradigm (Ibid).

Box 24.2: Information Technology Revolution

Although the technological inventions such as telephone by Bell in 1876, radio by Marconi in 1898, vacuum tube by De Forest in 1906 were landmark inventions in technological development, major technological brake through leading to a technological revolution in the human history based on electronics based technologies can be said to happened during and after the Second World War. The invention of transistor in 1947 made possible the processing of electronic impulses at a fast pace in binary mode of interruption and amplification, thus enabling the coding of the logic and of communication with and between machines. These processing devices are semiconductors, which are popularly called as chips. A decisive step in microelectronics had taken place with the invention of integrated circuit in 1957. It triggered a technological explosion. The giant leap forward in the diffusion of microelectronics in machine came in 1971 with the invention by an Intel engineer of Silicon valley, Ted Hoff, of microprocessor, that is the computer on a chip. Thus, information processing power could be installed everywhere.

The power of chips is evaluated by a combination of three characteristics: their integration capacity, indicated by the smallest line width in the chip measured in microns (1 micron is equal to 1 millionth of an inch); their memory capacity, measured in bits: thousands (k) and millions (megabits); and the speed of the microprocessor measured in megahertz. The technological advancements of the microprocessors were so fast that while the first microprocessor of 1971 laid in lines of about 6.5 microns the microprocessor of 1999 measured 0.25 microns. Greater miniaturisation, further specialisation and the decreasing price of increasingly powerful chips made it possible to place them in every machine in our everyday life.

The advent of microprocessor in 1971, with the capacity to put a computer on a chip, turned the electronics world and indeed the world itself upside down. The microcomputer or personal computer software also emerged in mid 1980s out of the enthusiasam generated by two Harvard drop-outs, Bill Gates and Paul Allen. Having realised its potential they went onto found Microsoft, today's software giant.

Indeed, to advances in microelectronics and software it has to be added major leaps forward in networking capabilities, which was made possible by major developments booth in tele communications and computer networking technologies during 1970s. during this period tele communications also had been revolutionized by a combination of 'node' technologies (electronic switches and routers) and new linkages (transmission technologies). Major advances in optoelectronics (fibre optics and laser transmission) and digital packet transmission technology dramatically broadened the capacity of transmission lines. Each leap and bound in specific technological field amplifies the effects of related information technologies.

Source: Castells 1996

Manuel Castells (1996) argues that in the new economy emerged around the world as a result of the current phase of globalisation process, productivity and competitiveness is by and large a function of knowledge generation and information processing or informatisation. In the new information age knowledge became the power and the tool for capital accumulation. According to Yoneji Masuda (1981) in the post-industrial, information-based society, knowledge, or the production of information values, will be the driving force of society, rather than industrial technologies (p. 29). Thus in the evolving information age the generation, dissemination and application of knowledge becomes the basis of all aspects of knowledge and hence it is also called as knowledge society.

Reflection and Action 24.1

Do you think the contemporary period is witnessing a technological transformation and a consquent social transformation? Why?

24.4 What is Knowledge/Information Society?

According to Daniel Bell, in information (and knowledge) society science plays an increased role in the productive forces; professional, scientific and technical groups will rise into prominence in addition to the vast expansion of information technology, which include a converging set of technologies in microelectronics, computing (machines and software), telecommunications/broadcasting, and optoelecronics etc. This will be the new axial principle of the economy and society. He forecasts the growth of new social framework based on tele communications which may be decisive for the way knowledge is created and retrieved, and the character of work and occupations people are engaged in. The computer will play a pivotal role. In information society knowledge and information will supplant labour and capital (as in Marxian view) as the central variables of the economy. Here the information will be treated as a commodity and the possession of information will give more power to its owner. There will be more and more penetration of information into more traditional areas of agriculture, manufacturing and services. There will be major social changes resulting from the establishment of new tele-communications infrastructure (Bell 1976). New forms of social interaction based on electronic communications devises are replacing older types of social relations. There is more application of IT to overcome the ecological and environmental problems associated with industrialism as well.

Mannual Castells (1996) prefer to call the emerging society as “informational” society where the process of generation and transformation of information generation has rather become the fundamental sources of productivity and power. To Scott Lash (1999) in the information society the source of power is information. Power in the manufacturing age was attached to property as the mechanical means of production. In the information age it is attached to intellectual property in the form of patent, copyright, and trademark so that they can be valorized to create profit. There is thus commodification of information and no time for reflection. In this society however it is not the commodification that is driving the informationalisation but the informationlisation that is driving commodification. In this age inequality is less defined in terms of the relations of production but more by exclusion.

The society that is emerging is a “knowledge society” one which is characterised by “new structures” of knowledge, methods of dissemination and a technology that permits and sustains “unrestricted” access to knowledge and control over it. Thus in the contemporary phase of human society the proliferation of information technology has led to the emergence of a mass society that produces knowledge and information on a mass scale as the driving force of

economy (Naisbitt 1986:7). Consequently there has been the rise of the category of knowledge workers, who are fast replacing both histories' traditional groups and the groups of industrial society; the group, which is fast becoming the center of gravity of the working population. This group is also becoming the single largest group of the work force in the postindustrial society (Drueker 1994).

The social and economic dynamics of the knowledge society are widely shaped by the new forces of production, influence of the global market and the state. To Antony Giddens (2000) globalisation and knowledge economy are the co-constituents of the global information order and that this economy is populated by an active and reflexive citizenry of wired workers, whose knowledge is the principal source of production and they are non-hierarchical in their work environment.

According to Bob Jessop (2003) knowledge can acquire commodity value after entering the labour market and once it is made artificially scarce and its access depends on payment of rent. Knowledge can be transformed into a fictious commodity by transforming it from a collective resources (intellectual commons) into intellectual property (eg. Patent, copyright etc.) for revenue generation; subsuming of knowledge production under exploitative class relations and by transforming intellectual labour into wage labour for producing knowledge for the market; and bringing intellectual labour under capitalist control through commoditisation and integration into a networked digitized production and a consumption process controlled by the capital. He foresees the possibilities of monopolies in knowledge and information by embedding them in technology, standards or legally entrenching in intellectual property rights.

It is now recoganised that in the wake of present phase of globalisation ICTs have paved the way for the emergence of global knowledge society and economy; a networked society with a varied kind of economic and educational requirements and principles of organising the society, its moral, values and identity. In essence the ICTs have been juxtaposed to the process of restructuring of economic and social institutional arrangements of the knowledge economy of information age locally and globally. ICTs now offer a challenge to the conventional ways of getting information, knowing and disseminating. Thus this cutting edge technology has been linked to the new discourse of development. In this information age knowledge is the basic form of capital and that economic growth is driven by the accumulation of knowledge (cf www.med.gov.nz). There has emerged a symbiotic relationship between knowledge economy and ICTs for releasing the creative potential and knowledge embodied in people and harnessing local-global connectivity, for generation of wealth and to widen the market of this economy (Ibid).

Following are some of the distinctive features of knowledge society:

- The basis of knowledge-based development in the knowledge societies is the generation, dissemination and deployment of knowledge.
- In knowledge society scientific knowledge is considered as an asset and the scientific and technical group will rise into prominence.
- The social network in a knowledge society is based on tele and other communication technologies.
- The creation and retrieval of knowledge plays a decisive role in the organisation of work and occupation. The occupations, which make more and more innovative knowledge, will become predominant in this economy.
- The knowledge/information is treated, as commodity and the possession of knowledge gives more power to the owner.

- In knowledge society inequality is defined in terms of exclusion from knowledge.
- In knowledge society knowledge is transformed from collective recourses (intellectual commons) into intellectual property for revenue generation.
- In knowledge society the conflict is between minority knowledge workers and the majority traditional workers.
- Knowledge society will be far more competitive than the earlier societies, as knowledge will be key competitive factor for career and earning opportunities.
- Knowledge in the knowledge society basically exists in specialised application by specialised experts. The central work force will be the highly specialised people and not the generalists. Here the people who acquire the specialised knowledge will have the ever more scope of mobility. "It demands for the first time in history that people with knowledge take responsibility for making themselves understood by the people who do not have the same knowledge base. It requires that people learn to assimilate into their own work specialised knowledge from other areas and disciplines" (Ibid).

Reflection and Action 24.2

Some of the features of knowledge society are given in this text. Can you pointout some more features

24.5 Knowledge Economy and Knowledge Workers in a Knowledge Society

In knowledge economy economic wealth is predominantly produced by using knowledge. Indeed it is an emerging society whose economic base is widely shaped by the processes of generation, dissemination and exploitation of knowledge. The neo-classical economists have emphasised on labour and capital to be key factors of development. To Paul Romer (1990) knowledge is the third factor of production and long-term growth it is the basic form of capital and that economic growth is driven by its accumulation. (www.med.govt.nz.). Here we may sum up the following features of knowledge economy:

- In knowledge economy knowledge is a public good, as this becomes object of wide use.
- As the knowledge economy is dependent on generation of knowledge for its prosperity here knowledge gained by experience is as important as formal education ad training.
- A knowledge economy is to become a learning economy in order to utilise its full capacity and to take its optimum advantage. "Learning means not only using new technologies to access global knowledge, but also to using them to communicate with others about innovation. In the learning economy individuals, firms and countries will be able to create wealth in proportion to their capacity to learn and share innovation (Foray and Lundvall 1996; Lundvall and Johnson 1994). Formal education, too, needs to become less about passing on information and focus more on leading people how to learn (Ibid). Learning thus becomes a life long process in knowledge economy.
- According to OECD, ICTs are the facilitators of knowledge creation. In the knowledge economy ICTs are the tools for releasing the creative potential and knowledge embodied in people. Wealth generation is becoming more closely tied to the capacity to add value using ICT products and services.

> Mondal (1997) highlights in a study that each job at Microsoft created 6.7 million new jobs in Washington State, whereas a jobs at Boeing created 3.8 million jobs. (Ibid)

In the information age individuals are put in the centre of the knowledge and skills based society. More than ever before, individuals want to master their own lives and expect to contribute to economy and society. The development of individuals as active citizens of society is increasingly given a central place in statements of learning, education and training objectives.

The individual is becoming the architect and builder responsible for developing his/her own skills, supported by public and enterprise investment in life long learning. ICTs are empowering the individual from a passive teacher-oriented approach to gaining knowledge; there is a shift towards learning for life and work, centered around the individual. The need to learn how to access, analyse and exploit information and transform it to new knowledge is increasing and in particular the Internet based technologies, offer great opportunities. The empowered individuals or the knowledge workers take charge of all spheres of society.

Knowledge workers of the knowledge society are distinctively different from those of the agrarian and industrial society workers. They are defined as "symbolic analyst" who manipulates symbols rather than machines. They include architects and bank workers, fashion designers and pharmaceutical researchers, teachers and policy analysts. They are associated primarily in service sector such as telecommunications, transport and financial services (www.med.gov.nz). Knowledge workers systematically accumulate knowledge, share it and deploy it purposefully. Continuously improving the stock of knowledge will be critical for their success. In the knowledge society the knowledge workers are valued very high. For e.g. In many of the American manufacturing companies the intangible assets are now worth more than tangiable assets. These intangible or intellectual assets are based primarily on the skills and capabilities of their so-called knowledge workers.

The distinctive features of the knowledge workers are noted down here.

- The knowledge workers are the leading class of the knowledge society and necessarily the ruling class. They differ fundamentally from the other, groups in history who occupied the leading dominant position in then values, expectations and social position.
- They get access to work and social position in knowledge society through formal education and training.
- Quantity and quality of knowledge work will differ substantially based on the amount and kind of formal knowledge and training required for a particular job.
- As formal education occupies the center stage of the knowledge society, formal schooling emerges to be the key institution. Here the components of knowledge (knowledge mix), quality of learning and teaching not only become central concern of the knowledge society, but also central political issues. "In fact it may not be fanciful to anticipate that the acquisition and distribution of formal knowledge will come to occupy the place in the politics of the knowledge society which acquisition and distribution of property and income have occupied in the age of capitalism" (Ibid).
- It is significant that not necessarily the conventional system of schooling, but the systematic continuing education offered in the place of employment would get importance. Here an educated person will be someone who has learnt how to learn and throughout her/his lifetime,

continues to learn especially in and out of formal education. Thus acquisition of knowledge is not age specific but life long.

- The knowledge workers work in terms and work as employee in an organisation. They are to learn different kinds of terms for different purposes – their performance capacities, strengths, limitations and trade-offs between various kinds of terms. They are also to learn how to switch from kind of team to another and to integrate one self into a team
- Organisations in general provide the platform to the knowledge workers to convert their specialised knowledge into performance. In the organisation the knowledge workers are at times the employee and at time the bosses.
- The knowledge workers also own the tools of production. Unlike the capitalist society, true investment in the knowledge society is the knowledge of the knowledge workers, without knowledge whole production process is unproductive. It is the knowledge investment that determines whether the employee is productive or not, rather than the tools, machines and capital the organisation furnishes (Ibid).

Reflection and Action 24.3

What do you understand by knowledge workes? People working in tourism and sector are knowledge workers. Do you agree with this statement? Why?

The Three Levels of Knowledge Based Development

As we have seen in the foregoing discussions in the information age knowledge has broader meaning. In the past also clever and creative people always used knowledge to design innovative products and services. But in information age instead of knowledge being vested in one or two creative people it will embedded in systems and data bases and made available to all. Here to achieve maximum effectiveness, knowledge must be systematically accumulated, shared and purposefully deployed.

That means knowledge based society is centered on the three process of knowledge accumulation, knowledge dissemination of the accumulated knowledge and application of that knowledge for the productivity of the society. An analysis of this process of knowledge accumulation, dissemination and deployment in terms of skills, infrastructure and experience in relation to knowledge production will enable to assess the dimensions of knowledge society and economy. It is required to take stock of the literacy and higher education levels to examine the skills for knowledge accumulation. The size and growth of the tele and other communication network will echo the infrastructure required for knowledge dissemination and economic structure will reflect the level of application of the knowledge in knowledge based society. Now in the following sections let us examine each of this separtely.

24.6 Skill Acquisition and Training for Work in Knowledge Society

From the preceding sections of this unit we already gathered that the key characteristic of the knowledge economy lies in the belief that wealth (or productivity) is increasingly dependent on the development and application of new knowledge by specialist knowledge workers. It has been increasingly recognised that in knowledge society people's endowment of skills and capabilities and investment in education and training constitute the key to economic and social development. It is not so much physical capital, or human skills (human capital) that determines economic growth. It is the nation's

capability to apply knowledge to knowledge itself that is essential to economic development. Economies are increasingly being built on a foundation of information, learning and adaptation. Here both the quantity of knowledge increases and the production of knowledge accelerates (Scott 1997).

So an important aspect of the emergence of knowledge society is the readiness to acquire new skills. ICT use represents an augmentation of human skills and capabilities. In examining the skills it is vital to develop measures that indicate the state of readiness to enlarge the use of information to develop knowledge. A principal indicator of such readiness is literacy level. Literacy is the first indicator of the attainment of the skills level needed for the productive use of ICT – an imperative of the information age. Here literacy means more than knowing how to read, write or calculate. It involves understanding and being able to use the information required to function effectively in the knowledge-based societies that will dominate the twenty-first century.

Illiteracy is a fundamental barrier to participation in knowledge societies. Vast majority of the illiterate population will be excluded from the emerging knowledge societies. The skill attainment is hierarchical. The hierarchy begins with the attainment of basic literacy. All the work processes in which ICTs can make a contribution to economic growth require basic literacy.

In knowledge societies it is recognised by governments and organisations that knowledge contributes to individual well being, societal and economic growth. This recognition is translated into action when new models for lifelong learning are encouraged. By investing in their human resources enterprises can improve productivity and compete successfully in increasingly integrated world markets. For e.g. in Denmark enterprises that introduced process and product innovation combined with targeted training were more likely to report output growth. Countries with highest incomes are also those where workers are most educated. Studies indicate in high-income countries primary education is universal, secondary education is almost universal and tertiary education is approaching 50% of the relevant age group. In contrast in poor countries (least developed) primary education is around 71.5% secondary education is around 16.4% and tertiary education enrolments a mere 3.2% of the relevant age group.

Even though higher education has always been formally designed as a structure for the production and organisation of advanced knowledge, the emergence of a knowledge economy and the importance of globalisation and ICT place new demands on higher education. Firms that wish to compete in the global economy will have to possess the organisational abilities/knowledge that enable them to maintain or increase their competitive advantage in a turbulent market environment. It implies that for firms there is a need to have and/or train a flexible and versatile workforce. Firms, therefore, will express a continuous demand for courses in which their employees are retrained. In other words, great emphasis has been given to lifelong learning and the realisation of learning society. For the education of students, one of the implications of the knowledge-driven economy is that students will have to be prepared for a labour market in which they could change jobs many times during their working career. This means that students should acquire appropriate skills for this, and this will have to be reflected in the higher education curriculum – in its content, structure, length and mode of delivery. Thus in knowledge society higher education has itself become a tradable product.

The developed countries have a higher access to ICTs than the developing countries. Fast proliferation of ICTs in developing countries is widely due to sustained investment in education, research and development activities. These countries invest an average 2% of their GDP (e.g. US 2.8%, UK and Australia

1.9% each) in research and development, while countries like India do not spend even 0.1% of the GDP for the same purpose (see Table 24.2). Similarly the developed countries have been consistently spending a higher proportion of their public expenditure in higher education. Advanced countries invest at least 30 times more per student in education and training than in the LDCs. However the developing countries started spending more on education than being spend previously. It becomes evident that human resources development and training contributes to improved productivity in the economy, reduces skills mis-matches in the labour market and promotes a country's international competitiveness.

Another important consequence of the acceleration of scientific and technological progress is the diminished emphasis on remembering countless facts and basic data and the growing importance of methodological knowledge and analytical skills — the skills needed for learning to think and to analyse information autonomously. Today, in a number of scientific disciplines, elements of factual knowledge taught in the first year of study may become obsolete before graduation. The learning process now needs to be increasingly based on the capacity to find and access knowledge and to apply it in problem solving. Learning to learn, learning to transform information into new knowledge, and learning to translate new knowledge into applications become more important than memorising specific information. In this new paradigm, primacy is given to analytical skills; that is, to the ability to seek and find information, crystallize issues, formulate testable hypotheses, marshal and evaluate evidence, and solve problems. The new competencies that employers value in the knowledge economy have to do with oral and written communications, teamwork, peer teaching, creativity, envisioning skills, resourcefulness, and the ability to adjust to change.

Lifelong learning: The second dimension of change in education and training needs is the short "shelf life" of knowledge, skills, and occupations and, as a consequence, the growing importance of continuing education and of regular updating of individual capacities and qualifications (Wagner 1999). In OECD countries a lifelong-education model is progressively replacing the traditional approach of studying for a discrete and finite period of time to acquire a first degree after secondary school or to complete graduate education before moving on to professional life. Graduates will be increasingly expected to return periodically to tertiary education institutions to acquire, learn to use, and relearn the knowledge and skills needed throughout their professional lives. This phenomenon goes beyond the narrow notion of a "second chance" for out-of-school young adults who did not have the opportunity to complete much formal study. It has more to do with the updating and upgrading of learning that will be required in order to refresh and enhance individual qualifications and to keep pace with innovations in products and services. The concept of "lifelong learning for all" adopted in 1996 by the OECD ministers of education stems from a new vision of education and training policies as supporting knowledge-based development. Lifelong-learning requirements may lead to a progressive blurring between initial and continuing studies.

Reflection and Action 24.4

What is the signifacance of life long learning in knowledge societies?

Table 24.2: Levels of Literacy, GDP and Access to ICTs in Some Selected Countries

Country	Adult Literacy (%)	GDP Per Capita US $	Urban Population	Telephone per 1000		Cellular Per 1000		Internet Per 1000		Public Expenditure on education		Public Exp. In Higher Education of Total of all levels	Expenditure on Research and Development as % of GDP
				1990	2002	1990	2002	1990	2002	GDP in %	Govt. Exp. In %		
Australia	100	28260	91.6	456	539	11	640	5.9	481.7	13.8	4.6	22.9	1.5
Canada	100	29480	80.1	656	635	22	377	3.7	512.8	14.2 (1990)	5.2	35.7	1.9
Netherlands	100	29100	65.4	464	618	5	745	3.3	506.3	10.4	5.0	26.5	1.9
U.S.	100	35750	79.8	547	646	21	488	8.0	551.4	15.4	5.6	26.3	2.8
U.K.	100	26150	89.0	441	591	19	841	0.9	423.1	NA	4.6	17.2	1.9
China	91.0	4580	37.7	6	167	0	161	0	46.0	12.8 (1990)	2.3	NA	1.1
Sri Lanka	92.1	3580	21.1	7	47	0	49	0	10.6	8.1 (1990)	1.3	13.4 (1990)	0.2
India	61.3	2670	28.1	6	40	0	12	0	15.9	12.7	4.1	20.3	NA
Bhutan	47.0	1969	8.2	4	28	0	0	0	14.5	12.9	5.3	NA	NA
Bangladesh	41.1	1700	23.9	2	5	0	8	0	1.5	15.8	2.3	11.1	NA
Nepal	44.1	1370	14.6	3	14	0	1	0	3.5	13.9	3.4	12.1	NA
Pakistan	41.5	1970	33.7	8	25	0	8	0.33	10.3	7.8	1.8	NA	NA

Source: UNDP 2005

24.7 ICT Infrastructure and Knowledge Dissemination

In knowledge societies not only the creation of knowledge is important, its dissemination and knowledge sharing with the world around is equally important. In the information age ICTs are the main medium for knowledge dissemination. In this information age the info-technological revolution is restructuring the global social economic equations — shifting from income divide to knowledge divide. We stand at the dawn of the new millennium which ushers with it a world of greater interconnectivity, accelerating flow of data and shrinking time and national boundaries. Accessibility of World Wide Web (WWW) is turning world into global village. The prediction is that around one billion will be

"online" by the end of 2005. The decreased cost of processing and dissemination of information and increased convergence of information, computer and telecommunication technologies became the base of knowledge societies.

Knowledge sharing is the interactive process of making the right information available to people at the right time in a comprehensible manner to enable them to act judiciously- enriching the knowledge base in the entire mechanism. Knowledge sharing can occur at all levels— between countries, within a country, between communities and among individuals. It can occur from local to global, from poor to rich and vice versa. Knowledge dissemination and sharing became indispensable in day today life, for good governance, participation of people in their development etc. Unrestricted and continuous sharing of global and local knowledge between policy makers, public and private sectors and civil society heralds the way forward to an empowered knowledge society, which can efficiently manage the development change process. It ensures inclusion of poor and marginalised communities in the change process.

Rapid technological advance since Second World War occurred due to the convergence of telecommunications and computing technology, known as Information and communication technologies (ICT). ICT have been the drivers of the knowledge society. They are providing new and faster ways of delivering and accessing information, innovative ways for real time communication and new ways to do business and create livelihood opportunities. Since ages, knowledge has been passed on from one generation to the other through written text, folklore, word of mouth religions and customs. The knowledge however remained preserved geographically and hierarchically. On the other hand ICT breaks all the natural, social, cultural and hierarchical barriers to knowledge sharing. It has the potenital to help the people to leapfrog some of the traditional barriers to development by making use of knowledge in various ways such as by improving access to information, expanding their market base, enhancing employment opportunities, making government services work better etc.

In the contemporary gloabl context the use of information and communication technologies (ICTs) is expanding rapidly. ICTs comprise a diverse set of technological tools and resources to create, diseeminate, store and manage data and information. Traditional ICT tools such as television, radio and the telephone have proven their effectiveness in promoting development. The emergence of computers, the Internet and wireless communications technology, along with powerful software for processing and intergrating text, sound and video into electronic media, comprise modern ICT. For the past two decades the spread of teh global electronic netwrok of computers, popularly referred to as the Internet, and wireless telephony has generated an unprecedented global flow of information, products, people, capital and idea. Internet based electronic mails, newsgroups, discussion groups and interactive web sites hold boundless potential to reach everyone who is connected to the Internet to target specific information.

The greatest advantage of ICTs is the reach and low cost of technology and data transmission. Technically, every individual can have a private or public access to a data terminal, which connects him to each and every individual in the world. Knowledge dissemination and knowledge sharing in knowledge societies depend on ICT infrastructure, which mainly include tele-communications, computer-mediated communication — the Internet and mass media of communication.

Tele-communication Network

Tele communication network is a key facilitator to knowledge society. Tele communications system is one of the most complex systems ever built by the humankind. It has penetrated to every aspect of human life. In the 19th

century, the invention of the telegraph and the telephone forever changed how messages moved around the world.

Telephony made possible virtually instantaneous two-way communication between any two places in the planet connected by appropriate wiring and switching devices. In the beginning most of the telephony networks were developed as public monopolies, though US was an exception. Extensive international organisational arrangements were established to ensure interconnectivity through common networks standards. The International Telecommunications Union (ITU) and related Treaty arrangements represent some of the first attempts to develop effective forms of international governance (Wiesman 1998). Since 1980s governments in all countries have come under increasing pressure to commercialise, privatise and deregulate their tele communications industries and by late 1990s virtually all national telephone networks have been at least partly privatised and opened up to national and international competition. This resulted in drastic decreases in the price of international communications services and thereby promoting a faster and cheaper knowledge dissemination.

Tele communications is now but one form of the processing information; transmission and linkage technologies are increasingly diversified and integrated into computer-operated networks.

The latest development in the tele communication technology, the cellular or mobile phones shows a convergence of different communication technologies. Although the cell phones, or at least the technology behind them, have been around since the 1960s, tremendous technological improvements in cell phones started happening for the last one-decade and half. Sending images, text messages and, of course, sound. Every month, it seems, a new cell phone comes out that's "smarter" than the last in its ability to gather and transmit a growing amount of data: voice, images, news and more. Of late technologies of photography, broadcasting, audio system and Internet all converged into one gadget of cellular phone.

Computer Mediated Communication Network — the Internet

The Internet network began in 1960s (see Box 24.5) in United States and soon became common. Internet network became the backbone of the computer-mediated communication in 1990s, since it gradually links up most networks. In the mid-1990s it connected 44000 computer networks and about 3.2 million host computers worldwide with an estimated 25 million users and it is expanding rapidly (Castells 1998). In the year 2005 Internet network crossed 6 million computer networks (see Table 24.5).

Box 24.3: The Beginning of Internet

The Internet originated in a daring scheme imagined in the 1960s by the technological worriers of US Defence Department Advanced Research Project Agency (DARPA) to prevent a Soviet takeover or destruction of American communication in case of nuclear war. To some extent it was the electronic equivalent of the Maoist tactics of dispersal of guerrilla forces around a vast territory to counter an enemy's might with versality and knowledge of terrain. The outcome was a network architecture that, as its inventors wanted, cannot be controlled from any centre, and is made up of thousands of autonomous computer networks that hane innumerable ways to link up going around electronic barriers. Ultimately ARAPANET, the network set up by the US Defence Department, became the foundation of the global, horizontal communication networks.

Source: Castells 1998

The rapid evolution of microprocessor technology since its discovery as well as the swift advances in fibre optic network technologies resulted in rapid growth of computing power and the communication power of people around the world. This advances in the technology enabled the development of new types of services to be used in digital format. Technological advances have also slashed the costs of information and communication. Services such as electronic mail (E-mail) has become free of cost. Internet telephony offers much cheaper long-distance communication than the traditional telephone. The cost of transmitting digital information anywhere in the world has also fallen dramatically. Until the early 1980s, communication was generally restricted to analog signaling, which means each telecommunication network was designed to carry different types of information separately. Voice traffic was carried over the telephone system, text used a separate telex network and high-frequency broadcast networks were dedicated to sending video and audio signals. With digital communication, these separate networks are becoming less differentiated. The Internet currently carries a combination of pictures, drawings, moving images, sound and text. The technologies of telephone and television, the radio and camera, the fax and word processor, the data base and the spread sheet all are integrated into one system, the Internet, which makes Internet unique in its capacity to support two-way interactions. Since early 1990s the World Wide Web (WWW) has become the mainstream environment for creating and disseminating digital information.

Previously access to Internet was almost exclusively form personal computers. This has been changing for the past couple of years. As mentioned earlier now Internet is available through mobile phones (data enabled wireless telephones). This development did enabled users in remote areas to access the Internet and its related services without a basic ICT infrastructure.

Table 24.3: World Internet Usage and Population Statistics in 2005

World Regions	Population (2005 Est.)	Population % of World	Internet Usage, Latest Data	Usage Growth 2000-2005	% Population (Penet-ration)	World Users %
Africa	896,721,874	14.0 %	**23,867,500**	428.7 %	2.7 %	2.5 %
Asia	3,622,994,130	56.4 %	**327,066,713**	186.1 %	9.0 %	34.2 %
Europe	731,018,523	11.4 %	**273,262,955**	165.1 %	37.4 %	28.5 %
Middle East	260,814,179	4.1 %	**21,422,500**	305.4 %	8.2 %	2.2 %
North America	328,387,059	5.1 %	**223,779,183**	107.0 %	68.1 %	23.4 %
Lain/America Caribbean	546,723,509	8.5 %	**70,699,084**	291.31 %	12.9 %	7.4%
Oceania / Australia	33,443,448	0.5 %	**17,655,737**	131.7 %	52.8 %	1.8 %
WORLD TOTAL	**6,420,102,722**	**100.0 %**	**957,753,672**	**165.3 %**	**14.9 %**	100%

Source: http://www.internetworldstats.com/stats.htm

Box 24.4: Increase in PC and Net users in India

Sale of personal computers increased by 20% in 2004-05 to 3.63 million units due to strong demand from the financial, IT and telecom sectors. It is expected to grow 17% to 4.25 million PCs during the current fiscal. Internet subscribers also went up by 23% in 2004-05 to 2.92 million over the previous year.

The rise in PC sales can be attributed to the home segment, which posted a growth of 48% Significant consumption by the telecom, banking, manufacturing as well as BPO and IT services segments also contributed to the rise in PC sales.

Smaller cities and towns fuelled the IT consumption with C class cities accounting for over 50% of total PC sales. The Manufacturers' Association for Information Technology (MAIT) made these projections based on a study conducted in 22 Indian cities. The survey showed small regional brands and unbranded systems accounted for 41% of sales in 2004-05, down from 53% in the previous year. Indian brands accounted for 24% of total sales, up from 21% in 2003-04 and MNC brands grew to 35% in 2004-05 from 26% a year ago.

The PC industry and been witnessing lower growth rates in the last four years due to a larger base. "the association is giving a very conservative estimate of 17% at this point of time, ad the growth could be about 25% over the next four years," said Vinnie Mehta, executive director, MAIT. Increased usage of broadband and higher penetration in small towns could drive up the growth rate of 25%.

Hindustan Times, July 6, 2005

Mass Media of Communication

Wireless broadcasting was one of the great contributors to the development of oral communications culture in the 20th century. It became one of the important mediums for knowledge dissemination in information age. Unless like telecommunication where communication happens form person to person, here knowledge is transferred from one person to many. The mass media are media of communication—newspapers, magazines, television, radio, movies, videos, CDs, and other forms—that reach mass audiences. Out of this visual media of which visual media became predominant communication medium especially in the information age. Led by television there had been a communication explosion in the last three decades. Marshall McLuhan argues that media influence society more in terms of how they communicate than in terms of what they communicate.

Reflection and Action 24.5

Do you think India is transforming towards a knowledge-based economy? Why?

24.8 Dimensions of Work Participation in Knowledge Economy

We have already learnt that in the postindustrial information society knowledge and information are the major sources of productivity and growth. The Asia-Pacific Economic Co-operation (APEC) Economic Committee extended this idea to state that in a knowledge based economy "the production, distribution and use of knowledge is the main driver of growth, wealth creation and employment across all industries" (APEC 2000). There is a growing belief in the past few decades that knowledge can do more than increasing economic growth; it can also lead to structural change in an economy and therefore society. Such change differs from the incremental changes to which all economies are constantly subjected. Neef (1998) states that the new products and services resulting from technology growth may bring about profound changes in the way we live and work. He argues that this economic transition is characterised by the changing nature of work from low skill to high skill. This is reflected in the rapid growth in the services sector since the 1960's and in more recent changes in the goods-producing sector towards employing higher-skilled employees.

It is important to note here that the classical theory of post industrialism combines three statements which show the trend in the shifting employment pattern (Bell 1976):

a) The source of productivity and growth lies in the generation of knowledge, extended to all realms of economic activity through information processing.

b) Economic activity would shift from goods production to services delivery. The demise of agricultural employment would be followed by the irreversible decline of manufacturing jobs, to the benefit of service jobs, which would ultimately form the overwhelming proportion of the employment. The more advanced an economy, the more its employment and its production would be focused on services.

c) The new economy would increase the importance of occupations with high information and knowledge content in their activity. Managerial, professional and technical occupations would grow faster than any other occupational position and would constitute the core of new social structure.

According to Toffler, the "second wave" formed an entirely new concept the "massification" in which we find mass production, mass markets, mass consumption, mass religion, mass political parties, weapons of mass destruction etc. He argues that the third wave will show a reverse trend where minority interests will come to the fore. The economy will be based on the productivity of knowledge work and knowledge worker. Whereas the organisations in second wave were built around the availability of land, labour and money, the third wave company will be firmly based on development of knowledge and imaginative use of technology. Hence it is obvious that in the information age there will be a change in the economic structure where there will be tilt towards the more openings in knowledge based economic sector, i.e. service sector. The contribution of high value added manufacturing and services to the national economy is measured as one of the key indicators of a knowledge economy. This is because they are more knowledge intensive and less labour intensive.

We have already seen that the revolutionising developments in information, computer and telecommunication technologies and its low cost and high accessibility created a marked change in the employment structure of both developed and developing economies. In knowledge societies knowledge-based service industries form a significant proportion of GDP and there is a reliance on knowledge technologies to foster business competitiveness, economic and employment growth. And this is evident if we examine the economic structure of different countries. Data shows that the agricultural workers who form the majority of the work force till the early 20th century and the industrial workers who grew very fast in the second half of the century in the developed countries now declined to be minority in the workforce. Now the workers of the service sector are replacing these categories of workers very fast all over the world though varying degrees (see Table 24.1). For example in Australia agricultural workers formed 5.0%, industrial workers 21% and the service workers formed 74% of the total work force and in India they formed 52.43%, 10.87% and 36.7% of the work force in 2001. There has been increase of the share of the service sector to the total GDP of these countries and corresponding decline of the share of the agriculture and industries.

Manuel Castells (1998) roughly classify service economy into different categories. This includes producer services (banking, insurance, real estate, engineering, accounting, miscellaneous business services and legal services), social services (medical, health services, hospital, education, welfare and religious services, non-profit organisations, postal service and miscellaneous social services), distributive services (transportation, communication, and whole scale and retail services) and personal services (domestic services, hotel, eating and drinking places, repair services, laundry, beauty and barber shops, entertainment, and miscellaneous personal services). He argues that there is a significant increase of job participation in these services in G7 countries in the past few decades. According to him the evolution of employment during post-industrial period (information age) shows at the same time, a general pattern of shifting away from manufacturing jobs, and

two different paths regarding manufacturing activity: the first amounts to a rapid phasing away of manufacturing, coupled with a strong expansion of in producer services (in rate) and in social services (in size), while other services activities are still kept as source of employment. A second, different path more closely links manufacturing and producer services, more cautiously increases social services employment and maintains distributive services (p 215)

24.9 Women in Knowledge Societies

The emerging knowledge societies, which are based on global competition, progress in information technologies and a move towards knowledge-based economy, pose several opportunities and challenges to women.

The New Job Opportunities for Women: The new ICTs enabled the work to be brought to homes and allows for better accommodation of work and family schedules and this created new types of jobs that favoured women. Women have also been able to capture a large proportion of jobs in ICTs-enabled services. The most promising potential for women is in the creation of new jobs at call centres and in work involving data processing. The ILO reports "telecentres and fax booths have created a quarter of a million jobs in India in the last four years alone, a huge proportion of which have gone to women".

By the end of the 1990s, almost 5000 women in the Carribean countries were employed in data-processing activities. The ILO Report adds, "in terms of numbers employed, the role of women in the digital economy has become more marked in on-line, export-oriented information-processing work rather than in telecommuting".

Internationally outsourced jobs, such as medical transcription work or software services, do make a considerable difference to the lives and career paths of women in developing countries. In software, women enjoy preferences on a scale that they never experienced in any other field of engineering and science. Women in India occupy 27 per cent of professional jobs in the software industry, which is worth 4 billion US dollars annually. Women's share in the employment total in that industry mounted to 30 per cent in 2001.

The ICTs have enabled women to tap global markets for their products and raised incomes. New technologies and networking are new means by which women are empowered to improve their economic and social status. Let us see some examples.

Sapphire Women, created by a woman in Kampala, Uganda, is an organization that supports women who have lost family members to AIDS, as well as supporting orphans created by the AIDS epidemic. The members of Sapphire weave traditional Ugandan baskets which are then sold on the Internet with the help of Peoplink, an American-based NGO with extensive experience in on-line sales of handicrafts.

The Grameen Bank Village Phone project, which provides mobile cell phones to its mostly female members in Bangladesh, demonstrates not only the employment-generating impact of the women who collect fees for the usage of their mobile phones, but other positive spill-over effects as well. Mobile phones and access to the Internet have given rural Bangladeshi women access to learning, created new opportunities for autonomy and improved their position in community and public life.

These examples illustrate how technology can improve the lives of poor women by opening up opportunities they were previously excluded from. Electronic networking between women has led to new social and economic phenomena, such as e-campaigns, e-commerce and e-consultation. The empowerment of women via technology in this way enables them to challenge discrimination and overcome gender barriers (ILO).

However, all these new avernes have been created around the contemporary development pattern of globalisation. This while creating some new opportunities for women also leaves negative imprint. While more competition sets in, the attention given to labour welfare decreases markedly. Moreover, most of the newly created job opportunities are in the informal sector, which provide no job security. All these compells women to work in an exploitative work atmosphere.

Reflection and Action 24.6

Examine the opportunities and challenges women have in the present economic scenerio shaped by large scale technological development.

24.10 Conclusion

During the second half of the 19th century there began a great revolution in storage and communication of information. After industrialisation society moved towards a post-industrial information age where production dissemination, and deployment of knowledge became the basis of productivity and social advancement. The evolving information/knowledge societies marked by rapid advances in science and technology, convergence of the information, computer and communication technologies and the reduced cost of processing and disseminating information; and the increasing connectedness of nations. These revolutionary changes said to transform societies into smart communities largely through the impact of the converging new information, computer and telecommunication technologies (ICTT).

This unit examines the background of the information revolution and the characteristic features of the emerging society. It also analyses why and how knowledge becomes the basic constituent of this society.

24.11 Further Reading

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