
BLOCK 1

ICT: Conceptual Framework	7
----------------------------------	----------

BLOCK 2

ICT For Development	69
----------------------------	-----------

BLOCK 3

ICT: Approaches and Applications	135
---	------------

BLOCK 4

Future of ICT4D	187
------------------------	------------

Disclaimer: Any materials and images adapted from web-based resources in this self-learning course material are being used for educational purposes only and not for commercial purposes.

PROGRAMME COORDINATOR: Prof. K.S. Arul Selvan

BLOCK 1			
Unit 1	Adopted from SOEDS, IGNOU	Unit 8	Dr. Geetika Vashishata, Adjunct Faculty, Manipal Institute of Communication, Manipal Manipal Academy of Higher Education, Manipal, Karnataka
Unit 2	Dr. Chhavi Garg, Assistant Professor, Department of Mass Communication and Media Studies, Central University of Punjab, Bathinda, Punjab	Unit 13	Dr. Anusuah Rajendran Assistant Professor, Department of Visual Communication, Mother Teresa Women's University, Kodaikanal, Tamil Nadu
Unit 3	Prof. K S Arul Selvan, SOJNMS, IGNOU Madhumita Das, SOJNMS, IGNOU	Unit 14	Dr. Anupa Lahkar, Post Doctoral fellow, ICSSR New Delhi
Unit 6	Dr. Chirasrota Jena, Visiting Faculty, Department of Journalism & Mass Communication, Ravenshaw University, Cuttack, Odisha		
Unit 9, 10, 11 & 12	Adopted from MADJ of SOJNMS, IGNOU	Unit 3, 5, 7 & 11	Adopted from E-PG Pathshala, Ministry of Education, Govt of India

PRODUCTION TEAM

Mr. Sanjay Agarwal
Asst. Registrar
MPDD, IGNOU, New Delhi

May, 2024

© Indira Gandhi National Open University, 2024

ISBN:

All rights reserved. No part of this work may be reproduced in any form, by mimeograph or any other means, without permission in writing from the Indira Gandhi National Open University.

Further information on the Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi.

Printed and published on behalf of the Indira Gandhi National Open University, New Delhi by the Registrar, MPDD, IGNOU, New Delhi.

Laser Typeset by Tessa Media & Computers, C-206, A.F.E.-II, Okhla, New Delhi.

CONTENTS

BLOCK 1	ICT: CONCEPTUAL FRAMEWORK	7
UNIT 1	ICT for Development - An Overview	9
UNIT 2	Implementation of ICT4D	28
UNIT 3	ICT and Digital Divide	42
UNIT 4	Issues of Digital Inequality	52
BLOCK 2	ICT FOR DEVELOPMENT	69
UNIT 5	ICT for Poverty Reduction	71
UNIT 6	ICT for Economic Development	81
UNIT 7	ICT for Rural Development	98
UNIT 8	ICT for Environment Sustainability	109
BLOCK 3	ICT: APPROACHES AND APPLICATIONS	135
UNIT 9	ICT for Open Learning	137
UNIT 10	ICT for Disability	159
UNIT 11	ICT for Agriculture	175
BLOCK 4	FUTURE OF ICT4D	187
UNIT 12	Characteristics of Knowledge Society	189
UNIT 13	Knowledge Society - Development Countries Perspectives	216
UNIT 14	E-Governance: Policy and Framework	229

COURSE MNM032 INTRODUCTION: ICT FOR DEVELOPMENT

The massive Information and Communication Technology (ICT) infrastructure established over the decades by many stakeholders provides immense support to developmental activities. This process becomes more crucial in developing countries, where there is a challenge of leveraging the ICT potential in the last-mile connectivity issues. However, mobile technology has a dominant reach, and many services are being moved towards online/digital platforms; it is pertinent to trace and understand the role of communication technologies in our daily lives within the context of developments. This course will cover various topics associated with ICT for Development; in short, it is being identified as ICT4D.

Block 1 - ICT: Conceptual Frameworks. Block 1 of our Information and Communication Technology (ICT) course deals with the context of development. In this Block, we explore and understand the conceptual framework of ICT and its implications for societal progress. Unit 1 lays the groundwork by introducing ICT for Development, emphasising its pivotal role in today's interconnected world. We will discuss its attributes, explore its interface with development, and examine the strategies driving e-development. Unit 2 explains the implementation of ICT4D, tracing its historical evolution and key components. Through case studies, we will discuss the successful ICT4D projects while dissecting challenges such as the digital divide and ethical considerations like privacy and inclusivity. Unit 3 shifts our focus to the profound impact of ICT on societal development and the disparities it creates, exploring the Digital Divide and its various dimensions. You will comprehend the nexus between the Digital Divide and Development and recognise the shaping influence of social media on access. Unit 4, we will discuss the multifaceted landscape of digital inequality, analysing its conceptual development, dimensions, and impact on contemporary society. Through sociological and technological lenses, we will explore various theoretical frameworks and gain insights into this pressing social problem.

Block 2 - ICT for Development. Throughout this Block, we will explore the role of Information and Communication Technologies (ICTs) in fostering global progress across various sectors. In Unit 5, we will explore how ICTs intersect with poverty reduction efforts, analysing their effectiveness and exploring avenues for equitable development, especially in rural areas. Unit 6, we will discuss the intricate connections between ICTs and economic development. From foundational concepts to real-world case studies, we will examine how digital technologies drive economic growth, productivity, and innovation, shaping global economic landscapes. In Unit 7, our focus shifts to rural development as we uncover the transformative potential of ICTs in rural areas. By infusing technology into these landscapes, we aim to bridge existing gaps, catalyse development, and propel progress. Unit 8, we will explore the crucial nexus between ICT and environmental sustainability. From green ICT initiatives to smart cities and e-waste management, we will

discuss how integrating ICT can pave the way for a greener, more sustainable future for all.

Block 3 - ICT: Approaches and Application. Throughout this Block, we will understand the multifaceted world of Information and Communication Technology (ICT) and its diverse applications across various domains. In Unit 9, we explore the dynamic realm of ICTs in open learning systems. From traditional classrooms to open and distance learning (ODL), ICTs are pivotal in shaping modern learning environments. We will examine current practices and envision prospects in this ever-evolving field. Unit 10 explores the transformative potential of ICT for disability, highlighting its role in fostering inclusivity and empowerment. From assistive devices to universal accessibility, we unravel the terminologies and historical evolution shaping this dynamic field, exploring its present and future landscapes. In Unit 11, we investigate the critical role of ICT in agriculture, addressing farmers' increasing demand for timely and accurate information amidst market liberalisation and globalisation.

Block 4 - Future of ICT4D. In this Block, we explore the dynamic landscape of Information and Communication Technologies for Development (ICT4D) and its implications for the future. Unit 12 sets the stage by exploring the characteristics of an Information/Knowledge Society. Here, we will understand the essence of information and its evolution into a knowledge-based society. You'll gain insights into how information systems shape our modern world. From understanding the information transfer chain to exploring the emergence of information and knowledge societies, this Unit provides a comprehensive view of our interconnected digital age. Unit 13 looks at the Knowledge Society from a Developing country perspective. Also, this Unit examines its role in driving societal evolution. You'll gain a nuanced understanding of the complex interplay between technology, economics, and development. In Unit 14, we explore E-Governance Policy and Framework. Unravelling the intricacies of e-governance, we explore its significance and understand concepts like Information Technology and Information System Management. Through in-depth discussions on various models, projects, and partnerships, you'll gain insights into the complexities and potentials of e-governance in our modern world.

Throughout the course, you will understand the challenges and opportunities of ICT for Development in diverse contexts from the perspectives of developing countries. This course will give you a broader understanding of the role of technology in improving human living standards.

Block

1

ICT: CONCEPTUAL FRAMEWORK

UNIT 1

ICT for Development - An Overview

UNIT 2

Implementation of ICT4D

UNIT 3

ICT and Digital Divide

UNIT 4

Issues of Digital Inequality

BLOCK 1 INTRODUCTION: ICT: CONCEPTUAL FRAMEWORK

In this Block, you will learn two fundamental components. The first is the potential of ICT to increase the speed of developmental work, and the second is the challenges of implementing technology-based developmental support systems. The conceptual framework of ICT and digital inequality are the focus areas of this Block, and they are being discussed in four Units.

Unit 1 - Introduction to ICT for Development - In today's interconnected world, Information and Communication Technology (ICT) plays a pivotal role in shaping societal progress. This Unit explains the essential concepts surrounding ICT and its profound impact on development. From understanding ICT's attributes to exploring its interface with development, we will explore the strategies driving e-development. The Unit provides you with scrutiny into the transformative power of ICT in fostering progress and inclusivity.

Unit 2 - Implementation of ICT4D - We Will explore the pivotal role of Information and Communication Technology for Development (ICT4D), its historical evolution, and key components like digital infrastructure and human capacity. Through case studies, we will witness successful ICT4D projects while dissecting challenges like the digital divide and cultural factors. We will also scrutinise ethical considerations, including privacy and inclusivity.

Unit 3 - ICT and Digital Divide - In this Unit, we will explore the profound impact of Information and Communication Technology (ICT) on societal development and the disparities it creates. We will discuss the Introduction of the Digital Divide, highlighting its evolution from mere telephone access to the contemporary gap in Internet accessibility. The divide manifests across various dimensions: rural-urban, rich-poor, and literate-illiterate. By the end of this Unit, you will comprehend the Digital Divide and Development nexus, grasp the nuances of Internet penetration in India, and recognise how social media shapes access.

Unit 4 - Issues of Digital Inequality - This Unit will explore the multifaceted landscape of digital inequality, a pressing social problem in today's interconnected world. We will explore the conceptual development of digital inequality, its dimensions, and its impact on contemporary society. Through sociological and technological lenses, we will analyse theoretical frameworks and approaches to understanding this complex issue. By the end of this Unit, you will gain insights into the various dimensions and perspectives of digital inequality.

We hope that the understanding from this Block will help you contextualise the scenarios of ICT-based initiatives in your living environments.

UNIT 1 ICT FOR DEVELOPMENT: AN OVERVIEW

Structure

- 1.1 Introduction
 - 1.2 Learning Outcomes
 - 1.3 ICT: Meaning and Attributes
 - 1.4 ICT and Development Interface
 - 1.5 ICT and Sectoral Development
 - 1.6 E-Development and its Strategies
 - 1.7 Let Us Sum Up
 - 1.8 Further Readings
 - 1.9 Check Your Progress: Possible Answers
-

1.1 INTRODUCTION

Information and Communication Technology (ICT)'s growth and significance in the contemporary scenario signifies the importance and interrelationship between technology, society, and progress. In this Unit, we will understand the various dimensions of ICT characteristics and their role in various sectors. More importantly, you will understand the role of ICT in social, economic, and developmental challenges. The ICT platform leverages the benefits through which individuals, communities, and nations empower for better human living environments.

It is a fact that developed nations use Information and Communication Technology (ICT) more than developing countries. In this unit, you will read about the role of ICT in development.

1.2 LEARNING OUTCOMES

After completing this unit, you should be able to:

- Define the meaning and explain attributes of ICT;
 - Explain the ICT and development interface;
 - Narrate the role of ICT in the development of various sectors; and
 - Comprehend e-Development strategies.
-

1.3 ICT: MEANING AND ATTRIBUTES

1.3.1 Meaning of ICT

Customarily, ICT refers to *information*, *communication*, and *technology*. Generally, we seek information and communicate it to others who may also be interested in its value through technology. *Technology* is essential in the effective transaction and communication of knowledge or information to its

seekers. ICTs include hardware, processes, and systems that store and manage communications and share information. These tools can be either manual or computerised. ICT is defined by the United Nations Development Programme (UNDP) as "ICTs are information handling tools, a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the 'old' ICTs of radio, television and telephone and the 'new' ICTs of computers, satellite and wireless technology and the Internet. These different tools are now able to work together and combine to form our 'networked world' – a massive infrastructure of interconnected telephone services, standardised computing hardware, the Internet, radio, and television, which reaches into every corner of the globe". The ICT has enabled ICT using nations to become an *Information Economy*. The UNDP document defines *Information Economy* as "a new global electronic structure where the production of information goods and services dominates wealth and job creation and is underpinned by the use of information and communication technologies (ICT) and the global infrastructure". The OECD member countries define the ICT sector as a combination of manufacturing and services industries that capture, transmit and display data and information electronically. Some commonly used ICT tools are described:

- i) **Mobile phones:** These are electronic, portable, and wireless communication devices that are available in different shapes, sizes, and models. Mobile phones connect to a wireless communication network through radio waves or satellite transmissions. According to the business dictionary, "Mobile Phone is a portable device that does not require the use of landlines. It utilises frequencies transmitted by cellular towers to connect the calls between two devices". Mobile phones can communicate via voice calls, emails, text messages, video, picture messages, Bluetooth, infrared and fax.
- ii) **Video Conferencing:** According to the BSNL, video conferencing services allow multiple participants to converse with each other regardless of their location through the video endpoints. It enables new ways of communication and collaboration between people at almost any global location. It involves the transmission of visuals and sounds to two or more separate locations through cameras, monitors, speakers, and microphones. Multiple video conferencing enables three or more individuals to sit in a virtual conference room and communicate as if they were sitting beside each other.
- iii) **Radio:** Radio is the wireless transmission through the space of electromagnetic waves in the approximate frequency range from 10 kilohertz to 300,000 megahertz. It is a user-friendly and cost-effective technology and an effective communication and knowledge-sharing tool.
- iv) **Internet:** The Internet is a global network and IT revolution that connects millions of computers. The Internet has become a public, cooperative, and self-sustaining facility available and accessible to millions of people, non-governmental organisations (NGOs), offices, civil society organisations, private corporate sectors, and more. The

Internet carries a vast array of information resources and services, most notably the interlinked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail (email), in addition to popular services such as video on demand, online shopping, online gaming, exchange of information from one-to-many or many-to-many by online chat, online social networking, online publishing, file transfer, file sharing and Voice over Internet Protocol (VoIP) or teleconferencing, telepresence, person-to-person communication via voice and video.

- v) **Television** is a widely used telecommunication medium for transmitting and receiving static and moving images, usually accompanied by sound. Televisions are available in different sizes and colours and black-and-white sets. Cable television and remote control are in recent use.

ICT has established an inherent relationship between information, communication, and technology. This synergistic relationship is described in Fig. 1.1.

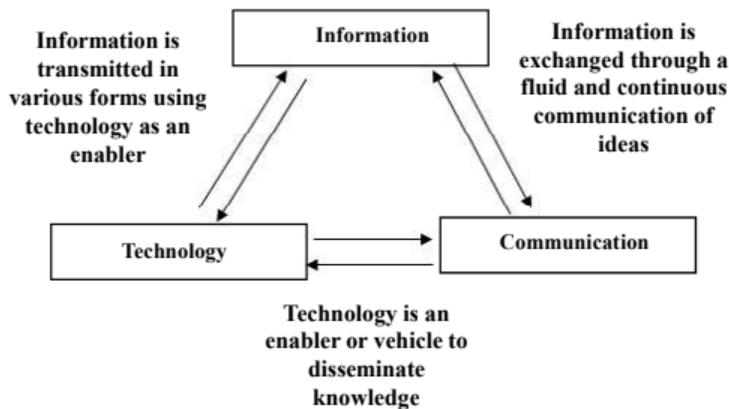


Fig. 1.1: Synergistic Relationship between Information, Communication and Technology

1.3.2 Attributes of ICT

After learning the meaning of ICT, it is essential to know its attributes. Some of the critical characteristics of ICT are:

- i) **Knowledge Revolution:** ICT has the dramatic power to organise information. This has also accelerated the pace of learning, innovation, and knowledge creation and dissemination. It has significantly helped knowledge power. The transfer of knowledge has been faster after the advent of ICT. ICT and the growth of knowledge society have become almost synonymous.
- ii) **Productivity Revolution:** The ICT has impacted the ICT using industries and services in raising overall productivity. The economically advanced country of the USA, which has effectively used ICT to enhance productivity across various sectors of the economy, is one of the illustrious examples. In India, sectors using ICT effectively can also raise productivity much faster than their counterparts. ICT in most service sectors has reduced costs and enhanced productivity and output.
- iii) **Learning Revolution:** According to the World Bank, ICT has created a

learning revolution that has given rise to lifelong learning. According to Resnick, ICT empowers students to become more active and independent learners. ICT has made people less dependent on classroom teaching.

- iv) Promoting Connections:** ICT has promoted connections among people, NGOs, enterprises, and communities. ICT gives rise to empowerment, participation, coordination, decentralisation, social learning, connecting communities of practice, mobilising social capital, and the globalisation of civil society concerns. ICTs have been increasingly described as *technologies of freedom*. ICT empowers people to connect, mobilise, organise, overcome isolation, and share their experiences and distinctive information.
- v) Innovation-Driven Economy:** ICT is an enabler in transforming the nation from an investment-driven economy to an innovation-driven economy, which is more efficient and productive. ICT has fastened the innovation process in scientific societies.
- vi) Globalisation booster:** ICTs have been a key engine for the performance and growth of economies since the early 1970s, becoming, of course, the main technological enabler of economic globalisation. Global information has become easily accessible through ICT. It is one of the essential energisers of globalisation and has made the world a global village.
- vii) Promoter of Human Development:** The United Nations has long recognised the need for timely and relevant information as a fundamental element of human development. It has emphasised universal access to information and communication services as a basic need. The digital divide affects human development.
- viii) Contribution to Research and Development:** ICT has contributed significantly to research and development. Research guides and scholars use ICTs to acquire information and knowledge. Various sectors and institutions' research and development activities have benefited immensely from the ICT revolution.

Check Your Progress: 1

Note: a) Use the spaces given below for your answers.

b) Check your answers with those given at the end of the unit.

1. What do you mean by ICT?

.....
.....
.....

2. How is the Internet helpful in carrying vast information resources and services?

.....
.....
.....

1.4 ICT AND DEVELOPMENT INTERFACE

Since the early 1970s, the pace of ICT has been recognised as a critical engine for enhancing development and accelerating the growth of economies. ICTs have the potential to not only improve the delivery system of government services but also enhance development outcomes through greater transparency, ease of access, people's participation, and cost reduction. While encouraging the role of ICT in development, Kofi Anan, the former Director General of UNO, said, "A technological revolution is profoundly transforming society. If harnessed and directed properly, ICTs can improve all aspects of our social, economic, and cultural life. ICTs can serve as an engine for development in the 21st century". The UN has recognised the need for timely and relevant information as a fundamental element of human development and has called for universal access to information and communication services as a primary development need. While delineating the role of ICT, the Asian Development Bank (ADB) has emphasised that "ICT for development is not about computers, mobile phones, and the Internet, but about help, support, and training people in linking them and communities for communication, learning and services. This will lead to improved well-being, increased work productivity, support for innovation and impetus for inclusive growth". The thrust areas of ICT strategies for development as envisaged by ADB are to create an enabling environment by fostering the development of innovative sector policies, strengthening public institutions, and developing ICT facilities and related infrastructure and networks. The World Bank states, "Information and communication technologies are a key input for economic development and growth. They offer opportunities for global integration while retaining the identity of traditional societies. ICT can increase poor people's economic and social well-being and empower individuals and communities. Finally, ICT can enhance the effectiveness, efficiency, and transparency of the public sector, including the delivery of social services". The ICT for development needs to emphasise the following dimensions of ICT:

- i) **Information-centric:** Focusing more on information and data and less on technology. In a knowledge society, information and knowledge are considered more powerful and important tools for empowerment. The Right To Information (RTI) Act in India empowers common citizens to get official information and play a proactive role in governance.
- ii) **Chain-centric:** The ICTs must provide the connected data about the main problem. For example, suppose the health status of a village is low. In that case, the ICT must provide data on infant mortality rate (IMR), institutional delivery, immunisation status, disease prevalence, etc., which are the determinants of health status. Sporadic information is dangerous and will cause more harm than benefit. It will not help the decision-maker to make appropriate decisions.
- iii) **Society-centric:** The ICTs need to provide data on social aspects such as health, education, the status of women, the role of youth in development, etc. Partial information is always dangerous and cannot be helpful to take corrective measures.

- iv) **Economy-centric:** The ICTs provide data and information about economic development and enable new or more productive income-generating activities. For example, in Bangladesh, villagers purchased their phones through the national phone operators as members of the Grameen Bank and got accessible payphone services. ICT can communicate information about various development schemes, welfare programmes, and successful projects to rural people.
- v) **Development-centric:** ICT, to promote development, should be development centric. The ADB is helping its member countries integrate ICT components into sector development strategies, especially in education, health, and agriculture. The focus is improving public administration and finance management and providing various electronic services to citizens and businesses. The ICT should give information about the performance of various development sectors and programmes.
- vi) **Manpower-Centric:** ICT plays an important role in human resources development. A study claims that ICT diffusion accounts for up to a 90 per cent increase in the Human Development Index of some nations. Therefore, most ICT proponents suggest that ICT should focus more on people than just human efficiency and raise their knowledge and productivity. For this, the requirements of the people who benefit from ICT must be understood, and how ICT can be helpful must be chalked out.

The ICT-enabled “Information Chain” for development is given in Fig.1.2

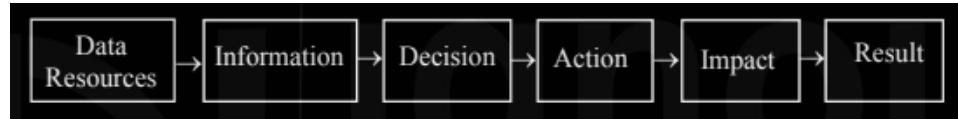


Fig. 1.2. ICT Information Chain

The three types of ICT-enabled development are:

- i) Direct Development
 - ii) Networked Development
 - iii) Grassroots Development
- i) **Direct Development:** In this model, ICTs deliver resources and services directly to the beneficiaries without any interventions of other development actors like NGOs, PRIs, SHGs, etc. The direct telecast of many government development programmes through ICT is a direct development endeavour.
 - ii) **Networked Development:** In this model, instead of directly providing information or data to the beneficiaries, the state or private agencies act through other connected actors or institutions that can effectively use ICTs. Here, the primary source is interconnected. These intermediaries are interconnected with the main sources and interconnected among themselves.

iii) Grassroots Development: In the grassroots development model, the main development agency, for example, the government, uses NGOs and other civil society organisations to reach the beneficiaries. Nowadays, the state as an actor of development is gradually transferring its onus to community-level organisations or civil society organisations. There are several successful examples of community development models. It is a democratic way of pursuing development.

Check Your Progress: 2

Note: a) Use the spaces given below for your answers.
 b) Check your answers with those given at the end of the unit.

1) ICT should be Development centric-Justify?

.....

2) Write a short note on the ICT-enabled grassroots model.

.....

1.5 ICT AND SECTORAL DEVELOPMENT

ICTs play an important role in enabling the nation to achieve the objective of the Millennium Development Goals. The economic, social, and human development needs of the developing nations, in particular, cannot be met promptly and effectively without the innovative and strategic use of new technologies. The *digital divide* is also one of the reasons for differences in the percentage of achievements in various development indicators in rural and urban areas. It is remarked that the *digital divide* reflects existing disparities between the haves and have-nots. According to the Organization for Economic Cooperation and Development (OECD), "The digital divide is a symptom of the existing economic and social divide, which will widen even in future, if developing countries are not helped to take advantage of ICT in tackling economic and social problems and are denied access to markets that are becoming increasingly ICT-dependent as a part of globalisation". The United Nations has developed an ICT Development Index, as shown in Table 1.1, in which Iceland occupies the first rank.

Table 1.1: Ranking of Nations on ICT Development Index, 2017 vs 2023

Rank	Countries	Value as of 2017	Value as of 2023
1.	Iceland	8.98	8.98
2.	South Korea	8.85	9.12
3.	Switzerland	8.74	8.91

4.	Denmark	8.71	8.87
5.	United Kingdom	8.65	8.65
10	Japan	8.43	8.59
14	Australia	8.24	8.33
16	USA	8.18	8.28
18	Singapore	8.05	8.12
29	Canada	7.77	7.83

Source: International Telecommunication Union ICT Development Index 2023 (<https://www.itu.int/itu-d/reports/statistics/IDI2023/>)

The discrepancy in urban and rural development is a cause of concern for many developing countries. One such discrepancy is higher literacy rates in urban areas than rural areas. Therefore, E-development should aim to harness the ongoing technological revolution to achieve Millennium Development Goals, one of which is raising literacy and educational status. E-Development would systematically address the opportunities to use ICT for the competitiveness of developing economies, expand employment and earning opportunities, access market information, and lower transaction costs for the poor, women, marginalised communities, farmers, traders, and artisans. It will achieve higher agricultural and industrial growth rates and enhance the literacy and health status of the country's population. However, it is observed that many developing countries are still lagging in the use of ICTs in various sectors of development. One of the findings on the role of ICT in development reveals that the technological information infrastructure has failed to link the growing awareness of the importance of knowledge for development to the key actors and the information seekers who can carry forward the development actions bridging ICT. The optimal and innovative use of ICT tools will have a decisive bearing on the success or failure of development. ICT's decisive role in facilitating the successful implementation of development objectives is spelt out in the declaration of principles of the World Summit on Information Society. The role of ICT in the development of various sectors is narrated as follows:

1.5.1 ICT and Poverty Reduction

ICTs play an important role in poverty reduction strategies adopted by various countries. One of the main opportunities for using ICT in poverty reduction is to provide information and knowledge to rural populations and to empower local development agents to serve the poor. Lack of knowledge regarding various poverty alleviation schemes and their implementation procedures are important reasons for poor implementation of governmental programmes, particularly rural development programmes. The illiterate people have poor access to information and, therefore, cannot tap the benefits meant for their upliftment. To cite a few examples, Chile's electronic rural information system has enabled development actors such as NGOs,

municipalities, and extension agencies to transmit information on prices, markets, inputs, weather, social services, and credit facilities for 40 per cent less than that using traditional methods. Another example is the land record computerisation in Karnataka, India, which has enabled the agencies to deliver land certificates within 15 minutes instead of 20–30 days and, in the process, has reduced transaction costs and corruption, created a viable land market, and enhanced the quality of life of the common man.

The telecentre or the community information and communication centres are important in transmitting information about various government development initiative programmes to the common person. These centres have enabled rural communities to conduct local dialogue, share practical, locally relevant information, and support community problem-solving. According to M. Fontaine, digital literacy centres in Benin and Ghana have become an important instrument for empowering low-income communities, enhancing employability, increasing capabilities, and extending learning opportunities beyond those available in education institutions. While justifying the role of ICTs, Mohammed Yunus (See Chhavi, 2008), the architect of microfinance in Bangladesh, remarked that “there is an ongoing view that IT is irrelevant for the poor who are generally illiterate; IT is too expensive for them to reach out; the poor do not need fancy IT, they need food. These are the voices of the sceptics. Now, in three years, there are more than 5000 telephone ladies in Bangladesh villages doing roaring business in selling telephone services.” Some of the lessons learned from the use of ICTs for poverty reduction are:

- i) Technologies used must be adequate to the skills of the poor to exploit their potential effectively; in other words, they must be user-friendly and pro-poor;
- ii) Content should receive as much attention as connectivity, and it must be people-centred, demand-driven and in local languages and
- iii) Ownership by the local communities, partnership, and networking are essential to effective poverty reduction programmes. Local NGOs and civil society organisations must be adequately involved through ICT for poverty reduction at the grassroots level.

1.5.2 ICT and Agriculture

Agriculture is the primary sector of development. ICT in agriculture is an emerging field that enhances agricultural productivity and growth rate. The technological revolution could benefit the agriculture sector through increased flow of information, transfer of capital and inputs and quality of various services provided to the agriculture sector. The role of ICT to enhance food security and support rural livelihoods is increasingly recognised and was officially endorsed at the World Summit on Information Services (WSIS, 2003–05). The ICT can potentially help the farming community in the following ways:

- i) Meet the information, technical and input needs of the farmer more efficiently;
- ii) Improve access to knowledge and technology among farmers and farmers-linked institutions;

- iii) Strengthen dialogue between and among farmers and farm-linked institutions;
- iv) Promote interactive learning among farmers and other local organisations, such as *panchayats*, milk cooperative societies, WSHGs, and village farmers groups.

All these will lead to an increase in farm outputs or more excellent value addition of farm products, increasing household incomes and quality of life of the farmers. Further, ICTs can promote trade and competitiveness of agricultural products and broaden agro-product markets, increasing domestic GDP. The FAO's *e-Agriculture* initiative aims to ensure systematic dissemination of information using ICTs on agriculture, animal husbandry, fisheries, forestry, and food to provide ready access to comprehensive, up-to-date, and detailed knowledge and information, particularly in rural areas.

Nowadays, ICTs play an important role in promoting public-private partnerships (PPP) in the area of *ICTs for agricultural development*. The four types of partnership which are desirable for agricultural development are:

- i) Providing affordable ICT access and connectivity to farmers and farm-linked institutions;
- ii) Providing relevant content to the experts, trainees, and extension agents;
- iii) Training and capacity building;
- iv) Projecting the locally available good practices;
- v) Promotion of contract farming through public-private partnership.
- vi) Enhancing farmer-to-farmer contact.

We need to understand how far ICT initiatives can address the farmers' needs regarding agriculture development.

1.5.3 ICT and Education

ICT is a powerful tool for extending educational opportunities, both formal and non-formal, to all sections of society, particularly to the unserved sections of the population. The International Institute for Communication and Development (IICD) has emphasised that ICT can improve education quality by enhancing educational content development, supporting administrative processes in schools and other educational establishments, and increasing access to education for teachers and pupils via distance learning. Regarding the use of ICT in education, two concepts, *e-learning* and *blended learning*, have recently been used to fortify the role of ICT in education. According to Tinio (see Gunjan, 2014), "e-learning encompasses learning at all levels, both formal and non-formal that uses an information net-work-the Internet; an intranet (LAN) or extranet (WAN) – whether wholly or in part, of course, delivery, interaction and/or facilitation". Others prefer the term online learning, which is web-based learning in a subset of e-learning and refers to learning using an Internet browser. The other term used in educational technology is blended learning. It refers to learning models that combine traditional classroom practice with e-learning solutions. For example, students in a traditional class can be assigned print-based and online

materials, have online mentoring sessions with their teachers through chats and subscribe to a class email list. UNESCO recognises that "These technologies have great potential for knowledge dissemination, effective learning, and the development of more efficient education services".

In India, satellite-based teleconferencing (one-way video and two-way audio) non-formal education has been operational since 1992 at national and regional levels. The ICT mission for school education in India aims to devise, catalyse, support, and sustain ICT and ICT-enabled activities and processes to improve access quality and efficiency in the school system.

According to UNESCO, ICTs can be used in education to:

- Improve administrative efficiency.
- Disseminate teaching learning materials to teachers and students.
- Improve the ICT skills of teachers and students.
- Allow teachers and students access to sources of information from around the world.
- Share ideas on education and learning.
- Collaborate on joint prospects.
- Conduct lessons from a remote location.

As emphasised by UNESCO, the six focus areas of ICT in education programmes are policy, teacher training, teaching, and learning, non-formal education, monitoring and measuring, research and knowledge sharing. The international institutions, as well as experts involved in communication and development, believe that ICTs in education will be of great help to achieve the Millennium Development Goals of universal primary education through the following ways:

- i) **Teacher Training:** Increase the supply of trained pre-service teachers through ICT-enhanced training and by creating teacher networks. ICT-enhanced teacher training programmes will be more effective and can be conducted faster than traditional methods.
- ii) **Teaching and learning in the classroom:** The capacity development of teachers to empower them to use ICT in the classroom and the development of curricula and support materials/resources through ICT. Teaching-learning through ICT will improve the process and raise the student attendance rate. It will enable teachers and students to use ICTs in their current and future teaching-learning processes.
- iii) **Management and administration:** Improve the efficiency and effectiveness of Ministries of Education and related bodies using ICTs for management and educational information. The department can use ICTs to procure records of educational institutions, teachers, and students and other loss and expenditure aspects relating to education. Online admission and online examination have fastened educational administration and made the administrative process cost-effective.
- iv) **Policy and strategy:** Integrating ICT policies and strategies into

education policies will establish an enabling environment and improve the overall strategic development of education. ICTs have also enabled educational planners to make educational policies, plans, and strategies accessible to teachers, students, administrators, and researchers. Feedback mechanisms have become easier with the advent of ICTs.

1.5.4 ICT and Health

The healthcare services will be improved, and the quality will be increased by the coordinated induction of information technology in all segments of the healthcare action chain; local, regional, and national health networks will strengthen cooperation and resource management in the healthcare sector. According to the World Health Organization (WHO), “Technology is the backbone of the services to prevent, diagnose and treat illness and disease. ICTs are only one category of the vast array of technologies that may be used. Given the right policies, organisation, resources and institution, ICTs can be powerful tools in the hands of those working to improve health”.

According to WHO, the use of ICTs in the health sector is not merely about technology but a means to reach a series of desired outcomes such as:

- i) Health workers making better treatment decisions;
- ii) Hospitals providing higher quality and safer care;
- iii) People making better choices about their health;
- iv) Governments are becoming more responsive to health needs;
- v) National and local information systems supporting the development of effective, efficient, and equitable health systems;
- vi) Policymakers and the public are aware of health risks and
- vii) People have better access to the information and knowledge they need for better health.

The use of ICT in health care has become an important aspect of health development. Healthcare solutions provided by ICTs are popularly known as *e-health*. The tools and services contributing to e-health provide better and more efficient healthcare services. The use of e-health technologies allows a mutually beneficial collaboration and involvement of patients and medical professionals in preventing and treating chronic diseases.

In Peru, Egypt and Uganda, effective use of ICTs has prevented avoidable maternal deaths. In South Africa, mobile phones have enabled patients to receive timely reminders to take their medication. In Cambodia, Rwanda, South Africa, and Nicaragua, multimedia communication programmes are increasing awareness of how to strengthen community response to HIV and AIDS.

Lastly, e-learning development strategies may target ICT as a core technological competency, given its need and potential as a tool for competitiveness. According to Sidharthan and Lal (2003), targeting technologies with substantial potential and spill over effects is shown to have greater economic benefits.

Accurate, relevant, and up-to-date information is essential for health service managers to recognise weaknesses in health service provisions and take action to improve service delivery. Therefore, developing an effective information system is a necessary precursor to managerial improvement in the healthcare system. The major elements of opportunities for ICT in primary health care are telemedicine and health services, health care data management, information systems, appropriate data collection devices and analysis tools, appropriate and affordable bio-medical equipment for grass root deployment, video/multi-model conferencing and e-connectivity and appropriate legal and administrative framework.

The ICT intervention in health development can be broadly categorised into the following areas:

- i) **Telemedicine:** According to the International Telecommunication Union, telemedicine is a powerful tool for empowering health care delivery. According to WHO, telemedicine is dealing with health care services where distance is a critical factor by health care professionals using information and communication technologies for the exchange of vital information for diagnosis, treatment and prevention of diseases and injuries, research and evaluation and the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities. E-health uses emerging information and communication technology, especially the Internet, to improve or enable health and health care.
- ii) **Health Management Information System (HMIS):** ICTs nowadays play an important role in most countries in maintaining medical records systems, district, block and village health status records, disease surveillance systems and health services delivery and recording systems.
- iii) **E-learning and capacity building:** ICTs are nowadays being used to build the capacity of health and health-related personnel by training institutions and NGOs involved in health sector developmental activities. The training organisations provide trainees with access to the Internet and other materials on recent developments in health education.
- iv) **IEC on community-based health care delivery:** Information Education and Communication (IEC) is one of the important components of community health care strategies. Many studies have found that using ICT materials in community orientation training on health has a better impact on knowledge, attitude, and behaviour. Some organisations dealing with health sector development emphasise local information access and telemedicine with a local indigenous knowledge base.
- v) **Health Research:** The role of ICTs in health research is undoubtedly one of the important components of ICT in health development. The bibliographies in health give several useful references that focus on the utility of ICT in health research. They also emphasise using electronic and online medical journals and ICTs to network with health researchers.

- vi) **Health Campaigns:** ICTs are used in large-scale health campaigns. Most African countries are using ICTs for HIV/AIDS health campaigns. USAID of South Africa seeks the development of an innovative public-private partnership that uses ICTs to reduce the impact of HIV/AIDS in South Africa. The ICTs primarily used are mobile/ cellular technology, computer-based technology, radio, video television, web, and social networking.

Media Lab Asia, 2005 recommendations on the use of ICT in different levels of the primary health care system are:

- i) The ICTs requirements for the centre are handheld computer devices for data collection and compilation, an enabled digital camera, a digital stethoscope, a digital glucometer, a portable digital weighing machine, an email facility, and a multimedia facility for training.
- ii) The ICTs requirements for the PHCs are a PC with printer and webcam, digital weighing machine, digital stethoscope, digital ECG machine, digital glucometer, diagnostic test kits, pulse oximeter, digital x-ray, digital microscope, digital ultrasound, etc
- iii) ICTs requirements for Community Health Centre (CHC) will be all the requirements at PHC and diagnostic kits, cardiac monitor, ICT augmented operation theatre, good communication and connectivity facilities like email, fax and video conferencing and good telemedicine facilities.

It is rightly remarked that continuous development in ICTs has resulted in the increasing use of those technologies in medicine and the provision of medical care.

1.5.5 ICT and Women Empowerment

ICT can play a vital role in promoting women's empowerment in developing countries. There are many examples of women using new technologies to improve their businesses, create new businesses, or find new employment opportunities. However, most women, particularly those residing in rural and semi-urban areas, are still excluded from the digital economy. Women need to become active promoters of ICT and e-commerce and enhance their capacities in IT training and skills. Further, women need to become more involved in ICT policymaking and development to ensure that women's needs are incorporated in infrastructure, access, training, and education policies. ICTs can be a powerful catalyst for women's political and social empowerment. June Lennie (2002), citing the Australian case, said that many women in rural Australia take leadership in community and economic development activities and are often extremely reliant on various communication technologies for personal, family, business, and networking purposes. UNESCO intends to overcome the gender divide by providing opportunities to women in knowledge societies through the development of ICTs. The UNESCAP (United Nations Economic and Social Commission for Asia and Pacific) emphasised closing the gender divide through gender-responsive ICT capacity development for women's organisations and

enhanced women's access to the benefits of ICT so that ICT becomes a central tool for women's empowerment and promotion of gender equality. The state of Kerala had initiated gender-focused approaches to ICTs and gender empowerment through Kudumbashree's ICT-based enterprise.

Kudumbashree ICT Unit

Techno World Digital Technologies (TDT) is a Kudumbashree ICT unit initiated in 1999 by ten women from below-poverty-line families. They provided US\$300 of their own money, matched by a US\$3,000 bank loan and a US\$2,500 local government subsidy to purchase a basic computing set-up. By 2004, their total asset base had risen fivefold to a system of 22 computers plus computing peripherals worth US\$30,000.

The unit mainly undertakes data entry work for state government departments under the government's digitisation programme. It has also undertaken work such as CD rewriting and some website maintenance, and it also provides IT training to several government schools. Work patterns are based on two main shifts (7.30 AM to 1.00 PM and 1.00 PM to 6.30 PM), and 40 additional staff have been employed over and above the original 10 women members, including several men.

Note: Kudumbashree, which means "Prosperity of the family," is an initiative of the Kerala State Poverty Eradication Mission (SPEM), which was launched on 1 April 1999 as a women-oriented participatory and integrated approach to fighting poverty.

Source: https://e-space.mmu.ac.uk/97901/1/di_wp20.pdf(accessed on 10/9/2018).

1.6 E-DEVELOPMENT AND ITS STRATEGIES

E-development is a process that uses ICTs or ICT applications to provide information and knowledge services necessary to enhance productivity, efficiency, and quality of life. The International Institute for Communication and Development (IICD) considers e-development as that development by which 'e' means effective, 'e' means efficient, and 'e' means empowering. It uses ICTs to increase people's opportunities to empower poor people and counter insecurity and vulnerability. ICT has a far-reaching role to play in developing urban and rural nations. Many developed nations have grasped the advantages of ICT, which has contributed immensely to their socio-economic development. The redevelopment has occupied an important place in the paradigm of development. Therefore, an efficient e-development strategy is *sine-qu-a-non* for development. It is emphasised that the measure of success of ICT in development will not focus on the spread of technology but on overall progress towards economic growth and ultimately towards the Millennium Development Goals (Dutta et al., 2004).

Some of the strategies to be followed for e-development are as follows:

- i) **Raising awareness:** An intensive campaign to propagate the role of ICT

in development is very much required. All the national, regional, state and even grassroots stakeholders need to be informed about ICT's role in development. The campaign should clarify the ICT options available for development and those that should be taken and used for development. Harnessing the role of the public, private sector, NGOs, and even civil societies will go a long way in promoting awareness of the role of ICT in development.

- ii) Building coalition:** E-development strategies need a coalition framework in which the public and private sectors work together to become successful. A successful public-private partnership model is required for the knowledge-based global economy.
- iii) Clarifying roles and responsibilities:** A national strategy should help to clarify the roles and responsibilities of various development actors, such as the government, private and civil society. The government needs to lead by setting the policy and institutional environment for promoting ICT industry development. However, it should not be viewed as a government-only strategy.
- iv) Scaling up:** Scaling up intra- and inter-ICT sectors is required. Therefore, reform and innovations are required within the ICT sector. Besides, scaling up ICT intra-sector to other development sectors, like health, education, rural development, urban development, etc., is also essential for a nation's holistic development. Appropriate policy, institutional reforms, and change in management practices are required during the scaling up of commitment and knowledge about processes to diffuse and scale up best practices.
- v) Leveraging ICT:** The role of e-development strategy can also be stated in terms of the three options for leveraging ICT, such as an industry or sector in its own right, as a general-purpose technology to be applied across sectors and an enabling infrastructure for empowerment and service delivery. To reduce the risks and improve the impact of targeting the ICT industry for promotion and focused efforts, governments should work with the private sector to identify target market opportunities, match specific niches to comparative advantage, systematically assess current constraints and jointly devise the policies and programmes to develop the industry and exploit market niches.

Check Your Progress: 3

- Note:** a) Use the spaces given below for your answers.
b) Check your answers with those given at the end of the unit.
- 1) What do you mean by e-Development?

.....
.....
.....

- 2) Are ICTs useful for the development of health? Comment.

1.7 LET US SUM UP

ICT is considered one of the important tools for development in this era of globalisation. Many developed countries have already reaped the benefits of ICTs and have successfully utilised them in their development processes. This unit describes in detail the meaning of ICT and its role in developing different sectors such as education, health, agriculture, industry, poverty alleviation, and women's empowerment. It also deals with the concept of development and various strategies for e-development.

1.8 FURTHER READINGS

1. Chhavi (2008), "ICT as a tool for poverty reduction", see [<https://bvicam.ac.in/news/INDIACom%202008%20Proceedings/pdfs/papers/119.pdf>]
2. Dutta, S., B. Lanvin and F. Pana (eds) (2004), Global Information Technology Report 2003-04, Oxford University Press, <http://www.weforum.org>
3. Gunjan N (2014), "ICT based education: A paradigm shift in India", Techno LEARN, 4(1), pp 15-26.
4. Health Link Worldwide (2006), "Improving health connections people: The role of ICTs in the health sector of developing countries", www.healthlink.org.uk
5. IICD, "ICT for Education impact and lessons learned from IICD-supported activities", International Institute for Communication and Development, The Hague, Netherlands, Source: <http://e-space.openrepository.com/e-space/bits>
6. IT Committee of the Secretary of State (1996), Den Norske IT-veien bit for bit, ISBN 82-7452-016-5.
7. Luanne L (2002), "Rural women's empowerment in a communication technology project: Some contradictory effects", Rural Society, Issue 12(3), pp 224-245.
8. Media Lab Asia (2005). ICT for Primary Health Care, A Report (Excerpts of the Report), New Delhi, www.medialabasia.in
9. Sharon YP Lin, <http://www.undp.org.my/upload/ict4d.pdf>
10. Siddharthan, N. S., & Lal, K. (2003), Liberalisation and growth of firms in India. Economic and Political Weekly, 38(20), 1983–1988.
11. UNDP "Information Communications Technology for Development" Evaluation Office, No.5, September 2001, [http://web.undp.org/evaluation/documents/essentials_5.pdf]

12. UNDP-Asia Pacific Development Information Programme, UN Service Building, Thailand.
13. WHO (2001), e-Health for Health Care Delivery: Strategy 2004–2007, Geneva.
14. World Bank Global Information & Communication Technologies Department, World Bank, Washington, DC.

Website Referred

1. <http://www.asksource.info/pdf/framework2.polf>
2. <http://www.iidc.org/articles/IICDnews.import1757>
3. <http://unesdoc.unesco.org/images/0012/001295/129538e.pdf>
4. http://shodhganga.inflibnet.ac.in/bitstream/10603/170610/16/16_chapter%208.pdf
5. <https://www.medialabasia.in/downloads/mlasia-ict-hc-rep-excerpts.pdf>
6. http://www.infodev.org/infodev-files/resource/InfodevDocuments_84.pdf

1.9 CHECK YOUR PROGRESS-POSSIBLE ANSWERS

Check Your Progress: 1

- 1) ICT refers to ‘information’, ‘communication’, and ‘technology’. Generally, we seek information and communicate it to others through technology who may also be interested in its value. Technology plays an important role in the effective transaction and communication of knowledge information to its seekers. ICT includes hardware, processes, and systems used to store and manage communications and share information.
- 2) The Internet carries a vast array of information resources and services, most notably the interlinked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail, in addition to popular services such as video on demand, online shopping, online gaming, exchange of information from one-to-many or many-to-many by online chat, online social networking, online publishing, file transfer, file sharing and Voice over Internet Protocol (VoIP) or teleconferencing, telepresence person-to-person communication via voice and video.

Check Your Progress: 2

- 1) ICT, to promote development, should be development centric. Asian Development Bank is helping its member countries integrate ICT components into sector development strategies, especially in education, health, and agriculture. The focus is improving public administration and finance management and providing various electronic services to citizens and businesses. The ICT should give information about the performance of various development sectors and programmes.

- 2) ICT effectively develops rural areas at the grassroots level by transacting information about various developmental projects and programmes to the countryside masses.

Check Your Progress: 3

- 1) E-development is a process of development that uses ICTs or ICT applications to provide information and knowledge services necessary to enhance productivity, efficiency, and quality of life. "The International Institute for Communication and Development (IICD) considers e-development to be that development by which 'e' means effective; 'e' means efficient, and 'e' means empowering.
- 2) The use of ICT in health care has become an important aspect of health development. Healthcare solutions provided by information and communication technology (ICT) are popularly known as "e-health". The tools and services contributing to e-health provide better and more efficient healthcare services. The use of e-health technologies allows a mutually beneficial collaboration and involvement of patients and medical professionals in preventing and treating chronic diseases.

UNIT 2 IMPLEMENTATION OF ICT4D

Structure

- 2.0 Introduction
 - 2.1 Learning Outcomes
 - 2.2 Introduction to ICT4D
 - 2.2.1 Definition of ICT4D and its Significance in Global Development.
 - 2.2.2 Brief historical Overview of the Evolution of ICT4D Initiatives.
 - 2.3 Key Components of ICT4D
 - 2.3.1 Digital Infrastructure: The Importance of Reliable and Accessible Digital Infrastructure.
 - 2.3.2 Human Capacity: Role of Education and Training in Building Human Capacity for ICT4D.
 - 2.4 Case Studies of Successful ICT4D Projects
 - 2.4.1 Highlights of Specific Projects that have Effectively Implemented ICT for Development.
 - 2.5 Challenges in ICT4D Implementation
 - 2.5.1 Digital Divide: Analysing Disparities in Access to Technology and Information.
 - 2.5.2 Cultural and Societal Factors: Discuss how Cultural Nuances Affect the Acceptance and Success of ICT4D Initiatives.
 - 2.6 Ethical Considerations in ICT4D
 - 2.6.1 Privacy Issues: Ethical Implications of Data Collection and Usage in Development Projects
 - 2.6.2 Ensuring Inclusivity: Strategies to Prevent Exclusion and Ensure the Benefits of ICT4D Reach all Segments of Society
 - 2.7 Let Us Sum Up
 - 2.8 Keywords
 - 2.9 Further Readings
 - 2.10 Check Your Progress: Possible Answer
-

2.0 INTRODUCTION

The debate around development started in the 1950s and 1960s and continues today. There has not been an absolute answer to defining or specific to the best development path. However, some issues have indeed been identified as integral to development. For instance, eradicating poverty, eliminating illiteracy, and ensuring physical and mental health have become intrinsic to development.

Many tools have been used for development worldwide to achieve these targets. Information, communication, and technology (ICT) have also emerged as important tools for development. ICT largely refers to the use of

digital technologies in any sector, and since these ICTs are being used for development, this use of ICTS in the development process is termed ICT4D.

ICT4D has largely benefited the development process, and because of modernisation or the dominant paradigm of development, the use of technology has been encouraged. Many initiatives have been taken for development in different areas, including health, agriculture, and education, where ICTs are being used to benefit the communities. However, we need to note that the integration of ICTs has not remained easy and smooth as both the physical and human resource infrastructure are still taking shape in some countries, particularly developing countries. We need to note that implementing ICT4D has not been without challenges. Hence, this Unit will introduce you to the evolution of ICT4D and the present situation, especially regarding challenges and ethical concerns.

2.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the evolution of ICT4D initiatives;
 - Comprehend the key components of ICT4D;
 - Analyse the challenges and ethical concerns of ICT4D; and
 - Gain an insight into the successful ICT4D projects.
-

2.2 INTRODUCTION TO ICT4D

ICT4D uses Information, Communication and Technology (ICT) for development. This term became popular with the increasing use of ICTs in different sectors for development worldwide. As we have learnt in the history of development paradigms, technology has become an important development component. From the initial definitions under the modernisation paradigm, ICTs nowadays have become integral to development. ICTs can be traced back to Daniel Lerner's belief in the potential of mass media technologies to modernise traditional societies (Melkote & Steeves, 2015). Hence, ICT4D is not a recent approach to development but has evolved from the 1950s onwards. Therefore, ICTs include the digital technologies of the present times and comprise the analogue technologies of radio and television (Melkote & Steeves, 2015). This integration of ICTs has happened owing to the adoption of ICTs in every aspect of life in all the world countries, including developing countries. Before going further, let us investigate the definitions of ICT4D and its evolution in detail.

16.2.1 Definition of ICT4D and its Significance in Global Development

Heeks (2018) defined ICT4D as “the application of any entity that processes or communicates digital data in order to deliver some part of the international development agenda in a developing country” (p.11). Melkote and Steeves (2015) state that ICT4D can be referred to as possibilities created through access and use of ICTs for modernisation.

UN (n.d.) says that the World Summit on the Information Society (WSIS) Geneva 2003 – Tunis 2005, the Copenhagen Declaration, and the Tunis Commitment all emphasised the potential of ICTs in the overall development of the countries, including economic, political, and social development. Further recognising the role of ICTs in development, the UN mentions that ICTs enable individuals and communities to create, access, utilise and share information and knowledge to achieve their full potential in promoting their development and improving their quality of life.

ICT4D is becoming increasingly popular as integrating ICTs has made the development process cheaper (relative cost- one computer can serve many), quicker and benefits many simultaneously. However, at the same time, it should be noted that as ICT4D is a concept generally applicable to developing countries, the challenges in developing countries are still prevalent in terms of fewer resources, inequality, and less investment. Therefore, there is no denying that implementing ICT4D is important not only for developing countries but also for development at the global level. However, the implementation must be done, taking challenges in its ambit.

2.2.2 Brief Historical Overview of the Evolution of ICT4D Initiatives

As you have learnt in earlier Units from the beginning of discussions around development, technology has been an important development pillar. ICT4D has extended this aspect of technology as it emphasises the use of information and communication technology in all aspects of life rather than being limited to the use of technology in the production process. ICT evolved from IT (Information Technology) to include the Communication aspect. The term IT was limited as it intended to provide only information to its users rather than communicate with them. It had more to do with government, multinational corporations, and one-dimensional economic growth than overall development. The inclusion of 'Communication' in IT made it more encompassing as ICTs aimed to give information to its users and give them a platform to share and communicate with the provider and fellow users.

Further, this process of sharing information and ideas with the provider of information (which remains most of the time, government, or sometimes non-governmental organisations) and fellow users was gradual and not sudden. Rather, ICT, in the beginning, was almost equivalent to IT and, hence, can be called ICT4D 0.0, in which communication or interaction aspect was lacking. Heeks (2008) mentions that ICT4D 0.0 was chiefly used in government offices to share information inside offices only, whereas in ICT 1.0, ICTs were brought out from the confines of government offices to rural areas. The most popular projects under ICT 1.0 in the first decade of the 21st century were telecentres, where a computer or desktop was installed with an internet connection in a small room largely meant to provide information to the villagers (Heeks, 2008). The idea for these projects was directly taken from the developed Western world and implemented in rural areas of the developing world without much consideration of the socio-cultural context of developing countries. Hence, these projects did introduce technology in these far-off areas but could not prove very beneficial and sustainable as

community involvement would not be generated much. This was also when the UN adopted eight Millennium Development Goals (MDGs) at the international level to define the development direction in 2000. A period of 15 years was kept achieving these goals, and though the role of ICTs was not explicitly explained, ICTs were taken as one of the important tools to achieve development under MDGs since some of the ICT4D was already showing results. After these initial projects came under ICT4D 2.0, interaction and feedback were given more importance to make the projects more sustainable. Heeks (2008) says there is no clear distinction between when ICT4D1.0 ended and when ICT4D2.0 started. Rather, ICT 2.0 is still evolving. This phase may be related to the adoption of 17 Sustainable Development Goals (SDGs) after the experience of MDGs in which the role of ICTs was made an implicit part of some of the targets under specific goals. Figure 1 shows the evolution of ICT4D, and perceptions related to how ICTs were ignored or isolated initially, slowly giving way to integration and innovation in ICT4D projects.

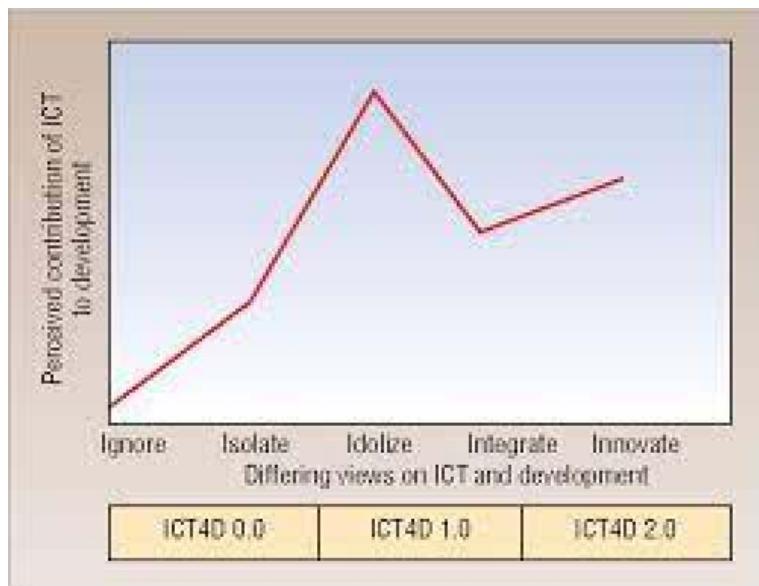


Figure 1: Changing Views on ICTs and Development (Source: Heeks (2008))

Check your Progress: 1

- Note:** 1) Use the space below for your answer.
 2) Compare your answers with those given at the end of this Unit.

- What do you understand by ICT4D?

.....

2.3 KEY COMPONENTS OF ICT4D

ICT4D comprises two key components: the establishment of Digital Infrastructure and the building of Human Capacity. Both are equally important, as one cannot function without the other. Some of the early initiatives have not been very successful as more emphasis was placed on one

aspect of the ICT4D, ignoring the other. Hence, we need to learn both components in detail, which are as follows:

2.3.1 Digital Infrastructure: The Importance of Reliable and Accessible Digital Infrastructure

Digital Infrastructure refers to establishing the physical infrastructure needed for development in different sectors of the economy and society. It consists of the technologies required to reach the participants in the development process. Among other technologies, it may include radio, television, mobile phones, computers, and internet connectivity. We have seen that these technologies have been made available in many parts of the world, including the developing world and the farther rural areas. Nearly 70% of the world's population has become internet users (ITU, 2023). However, most of the infrastructure was not sustainable in its working. Most development projects have been made operational once, but more attention is needed to make them sustainable. Problems like an irregular supply of electricity and repair and maintenance have led to the discontinuance of these projects. Lately, however, with the reach of handy digital devices and the widespread internet network, digital infrastructure has been gaining a foothold in inaccessible areas.

The accessibility of digital infrastructure also needs to be understood in terms of language issues. We know that most technologies have been developed by multinational corporations that use English as their only language—people who need help understanding English face many challenges in accessing these technologies. Though many initiatives have now incorporated regional languages in their digital content, more attention is still needed to understand this aspect of the accessibility of ICTs.

2.3.2 Human Capacity: role of education and training in building human capacity for ICT4D

Human capacity refers to the ability and capacity of the people to operate the digital infrastructure. The aim of building human capacity remains not only to operate the technologies but also to operate them so that maximum output may be derived from using technology for the community around them. Establishing the digital infrastructure is just one part of the ICT4D initiatives; inculcating digital skills among the community is an equally important part of these initiatives to utilise the full potential of these technologies. Imparting skills and building capacities among community members to operate these ICTs are also important for the sustainability of these digital initiatives, as some of the early projects failed owing to a lack of human resources who could operate and utilise these technologies. When the physical infrastructure was set up, some experts came to operate it but left after some time, leaving the infrastructure useless as nobody in the community knew how to maintain and utilise it.

Digital skills are the skills needed to operate the digital infrastructure. These also include language skills, as most of the content available through ICTs is in English, which might need to be understood at regional and local levels, especially in rural areas.

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. List the key components of ICT4D.

.....
.....
.....
.....
.....

2.4 CASE STUDIES OF SUCCESSFUL ICT4D PROJECTS

Numerous projects related to ICT4D have been undertaken in different parts of the world from the early 1970s to the present. As discussed, ICT4D projects utilised recent digital technologies and mass media, such as radio and television, to reach the marginalised sections in different countries. These projects have been implemented in agriculture, education, health, and small-rural entrepreneurship. In the next section, we will discuss some of the projects which may be termed successful stories of ICT4D projects. It may be kept in mind that these projects might not be able to achieve all the targets that they had set for the beneficiaries but were at least able to utilise comparatively new tools of development, ICTs, in the development process and could learn from the cavities that hindered the full potential of the projects.

2.4.1 Highlights of Specific Projects that have Effectively Implemented ICT for Development

The Satellite Instructional Television Experiment (SITE) in India, the Palapa Experiment in Indonesia, and experiments with satellite-based rural telephony in Peru were some earlier examples of ICTs in the 1970s and 1980s (Melkote & Steeves, 2015).

SITE was a one-year experiment conducted during 1975-76 in India in which satellite Television was used for disseminating information related to various aspects, including agriculture, education, and health for diverse rural populations. Nearly 2400 villages belonging to different linguistic, cultural, climatic, and agricultural regions of the country were covered under the project. The programme content was also a combination of centralisation and decentralisation as some of the content was produced in centrally located studios with the help of experts. In contrast, some programmes were produced locally to connect to the local population. SITE was designed to give policymakers, programme producers, and social scientists insights into how TV can be used to further develop in diverse socio-economic and cultural situations.

The Palapa Ring project in Indonesia, initiated in 1976, aimed at connecting all the islands in the country. The project attempted to provide internet access to all provinces in the country by 2019. Still, the evaluation of the project shows that internet access provided under the project has led to an increase only in personal computing consumption. In contrast, the processes at workplaces or educational institutions have not benefited much from it (Gupta, n.d.). The internet access under the project has reached the villages, but the information being provided to villagers needs to be more specific to their needs to reap maximum benefit from using ICTs in development projects.

The Rural Communication Services Project (RCSP) was launched in Peru to integrate satellite communication into rural development. The project was based on the premise that connecting villages through telecommunications would enable them to overcome infrastructure and other resource limitations. The project introduced telephony in many rural areas of Peru, but solid institutional support, sound management, and dynamic leadership were needed to fully benefit the users (Tietjen et al., 1987).

Another popular project launched in India, which was among the pioneers in e-governance projects, was Gyandoot. Gyandoot, which means "Purveyor of Knowledge" in Hindi, was an intranet-based service portal implemented in India's Dhar district of Madhya Pradesh in 2000 (Bhatnagar et al., 2003). This portal was made available to villagers through information kiosks, which were set up in different villages. Villagers, with the help of a person who was managing the kiosk, could register their complaints or grievances to government officials sitting in their villages and access information related to different fields, including crop prices or details of land. The project evaluation showed that people felt they could approach government officials much quicker through these kiosks (Bhatnagar et al., 2003).

In e-governance, governments of many countries have started web portals to provide information on all government services and schemes on one platform. The National Portal of India was one such initiative taken up by the Indian government in 2005 and continues to provide information related to varied fields like agriculture, social development, law and justice, environment, and youth and sports.

With the increasing penetration of digital technologies, including mobile phones, computers, and the Internet, after the 2000s, many governmental and non-governmental organisations have introduced projects related to these digital technologies where various services were provided to users on their mobile phone handsets. Many people belonging to marginalised sections, especially in rural areas, were provided with digital devices like mobile phones and laptops to access the benefits of ICTs in the development process. However, again, challenges like lack of maintenance facilities and lack of digital skills have slowed down the progress of these projects to some extent. However, after evaluating these projects, more sustainable strategies have been adopted where community members have been involved in ICT4D right from the decision-making to implementation and, finally, evaluation of projects.

Activity: 1

Identify any ICT4D in your nearby area and analyse its implementation.

.....
.....

2.5 CHALLENGES IN ICT4D IMPLEMENTATION

Implementation of ICT4D has not been without challenges. Two challenges, the digital divide, and socio-cultural differences, have remained primary in using ICTs for Development.

2.5.1 Digital Divide: Analysing Disparities in Access to Technology and Information

Digital Divide, as the name suggests, refers to the gap that has developed due to the lack of access to and use of digital technologies in some countries. The developing world lacked access to and use of digital technologies, hence adding one more parameter: lagging behind the developed world or the Global North. A report by ITU (2017) found that European countries continue to lead in developing ICTs. In contrast, countries in the continent of Africa have still seen the least development of ICTs. It should be noted here that not only the reach and access that have created disparities in the use of ICTs but also the skill level of users has led to the digital divide. Most of the time, the focus remains on making digital technology accessible among community members through government and non-governmental organisations while not making the community members capable of using the technology. Rather, in the early initiatives, organisations introduced the technology used to bring in their expert personnel to operate the technologies, making the community members dependent on this person. However, with the coming up of personal digital devices like mobile phones, digital literacy has become an important part of implementing ICT4D.

A closer look would reveal that this digital divide not only exists in terms of countries, but many other sections of society face this digital divide. For instance, the gender digital divide has also become apparent as fewer women than men would usually be able to access and use digital technologies. A report by ITU (2017) mentions that the digital gender divide is relatively small in developed countries and more pronounced in developing countries. In contrast, it is substantial in Least Developed Countries (LDCs). Similarly, compared to urban areas, rural areas would face many barriers to accessing digital technologies, keeping rural areas or villages at a disadvantage. ITU (2023) states that only 50% of people in rural areas, compared to 81% in urban areas, can access the Internet. Even in the case of age groups, we see that generally, youth have both access and skills to use ICTs, whereas older people remain aloof from the digital world. A report by ITU (2017) states that the proportion of the population aged 15-24 years who are online is estimated to be over 70% compared to 48 % of the overall population, adding that older adults are less likely to be online.

2.5.2 Cultural and Societal Factors: Discussing how Cultural Nuances Affect the Acceptance and Success of ICT4D Initiatives

Socio-cultural factors have remained another big challenge in the implementation of ICTs. As we have seen in the evolution of ICT4D, most digital initiatives have been taken up originally in the developed world of Western countries and replicated in the developing world of Eastern countries. Under modernisation or the dominant paradigm of development, when technology adoption was considered one of the major paths for development in developing countries, these digital initiatives were implemented in developing countries without considering socio-cultural factors. Rather, in the 1950s and 1960s, a clear distinction was made regarding the characteristics of traditional and modern societies. Along with more use of technology in modern societies than in traditional societies, traditional societies were also termed as having less empathy, close-knit communities, limited view of the world, and less openness to innovation and experimentation. Hence, all these factors have played a role in hindering the adoption of digital technologies and continue to slow down the rate of adoption of ICTs in developing countries. For instance, community members in developing countries believe in subsistence production. This production can fulfil their own needs, and they think that if they aspire for more, they might interfere with the share of others. Therefore, they still do not appreciate the technologies that encourage mass production. Along similar lines, religion has always remained a very important part of their lives, and hence, the use of many technologies sometimes does not go by their beliefs and norms. Gender, too, plays an important role in many countries. Women are still not considered to be capable enough to use ICTs independently. ITU (2023) states that there is only a 5% difference in internet usage among men and women at the world level, but it increases to 10% in the case of Africa. Hence, the socio-cultural factors of every community need to be kept in mind before introducing technology so that the technology can be used efficiently and effectively by the community members.

Figure 2 depicts the changing issues and concerns regarding the use of ICT4D over time. It shows that the implementation of ICT4D starts with the reach and accessibility of ICTs in a particular community and ends with the culmination of evaluating the community's goals.

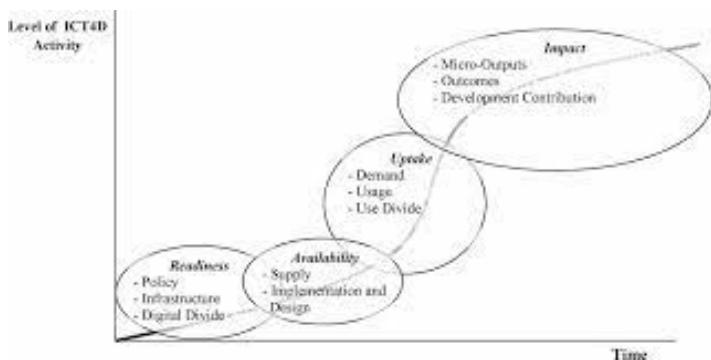


Figure 2: Changing ICT4D Issues Over Time (Source: Heeks (2008))

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. How do you think the digital divide hinders ICT4D?

.....
.....
.....
.....
.....

Activity: 2

1. Look for a project related to ICT4D in your nearby area and analyse if the implementing agency faced any challenges in implementing it.

.....
.....

2. Identify if there is any group of community members who have not been able to access (digital divide) the ICT4D.

.....
.....

2.6 ETHICAL CONSIDERATIONS IN ICT4D

Despite challenges in most countries, ICTs have been much appreciated and accommodated, as the digital world is the only way forward. However, some ethical issues regarding using ICTs in development are still being discussed. Invasion of privacy and ensuring inclusivity are considered concerns from an ethical point of view in implementing ICT4D. Both the concerns are discussed below: -

2.6.1 Privacy Issues: Ethical Implications of Data Collection and Usage in Development Projects

ICTs are being seen as invasive as most technologies are individualistic. To make these technologies more effective and custom-made, they collect a lot of personal information about the people they intend to benefit from. However, since people, especially in developing countries, are not used to sharing personal details like age and income, people in these countries have become even more scared of using these technologies. Furthermore, since many of the projects related to ICT4D, especially in the initial period, were handled by Multinational Corporations (MNCs) and many trace the origin of technology-driven initiatives to the Western capitalistic world, thinkers in the field of ICT4D and users themselves remain wary of the motives of implementing agencies of ICT4D. MNCs have often used the data collected

to implement ICT4D and further their commercial interests. Rather, some studies have pointed out that this data is also being used for political purposes as it is vast. A term has also been devised for this kind of data: Big data. Big data is a large dataset generated with the help of ICTs. It can be used to reach many people with specific aims and may also be used to analyse the attributes of the public.

2.6.2 Ensuring Inclusivity: Strategies to Prevent Exclusion and Ensure the Benefits of ICT4D Reach all Segments of Society

As discussed above in the challenges to implementing ICT4D, the digital divide has remained an important concern; ensuring inclusivity has also emerged as an ethical concern due to the diversity in different societies and communities. In fact, 'inclusive development' has become an important term in development studies. It refers to all development, irrespective of gender, caste, class, religion, or race. It aims to develop every member of the society or community rather than benefiting some community members. The debate around inclusivity started immediately after the modernisation or dominant paradigm as the steps taken under this paradigm had led to the development of only a few sections of the society, leaving many behind and, hence, creating a further gap between 'haves' and 'have-nots'. Lately, however, it has been realised that the strategies adopted in the early stages of development need to be revised to take everyone along. Taking everyone along would make the development inclusive and sustainable, where we do not need to care about future resources or generations, as inclusive development would ensure stability. To unite all the stakeholders, various strategies are being deployed by the government and NGOs. A horizontal approach to development and communication is encouraged to ensure inclusivity instead of a vertical approach. Rather, in the present times, both approaches are combined to elicit maximum benefit. The horizontal approach to development and communication refers to bringing in all the stakeholders of the development process in one place, holding discussions and devising the development plan instead of implementing the plans made by central-level experts in a far-off community, paying less attention to the community's specific needs. The vertical approach emphasises a top-down approach, whereas the horizontal approach encourages a bottom-up strategy in which community members are encouraged to identify their problems and devise their development path. Horizontal development also encourages self-development, which produces more. When people own and take responsibility for their development, they work more passionately for it, maximising the benefit for all. Similarly, Participatory approaches have also been encouraged for undertaking development where community members participate in every step of development, from decision-making to generating resources for the project to executing the project on the ground level and then evaluating the project. This evaluation of the project provides a road map for future development projects.

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. What strategies are being incorporated in ICT4D projects to ensure inclusivity?

.....
.....
.....
.....
.....
.....

2.7 LET US SUM UP

ICT4D has become an integral part of the development process as ICTs have become intrinsic to all aspects of our lives. Having been initiated into the development process in the early 1990s as one of the tools, today, ICTs have become important as the reach and access of ICTs have increased multi-fold. Many initiatives are being taken to keep ICTs at the centre, both by government and non-government organisations. However, the implementation of ICT4D has not been without challenges and concerns. Establishing digital infrastructure and building human capacities are still posing challenges in the path of ICT4D. Also, sometimes, intrusive use of ICTs and ensuring inclusivity become ethical concerns due to stakeholders' diversity in the development process. However, despite all these challenges and concerns, initiatives in ICT4D are being taken up by development agencies, and transversing on the development path by these agencies is also taking place with the active participation of community members.

2.8 KEYWORDS

Digital Divide- The gap exists between those who can access and use digital technologies and those who cannot.

Digital Literacy is the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies.

Sustainable development is the kind of development in which the needs of the present generation are met without compromising on the needs of future generations.

Inclusive development refers to all development, irrespective of gender, caste, class, religion, or race.

Big Data- Big data is the large datasets which are being generated with the help of ICTs and can be used or analysed to reach many people with the specific aim.

2.9 FURTHER READINGS

1. Bhatnagar, S., Dewan, A., Moreno, T.M. & Kanungo, P. (2003). Gyandoot Project: ICT initiative in Dhar, Madhya Pradesh (English). Empowerment case studies Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/621851468267614396/Gyan_doot-Project-ICT-initiative-in-the-district-of-Dhar-Madhya-Pradesh
2. Gupta, S. (n.d.). Palapa Ring Project: Indonesia's Digitalization. <https://aciperspectives.com/2021/10/22/palapa-ring-project-indonesias-digitalisation/>
3. Heeks, R. (2008). "ICT4D2.0: the next phase of applying ICT for international development", *IEEE Computer*, 41(6), 26–33.
4. Heeks, R. (2018). *Information and Communication Technology for Development (ICT4D)*. Routledge.
5. ITU. (2017). Measuring the Information Society Report 2017: Executive summary. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_ES_E.pdf
6. ITU. (2023). Measuring digital development: Facts and Figures 2023. https://www.itu.int/hub/publication/d-ind-ict_mdd-2023-1/
7. Melkote, S. R. & Steeves, H.L. (2015). *Communication for Development: Theory and Practice for Empowerment and Social Justice*. Sage.
8. Tietjen, K., Shaw, W. & Block, C.H. (1987). The impact of Telephone networks on rural and educational development: Experiences of the AID rural satellite program. https://pdf.usaid.gov/pdf_docs/PNABH188.pdf.
9. UN. (n.d.). <https://www.un.org/development/desa/socialperspectiveondevelopment/issues/information-and-communication-technologies-icts.html>

2.10 CHECK YOUR PROGRESS: POSSIBLE ANSWER

Check Your Progress: 1

1. ICT4D uses Information, Communication, and Technology (ICT) for development. This term became popular with the increasing use of ICTs in different sectors for development worldwide.

Check Your Progress: 2

1. The following are the key components of ICT4D: -
 - i. Establishment of Digital Infrastructure
 - ii. Building of Human Capacity

Check Your Progress: 3

**Implementation of
ICT4D**

1. By creating a gap between the people with access to ICTs and those without access, the digital divide has given rise to another divide between 'haves' and 'have-nots. It has created a section of people who cannot reap the benefits of ICT4D as they neither have access to digital infrastructure nor the digital skills to access the technologies.

Check Your Progress: 4

1. Participatory approaches to development are encouraged to ensure inclusivity in ICT4D so that community members can participate in every step of development, from decision-making to generating resources for the project to executing the project on the ground level and then also evaluating the project. Similarly, attention is paid to horizontal approaches instead of solely relying on vertical or top-down approaches.

UNIT 3 ICT AND DIGITAL DIVIDE

Structure

- 3.0 Introduction
 - 3.1 Learning Outcomes
 - 3.2 What is the Digital Divide?
 - 3.3 What is Development?
 - 3.4 How are Development and the Digital Divide interlinked?
 - 3.5 ICT in India
 - 3.5.1 Role of ICT in Development
 - 3.5.2 ICT and Governance in India
 - 3.6 Prerequisites for Proper Functioning of ICT
 - 3.7 Let Us Sum Up
 - 3.8 Further Readings
 - 3.9 Check Your Progress: Possible Answers
-

3.0 INTRODUCTION

Digital Divide means the gap in access and usage of Information and Communication Technology (ICT). Initially, the Digital Divide indicated the division between those with and without telephone access. However, since the late 1990s, the term has been used mainly to refer to the divide between people with access to the Internet (particularly broadband) and people without access to the Internet. Over the years, the term Digital Divide has achieved numerous connotations and can be found to manifest at multiple levels. It may manifest as a divide between rural and urban areas, rich and poor, literate, and illiterate, socio-economic groups, or more developed and less industrially developed nations. It may also exist due to a technological divide in the form of low-performing computers, low-speed wireless connections, or an economic divide in the form of broadband or internet services pricing. In developed economies where the service sector plays a vital role in GDP, a higher digital divide can prove counterproductive to Development since Information and Communication Technology (ICT) plays a vital role in such economies, and a higher digital divide is indicative of the fact that access to ICT is not uniform across the social and economic strata.

3.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand what the Digital Divide means;
- Explain the interlinkage between Digital Divide and Development;
- Understand the level of internet penetration in India;
- Explain the role of social media in driving internet access in India; and
- Enumerate influences of ICT in commerce.

3.2 WHAT IS THE DIGITAL DIVIDE?

The Digital Divide may refer to the gap between demographics and regions with access to ICT and those that do not have access to it or, at the most, have restricted access due to economic, technical, or social reasons, say lesser bandwidth (technical reason). The Digital Divide may also refer to the gap in access and usage between people of the same region due to inhibiting reasons of socio-economic disparity. A poor person who has to manage the daily bread for himself and his family hardly has the time and resources to access Information and Communication Technology (ICT), either for his leisurely or economic activities. A country like India, where 55% of the workforce is engaged in agriculture (Census 2011) with 118.7 million cultivators, hardly has access to ICT for the population living at the subsistence level. Coupled with this is the high cost of Internet access, which inhibits even the well-off from accessing ICT for leisure or economic activities.

Therefore, the Digital Divide essentially refers to the gap between people, households, and geographic areas at different socio-economic tiers concerning their opportunity to access ICTs and their Internet use for several chores. The term "Digital Divide" might have raised several doubts and questions in you, such as 'Where does it occur and why?', 'What are its causes?', 'How can it be measured?', "What are the factors which affect it?", 'How can it be reduced?' etc.

Well, we will investigate each one by one. But first, let's understand the term 'Development'.

3.3 WHAT IS DEVELOPMENT?

There are various definitions of development, depending upon the perspective from which we are looking. Consequently, we have Economic Development, Social Development, Material development, Immaterial Development, Inclusive Development, etc. In its simplest sense, development can be understood as progress or growth towards a desired direction. This progress or growth can have an economic or social dimension, material or immaterial, inclusive, or exclusive. However, in most cases, the word development is often spoken with economic intent.

The term "development" in international usage implies the need and methods for providing better living conditions for people, especially those residing in poor countries. It includes not just economic growth, though that is crucial, but also human development—which implies providing for health, nutrition, sanitation, education, and a sustainable environment.

The United Nations Development Programme (UNDP) uses a more elaborate definition of development, which aims 'to enable people to lead long and healthy lives, to be knowledgeable, to have access to the resources which enable a decent standard of living and to participate in the life of the community.'

Development is, therefore, empowerment. It should be aimed at unshackling people from obstacles that constrain their abilities to advance their lives and

those of the communities. In 2000, the UN Millennium Declaration was adopted, which aimed to remove poverty, buttress human dignity and equality, and realise peace, democracy, and environmental sustainability. The eight goals enshrined in the declaration reflect the meaning and aim of development that the UN envisages. These eight goals are-

1. To ensure environmental sustainability.
2. To remove extreme poverty and hunger
3. To ensure gender equality and to empower women.
4. To improve maternal health
5. To achieve universal primary education
6. To tackle the menace of HIV/AIDS, malaria, and other diseases
7. To develop a global partnership for development
8. To reduce the child mortality rate

The role of ICT in pursuing the aforementioned objectives of the UN can be that of a facilitator.

3.4 HOW DEVELOPMENT AND DIGITAL DIVIDE ARE INTERLINKED?

If we chart the growth of the economy since early civilisation, we will come across three stages:

- i. Agricultural economy phase
- ii. Industrial economy phase, and finally
- iii. Service economy phase.

Agriculture played an important role in human civilisation. Civilisation develops only with settled agriculture. During the agricultural phase, man uses his skills upon nature to produce and fulfil his material needs. He lived in this phase for centuries, where he carved out glorious empires and built magnificent buildings. However, a turning point occurred with the Industrial Revolution's advent in 18th C. AD. The whole process of production undergoes a drastic change. The earlier manual mode of production gave way to the machine mode of production, drastically reducing the time required for production and increasing the quality of goods produced. Technology played an important role in this phase, and the growth or development of the economy became contingent upon technology.

However, the third phase, i.e., the emergence of the service economy, played (and continues to play) a dominant role in a country's economy and, consequently, its development. It must be noted that the emergence of this sector coincided with the emergence of Information and Communication Technology. ICT prepared the ground for the emergence and proliferation of the service sector. It is here that ICT (and its demographic corollary- digital divide) plays an important role in development. Given the role ICT has attained in the service sector, the transition of any country from a developing to a developed economy without it is considered unimaginable.

Since there is no unanimity upon the definition of a developed and developing economy (or country), the basic difference, as far as our study is concerned, can be presumed to be the relative share of the primary and tertiary sectors in the economy of the country. While developed economies usually have a larger tertiary sector and most of the workforce is engaged in its service industries, agriculture (primary sector) is the major contributor to the country's GDP in less developed economies.

Therefore, ICT becomes pivotal in a developed economy since the service industry is existentially dependent on it.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. How would you define the Digital Divide, and what factors contribute to its existence in today's society?

.....
.....
.....

2. Explore various dimensions of development beyond economic growth and discuss how they relate to societal progress and well-being.

.....
.....
.....

3. Discuss the interconnectedness between the Digital Divide and Development.

.....
.....
.....

3.5 ICT IN INDIA

It becomes pertinent to peek into the role and reach of ICT in India. Before we proceed, let us have a statistical look at the level of internet penetration in India. Though India has 460 million Internet users and is ranked as the second largest online market after China, its Internet penetration is dismal when counted in terms of the percentage of people accessing the Internet. Nevertheless, ICT has stimulated progress across various dimensions of society, from connecting individuals to spreading across businesses and governments. Unfortunately, a digital divide exists in accessibility between higher-income and lower-income nations. High-income countries will inevitably show greater penetration of information communication technology than less developed countries. What is needed is that to be able to uphold greater social development in the world, it is vital to escalate access to digital technology universally.

There has been exponential growth in internet users in the past two decades. The increasing penetration of information communication technology by bridging the existing digital divide is directly related to any nation's greater social growth. It is also important to build up the consistent human capital required to use the technology optimally. ICT can benefit the economy by increasing output, but only if people with access to the technology have the necessary potential to make the best use of it.

We can state here that to bring greater diffusion of information communication technology to society, we must make it more affordable so that people of every class can afford it. This is possible through support from multilateral organisations to the developing nations by assisting them in building their communication infrastructure. Moreover, promoting healthy market competition in Internet provision and reassuring public-private partnerships in building digital infrastructure could increase the affordability of ICT and thus improve access to it. Further, digital divides can also be lessened by bringing greater awareness among citizens about the use of digital technology, which could help decrease information inequality in society.

Retail e-commerce sales in India stood at 16.08 billion US dollars in 2016, making it the second-largest online market after China. It is expected to surpass 45 billion USD in 2021. From the above figures, it is evident that most Indians use the Internet for socialising and purchasing. Though the former may be discarded as a leisurely activity, the latter can be an index of economic development since the volume of online trade that is taking place in India, as is evident from the figures above, is indicative of the country's economic robustness. After looking into facts, figures, and statistics, let us revert to the basic question: What role does ICT play in development, and how is the digital divide an impediment in its pursuance?

3.5.1 Role of ICT in Development

You are already aware that the scopes of ICT in Development are numerous and can be summarised in the following points as per a United Nations report-

- The ICT sector's output directly contributes to the economy.
- Advancement in public administration through ICT in governance by bringing administration closer to people through e-portals of the government departments. In this way, transparency in the procurement process for public service contracts can be ensured, thereby reducing corruptive practices.
- ICT can be used to improve education, including distance learning and training.
- ICT can be used to improve the delivery of healthcare services, including the application of telemedicine.
- ICT can be used to monitor ecological situations and maintain environmental stability.

The benefits of ICT can be used to tackle the problems of poverty, illiteracy, and universal healthcare, as well as to bring governance closer to people and make it more citizens centric. As said before, a country's transition from a developing to a developed economy is contingent upon the spread and use of ICT in its service industry.

An economy evolves in a dialectical fashion. On one hand, it opens up newer opportunities and professions, thereby playing a pivotal role in employment generation; on the other hand, it throws up the complexities of managing and governing vast urban expanses which face a shortage of amenities and services. Consequently, cities today face the problem of urban implosion, whereby the services and basic amenities required are falling short of demand, nullifying the very reason for the migration of people from rural to urban areas. The above problem can be addressed by employing ICT in governance and in the provisioning of services.

3.5.2 ICT and Governance in India

The majority of Indians reside in rural areas. As per the Census 2011, 69% of the population resides in rural areas (in the previous Census, this figure stood at 72%), and 55% of its workforce is in the primary sector. To enhance and sustain the overall prosperity, economic growth and social development in the global competitive regime, the Government of India initiated a National E-Governance Plan (NeGP), which is an initiative of the Government to make all its services available to the citizens of India via electronic media. The rural e-Governance projects implemented in the recent few years have aptly demonstrated the importance of ICT in the areas of rural development that are in question. Some of the schemes introduced in rural India have improved government services immensely. Instances like Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Online Income Tax, Online Central Excise, Unique ID (Aadhaar), e- Stamp, E-office, online payment of bills, online booking (of goods and services), e-Choupal, e-Krishi, online FIR etc has not just accelerated the growth of respective areas and contributed to country's economic development, but also brought governance to every doorstep. The ambitious Aadhaar project is linking every citizen digitally and curbing the malpractices of bribery, red-tapism, tax evasion, etc, by bringing more transparency into governance.

ICT not only impacts citizen service delivery but also provides the much-needed stimulus to economic growth due to its focus on crucial social and industry sectors. The extensive use of ICT in governance not only provides better citizen service but also enhances the efficiency, transparency, and accountability of various government departments and agencies.

3.6 PREREQUISITES FOR PROPER FUNCTIONING OF ICT

However, the objectives mentioned above can only be achieved if a proper ICT infrastructure exists in the country. Infrastructure does not imply only the physical infrastructure (the availability of cheap internet services being a prime reason) but the social infrastructure as well, which means the

acceptability, readiness, and digital literacy of the citizens to use ICT to meet the demands of their service. It is here that the digital divide plays a role. With just one-fourth of the population having access to the Internet, the benefits of ICT in governance and development are constrained.

The digital divide does not exist merely at the level of availability of ICT, but also (and more importantly) at the level of adaptability and ability to use ICT for furthering one's development and that of the society in particular and the nation as a whole. Thus, there exists a digital divide between people living in urban areas and the ones living in rural areas, between rich and poor, between the young (who are more capable of using ICT for their own needs and desires) and the old generation (who find technology a bit difficult to comprehend). The digital divide also exists between men and women, as data suggests above. Men dominate internet usage in India with 71% compared to 29% of women. Thus, it is evident that the digital divide manifests itself at multiple levels and is not concentrated in a particular section or strata. This digital divide acts as an impediment towards growth and development.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. What factors have influenced India's growth in internet usage, and what challenges persist in bridging the digital gap across different regions and demographics?

.....
.....
.....

2. Explore the role of social media in driving internet access in India. How has the widespread adoption of social networking platforms contributed to increased connectivity and digital inclusion?

.....
.....
.....

3. Investigate the impact of Information and Communication Technology (ICT) on commerce and economic development.

.....
.....
.....

3.7 LET US SUM UP

With a global shift towards a service economy, ICT's role in any country's development has become inevitable. It is not just development that also plays an important role in governance. Apart from providing better citizen service, ICT has also ushered in transparency and accountability in government

departments and agencies. It has brought administration closer to people, has radically transformed the way education used to be imparted, has ushered a revolution in healthcare through telemedicine or medical transcription, improved monitoring of welfare policies, improved management of ecology and maintenance of environmental stability, etc. ICT has no doubt brought about a revolutionary transformation in the economy as well as in the society. However, its benefits cannot be inclusive unless a large digital divide incapacitates three-fourths of the population and puts them outside the domain of ICT. Consequently, if this digital divide is not bridged or addressed on time, it will again give rise to socio-economic disparity, with the disparity not being centred on literacy but on digital literacy.

3.8 FURTHER READINGS

1. Aissaoui, N. (2022). The digital divide: a literature review and some directions for future research in light of COVID-19. *Global Knowledge, Memory, and Communication*, 71(8/9), 686-708.
2. Heeks, R. (2022). Digital inequality beyond the digital divide: conceptualizing adverse digital incorporation in the global South. *Information Technology for Development*, 28(4), 688-704. <https://www.tandfonline.com/doi/pdf/10.1080/02681102.2022.2068492>
3. Imran, A. (2023). Why addressing digital inequality should be a priority. *The Electronic Journal of Information Systems in Developing Countries*, 89(3), e12255. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/isd2.12255>
4. Kuhn, C., Khoo, S. M., Czerniewicz, L., Lilley, W., Bute, S., Crean, A., ... & MacKenzie, A. (2023). Understanding digital inequality: a theoretical kaleidoscope. *Constructing Postdigital Research: Method and Emancipation*, 333-373. <https://link.springer.com/content/pdf/10.1007/s42438-023-00395-8.pdf>
5. Lomborg, S., & Ytre-Arne, B. (2021). Advancing digital disconnection research: Introduction to the special issue. *Convergence*, 27(6), 1529-1535. <https://journals.sagepub.com/doi/pdf/10.1177/13548565211057518>
6. Macevičiūtė, E., & Wilson, T. D. (2018). Digital means for reducing digital inequality: Literature review. *Informing science: the international journal of an emerging transdiscipline*, 21, 269-287.
7. Mubarak, F., Suomi, R., & Kantola, S. P. (2020). Confirming the links between socio-economic variables and digitalization worldwide: the unsettled debate on digital divide. *Journal of Information, Communication and Ethics in Society*, 18(3), 415-430. <https://www.emerald.com/insight/content/doi/10.1108/JICES-02-2019-0021/full/pdf>
8. Rothe, F. F., Van Audenhove, L., & Loisen, J. (2023). Digital development, inequalities & the Sustainable Development Goals: what does 'Leave No-One Behind' mean for ICT4D? *Information Technology for Development*, 29(1), 9-26.

3.9 CHECK YOUR PROGRESS: POSSIBLE ANSWER

Check Your Progress 1

1. The Digital Divide refers to the gap between those who have access to modern information and communication technologies (ICTs) and those who do not, exacerbating social and economic inequalities. Factors contributing to its existence include economic disparities, infrastructure limitations, educational barriers, and socio-cultural factors. Additionally, disparities in digital literacy and skills, as well as issues of affordability and accessibility, play crucial roles. Discrimination based on gender, age, ethnicity, and geographic location further widens the divide, hindering marginalised communities from benefiting from digital advancements.
2. Development encompasses various dimensions beyond economic growth, including social, environmental, and political aspects. Societal progress and well-being hinge on factors such as healthcare, education, environmental sustainability, equality, and political stability. Quality of life indicators, like life expectancy, education levels, and access to basic amenities, reflect a society's holistic development. Addressing social inequalities, promoting environmental sustainability, ensuring political inclusivity, and fostering cultural preservation are integral to achieving comprehensive development and enhancing overall well-being.
3. The Digital Divide and Development are intricately linked, with access to digital technologies playing a significant role in socio-economic progress. Bridging the divide can enhance education, healthcare, employment opportunities, and access to information, thereby fostering overall development. Conversely, unequal access to digital resources can exacerbate existing inequalities, hindering socio-economic advancement. Development efforts must prioritise closing the digital gap to ensure inclusive growth and empower marginalised communities. Additionally, digital literacy and skill-building initiatives are essential to maximise the benefits of technology and promote sustainable development.

Check Your Progress 2:

1. India's growth in internet usage has been influenced by factors such as technological advancements, government initiatives, and increased mobile penetration. Initiatives like Digital India aim to expand digital infrastructure and promote digital literacy, driving internet adoption across the country. However, challenges persist in bridging the digital gap, including inadequate infrastructure in rural areas, affordability constraints, linguistic diversity, and disparities in educational attainment. Additionally, cultural barriers and gender disparities contribute to unequal access to technology. Efforts to address these challenges require holistic approaches, including infrastructure development, affordability measures, and targeted interventions to empower marginalised communities.
2. Social media has played a pivotal role in driving internet access in India,

facilitating connectivity and digital inclusion. Platforms like Facebook, Twitter, and Instagram have provided avenues for communication, networking, and information sharing, particularly in rural and underserved communities. Social media's popularity has spurred internet adoption, especially among youth and urban populations. Furthermore, initiatives like Facebook's Free Basics have aimed to provide free access to essential online services, further promoting connectivity. However, challenges such as misinformation, privacy concerns, and digital divides based on socio-economic factors persist. Leveraging social media for digital literacy efforts and community engagement can enhance its role in promoting inclusive connectivity and bridging the digital gap.

3. Information and Communication Technology (ICT) has significantly impacted commerce and economic development, transforming business models, markets, and trade practices. ICT facilitates global connectivity, enabling businesses to reach wider markets, streamline operations, and enhance productivity. E-commerce platforms have revolutionised retail, providing convenience and accessibility to consumers while promoting entrepreneurship and market competitiveness. Moreover, ICT-driven innovations like mobile banking and digital payment systems have expanded financial inclusion, empowering individuals, and businesses. However, challenges such as digital security, infrastructure limitations, and skill gaps need to be addressed to maximise the socio-economic benefits of ICT. Overall, embracing ICT can foster economic growth, create employment opportunities, and drive sustainable development.

UNIT 4 ISSUES OF DIGITAL INEQUALITY

Structure

- 4.0 Introduction
 - 4.1 Learning Outcomes
 - 4.2 Digital Inequality: A Social Problem
 - 4.3 Understanding the Conceptual Development
 - 4.3.1 Shift from Divide to Inequality
 - 4.3.2 Dimensions of Digital Inequality
 - 4.3.3 Concept of Digital Inequality
 - 4.4 Digital Inequality and Contemporary Society
 - 4.4.1 Inequality in the Information Society
 - 4.4.2 Inequality in the Network Society
 - 4.5 Technological Approach to Digital Inequalities
 - 4.5.1 Diffusion of Innovation Theory
 - 4.5.2 Unified Theory of Acceptance and Use of Technology (UTAUT)
 - 4.5.3 Resources and Appropriation Theory
 - 4.6 Conceptual Dimensions from a Sociological Perspective
 - 4.6.1 Bourdieusian Approach
 - 4.6.2 Weberian Approach
 - 4.7 Digital Capital
 - 4.8 Digital Inclusion-Exclusion and Participation
 - 4.9 New Forms of Digital Inequality
 - 4.10 Let Us Sum Up
 - 4.11 Keywords
 - 4.12 Further Readings
 - 4.13 Check Your Progress: Possible Answers
-

4.0 INTRODUCTION

The proliferation of information and communications technology (ICT) has given prominence to the digital divide discourse, which has become a subject of global concern. With the rise of new ICTs in the second half of the 1990s, the notion of the digital divide emerged in the policy context to address unequal access to digital technologies. Not all countries have the same ICT penetration or growth rate. Developing countries, particularly in Africa, Asia, and Latin America, often face significant challenges regarding access to digital infrastructure, affordability of digital devices, and availability of digital skills and knowledge. Although it has become hard to imagine life without the Internet and other forms of ICT, only some have the same access to devices such as phones, tablets, laptops, and desktop computers. Thus, the discussion over access to digital technologies has given rise to a debate over their usage from the standpoint of equality.

Simply put, digital inequality results from unequal access, skill, and use of the Internet and other ICTs. The conceptual framework for understanding digital inequality deals with the causes and consequences of digital inequality concerning ICTs, considering those as empowerment tools. Several disciplines contribute elements to the framework of digital inequality. Sociology emphasises social inequality regarding access to resources, control over different types of capital, and social involvement. Psychology examines problems as well as attitudes and reasons for using technology. Economics emphasises the spread of relevant innovations. Education deals with digital literacy, skills, and competence. Above all, communication studies deal with the tangents of mediated communication by constructing a connection between elements. Therefore, addressing the concept through the lens of communication studies requires a multi-faceted approach that involves sociological and technological perspectives intertwined with psychological, educational, and economic dimensions.

This Unit describes conceptual and theoretical patterns for identifying and understanding digital inequality using socio- and techno-centric accounts. Although only a small amount of theoretical study has been done on digital inequality so far, the Unit sheds light on traditional and emerging concepts and frameworks that revolve around the rise of the digital divide, the manifestation of digital inequality, multiple concepts related to its components, and new forms of digital inequality.

4.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the multidimensionality of digital inequality;
- Explain the nuanced conceptual and theoretical approaches in the field of digital inequality;
- Discuss the digital inequality from a Sociological Perspective; and
- Understand the technological approach to digital inequality.

4.2 DIGITAL INEQUALITY: A SOCIAL PROBLEM

Neither the essences of individuals nor the essences of specific collectives or systems (such as capitalism or patriarchy) serve as the starting point for this idea of inequality (van Dijk, 2005). Instead, inequality is based on the connections, relationships, interactions, and transactions between people. Therefore, digital inequality is a societal rather than a technical issue.

Access to digital technologies is necessary for participation in many aspects of life, including education, employment, healthcare, and social interaction. Individuals with limited access to digital technologies may find it difficult to fill out online job applications, communicate with potential employers, access online training resources, etc. Digital inequality is a social issue because it creates and expands social inequalities in education, employment, and information access. Those with limited access to digital technologies and

skills may experience significant disadvantages in these areas, affecting their social and economic well-being.

Digital inequality can exacerbate other forms of social inequality, such as those based on race, gender, and socioeconomic standing. Those already marginalised in these areas may experience even more difficulty gaining access to and utilising digital technologies, which can exacerbate existing social disparities. As an example, in India, the digital gender gap encourages gender inequity. With internet connectivity, women may be included in employment opportunities, educational opportunities, and social networks, restricting their social mobility and economic desires. Digital inequality is a social concern because it creates and reinforces social inequalities, which can have long-term repercussions for individuals and society.

4.3 UNDERSTANDING THE CONCEPTUAL DEVELOPMENT

The term "digital divide" was not coined by any theorist; instead, it was first used in an official publication by the National Telecommunications and Information Administration (NTIA, 1999) in North America. In the earliest accounts of the phenomenon, the "digital divide" meant a disparity in the likelihood of having access to information and communication technologies (ICT) based on demographic characteristics such as race, gender, age, socioeconomic status, level of education, and the composition of the household. As the prevalence of computers and the Internet increased in developed nations, the discourse began to evolve, and more intricate conceptualisations were devised. In a short period, research on the digital divide has gained importance as an academic field; as a result, the concept of the "digital divide" has become more comprehensive with the emergence of "digital inequality".

4.3.1 Shift From Divide to Inequality

The term "digital divide" originally referred to the disparity between people with access to modern technologies and those without access (Van Dijk, 2005). This definition of the digital divide has been observed in terms of physical access to telephones, personal computers, cellular devices, etc. Later on, the definition became discordant with understanding the multidimensionality of communication beyond physical access to technologies. Moreover, it has become clear to social scientists that the digital divide is not related to a single binary gap but is intertwined with various social, economic, and technological issues. As social scientists observed the nuances of digital access's social causes and consequences, the term got another social dimension called "inequality". According to this concept, the differences in access and usage of digital technologies are directly or indirectly related to social, cultural, political, and economic inequalities.

4.3.2 Dimensions of Digital Inequality

The digital divide laid the foundation for the concept of digital inequality. To understand the concept of digital inequality, one needs to understand the

levels of the digital divide. Three levels of the digital divide correspond to multiple dimensions of digital inequality.

Table 1. The three levels of the digital divide

Levels	Deals With
First level	Binary access to ICTs (have or have not)
Second level	Digital skills
Third level	The tangible outcome of digital usage

Source: Author's compilation

The first level: The first level of the digital divide describes the unequal distribution of access to digital technologies. Low-income persons, those living in rural regions, people with impairments, and members of racial and ethnic minorities are disproportionately impacted by this divide.

Second level: The second level of the digital divide refers to the unequal distribution of digital skills and competence among people with access to digital technologies. This divide affects those with access to digital technologies but lack the skills and competence to use them effectively. Individuals from low-income or marginalised communities may lack access to education or training in digital skills, resulting in the second level of the digital divide.

Third level: Access to digital devices and acquiring digital skills often fail to predict evenly distributed digital participation (meaningfully participating in the digital sphere). The third level of divide refers to the disparities in abilities to use digital technologies to achieve tangible outcomes of technology usage, such as online learning, remote work, e-commerce, and civic engagement.

4.3.3 Concept of Digital Inequality

The term "digital inequality" reflects a broader conception of the digital divide and incorporates a variety of factors beyond access to technology, including skills, usage patterns, and stakeholders involved in the acquisition of empowerment through technology. It acknowledges that more than merely providing access (binary access to digital technologies) to technology is required to ensure equal benefits from its opportunities. Unequal access to economic, social, cultural, and personal resources impacts digital engagement (Helsper, 2012). Inequality may limit or boost citizens' social, economic, political, personal, and cultural capital, affecting their access to essential knowledge and ability to engage in society (Van Dijk, 2005). A range of determinants contribute to disparities in access to and use digital technologies.

Table 2. Determinants of digital inequality

Socio-demographic	Age, gender, marital status, residency, living area
Economic	Income, employment status, employment type, occupational status, educational level

Social	Online social interaction, social networking, types of social activities
Cultural	Religion, ethnicity, internet use, language
Personal	Type of online activity language skills, English skills, cognitive function
Material	Internet access, access locations, number of electronic devices
Motivational	Attitude towards ICTs, internet motivation, frequency of internet use, time spent online

Source: Adapted from Scheerder, Deursen, & Dijk (2017)

4.4 DIGITAL INEQUALITY AND CONTEMPORARY SOCIETY

The information and network society context best describes high-tech cultures of particular interest that cater to the digital environment. Scholars, including Manuel Castells and Jan van Dijk, used information and/or network societies to discuss disparities in ICTs. Although developed civilisations often display more information and network society features, discussing these concepts must be addressed in pursuing digital inequality, even in other world sections.

4.4.1 Inequality in Information Society

The idea of an information society broadly describes cultures in which information increasingly serves as both the primary input and output for all processes. Manuel Castells (2011) says that an information society is a social organisation where information creation, processing, and transmission become the primary sources of productivity and power. Knowledge, information, and data continually expand and advance quickly in the information society. Inequality in the information society appears at the most fundamental level of information need, which leads to a widening gap in the capacity for association and knowledge transfer and in the capacity to judge the quality of information and make other related decisions. In modern times, there is a considerable disparity in the distribution of information abilities among different groups of people.

4.4.2 Inequality in the Network Society

The concept of network society is not synonymous with the concept of information society; instead, it is an extension of it. The notion of an information society emphasises the changing nature of activities and processes in modern developed nations. According to Castells (2011), the network society is an informational society in which networks serve as the core organisational structure and pervade all areas. Van Dijk (2006) characterised the network society as an information society shaped by a nervous system of social and media networks. Networks are formed when specific actors select others to join them. As a result, individuals or organisations are either included or removed. Being unable to connect to

these networks entails complete exclusion and digital marginalisation.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. Explain the concept of “digital inequality”.

.....
.....
.....

2. What are the levels of digital inequality?

.....
.....
.....

3. Mention any three essential determinants of digital inequality.

.....
.....
.....

4. How does inequality affect the information society?

.....
.....
.....

4.5 TECHNOLOGICAL APPROACH TO DIGITAL INEQUALITIES

Research-based theories and models help us make sense of complex ideas. Digital inequality, an interconnected and complex phenomenon, can be observed through various theoretical frameworks. Over the past decades, several theories regarding the unequal distribution of ICTs have emerged from studying their introduction, diffusion, and use. Theoretical frameworks for comprehending inequalities regarding how people adopt and integrate new technologies to be discussed include the Diffusion of Innovation Theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Resources and Appropriation Theory (RAT).

4.5.1 Diffusion of Innovation Theory

The diffusion of innovation theory was developed by E.M. Rogers in 1962 to describe how a community of potential customers adopts and spreads an innovation. This theory constructs the pattern by which new ideas, practices or products spread through a population. In this process of innovation and diffusion, diffusion occurs when individuals go through the steps of being aware of the need for an invention, deciding to adopt or reject the innovation, trying out the innovation for the first time, and then using the innovation

regularly. Rogers divided adopters into five groups according to how long it took them to decide to adopt. The categories are innovators, early adopters, early majority, late majority, and laggards.

Innovators: People willing to take risks are the first to try new ideas.

Early adopters: Those eager to test the latest innovations and determine their application for everyone.

Early majority: People from the general population who are the first to adopt new technology in the mainstream.

Late majority: People from another part of the general population who follow the early majority and start using the new things in their everyday lives.

Laggards: People who are slower to adopt new products and ideas. They are risk-averse and inflexible.

Each of the five types of adopters is affected by the five primary elements that influence innovation adoption, although to varying degrees: relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage is the extent to which an innovation is perceived as superior to the concept, product, or item it replaces.

Compatibility is the degree to which the innovation is consistent with the prospective adopters' values, experiences, and requirements.

Complexity: The difficulty in comprehending and/or implementing the innovation.

Trialability: The extent to which an innovation can be evaluated or experimented with prior to adoption.

Observability: The degree to which the innovation yields measurable outcomes.

Relevance in the pursuit of digital inequality: The theory may lack some ICT-specific modifications of components, but it is more robust to the diverse and constantly shifting complexities of technologies. Thus, it provides an understanding of the adoption of ICT over time or the diffusion of the Internet.

4.5.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

In 2003, V. Venkatesh, M.G. Morris, G.B. Davis, and F.D. Davis proposed UTAUT by utilising popular models in the field of technology adoption. UTAUT is a popular framework for understanding how people adopt and use new technologies. It suggests that actual technology use is determined by behavioural intent. According to this theory, the perceived likelihood of adopting technology is directly influenced by four critical constructs: performance expectation, effort expectation, social influence, and enabling conditions. Age, gender, experience, and voluntariness moderate the effect of these indicators.

Components of the UTAUT include -

Performance expectation: This refers to the degree to which individuals perceive that a specific technology will assist them in performing their tasks more effectively or efficiently.

Effort expectation refers to the degree to which individuals assume that using a specific technology will be simple and require minimal effort.

Social influence: This refers to the extent to which individuals are influenced by the opinions and attitudes of others in their social networks, such as family, friends, and colleagues.

Enabling conditions refer to the extent to which individuals have access to the required resources and infrastructure to use a specific technology, such as computers, internet connectivity, and technical support.

Relevance in the pursuit of digital inequality: Researchers have used the UTAUT to examine the factors that influence the adoption and use of digital technologies in communities with limited access in the context of the digital divide. Although the UTAUT has been widely used to characterise the digital gap, it and its components have been limited in characterising recent patterns of digital inequality.

4.5.3 Resources and Appropriation Theory

Jan van Dijk (2005) explained the resources and appropriation theory, addressing the social, cultural, and technological factors contributing to digital inequality.

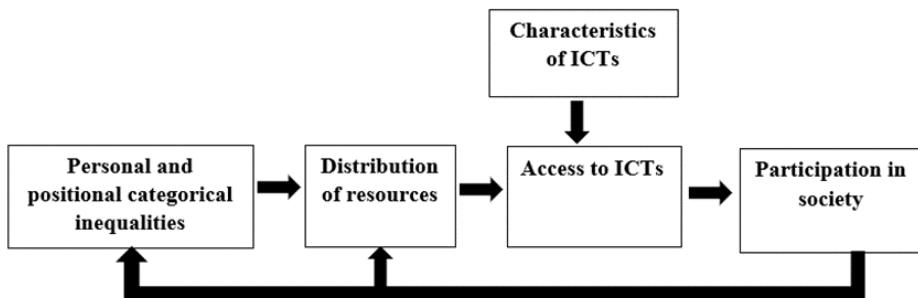


Figure 1. A Casual Model of Core Arguments

Source: Jan van Dijk (2005), The Deepening Divide

The core arguments of the theory are as follows:

- The unequal distribution of resources results from categorical inequalities in society.
- Unequal access to digital technologies results from an unequal distribution of resources.
- Unequal access to digital technologies is also influenced by the features associated with the technology.
- Unequal participation in society results from unequal access to digital technologies.
- Unequal distribution of resources and categorical inequalities are reinforced by unequal participation in society.

The components of the core arguments have been narrated as follows:

- i) **Categorical inequalities:** Various personal and positional categories are accountable for the unequal distribution of resources required to access digital technologies. Personal categories comprise individual traits such as age, sex, race, intelligence (cognitive, emotional, and social), and personality (introvert, extrovert, and others). Positional categories include stratifications in the following areas: household (parent-child, husband-wife), management-executive, developing-developed, urban-rural, citizen-migrant, and high-low education.
- ii) **Resources and mechanisms of distribution:** An uneven access to digital technologies results from an unequal distribution of resources, where a few mechanisms (social exclusion, exploitation, and control) work throughout the process. The resources identified in theory are temporal (time to spend on different activities in life); material resources (income and all kinds of monetary properties); mental resources (knowledge, social, and technical skills, excluding digital skills); social resources (social network positions and relationships); and cultural resources (cultural status and all kinds of credentials).
- iii) **Successive kinds of access:** The fundamentals of resources and appropriation theory explain the stages of digital appropriation, with motivation access being the first, material access being the second, and usage access following after skill access.
 - **Motivational access:** Motivation refers to the factors, such as perceived utility and relevance, that influence people's interest in and engagement with digital technologies. Motivations vary from an attitude towards a particular digital medium to financial factors.
 - **Material or physical access:** Material or physical access refers to the physical accessibility of digital technologies such as computers and the Internet. Time (whether one has time or not) and places (home, school, public places, etc.) to use digital tools and technologies all come under physical access.
 - **Skills access:** Skill access refers to the digital literacy and skills required to effectively utilise digital technologies and the Internet. Skills that account for the usage of digital media encompass operational (the skills needed to operate computers and internet connections), informational (skills used to search, select, and process information from computer and network sources), and strategic (skills to achieve personal or professional goals).
 - **Usage access** describes how individuals utilise digital technologies and the Internet, precisely the intensity of usage time and diversity of applications.
- iv) **Properties of ICT (Hardware, Software, and Content):** The degree to which a person accesses a particular ICT depends on its technological characteristics. Some of the properties of an ICT tool facilitate access, while others limit it. Complexity and expense limit access, while

multipfunctionality and network effects expand it. The formats of new media content are an essential characteristic that has a more significant impact on accessibility.

- v) **Fields of participation in society:** In many parts of society, access to new media can mean the difference between being included and excluded. The umbrella term for these repercussions is participation in society. People with less exposure to digital media have steadily decreasing opportunities to participate in arenas such as citizenship, education, politics, culture, social interactions, and health care.

Relevance in the pursuit of digital inequality: Researchers have used resources and appropriation theory to comprehend digital inequality by analysing the distribution of resources and how individuals and groups appropriate and utilise them in the digital domain.

4.6 CONCEPTUAL DIMENSIONS FROM A SOCIOLOGICAL PERSPECTIVE

Several traditional social theories serve as a background to the conceptual understanding of sociological approaches to digital inequality that can be used to probe its many facets and depths. Bourdieu's conceptions of capital and Weber's social stratification delve into the humanistic and social influences residing in digital inequality.

4.6.1 Bourdieusian Approach

Bourdieu (1986) defines capital as any resource that gives an individual an advantage that can be accumulated over time. Capital enables agents to replicate their positions within the social field and can take one of three fundamental forms: economic, cultural, or social capital, based on the arena in which it operates. In turn, each person's capital supports social inequality and social hierarchy. The conceptualisation of capital by Bourdieu has laid a foundation for a deeper understanding of digital inequality (Ragnedda & Ruiu, 2020).

In other words, people use and invest their social, cultural, and economic assets to strengthen their social status (symbolic capital). The capital of an individual not only creates the first level of the digital divide between those who can and cannot access the Internet but also the second level of the digital divide in terms of skill and capacity to use the Internet and the third level of the digital divide in terms of the social, economic, cultural, political, and personal advantages of being an internet user.

Bourdieu introduced the concept of social fields, structured spaces where individuals and groups compete for resources and power. In digital inequality, the digital realm can be considered a social field where individuals' engagement is influenced by their habits—the internalised set of dispositions, behaviours, and preferences shaped by their social and cultural background. Digital inequality through the lens of social fields and habits allows an understanding of how individuals' social positioning and cultural capital influence their access to and use of digital technologies.

4.6.2 Weberian Approach

The Weberian approach, rooted in the sociological theories of Max Weber, can provide valuable insights into the intertwined processes between social and digital inequalities. Social inequalities as a potential topic of discussion in the discipline of digital inequality have been examined through the lens of Weber's social stratification and power dynamics. The Weberian approach to digital inequality uncovers the structural and systemic factors that contribute to digital inequality and guides efforts to mitigate disparities in access, skills, and resources in the digital realm.

Weber emphasised social stratification based on various dimensions, such as class, status, and power. Social stratification illuminates the manifested and circulated uneven distribution of resources. As per the concept, a group of people, being in a privileged position in society, take more advantage of ICTs and put them to use in achieving a tangible outcome (enhancement of life chances), such as job search, purchase, access to health care, political engagement, learning, socialisation, cybersecurity, leisure, and relationships with bureaucracy. As a result, different social groups, such as economically disadvantaged or marginalised communities, experience different levels (high to low) of access and benefits in the digital realm.

According to this approach, digital stratification intensifies on the following grounds:

Class: A class with limited capacity to use ICTs lacks the economic opportunities they offer.

Status group: A status group with limited capacities to use ICTs cannot benefit from usage in status building, enhancement, and improvement.

Power: Limited capacities to use ICTs delimit personal interests, political power, and influence.

4.7 DIGITAL CAPITAL

Digital capital is the Bourdieusian approach to the digital realm. Following Bourdieu's concept of capital, digital capital is defined as the accumulation of both digital competence (internal skills and attitudes) and digital devices (external resources). It improves the tangible outcome of digital technologies by turning them into other forms of capital, such as social, economic, and cultural.

The core arguments for the concept are as follows:

- Digital capital is closely connected with economic, social, and cultural capital. A person needs these three capitals to build a good attitude and the right skills to use technology well.
- Digital capital is distributed unequally in society. Individuals with higher traditional forms of capital (such as education and social prestige) tend to have higher levels of digital capital. This indicates that people from more privileged backgrounds are more likely to have the skills, resources, and

social connections necessary to flourish in the digital world. In contrast, less privileged people may struggle to access and use digital resources effectively.

- People need a network of support (social capital), such as friends, family, and an online community, to build up their digital capital. At the same time, they need money (economic capital) to access ICTs and knowledge, skills, and abilities (cultural capital) to use ICTs effectively.

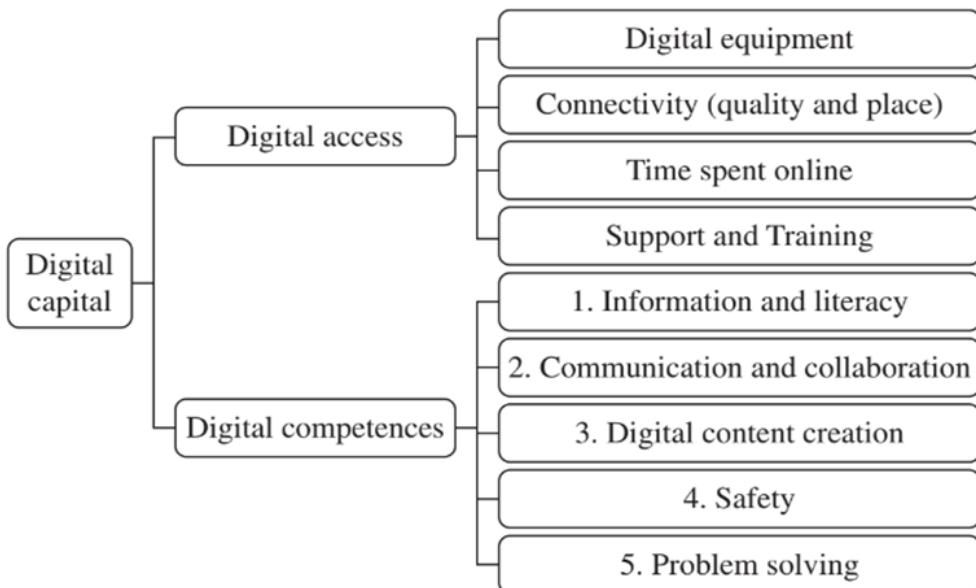


Figure 2. The Components of the Digital Capital Model

Source: Massimo Ragnedda and Maria Laura Ruiu (2020), Digital Capital: A Bourdieusian Perspective on the Digital Divide.

In 2020, Massimo Ragnedda and Maria Laura Ruiu proposed the digital capital model. Digital competence and access are two distinct components of digital capital that can be built up and transferred to improve life chances. According to the concept, in an Internet-based society, digital capital joins the Bourdieusian capitals as an essential factor in illuminating the causes and consequences of social stratification and differentiation.

An individual's digital capital can be accessed by cumulating all digital access and competence elements. This model helps comprehend the patterns of digital inequality concerning digital capital resourcefulness. In simple words, it identifies digital capital inequality.

The elements of the core components have been described below:

Digital Access

Four elements of digital access:

- i) **Digital equipment:** Devices used to access the Internet, such as mobile phones or smartphones, laptops, and desktop computers.
- ii) **Connectivity:** Access quality depends on which setting is used to access the Internet.
- iii) **Time spent online:** Cumulative experience in using ICTs in terms of total time of internet usage (years of usage)

- iv) **Support:** Seeking help to support experiences related to digital technology

Digital competence

- i) Competence Area 1: Information and Literacy
 - The activities of browsing, searching, filtering, data, information, and digital content
 - Evaluating data, information, and digital content
 - Managing data, information, and digital content
- ii) Competence Area 2: Communication and Collaboration
 - Interacting through digital technologies
 - Engaging in citizenship
 - Sharing and collaborating through digital technologies
 - Managing digital identity
- iii) Competence Area 3: Digital Content Creation
 - Developing, integrating, and re-elaborating digital content
 - Knowledge about copyright and licences
 - Programming
- iv) Competence Area 4: Safety
 - Protecting devices, personal data and privacy
 - Protecting health and well-being and the environment
- v) Competence area 5: Problem-solving
 - Solving technical problems, identifying needs and technological responses
 - Identifying digital competence gaps

4.8 DIGITAL INCLUSION - EXCLUSION AND PARTICIPATION

Digital inclusion refers to the efforts and initiatives aimed at ensuring that all individuals, regardless of socioeconomic background, geographic location, age, gender, or ability, have equal access to and opportunity to use digital technologies effectively. Digital inclusion efforts may involve:

- Increasing internet access
- Bridging the digital skills gap
- Access to digital devices
- Creating digital content
- Addressing affordability
- Empowering marginalised communities
- Policy and regulatory interventions

Digital exclusion is when individuals or groups are systematically excluded from accessing and utilising digital technologies and resources, resulting in a

lack of participation in the digital world.

The digital participation of individuals assures the digital inclusion of an individual and, on a larger scale, a specific group or community. In this context, participatory inequality, which may be defined as people's inability to use the Internet to produce and disseminate digital resources, is a potential barrier to the growth of a network society.

Table 3. Areas of participatory inequality

Area	Inequality
Economic participation	Inequalities regarding the usage of ICTs to participate in the labour market and business
Educational participation	Inequalities regarding educational usage of ICTs
Social participation	Inequality in the field of social capital building (e.g., building social networks)
Cultural participation	Inequality related to online cultural practices
Political participation	Inequality over the Online political discourse
Institutional participation	Inequality in achieving digital citizenship

Source: Adapted from Jan van Dijk (2005)

To eradicate digital exclusion, stakeholders (governments, organisations, and local groups) must work together. Efforts to close the digital gap include building internet infrastructure, making devices and connections more affordable, providing digital skills training and literacy programmes, and creating digital platforms open to all users and meeting their needs. These actions aim to ensure that everyone has the same chance to access and benefit from the digital world.

4.9 NEW FORMS OF DIGITAL INEQUALITY

The rapid advancement of technology has resulted in the emergence of new types of digital inequality, discussed as follows:

Privacy and digital inequality: Privacy concerns are more important than ever in the digital age. Those with more information, resources, and technological skills can protect their data by implementing privacy-enhancing methods and practices. On the other hand, people with little access to resources or digital literacy may be more at risk of privacy violations, data exploitation, or data hacking, which can increase inequality.

Algorithms and digital inequality: Everything from search engine results to automated decision-making systems depends heavily on algorithms. Internet users consciously or unconsciously deal with unseen infrastructure called algorithms, logical rules, and technical prescriptions developed by programmers, mathematicians, and data engineers. Algorithms are essential for creating favourable conditions for participation in digital life; therefore, digital inequality arises from a lack of understanding of algorithms. Lack of awareness could negatively affect democracy and public involvement on a

societal level.

Artificial intelligence (AI) and digital inequality: Automation and other emerging technologies like artificial intelligence (AI) have the potential to produce new types of inequality. Access to and proficiency with these technologies can lead to increased productivity, better career possibilities, and financial gains. However, those people and communities that do not have the digital literacy to adapt to these disruptive technologies may be excluded from these advantages, which would increase inequality.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. Explain the Weberian approach to digital inequality.

.....
.....
.....

2. What are the core arguments of “Resources and Appropriation Theory”?

.....
.....
.....

3. Write the definition of digital inclusion.

.....
.....
.....

4. What are the two components of the digital capital model?

.....
.....
.....

4.10 LET US SUM UP

In this Unit, we gained a comprehensive understanding of digital inequality. It explained the factors contributing to inequality, such as disparities in access to technology, internet connectivity, digital skills, and usage factors. Delving into diverse frameworks of digital inequality, it defined the patterns and manifestations of digital inequality across different dimensions of academic disciplines. It also sheds light on how digital disparities intersect with age, gender, race, ethnicity, income, geographical location, and unequal access to digital resources and skills, affecting opportunities, outcomes, and possibilities to ensure equitable and secure digital environments. We learnt that the challenges faced by digital exclusion contribute to broader social and economic inequalities. We also explored new inequalities such as privacy, algorithmic, and AI-related inequalities. The discussion provided a deep understanding of the concept, offered diverse perspectives, and equipped you

4.11 KEYWORDS

Internet inequality: Internet inequality refers to the differences between people, communities, and nations regarding their capacity to access and efficiently use the Internet.

Digital inclusion refers to the inclusion of individuals and communities in the digital world. This means that they have access to digital technologies, internet connectivity, and the necessary skills to use them effectively, thus gaining access to the economic, social, and cultural benefits of the digital world.

ICT: Information and communication technology (ICT) comprises diverse hardware, software, networks, and digital systems that process, store, transmit, and retrieve data and information.

Digital participation is the active engagement, involvement, and inclusion of individuals and communities in the digital world through digital technologies. These technologies allow them to access information, communicate, create, collaborate, and contribute to digital content and platforms.

AI: Artificial intelligence (AI) refers to emulating human intelligence in machines programmed to carry out tasks that typically require human intelligence. It allows machines to perceive, reason, learn, and solve problems, enabling them to imitate or replicate human cognitive abilities.

4.12 FURTHER READINGS

1. Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). New York, NY: Greenwood.
2. Castells, M. (2011). *The Rise of the Network Society*. Germany: Wiley.
3. Helsper, E. J. (2012). A corresponding fields model for the links between social and digital exclusion. *Communication theory*, 22(4), 403-426.
4. Ragnedda, M., & Ruiu, M. L. (2020). *Digital capital: A Bourdieusian perspective on the digital divide*. Emerald Group Publishing.
5. Rogers, E. M. (1962). *Diffusion of Innovations*, (1st Ed.). United Kingdom: Free Press.
6. Scheerder, A., Van Deursen, A., & Van Dijk, J. (2017). Determinants of Internet skills use and outcomes. A systematic review of the second-and third-level digital divide. *Telematics and informatics*, 34(8), 1607-1624.
7. Van Dijk, J. A. (2005). *The Deepening Divide: Inequality in the Information Society*. United States: SAGE Publications.
8. Van Dijk, J. A. (2006). *The network society*. (2nd ed.). London: SAGE Publications.
9. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

4.13 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. The term "digital inequality" reflects a broader conception of the digital divide and incorporates a variety of factors beyond access to technology, including skills, usage patterns, and stakeholders involved. It acknowledges that merely providing access (binary access to digital technologies) to technology is insufficient to ensure equal benefits from the opportunities it provides.
2. Three levels of the digital divide correspond to multiple dimensions of digital inequality. The first level of the digital divide describes the unequal distribution of access to digital technologies. The second level of the digital divide refers to the unequal distribution of digital skills and competence among people with access to digital technologies. The third level of divide refers to the disparities in individuals' abilities to use digital technologies to achieve tangible outcomes of technology usage.
3. Determinants of digital inequality include economic determinants - income, employment status, employment type, occupational status, and educational level; social determinants - online social interaction, social networking, types of social activities; cultural determinants - religion, ethnicity, and internet use language.
4. Inequality in the information society appears at the most fundamental level of information need, leading to a widening gap in the capacity for association and knowledge transfer, the capacity to judge the quality of information and other information-related decisions. In modern times, there is a considerable disparity in the distribution of information abilities among different groups of people.

Check Your Progress: 2

1. Social inequalities as a potential topic of discussion in digital inequality have been examined through Weber's social stratification and power dynamics. The Weberian approach uncovers the structural and systemic factors contributing to digital inequality and guides efforts to mitigate disparities in access, skills, and resources in the digital realm.
2. Core arguments of the Resources and Appropriation Theory are (i) Unequal distribution of resources results from categorical inequalities in society. (ii) Unequal access to digital technologies results from an unequal distribution of resources. (iii) Their features also influence unequal access to digital technologies. (iv) Unequal social participation results from unequal access to digital technologies.
3. Digital inclusion refers to the efforts and initiatives to ensure that all individuals, regardless of socioeconomic background, geographic location, age, gender, or ability, have equal access to and opportunity to use digital technologies effectively.
4. Digital competence and access are two distinct components of digital capital that can be built up and transferred to improve life chances.

Block

2

ICT FOR DEVELOPMENT

UNIT 5

ICT for Poverty Reduction

UNIT 6

ICT for Economic Development

UNIT 7

ICT for Rural Development

UNIT 8

ICT for Environment Sustainability

BLOCK 2 INTRODUCTION: ICT FOR DEVELOPMENT

After going through the conceptual frameworks of ICT and the challenges of digital inequalities, this Block takes you through the real scenarios and ground realities in select sectors. Four sectors where ICT has the potential to make substantial differences - poverty reduction, economic development, rural development and environmental sustainability. This Block contextualises the role of ICTs in these specific sectors, which are the main components of developing countries.

Unit 5: ICT in Poverty Reduction. In this Unit, we explore the impact of Information and Communication Technologies (ICTs) on alleviating poverty. We scrutinise the connections between ICTs and poverty reduction, assessing their strengths and weaknesses in tackling this global challenge. This Unit also aims to reunite how ICTs offer avenues for equitable development, particularly in rural areas.

Unit 6: ICTs for Economic Development. In this Unit, we will Discuss the role of Information Communication Technology (ICT) in fostering economic progress. We will explore how ICT shapes economic landscapes, from foundational concepts to historical milestones. We will uncover how digital technologies drive growth and productivity through case studies and analyses. Additionally, we'll examine the transformative power of e-governance and the burgeoning realm of ICT entrepreneurship. This Unit gives a broader global perspective on ICT's dynamic impact on economic development.

Unit 7: ICT and Rural Development. We will understand the role of Information and Communication Technology (ICT) in fostering rural development. It's essential to grasp the significance of ICT in the broader context of national progress. This Unit aims to unite the intricate ways ICT can revolutionise rural landscapes. We can catalyse development, bridge existing gaps, and propel progress by infusing technology into these areas. Throughout our discussions, we'll examine the vast potential of ICT in rural development while dissecting the challenges that governments and stakeholders may encounter.

Unit 8: ICT and Environment Sustainability. This Unit will Discuss the intricate relationship between Information and Communication Technology (ICT) and environmental sustainability. From understanding ICT's life cycle impact on the environment to exploring the pillars of sustainable development, we will explore key concepts like Green ICT, smart cities, energy efficiency, and e-waste management. This unit teaches you how integrating ICT can pave the way for a greener, more sustainable future.

The backbone of any developing country is that it strengthens the core economic activities through which every section of society reaps relevant benefits. How ICT plays a role in this process is the core discussion point of this Block.

UNIT 5 ICT IN POVERTY REDUCTION

Structure

- 5.0 Introduction
 - 5.1 Learning Outcomes
 - 5.3 Connections between ICTs and Poverty Reduction
 - 5.4 Scope of ICTs in Poverty Reduction
 - 5.5 ICT Approach in Poverty Reduction: Strengths and Weaknesses
 - 5.5.1 Strengths of ICT as a tool for poverty eradication
 - 5.5.2 Weaknesses of ICT as a tool for poverty eradication
 - 5.6 Let Us Sum Up
 - 5.7 Further Readings
 - 5.8 Check Your Progress: Possible Answers
-

5.0 INTRODUCTION

ICT plays an important role in every sector of development be it health or agriculture. So far in the previous three Units we have studied how ICT can benefit the poor and marginalised and improve their socio-economic conditions contributing to the overall development process of the nation. This Unit will look into the possible effects and implications of ICT in poverty reduction. How effective ICT is in alleviating poverty, which is a major problem of the developing world. At the same time, we have to accept that the developing nations are increasingly utilising ICTs today yet the evidence on the usefulness of ICTs in the process of development is rather limited.

In the last Unit of ICT and its impact on rural development, we have illustrated through case studies and evidence that access to ICTs in rural areas can help in the improvement of health as well as increase income opportunities amongst the underprivileged. In that Unit, we have also noted how ICTs can offer scopes of equitable development in rural areas through timely and updated information on relevant issues. We have noticed in the previous Units that ICT can strengthen and enhance the efforts for development supported with the right policies combined with holistic approaches. Access to ICTs can really make a significant difference in the process of development and in this Unit, we will be learning what reasonable role ICT has to play in poverty reduction. One of the most significant questions that this Unit will try to investigate is that whether factors like economic growth globalisation along with ICT can diminish poverty. It is also to be seen here that whether the approach of technology as a solution to poverty reduction considers the social structures that basically define access to new media and its influences.

5.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the scope of Information and Communication Technologies in poverty reduction;
- Evaluate the strengths and weaknesses of ICT approaches in poverty reduction;
- Analyse the strengths and weaknesses of ICT as a tool for poverty reduction.

5.2 CONNECTIONS BETWEEN ICTS AND POVERTY REDUCTION

Here the central question is whether ICT remains side-lined in the broader outlook of financial and social notions of poverty. Now before we proceed to illustrate the scopes and possibilities of ICT in reduction of poverty, we need to understand what the dimensions of poverty are. Is economic growth or equal income opportunities enough for eradication of poverty or for development of the basic resources for the poor people? With the existing social inequality, can the marginalised people have access to the benefits of the expanded economic activities? Further, how do we anticipate that poor people who do not have access to basic education can take advantage of employment opportunities created by globalisation or economic growth?

Defining poverty is complex. It is basically a condition that generates from gross discrimination in the ownership of assets and hence can be said as a mixture of socio-economic problems. Biased conditions in the market competition or potential benefits of economic growth, it is quite likely that the disadvantaged people will remain outside of such unequal market coalitions generally favouring the affluent. We will be elaborating this point in the following paragraphs. As we mentioned earlier poor people also have to deal with issues like lack of essential assets and nil access to information and government services. So, in the backdrop of these issues, this Unit will try to highlight how ICT can enable government assistance and policies to reach the poor people.

If we recollect, we learnt in all the previous three Units that communication forms the basis of the development process. The scope of ICT in eradication of poverty by initiating sustainable development is huge and it is a topic of central debate across the world. ICTs possess enormous power of starting the information flow and empowering deprived people. As in the previous paragraph we observed that the poor people not only lack the basic resources, but they also are deprived of the access to information and hence are easily vulnerable to disparities. They lack political perceptibility and remain voiceless, and ICT can help in improving their livelihoods to a great extent by providing them the knowledge and skills and information about income opportunities, their rights, government policies, etc. It is important as lack of transparency can make the government unresponsive and unequal access to information can also lead to corruption and increasing discrimination. In developing countries, socio-structural inhibitions to economic growth are comparatively higher and weaken the ability of larger society to respond to the needs of the deprived.

In the Unit where we discussed the role of ICT in rural development, we have noticed three points where ICT can improve to be useful and these were increased agricultural productivity, improved access to market and massive business opportunities. Now, these opportunities offered by ICT to marginalised people in rural areas leads to possibilities of reduced inequality. Although the educational and knowledge skill levels of the poor people are usually too low, yet ICT manufacturing sector can offer scopes of employment. What is unfortunate is that the information and communication needs of the poor people remain mostly unaddressed. Considering the disadvantaged position the poorer people have to deal with a number of challenges for their daily existence and that they are left with little time to assert their privileges to government schemes and services. The ill-informed attitude combined with an ineffective voice of the poor perpetuates an indifferent government and the needs of the underprivileged remain ignored as there is no one to pressurise the authority to be responsive towards their needs. Further, the experiences and knowledge of the marginalised are mostly underestimated. In this context, it is believed that in places where access to information is widespread, government offices are more likely to be efficient in defending the interests of the poor.

5.3 SCOPE OF ICTS IN POVERTY REDUCTION

What we found common is that there is a strong correlation in the role of ICT in rural development and in poverty reduction. It is a good sign that most of the developing nations are making efforts to incorporate ICT in its development schemes. Grameen Bank of Bangladesh is one such example where initiatives have been taken for realising the ICT benefits in the economic growth of the rural sector. The increasing demand for ICT based services in developing countries is extensive and for meeting these on-going demands can be met by enabling an environment with effective regulatory mechanisms. Social science scholars are of the opinion that ICT can be used for increasing market access and efficient e-commerce sectors paving the way for local artisans or farmers to trade their products directly to the consumers bypassing the middlemen.

It is quite possible that poor people remain unaware of their rights and basic entitlements, a proper communication and knowledge system can effectively articulate their interests in learning about the same and taking steps towards fulfilling their needs and extension services. ICT has the potential to change and refresh old occupations by adding new dimensions to it and the government should make full use of it. One example can be by enabling all post offices of the country to be also used as mobile centres for reaching out to maximum people. People need access centres from where they can use the services of ICT. If a poorer section of the society cannot afford a personal mobile, then such telecom centres can come to the aid. Poor people can have market prices and related information through such extension services offered by the ICT tools. With the help of mobile phones, a poor villager can call someone living in a distant place and have updated information about anything associated with their livelihood like health, agriculture, or employment. ICT helps in opening the limited boundaries of the deprived

people. The more exposure they have about the larger world, the more they become aware of their condition which in turn becomes an opportunity for asserting their basic rights. People of rural areas can have information about possible work prospects in urban areas, minimum wages, etc. We have an idea that people from rural areas migrate to urban areas for employment and such prior information can avert the chances of exploitation.

From the above discussions we gather that a constant change is occurring in the field of information and communication technology. In this context a distinction should be made particularly of the sectors of ICT usage i.e. Direct use and indirect use of ICT for poverty reduction. The first being the category where ICT applications are vastly used through the process of digitization. This first category includes the amalgamation of ICT into any existing activity which it can either enhance or possibly alter as well; it can make the task easier or improve the quality and reduce the usage cost significantly. E-governance, e-health, e-learning are some of the examples of this first category. However, the direct usage of ICTs like computers and internet by the underprivileged and poor people is rather more restricted. Secondly, the other category is where ICT use can generate some new activities which did not exist beforehand. Computer training, manufacturing of computer software, selling of computer or mobile related services falls under the second category. It basically implies creation of new revenue generating options. This distinction is relevant as it clearly specifies that the scopes and impacts are different between the direct and indirect use of ICT.

We draw out these following relations between ICT and poverty reduction –

- Technology has the scope of impacting the lives of the poor but with time the poorer sections are also becoming active users of ICT themselves influencing the direct impact.
- ICTs can be used in many ways for improving the socio-economic conditions of the poor and has a direct link with economic growth.
- ICT use by the government for the development of the poor comes under the broader development context.
- The impact of ICT is different when used in terms of economic improvement and social improvement.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. How do Information and Communication Technologies (ICTs) contribute to addressing poverty, and what factors influence their effectiveness in doing so?

.....
.....
.....
.....

2. What are the necessities of understanding ICTs in the context of poverty reduction, and how do they contribute to understanding the role of technology in socio-economic development?

.....
.....
.....
.....
.....
.....
.....

3. What role do social structures play in shaping access to ICTs and their benefits for poverty reduction, and how can these barriers be addressed?

.....
.....
.....
.....
.....

5.4 ICT APPROACH IN POVERTY REDUCTION: STRENGTHS AND WEAKNESSES

So far, we observed that the critical component of eradication of poverty is increasing information and communication flow. But an important question that arises here is does improving information flow sufficient to eradicate poverty? What we can state here from the above observations is that communication flow is a necessity, but it may not be a sufficient condition for development of the poor. For instance, a rural farmer who may have information access about the current market price for his products, but he still may be unable to get his share of profit because of the existing unequal power relations or he might not be able to deliver the goods on time because of poor road infrastructure. These are all challenges that hinder the process of development and hence initiatives from all sectors must be taken by the government.

In one of the above sections, we talked about the multi-dimensional concept of poverty. Now turning to this point again, if we try to understand it in simple economic terms then poverty eradication is directly associated with increase in daily income. But poverty reduction is more than solving the economic issue. An enhanced livelihood with equal health, information, education, and skills combined with the freedom to voice their opinions and have complete power over their own lives also constitute the eradication of poverty.

So far, this Unit has mainly focused on the positive influences of ICT on the lives of the deprived people in terms of economy and livelihood. There are several ways through which ICTs are enabling rural productivity. It is a hard-core truth that in a rural context ICTs are not able to provide much employment scopes or direct revenue benefits. We need to understand that ICT itself is not like any other labour-intensive manufacturing sector creating substantial employment for the rural masses. So, for an overall analysis of the effect of ICT in poverty reduction, its impact in terms of productivity in agriculture or other rural economic activities needed to be evaluated.

5.4.1 Strengths of ICT as a Tool for Poverty Eradication

The potential influence of ICT in eradication of poverty can be found at micro, intermediate and macro levels. We will be discussing all these three levels in the following paragraphs and with small examples to give you a clear idea. ICT use at the micro level means the poor have access to ICT and are used directly by them for addressing their needs right from economy to opinion expression. ICTs allow improved business efficiency and global connectivity with a lower cost of information. The point about the impact of ICTs on agricultural productivity implies that access to productive resources is required for being able to employ the increased information and knowledge. For example, one can have information about weather conditions, but it is only applicable to those who have the land resources and not to those who sell their labour power. So, there is a downside of ICT that it is not applicable everywhere. Yet, this one aspect does not limit the scopes of ICT in the upliftment of the marginalised people.

In the Unit where we discussed the role of ICT in health development, we observed that it is not necessary that every individual need to have access to ICT for development of personal health; rather if one community health centre has access to ICTs then it can benefit the larger group. So, here in this case, every rural farmer might not have access to ICT and might not know how to use it, so agricultural extension agents can come to the rescue of farmers informing them about global knowledge of crops, irrigation, pesticides, etc. relevant for improving their productivity. Through ICTs, the local government can get information about the requirements of the poorest and communicate such needs to the concerned levels of the government. In rural areas, teachers can get exposed to newer ways of teaching and learning materials and share the ideas with the needy children. These are all examples of ICT impact in the intermediate level benefiting those who do not have direct or personal access.

Lastly, macro level ICTs help civil society groups or the non-government agencies to mobilise and address the needs of the poor and share with similar agencies working elsewhere. It will collectively help in developing a bigger movement with shared information and strategies leading to transparent markets, governance, and innovation of social and economic reforms for the poor people. So, what we learnt from the above points is that no matter in what level or in what ways ICTs are used, it eventually helps in the development of the marginalised section and promoting rural finance.

Most of the attention while discussing ICT in combating poverty is restricted to new media technologies and the Internet. However, the full range of ICTs is beyond that with Radio and Television being important information tools. In fact, these two tools are much more widespread, and ICT enhances their role as drivers of poverty reduction and fostering social development.

5.4.2 Weaknesses of ICT as a Tool for Poverty Eradication

We are aware that ICT is undoubtedly a valuable tool of creating awareness and sharing of updated information yet there are limitations and inhibitions in the implementation of ICT to combat poverty. Considering the present

scenario, it can be said that there exists an inequality in the reach of ICT tools. The risk remains with the rich having greater access to ICTs and knowledge economy and the poorest remaining excluded of all such benefits. Such digital divide may perpetuate the already existing discrepancies in finance, skills, privileges, and other sectors of social growth. To reduce the disparities the technologies must be deployed where information is made possible to the poor, make their voices heard effectively and make the functioning of government transparent.

Poor and less educated or illiterate people especially women might find it comparatively difficult or might face constraints in using ICTs. Rural areas are also characterised by gender discrimination and women in such areas might not be able to pay for accessing ICT tools as they lack funds and may not have any control over the household income or expenditure. Hence, what we see here is that ICTs have limitations, and it is useful to those who have the access and knows to make full use of it.

Despite all these weaknesses, ICTs offer scopes of information availability and several remedial approaches for meeting the challenges and needs of the poor. Promoting the access of ICT among the poor in far off areas would require the initiatives by the government and its allied partners. It is unfortunate that because of the economic and technical weaknesses the rural marginalised people are the last to have access to the ICT infrastructures and services in a developing country. What is understood from these two statements is that the role of making ICT a vital tool for empowering the poor and eradication of poverty is to be addressed by the government and concerned authorities.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. How can the strengths and weaknesses of ICT approaches in poverty reduction be assessed, and what implications do they have for policymakers and development practitioners?

.....
.....
.....
.....
.....
.....

2. How can the scope of Information and Communication Technologies (ICTs) be understood in the broader context of development, and what opportunities do they offer for addressing poverty?

.....
.....
.....
.....

3. What are the implications of relying on technology as a solution to poverty reduction, and how can holistic approaches be adopted to address underlying inequalities?
-
.....
.....
.....

5.5 LET US SUM UP

In this Unit, we conceptualised poverty through the parameters of economic growth, improved livelihood, and knowledge skills. We learnt that poverty is a complex situation which is characterised by lack of basic essential assets. Poor people also suffer from unhygienic living conditions, poor resources, low income, and discrimination. This Unit gave an overview of different perspectives of ICT in poverty reduction starting from economic and noneconomic to direct and indirect use and how in every sector it is related to the upliftment of the poor people. Economic growth is considered as one of the main parameters of poverty reduction. We also learnt the two main categories of ICT application in relevance to poverty eradication. So, this Unit basically summarises the strengths and weaknesses of ICT approach in poverty reduction. We also had an idea that the question of digital divide also needs to be addressed for the wider development of the community as rural areas are prevalent with low educational levels and landlessness. Lastly, creating information rich environments through ICT not only means that availability of information but also assures that the voices of the poor are heard. So, this Unit discussed understandings of poverty and the welfare of the marginalised people from the viewpoint of grassroots local level and not from the international development perceptions.

5.6 FURTHER READINGS

1. Afzal, A., Firdousi, S. F., Waqar, A., & Awais, M. (2022). The influence of Internet penetration on poverty and income inequality. *Sage Open*, 12(3), 21582440221116104.
<https://journals.sagepub.com/doi/pdf/10.1177/21582440221116104>
2. Khuhawar, K. H., Jianqiu, Z., Farkhunda, S., & Ye, Y. (2014). Crush the poverty by information and communication technology. *Population*, 3(4), 250-256.
3. Lechman, E., & Popowska, M. (2022). Harnessing digital technologies for poverty reduction. Evidence for low-income and lower-middle income countries. *Telecommunications Policy*, 46(6), 102313.
4. May, J., & Diga, K. (2015). Progress towards resolving the measurement link between ICT and poverty reduction. *Impact of information society research in the global south*, 83-104.
<https://library.oapen.org/bitstream/handle/20.500.12657/28057/1/1001937.pdf>
5. Rizquulloh, M. I., & Firmansyah, M. F. (2021). The effect of information and communication technology on poverty reduction. *International Journal of Engineering, Science, and Information Technology*, 1(3), 92-97.
<https://ijesty.org/index.php/ijesty/article/download/116/94>
https://mostwiedzy.pl/pl/publication/download/1/harnessing-digital-technologies-for-poverty-reduction-evidence-for-low-income-and-lower-middle-incom_67572.pdf

6. Ruhvana, N. F., & Essa, W. Y. (2020). Opportunities of using information and communication technology in reducing poverty. JEJAK: Jurnal Ekonomi Dan Kebijakan, 13(2), 319-331.
<https://journal.unnes.ac.id/nju/jejak/article/download/25036/10796>
7. YILMAZ, R., & KOYUNCU, J. Y. (2018). The contribution of ICT to poverty reduction: panel data evidence. Sosyal Bilimler Araştırmaları Dergisi, 7(4), 63-75.

5.5 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

1. ICTs contribute to poverty reduction by providing access to information, enhancing communication, and empowering marginalised communities. However, their effectiveness is influenced by factors such as infrastructure availability, affordability, digital literacy, and socio-economic context. Addressing these factors requires investment in infrastructure development, promotion of digital literacy programs, and implementation of policies to ensure affordability and inclusivity. Maximising the impact of ICTs on poverty reduction necessitates holistic approaches that consider the diverse needs and challenges faced by marginalised populations. By addressing these barriers, ICTs can play a significant role in bridging the digital divide and promoting socio-economic development.
2. The main learning outcomes of studying ICTs in the context of poverty reduction include understanding the scope of ICTs in poverty reduction, evaluating their strengths and weaknesses, and analysing their effectiveness as tools for poverty alleviation. These outcomes contribute to understanding the role of technology in socio-economic development by providing insights into how ICTs can empower marginalised communities, improve access to resources, and facilitate inclusive growth. By critically assessing the potential benefits and limitations of ICT approaches, policymakers and development practitioners can design more effective strategies to address poverty and promote sustainable development.
3. Social structures significantly influence access to ICTs and their benefits for poverty reduction, including factors such as infrastructure development, digital literacy, and affordability. These barriers can be addressed through targeted interventions such as infrastructure investment, digital skills training, and policy initiatives to promote affordability and accessibility. By adopting a holistic approach that considers the broader socio-economic context and underlying inequalities, policymakers can create an enabling environment for ICT adoption and maximise their impact on poverty alleviation. This requires collaboration between government, civil society, and the private sector to ensure that ICT initiatives are inclusive and address the diverse needs of marginalised populations.

Check Your Progress 2

1. Assessing the strengths and weaknesses of ICT approaches in poverty

reduction involves understanding their capacity to provide access to information, enhance communication, and empower marginalised communities. Strengths include increased access to resources and services, while weaknesses may include limited infrastructure and digital literacy barriers. Policymakers and development practitioners must consider these factors when designing interventions to ensure they address the specific needs and challenges of the target population. By acknowledging both the benefits and limitations of ICTs, policymakers can develop more comprehensive and effective poverty reduction strategies that promote inclusive development and address underlying inequalities.

2. Understanding the scope of ICTs involves recognizing their potential contributions to poverty reduction, including opportunities for income generation, skill development, and access to essential information. Leveraging these opportunities requires investment in infrastructure, promotion of digital literacy, and adoption of policies that promote inclusivity and affordability. By harnessing the transformative power of ICTs, policymakers can create new avenues for economic growth and social development, ultimately reducing poverty and promoting sustainable development. However, realising the full potential of ICTs requires addressing underlying barriers such as digital inequality and ensuring that benefits are equitably distributed across society.
3. Relying solely on technology as a solution to poverty reduction may overlook underlying inequalities and power dynamics that limit access to ICTs and their benefits for marginalised communities. Holistic approaches that consider social structures, policy frameworks, and community engagement are essential for addressing these challenges and promoting inclusive development. This requires collaboration between government, civil society, and the private sector to design interventions that address the root causes of poverty and promote sustainable development. By adopting a comprehensive approach that considers the diverse needs and perspectives of marginalised populations, policymakers can ensure that ICT initiatives contribute to poverty reduction and promote equitable access to opportunities for all.

UNIT 6 ICTs FOR ECONOMIC DEVELOPMENT

Structure

- 6.0 Introduction
 - 6.1 Learning Outcomes
 - 6.2 Introduction to ICT and Economic Development
 - 6.2.1 Foundational Concepts of ICT and its Role in Shaping Economic Landscapes
 - 6.3 The Economic Impact of Digital Technologies
 - 6.3.1 Digital Technologies Influence Economic Growth and Productivity
 - 6.3.2 Case Studies on Successful Integration of ICT in Various Industries
 - 6.4 E-Governance and Economic Transformation
 - 6.4.1 Role of ICT in Transforming Governance Structures for Economic Advancement
 - 6.4.2 Global Best Practices in e-Governance and Their Impact on Economies
 - 6.5 ICT Entrepreneurship and Start-up Ecosystems
 - 6.5.1 ICT Role in the Rise of Entrepreneurship
 - 6.6.2 Digital Start-up Ecosystem.
 - 6.6 Global Perspectives on ICT and Economic Development
 - 6.6.1 Comparing and Contrasting International Approaches to Leveraging ICT for Economic Growth
 - 6.6.2 Global Interconnectedness of Digital Economies
 - 6.7 Let Us Sum Up
 - 6.8 Keywords
 - 6.9 Further Readings
 - 6.10 Check Your Progress: Possible Answers
-

6.0 INTRODUCTION

You must know the benefits of information communication technology (ICT) in our daily lives. ICT is making our lives quite comfortable and providing us with opportunities. At the same time, ICT is helping our economy progress. This Unit examines the role of ICT in bringing about economic development. There are also discussions on how e-governance is bringing about economic transformation. We will also discuss ICT entrepreneurship, the digital start-up ecosystems and the standpoint of global bodies and countries on the transforming role of ICT in the economic system.

6.1 LEARNING OUTCOMES

After completing this Unit, you will be able to:

- Understand the core concepts of ICT and key milestones in the development of ICT;
- Explain the role of ICT in bringing economic development;

- Understand the impact of e-governance on economic transformation;
- Explain the digital start-up and its ecosystem and
- Discuss the global standpoint on ICT and economic development.

6.2 INTRODUCTION TO ICT AND ECONOMIC DEVELOPMENT

Economic development refers to a process in which an economy grows, and overall development happens among the country's citizens. The economic development of a country depends on various factors. Among them, technology is considered an important factor that contributes to the development process of a nation. In the late twentieth century, the revolution seen in the Information Communication Technology (ICT) sector helped many economies, especially India, to go up the ladder of economic development. ICT includes both information and communication technology that helps to process information. By creating huge job opportunities, the ICT sector is directly contributing to the growth of a nation. The service industry is directly helping the economy to develop by exporting software and other services. There is a direct link between ICT and economic development within an economy. It has also been recognised for quite a long time.

The trade reforms during the 1990s brought accolades for India as the fastest-growing economy during 2000 and afterwards. For this, the knowledge-driven ICT sector has played a crucial role. The global village concept, as coined by Marshall McLuhan, has become a reality with the growth of the ICT sector. Liberalisation and globalisation have fuelled the growth of the ICT sector globally. The increasing adoption of ICT in various other sectors pushes for economic growth in India. The ICT sector currently contributes more than 13% of India's GDP. According to NASSCOM, the technology industry has grown from \$ 220 billion in revenue in 2020 to \$ 227 billion in 2021. All these data show that the revenue generated from the ICT sector directly contributes to the development of the Indian economy. In developing economies, an appropriate ICT infrastructure, including internet usage and hardware and software deployment through innovation, brings economic development.

6.2.1 Foundational Concepts of ICT and its Role in Shaping Economic Landscapes.

Information is power. It is an organised, meaningful, and useful interpretation of data. Data and information can be used interchangeably. This data may be text, sound, images, visuals, etc. It is the news that the information seeker wants and that is passed on either orally or written. But now, with the invention of technology, information is passed on to the receiver with the help of technology. The basic concept of ICT revolves around three important elements: information, communication, and technology. The introduction of the desktop computer was the first step that led to the invention of ICT. Later, the invention of the Internet and mobile technologies added fuel to the development process of ICT worldwide. ICT is an umbrella term that includes hardware, software, and internet technologies. These

technologies are helping people to communicate and share information digitally within a fraction of the time. The invention of the telephone, computer and Internet has changed how people communicate earlier. The technology uses computers, networking equipment, software, and the Internet to store, process, retrieve and protect information. The term ICT is an extension of the term IT (Information Technology). The integration of communication technology such as audio-visual broadcasting and telecommunication equipment along with the Internet helps users to store, process, access, transmit and manipulate information as and when required. The communication term in ICT refers to the communication of information or data through the use of the Internet in electronic form. The technology used in the present era is digital technology. This digital technology helps people to communicate information digitally throughout the globe.

The three main components of ICT are computers, communication networks, and digital technology, which ensure the smooth transmission of data. Computers are electronic devices that can be given instructions to process, store and publish data to the user. We need hardware, software programs, data, or information to run a computer. Next comes the communication network, which includes networking devices and the Internet to transmit and receive data. Connectivity and wireless technology are the most significant contributors to the development of advanced networking. Mobile and wireless communication devices have changed the ICT landscape. Electronic media devices also play an important role in managing information.

You must be aware of the various benefits of ICT. The application of ICT is seen in every field, be it in science, technology, communication, business, entertainment, and many others. It not only improves our lives but also helps the economy to grow across the globe. E-commerce, E-banking, E-governance, and E-learning are some areas where ICT has been applied. In the initial development phase, ICT has a limited role in shaping the economic landscape. Rather, the process was very slow. Later, investment in infrastructure and innovations in this area has impacted the economic landscapes of different countries. ICT has catalysed economic development in developing countries in the past decades.

Looking back 20 years, the situation has changed dramatically due to various technological innovations. Big corporations have taken interest and invested crores of rupees in this sector. The ICT sector includes hardware, software, applications, content, network, telephony, service support, and others through their business, contributing major revenue to the economy. This sector has proven itself as the foundation for every other sector in the business enterprise segment. ICT has brought economic growth at every level by providing necessary information, solutions, immediate connections, enhanced production, and access to global and virtual geographical markets. Organisations using ICT tools are seeing faster growth, which eventually shapes the economic growth of a nation. It facilitates economic growth by impacting a nation's GDP (Gross Domestic Product). ICT, including hardware, software, telecommunications, and electronic equipment manufacturers, is leading economic growth. Various research studies have also found that high internet penetration and technological deployments have

directly impacted the economic development of nations. The following are a few benefits of ICT that have helped to shape the economic landscape towards the growth and development of various nations, especially India.

- **Faster Connectivity:** Digital technology has helped businesses overcome many problems with connectivity. It has wiped out the distance barrier, thus assisting organisations in facilitating information, expanding their product markets, facilitating monetary transactions through wire transfers, communicating through email, voice, and video calling, etc. It improves people's access to information and communication habits.
- **Employment generation:** ICT is creating job opportunities for the unemployed. We have a huge talent pool of educated youth with highly skilled and semi-skilled knowledge. ICT deployment in business houses also creates IT-related jobs for younger job seekers. In return, it helps organisations allocate workers efficiently and maintain transparency in the employment markets.
- **Global Investment:** Due to advanced technology deployment and huge technical experts, multinational companies in the telecommunication, electronic equipment, hardware, and software sectors are investing crores of rupees. This directly impacts the foreign direct investment scenario of a nation.
- **Increase in Efficiency:** We can see the increase in efficiency of the working population with high-speed Internet, broadband connectivity, the increasing speed of computing, and the application of various ICT-related technologies. Even government organisations in low-income and developing countries have realised the importance of ICT and have started investing in digital infrastructure through e-governance, e-banking, and others.
- **Growth of Social Capital:** To achieve economic growth, a nation must develop its social capital. Innovations in digital technology are directly impacting this development. The availability of social media platforms, along with cheap data, has been helping people connect globally. If society functions properly, the nation will develop; we need a strong social capital base. ICT helps the social capital base develop and contributes positively to economic growth.

These are some of the positive impacts of digital technologies on a nation's economic scenario. Applying ICT also creates knowledge cities, increases agricultural produce exports, promotes digital innovation, reduces consumer and business transportation costs, etc. Therefore, there is a positive correlation between ICT and economic growth.

Check Your Progress: 1

Note: 1) Use the space provided below for your Answers.

2) Compare your answers with those given at the end of this Unit.

1. Point out the benefits of ICT that contribute to the economic growth of a nation.

6.3 THE ECONOMIC IMPACT OF DIGITAL TECHNOLOGIES

Digital technology mainly comprises the Internet, automation of different sectors, artificial intelligence, 5G, and others that are playing a leading role in the economic growth process of a nation. Adopting digital technologies in various sectors creates employment opportunities, increases exports, and produces high-quality industrial products. The ICT sector also helps the industrial sector reduce its cost of operation, assists back-office support, enhances workforce efficiency, and many other ways. The GDP rate can measure whether an economy is progressing or not. The higher the GDP rate of a nation, the higher the economy of that country progresses. The dynamic ICT sector is positively impacting the economy. According to NASSCOM, the revenue from the Indian technology industry is estimated to cross \$245 billion, an additional \$19 billion over last year. This amount can be an explicit eye-opener for all of us to realise the contribution the ICT sector is making to the Indian economy.

6.3.1 Digital Technologies Influence Economic Growth And Productivity.

Economic growth in a country is realised only when the size of that country's economy increases over a period. Economic growth is achieved when the total production of goods and services increases compared to the last year. Several sectors contribute mainly to economic growth. Only during 1990-2000 was the ICT sector recognised as an essential sector that played a leading role in shaping the economic condition of a few nations, especially India. The software industry in India, with its highly skilled labour, has been able to attract foreign investments and generate foreign currency. India is now considered an economic powerhouse because of its continuously rising GDP growth rate.

The manufacturing sector, especially the electronics and telecommunication industries, has a dominant share of the government's total revenue earnings. As of 2023, India's GDP rate is more than 7%, and the government is optimistic about achieving more than 8% in the coming financial year. The high rate of broadband penetration also has a direct effect on the GDP growth rate. The growth of e-commerce platforms such as Amazon, Flipkart, Zomato, JioMart and others have influenced the Indian economy. The introduction of online payment applications and systems has further pushed the economy ahead.

Digital automation is the most important advantage of digital technology. This automation has saved a lot of working hours. These workers can utilise

their free time for more productive work. Various offerings of public services through online platforms and mobile applications have increased the productivity of the common masses. The digitalisation of banking, government, manufacturing, and other sectors has positively impacted productivity. Seamless communication and access to the latest technology and digital tools have increased productivity across the sectors. The declining cost of data charges, high-speed Internet and low-cost computing, the advantage of the time difference, etc., have added fuel for economic growth.

6.3.2 Case Studies on Successful Integration of ICT in Various Industries.

The integration of ICT in various industries has increased workers' efficiency and productivity and eased access to goods, services, information, etc. It has also opened the doors for businesses to access global markets. Digital technologies have been integrated into banking, manufacturing, governance, agriculture, roads and transport, and other sectors. Let us discuss a few successful case studies on applying ICT tools in various sectors that helped to grow the Indian economy.

- 1) The Gyandoot Case Study:** It was a government-to-citizen initiative taken by the Madhya Pradesh (MP) to provide services regarding agricultural produce pricing, marketing, other citizen services like application and issuing of income certificates, domicile certificates, caste certificates, public grievance redressal, etc. This project was implemented in Dhar district in 2000. In this project, the MP government developed an intranet system to run a web portal through which the common citizen can access information with the help of ICT tools. The project was also aimed to connect citizens with the local administration. This project has contributed to the development of human beings and, hence, the economy.
- 2) e-Choupal.com:** This is another initiative the business conglomerate ITC Limited took to connect farmers directly with the corporates for selling their produce. The company's agri-business segment is an exporter of agricultural products. They can get the actual benefits by connecting the farmers directly with the company without any interference from the middlemen. The integration of ICT has helped connect the farm directly to the factory. This has helped the farmers to handle challenges such as fragmented farms and weak infrastructure, such as the absence of cold storage. This initiative has helped to increase rural income through higher productivity and high-quality produce, and hence, there is a demand for higher industrial goods. This demand will directly impact the economy.

6.4 E-GOVERNANCE AND ECONOMIC TRANSFORMATION

As per a survey report published by the United Nations in 2022, a positive relationship was found between the income level of a country and its E-Government Development Index (EGDI) value. Denmark, Finland, the

Republic of Korea, New Zealand, and Sweden are some countries doing good in the e-governance sector. The ICT tools are helping governments across the globe to deliver public services efficiently and transparently. The system has much accountability and is now considered the most reliable platform for connecting with citizens. With electronic governance, citizens are asked to participate actively in the administrative process, and less corruption is found in the system. These initiatives help small business houses to be part of the economic system and contribute to the nation's income generation process. E-governance projects have the potential to contribute both directly and indirectly to the economic transformation of a nation. Active citizen participation and efficient e-governance initiatives can contribute towards economic development through proper information channels, transparent administrative systems, less processing time, less travel time, reduced cost, etc. The role of e-governance in India is an important driver in achieving the concept of a digital economy. In India, the first e-governance project was started in e-learning in Kerala.

6.4.1 Role of ICT in Transforming Governance Structures for Economic Advancement.

In the present era, technology is helping us to transform governance by making governments of different countries more transparent, efficient, effective, and responsive. ICT plays a leading role in the implementation of e-governance projects. Digital technology in e-governance initiatives can improve the government information management system. It empowers citizens with easy access to information and government services, optimises business collaborations, etc. Some of the initiatives taken by the government of India in this area are Aadhaar, Digi-Locker, Mobile Seva, online tax filing and payment and many other services. Under the National e-Governance Plan (NeGP) launched in 2015, the Indian government has moved from mere computerising government departments to providing citizen-centric services. Implementing digital technology in various government departments has helped the citizens pay fees and taxes directly, contributing to the nation's exchequer. The Government e-marketplace project has benefited business houses in e-auctioning, e-bidding, comparing prices, searching for better business options and other e-commerce options. The Government of India has launched the Digital India programme to empower citizens digitally as part of the e-governance project.

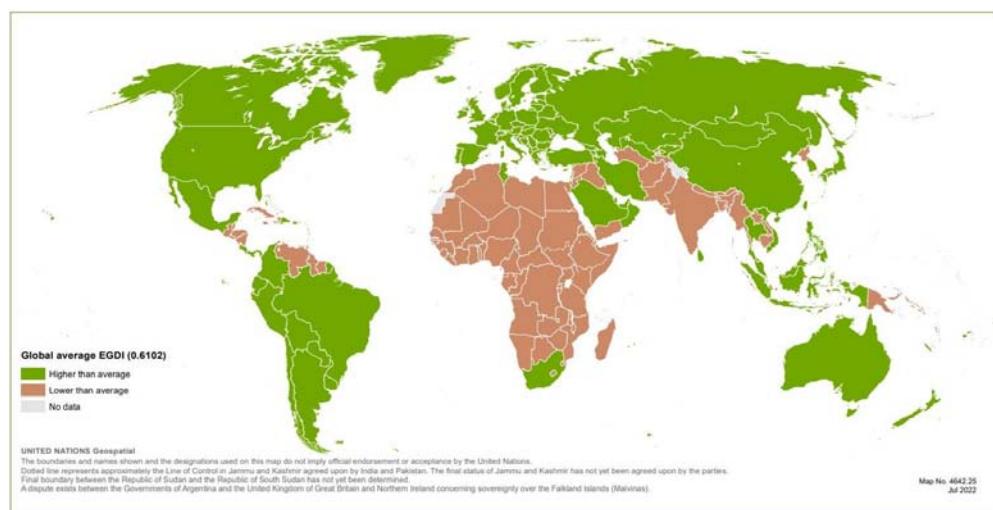
Several research studies have also been done on the contribution of solid e-governance initiatives towards the economic growth of various nations. An increase in the e-governance index will positively impact the GDP rate. Another essential element in fuelling economic advancement is the reduction of corruption practices. Various online web portals providing citizen services have been key in tackling corruption. Though it has not been able to be rooted out of the administrative and bureaucratic system, to some extent, the scale has been reduced. This also translates into the economic advancement of a nation. Let us take an example of income tax e-filing. Online income tax filing has various benefits for taxpayers and the government. It provides an easy and convenient way to file and secure transactions, less administrative burden for the government, no involvement of middlemen, swift transfer of

funds to the government exchequer, etc. Therefore, the ICT tools have positively impacted various governance structures through a more competitive business environment, easy access to information, better methods of record keeping, etc.

6.4.2 Global Best Practices in E-governance and Their Impact on Economies

Both the World Bank and the United Nations are stressing the use of digital technologies in delivering services to citizens to bring transparency, a faster communication process and a corruption-free state. Most countries are now practising e-governance in their operations. The USA has taken the initiative to use IT in government systems to reduce paperwork, increase response time, etc., from 2001 onwards. Around the same time, the New Zealand government has also set up an e-government unit to integrate ICT into the governmental system. The United Nations Department of Economic and Social Welfare (UNDESA) surveys the member nations on their performance and progress in e-governance initiatives from time to time.

(UN Report on E-Governance Development Index)



Let us discuss some of the best practices that have fared well and positively impacted the country's economic growth. India's 12-digit Aadhaar card system has been a landmark offering for its citizens. This system has facilitated identity verification, easy service delivery, increased the common man's financial inclusion, reduced fraud, and higher social benefits. An increase in the common man's financial inclusion directly impacts a nation's economy.

Norway's Altinn Platform is another best practice in e-governance initiatives to discuss. The Norwegian government has developed a one-stop website to facilitate direct interaction between businesses and all government agencies. The government also occasionally publishes all kinds of regulatory information required for businesses. This system has been able to increase the productivity of the business houses, enhance the regulatory compliance system, lessen the burden on the government machinery, etc. The National Job Bank of Canada is one such initiative where young people aged 15-30 can search for job opportunities across Canada. The Canadian government

has installed multiple kiosks across the nation which are connected to the Internet. Youths can search for career information, programmes, services, etc. These are directly related to the employment generation segment of its economic advancement.

The Malaysian government felt the requirement for a robust ICT infrastructure long ago. Its poor telecommunication infrastructure was a deterrent to the development of the economy. The government has invested much in the basic telecommunication infrastructure by recognising its weaknesses. ICT tools were then integrated into government systems, and many e-commerce initiatives were considered. MyBiz is a website developed for small and medium business houses by the government to facilitate their business requirements and to reach global customers, helping businesses with collaborative marketing and creating a conducive environment for industries with the help of electronic governance initiatives. Other countries like Sweden, the Republic of Korea, and New Zealand are also doing well. Their excellent digital strategic policy has helped them achieve economic growth.

Check Your Progress: 2

- Note:** 1) Use the space provided below for your Answers.
2) Compare your answers with those given at the end of this Unit.

1. Briefly explain the role of e-governance in economic transformation.

.....
.....
.....
.....

6.5 ICT ENTREPRENEURSHIP AND START-UP ECOSYSTEMS

According to Nobel Peace Prize winner and microfinance pioneer Muhammad Yunus, all human beings are entrepreneurs. Anyone can be an entrepreneur now. Flexible enterprise policy, along with the advancement of technology and transformation in the business environment, has given many young talents the thought to choose entrepreneurship over highly paid jobs. The growing digital technology market has attracted people to venture into this segment. According to statista.com, the global ICT market is expected to reach six trillion dollars in 2023. Young entrepreneurs with proactiveness, innovativeness and risk-taking capability are entering the ICT business with new concepts. Entrepreneurs are looking to do business with upcoming technologies such as artificial intelligence, the Internet of Things, cloud computing, digital products, and others, which have enormous potential in the future.

Digital transformation has opened various opportunities and challenges for us. Entrepreneurs are starting companies to develop a product or service in the ICT sector. These new companies are known as start-ups and are in the initial operation phase. They are separate from other enterprises due to their

capability to take high risks and use innovative and agile methods Start-up companies, people, funding organisations, government, support organisations and others form the start-up ecosystems Mentors, investors, advisors, and facilitators are also part of the start-up ecosystem Apart from this, money, time, and skilled workers are also components of the ecosystem An interesting subject of this ecosystem is that the partners are not likely to be operating from the same place They may be located in different parts of the world but are working for the same start-up venture capitalists, crowdfunding, and other grant or loan-providing agencies are the sources of investment for start-ups.

6.5.1 ICT Role in The Rise of Entrepreneurship

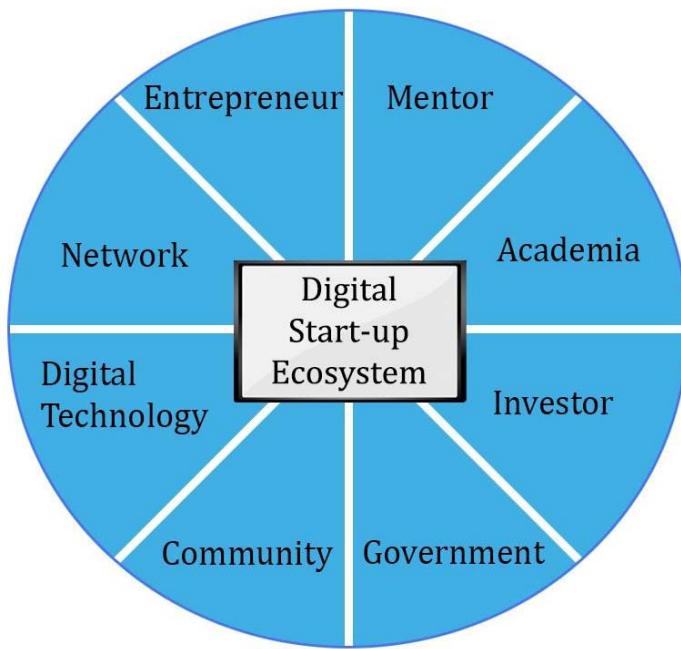
Though there are several reasons behind the rise of entrepreneurship, the ICT ecosystem has increased the number of entrepreneurs. Entrepreneurship plays a leading role in bringing growth to a nation. An entrepreneur must be able to take risks, innovate, be determined, and look for new opportunities. After the invention and integration of ICT in the business ecosystem, there has been a rise in the number of entrepreneurs going digital, which is the new mantra for businesses to succeed. ICT can expand economic opportunities by providing better process efficiencies and facilitating the information needs of entrepreneurs. It is the critical enabler for a business house to do business effectively. The application of ICT in the financial and education sectors has significantly benefited many entrepreneurs in earning profit. This has attracted others to join the bandwagon.

Entrepreneurs are now finding new ways to deal with customers after ICT integration into their business processes They can track their customer's orders, respond quickly to their queries and retain customers in a much easier way Along with this, sales, marketing, production, and consumption processes also offer much more flexible operations after the integration of ICT into the central infrastructure of every business the ease of doing business by sitting in a remote place and expanding your business globally has encouraged many people Government policies in different countries are now introducing digital entrepreneurship action plans to bring youngsters into the entrepreneurship forum The greater penetration of the Internet, along with ICT tools, has reduced the cost of communication and, hence, created cooperation among large and small businesses Therefore, small businesses with limited resources depend on big firms for collaboration on innovation The use of digital technology in various government processes has also simplified the process of business registration and licensing, facilitating training for professionals applying for grants, etc.

6.5.2 Digital Start-up Ecosystem

Digital start-ups are now considered an essential element in a country's economic system They are the companies working in the digital technology areas and are innovative high-tech companies They prefer to work on a low scale at first with low investment and low cost Later, with various innovative business models, they expand to reach global markets digital transformation has brought a new generation of entrepreneurs in the digital technology

segment. These start-ups not only generate employment opportunities but also contribute to the country's economic growth. Various stakeholders in a digital start-up ecosystem are start-up companies, mentors, investors, academia, government, incubators, support organisations and others. They are interdependent and include communities, organisations, resources, service providers, etc. They work in collaboration with each other to help start-up companies progress as a system. Various factors, such as the marketing environment, financial climate, innovations, and the skills of various persons control digital start-up ecosystems.



The digital start-up ecosystem must function under specific policies, practices, protocols, etc. These start-ups are doing business in different areas of upcoming technologies such as artificial intelligence, virtual reality, augmented reality, Internet of Things, mobile applications, digital devices and many other advanced areas of digital technology as per the data available on the Indian government's start-up website, India had the third-largest start-up ecosystem in the world in 2018 out of 50,000 start-ups, more than 9000 start-ups are operating in the technology space. The Indian government has started a new initiative called 'Start-up India' to encourage young talents to be part of the start-up culture and build an ecosystem for entrepreneurs to do their business smoothly in 2015. Some of the digital start-up companies operating in India are Paytm, Boat, Razorpay, Unacademy, CRED, etc. Corporate connect and government support are the two catalysts that helped to grow the start-up ecosystem in India.

6.6 GLOBAL PERSPECTIVES ON ICT AND ECONOMIC DEVELOPMENT

Countries around the world have already realised the integration of technology with various platforms is essential for sustainable economic development. Numerous studies have been done on this subject, too, which have also established a direct relationship between ICT usage and economic development. United Nations is optimistic about the contribution of ICT to

achieve all the 17 Sustainable Development Goals (SDG) international Telecommunication Union (ITU), which plays a dominant role in upgrading the ICT infrastructure of developing countries through various initiatives it provides support to developing countries for making ICT tools affordable for all most of the global bodies think that the benefits of ICT integration and ICT for all are realised only in developed countries As per the Digital Development Review page of the World Bank website, about one-third of the global population remain offline in 2023 it was also found that in the ICT segment, usage of the Internet, mobile phones, and broadband penetration has a direct impact on the economic development of a nation There is still a digital divide in some developing and low-income countries.

The European Union has drafted policy guidelines under the Digital Education Action Plan (2021-2027) for integrating ICT tools into digital education ecosystems. According to the European Commission, the development of ICT is essential for Europe to remain ahead in the digital economy. Has already realised the importance of ICT for economic growth, and therefore, over 20 billion euros from the European Regional Development Fund has been available for ICT investment from 2014 to 2020 after realising the role of ICT in economic development, UAE's Digital Economy Strategy has planned to double the contribution of the digital economy to 20% of GDP by 2031 the government has taken strong steps to digitalise the private and public sectors to boost its economy the Information Technology and Innovation Foundation, in an article, has opined that the ICT sector, through its exports, has helped to drive the economy upward and counter inflation along with job creation.

6.6.1 Comparing and Contrasting International Approaches to Leveraging ICT for Economic Growth.

Among various determinants of economic growth in the present era, ICT is considered one of the most important of all any empirical studies have been done on the positive contribution of ICT towards economic growth in various advanced economies Some developed countries, like the USA, Japan, the UK, etc., have already leveraged ICT to achieve economic growth Some developing countries like India and China have started the integration of digital technologies in various segments to attain economic growth However, there are also some underdeveloped countries where we are seeing a wide gap in accessing digital technology Differences were found in getting a return on investment in ICT in different countries World Bank, in its various reports on ICT, has expressed that digital technology should reduce information barriers, increase productivity through automation and bring innovations through building knowledge societies since 2007, the World Bank has started supporting countries in increasing internet penetration, providing high-speed broadband through investment in telecommunication and mobile infrastructure Many people in Asia and the Pacific, the Arab region and African countries still need to be connected to the Internet There is also a gap found between men and women in accessing digital services like accessing the Internet, e-banking services, usage of smartphones, etc.

India, as a developing country, has been able to attract investment from both foreign and domestic investors in the ICT sector; therefore, the ICT sector has been able to generate employment opportunities and thus contribute to the GDP in this digital era, e-commerce is one of the significant revenue generators. China is the largest e-commerce market in the world - commerce is earning a whopping revenue of 925 billion US dollars. Consumers are getting a rich online shopping experience with the use of smartphones on social media platforms such as Instagram, Facebook and others have also created opportunities for the seller community. Most of the countries have made their mark on integrating ICT in the education sector. Covid-19 restrictions have compelled some governments to think of boosting ICT infrastructure in their respective countries to meet health emergencies, countries like India have upgraded the data management systems to connect the government with health care providers and the public. The government in the USA is still spending around 70% of its ICT budget on upgrading to new technology. Developing countries are now adopting cloud computing to manage their IT resources. This technology comes to rescue the government in managing its exponentially growing data. When Russia attacked Ukraine in 2022, the Ukrainian government suddenly secured its civil service provisions through cloud computing.

6.6.2 Global Interconnectedness of Digital Economies

As per the survey report of UNDESA 2022, the global digital economy is growing faster than the global GDP; it is expected to reach \$25 trillion within the next 5-6 years. The backbone of the digital economy emphasises interconnectedness among people, machines, the Internet and organisations. Digital data, digital technology and infrastructure are the three pillars of the digital economy. The new trend and policies practised by various countries in their e-governance approach will raise their respective digital economies. Frontier technologies, such as AI, IoT, VR, cloud computing, etc., will drive economic growth. The COVID-19 and other challenges have compelled world leaders to think in a collaborative way to face difficult situations. Mobile applications developed for transferring money have benefitted people residing in rural areas where banking operations were a distant dream. Internet Governance Forum is a platform created for multiple stakeholders from different countries to collaborate and share knowledge on a global scale. World Bank has started working with partners like ITU on policy formulations. It has also worked with African countries to finance ICT infrastructure.

There should be a proper policy guideline to introduce digital economy integration among nations, e.g. Many countries see a digital divide due to ICT infrastructure's non-availability or poor availability. It is a difficult task to bring them into the purview of the digital economy to bring these countries into the global digital economy scenario; the developed countries, along with the UN and ITU, must guide and support the digital transformation process. The giants Microsoft, Google, Facebook and others have played essential roles in building ICT infrastructure in less developed countries to provide a wide range of ICT services due to interconnected global economic activities. Our economies are interconnected through digital transformation through

digital data, technology, and infrastructure, which will help achieve global interconnectedness in the digital economy.

Check Your Progress: 3

Note: 1) Use the space provided below for your Answers.

2) Compare your answers with those given at the end of this Unit.

1. Write a brief note on the digital start-up ecosystem in India.

.....
.....
.....

2. Name four frontier technologies that are in the limelight throughout the globe.

.....
.....
.....

6.7 LET US SUM UP

In this Unit, we have discussed various elements of ICT and its role in bringing economic development and growth. We have also learned about the role of e-governance in a nation's economic transformation process. We have also discussed the digital start-up ecosystem and its economic contribution. Finally, we analysed discussions on global perspectives on ICT and the digital economy.

6.8 KEYWORDS

Entrepreneurship: The entrepreneur's ability to do business by taking risks to earn profit.

Economic growth is the development within an economy in a specified period, i.e., a year.

Digital economy: This is an economy in which digital technology plays a vital role in connecting people, organisations, data, businesses, etc.

6.9 FURTHER READINGS

1. Adam, I. O. (2020). ICT development, e-government development, and economic development. Does institutional quality matter? *Information Technologies & International Development*, 16, 19. <https://itidjournal.org/index.php/itid/article/download/1745/1745-5478-2-PB.pdf>
2. Adeleye, B. N., Adedoyin, F., & Nathaniel, S. (2021). The criticality of ICT-trade nexus on economic and inclusive growth. *Information Technology for Development*, 27(2), 293-313. https://eprints.bournemouth.ac.uk/34868/3/Final%20Manuscript_ICT-Trade%20Nexus%20on%20Economic%20Growth%2C%20Africa.pdf

3. Avgerou, C. (2003). The link between ICT and economic growth in the discourse of development. In Organizational Information Systems in the Context of Globalization: IFIP TC8 & TC9/WG8. 2 & WG9. 4 Working Conference on Information Systems Perspectives and Challenges in the Context of Globalization June 15–17, 2003, Athens, Greece (pp. 373-386). Springer US. https://eprints.lse.ac.uk/2575/1/The_link_between_ICT_and_economic_growth_in_the_discourse_of_development_%28LSERO%29.pdf
4. Bilan, Y., Mishchuk, H., Samoliuk, N., & Grishnova, O. (2019). ICT and economic growth: Links and possibilities of engaging. *Intellectual Economics*, 13(1), 93-104. <https://www3.mruni.eu/ojs/intellectual-economics/article/download/5066/4597>
5. Eggleston, K., Jensen, R., & Zeckhauser, R. (2002). Information and communication technologies, markets, and economic development. The Global Information Technology Report 2001-2002: Readiness for the Networked World. <https://livernspleen.com/wp-content/uploads/2012/12/readiness-for-the-networked-world.pdf#page=78>
6. Maiti, D., Castellacci, F., & Melchior, A. (2020). Digitalisation and development: Issues for India and beyond (pp. 3-29). Springer Singapore. https://link.springer.com/content/pdf/10.1007/978-981-13-9996-1_1.pdf
7. Niebel, T. (2018). ICT and economic growth—Comparing developing, emerging and developed countries. *World Development*, 104, 197-211. <https://madoc.bib.uni-mannheim.de/37488/1/dp14117.pdf>
8. Palvia, P., Baqir, N., & Nemati, H. (2018). ICT for socio-economic development: A citizens' perspective. *Information & Management*, 55(2), 160-176. https://libres.uncg.edu/ir/uncg/f/P_Palvia_ICT_2018.pdf
9. Pradhan, R. P., Arvin, M. B., Nair, M. S., Hall, J. H., & Bennett, S. E. (2021). Sustainable economic development in India: The dynamics between financial inclusion, ICT development, and economic growth. *Technological Forecasting and Social Change*, 169, 120758. https://repository.up.ac.za/bitstream/handle/2263/88122/Pradhan_Sustainable_2021.pdf?sequence=1
10. Sarangi, A. K., & Pradhan, R. P. (2020). ICT infrastructure and economic growth: A critical assessment and some policy implications. *Decision*, 47(4), 363-383.

References:

1. Department for International Trade. (n.d.). India - Information and Communication Technology (ICT). Retrieved from <https://www.trade.gov/country-commercial-guides/india-information-and-communication-technology>
2. Department of Economic and Social Affairs. (2022). Information and Communication Technologies (ICTs). Retrieved from <https://www.un.org/development/desa/socialperspectiveondevelopment/issues/information-and-communication-technologies-icts.html>

3. European Commission. (n.d.). Information and Communication Technologies (ICT). Retrieved from https://ec.europa.eu/regional_policy/policy/themes/ict_en
4. International Monetary Fund. (2023). How the IT Sector Powers the US Economy. Retrieved from <https://itif.org/publications/2022/09/19/how-the-it-sector-powers-the-us-economy/>
5. National Association of Software and Service Companies. (n.d.). Technology Sector India 2023: Strategic Review. Retrieved from <https://nasscom.in/knowledge-center/publications/technology-sector-india-2023-strategic-review#:~:text=In%20FY2023%2C%20India's%20technology%20industry,%2419%20Bn%20over%20last%20year>
6. Ministry of Electronics and Information Technology. (2003). E-Readiness: Vision 2003. Retrieved from https://www.meity.gov.in/writereaddata/files/eready2003/CHAPTER3_32-57.pdf
7. United Nations. (n.d.). Information and Communication Technologies (ICTs). Retrieved from <https://www.un.org/development/desa/socialperspectiveondevelopment/issues/information-and-communication-technologies-icts.html>
8. United Nations Department of Economic and Social Affairs. (2022). Chapter 1: ICT and Sustainable Development. Retrieved from <https://desapublications.un.org/sites/default/files/publications/2022-09/Chapter%201.pdf>
9. United Nations Department of Economic and Social Affairs. (2022). Chapter 5: ICT for Inclusive Development. Retrieved from <https://desapublications.un.org/sites/default/files/publications/2022-09/Chapter%205.pdf>
10. World Bank. (n.d.). Digital Development. Retrieved from <https://www.worldbank.org/en/topic/digitaldevelopment/overview#:~:text=The%20World%20Bank%20provides%20knowledge,the%20ongoing%20Digital%20Development%20revolution>

6.10 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. The four benefits of ICT that contribute to economic growth are faster connectivity, employment generation, global investment, increased efficiency, and the development of social capital.

Check Your Progress: 2

1. E-governance plays an important role in a nation's economic transformation. Efficient e-governance initiatives can contribute to economic development through proper information channels, transparent administrative systems, less processing time, less travel time, and reduced costs.

Check Your Progress: 3

**ICTs for Economic
Development**

1. India has the third-largest start-up ecosystem in the world. 2018, out of 50,000 start-ups, over 9000 were operating in the technology space. The Indian government has started a new initiative called 'Start-up India' to encourage young talents to join the start-up culture and build an ecosystem for entrepreneurs to do their business smoothly.
2. Four frontier technologies are artificial intelligence, virtual reality, the Internet of Things, and cloud computing.

UNIT 7 ICT AND RURAL DEVELOPMENT

Structure

- 7.0 Introduction
 - 7.1 Learning Outcomes
 - 7.2 Rural Development
 - 7.3 ICT and Rural Development: Growth and Opportunity
 - 7.3.1 Possible Ways of Implementing ICT for Rural Growth
 - 7.3.2 ICT Projects in Rural India: Case Studies
 - 7.3.4 Challenges
 - 7.3.5 Ways of Overcoming the ICT Challenges
 - 7.4 Let Us Sum Up
 - 7.5 Further Readings
 - 7.6 Check Your Progress: Possible Answers
-

7.0 INTRODUCTION

This Unit will discuss the role of ICT in rural development. In the previous two Units, you have learnt about the role of ICT in the overall development of any nation and about its segregated role in the development of the health sector. Now, one standard question that comes up is why we are discussing the role of ICT in individual sectors when we have thoroughly discussed the role of ICT in the overall development of a nation. It is important because the developments in individual sectors contribute to overall development, and hence, we need to understand the role of ICT in such individual contributing sectors.

We know that Information and Communication Technology can play a very prominent role in strengthening the development of rural areas. But the question is how? An infusion of ICT in rural areas can speed up the development process and help fill the gaps in the existing systems or projects meant for such areas. Prospects for the application of ICT in rural development are immense, but it is also true that the government will face some challenges, which we noticed in the previous two Units. This article focuses on the scope of ICT in rural development and the opportunities and challenges. In this Unit, we will particularly illustrate the role of ICT in enabling various development goals and the benefits of ICT in optimising the quality of life of people residing in rural areas.

7.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the role of ICT in rural development;
- Evaluate the potential applications of ICT in rural development; and
- Analyse the challenges and propose solutions for integrating ICT for rural development.

7.2 RURAL DEVELOPMENT

Before we approach the idea of ICT and rural development, as well as its scopes and possibilities, we need to understand what rural development means. We will be discussing the concept of rural development in short here. The concept of rural development is multidimensional and multifaceted; thus, the challenges of rural areas are multi-layered. To be defined more accurately, rural development is an approach that enables marginalised poor rural people to gain what they rightfully deserve and need for themselves. It is a strategy that helps the poorest seek a proper livelihood, including small-scale tenants, farmers and the landless. So, the transformation of rural areas is fundamental to improving people's livelihoods. Since agriculture is the basis of rural livelihoods in a developing nation like India, it is particularly vital to look for connections between agriculture and ICTs. In rural development, one thread is closely associated with the other. For instance, rural poverty reduction is directly related to increased agricultural productivity.

A lack of basic amenities and infrastructure and low literacy levels mainly characterise rural areas. Rural development comprises strategies that focus on better livelihood for people with provisions for access to basic infrastructure and facilities. India is still considered a developing nation after so many years of independence. The question here is whether the government or public administration has been able to respond effectively to the changing requirements of the present twentieth century. In this context, the use and application of ICT is seen as a paradigm shift from traditional approaches to the execution of government strategies. As the meaning suggests, ICT has enabled the rendering of government policies and services to the public using electronic means.

Recent innovations in ICT have strengthened broad-based development. We can elaborate on this point by examining the experiences that we notice in and around us every day. ICT can help create scopes for social and economic empowerment for marginalised people. It can help the poor overcome powerlessness despite inequities in traditional assets like educational opportunities, finance, or land, etc. The scope of direct information and communication can transform the business relationships of poor producers who can directly quote their deserved demands. ICT advancements can also help promote government responsiveness towards rural areas and marginalised people as connectivity through the Internet, telephones, televisions, and the radio enables the voices of the excluded to be heard.

In India, telephone lines have reached rural interior areas by introducing public call offices (PCOs), so it can be assumed that people with low incomes will indeed have minimal access to ICT. In rural areas, people are mostly isolated from the ongoing information revolution. Several studies on ICT for rural development help us gain a proper perspective on the various aspects of the subject, such as social exclusion or the digital divide. Evaluating the developmental impact of ICT applications on rural areas can be seen through e-governance. Through Amartya Sen's capability approach, human development can be conceptualised, which sees development as freedom. This concept is even more significant in rural areas where people do not have

access to many basic amenities of life. Development in this context would mean more opportunities to live free from poverty, political subjugation, and disparities. The capabilities or the capacity to use ICT is seen as freedom and is very relevant in rural areas.

Check Your Progress: 1

Note: 1) Use the space provided below for your Answers.

2) Compare your answers with those given at the end of this Unit.

1. How does the integration of Information and Communication Technology (ICT) contribute to the development of rural areas?

.....
.....
.....
.....

2. What is the key understanding of the role of ICT in rural development? How do these outcomes contribute to your understanding of technology's impact on societal progress?

.....
.....
.....
.....

3. Discuss the significance of understanding the role of ICT in individual sectors, such as rural development.

.....
.....
.....
.....

7.3 ICT AND RURAL DEVELOPMENT: GROWTH AND OPPORTUNITY

Developing countries worldwide are attempting to use ICTs to achieve developmental goals, and India has also attempted to harness ICTs for development. In the first Unit, where we discussed the scopes of ICT in the development process, we learnt that ICT applications can add efficiency to the existing socio-economic, political, and governmental spheres. In rural areas, poverty is one of the major areas with multiple dimensions. Being poor does not mean lacking basic resources; in other words, a lack of ICTs can also lead to poverty. So, to make the rural areas developed, the rural farmers with access to information must be brought out of poverty. It is inevitable that through the use of ICTs, rural people can voice their problems and communicate better. Moreover, access to ICTs can equip the people of rural

areas with skills that can help improve their overall well-being. ICT can help them gain skills through various sources, including the Internet and mobile phones.

Agriculture is one of the main activities in the Indian rural scenario, and the functionality of ICT in this sector is one of the major contexts in rural development. In our country, most of the population resides in rural areas and suffers from many problems like food insecurity, poverty, low income, poor educational facilities, etc. The income generated from agriculture is usually low because of several factors. As agriculture is the major source of income and employment in rural areas, it must be seen how ICT can improve rural livelihoods by improving the prospects of agriculture. In the following sections, we will be discussing the scopes of ICT in rural areas.

We have mentioned earlier that agriculture plays a vital role in rural areas' social and economic growth. Agricultural informatics is a new concept that has evolved due to the development of ICTs. Let us illustrate this point a little more. Agriculture is significant because improved agricultural production can not only provide food security to rural communities but can also decrease the problem of poverty. Scholars agree that to reduce poverty, the focus should be on the transformation of the agricultural sector. Besides labour productivity, access to major remunerative markets and land use, as well as increased ICT use, can also directly influence issues of agriculture and food security at the rural and national levels. From an economic viewpoint, the integration of ICTs in the existing development strategies for agriculture has a prospective of increased access to markets nearby or across the country for proper selling and remuneration of agricultural produce. It can thereby benefit the rural economy and other associated growth.

On the other hand, the absence of ICTs can lead to inappropriate market information and huge losses in agricultural production. Timely information can also alleviate the cause of low productivity in agriculture. It was one aspect of rural development that we have touched on through ICT.

Now, we will be looking at the other expected outcomes of ICT. We know that rural development is an integrated concept of growth, and the basic infrastructures, like health, education, and food, constitute the rural development programmes. Communication can solve major social problems and inequities. We will discuss how ICT can touch upon the other aspects of rural development. The introduction of communication through ICT can be used to improve education, social awareness, nutrition, health, and hygiene. Developing countries worldwide have initiated the implementation of ICTs for the benefit of the rural marginalised. The conventional media in the pre-economic liberalisation period were used to reach the huge rural population for development projects and

In the post-liberalisation period, ICT was added to rural development projects to provide information based on individual or communication needs through the Internet.

7.3.1 Possible Ways of Implementing ICT for Rural Growth

From the above, we have learnt that through ICT, village farmers can improve market efficiency. Farmers can easily access any information through ICTs from any place instead of travelling in search of current market prices or business updates. Introducing ICTs has improved communication between sellers and buyers and reduced transaction costs. It has also enabled the rural farmers to conduct their business efficiently and professionally. So, the opportunities offered by the development of ICT in developing countries are plentiful and considerable if the policies are implemented adequately.

Interestingly, the scope of ICT is no longer confined to only the information and communication sectors; it has penetrated all sectors and fields. Rural tourism can also be promoted through websites and has a global reach. The following are some of the possible ways to highlight the role of ICTs in promoting rural livelihoods in the country.

Distant learning in rural areas can be made possible through ICT as the quality of education can be improved with drastically reduced costs. ICT should be appropriately integrated into the curriculum to train teachers as they are considered knowledge multipliers. To bridge gaps in the reach of educational facilities to marginalised people with low incomes, technological skills must be acquired in all spheres of education. The introduction of ICT for open and distance learning is a step towards bridging the prevalent social and educational gap, especially in rural areas. Studies indicate that ICT in education has helped poor people in rural areas improve their socio-economic conditions. It is a common notion that ICT and its benefits are only affordable to the rich, and they can take advantage of it, be it in education or development in any other sector. So, local government must initiate entrepreneurship and investment, which are also vital for sustaining development for marginalised people.

ICT has a major role in healthcare development, especially in rural areas. In the second Unit on ICT and health development, we learned that ICT could help development by improving access to various services. ICT offers scopes for extending public education campaigns such as sanitary behaviour and healthy habits to the rural poor, reinforcing information exchange between researchers across the globe, and valorising establishments of public health development. ICTs have improved health care through the telemedicine delivery model, which is very applicable in rural areas, making it possible for a rural patient to contact a specialist doctor.

ICTs also allow the establishment of business links between big commercial companies and small firms in rural areas to enhance adequate business transactions. ICTs can also reduce the chances of saving plantations and crops from environmental risks by providing timely interventions and information to farmers. Land records hold greater significance in contemporary socio-economic laws; from time to time, revision and upgradation are necessary to notice any change in rural social dynamics. Thus, ICT can facilitate the management of data or records of land and create an information base so that any dispute can be handled proficiently. As land is an important factor for agricultural growth, and for the same reason,

creating a database of basic records is significant. ICT application enables minimising the possibility of manipulating existing records. In the same context, ICT can also reduce the manipulation of the basic rights of rural farmers, the majority of whom might not be literate enough to understand their rights.

So, in short, we can say from the above discussions that ICTs have been adopted in rural communities to enhance their livelihoods by giving them opportunities to increase their income, thus improving their probabilities of evading persistent poverty.

ICT Projects in Rural India: Case Studies

We have noted that most rural people in India remain isolated from the information revolution. We will discuss some case studies highlighting ICT applications in rural areas where ICT has been used effectively for empowerment and security.

Gyandoot: e-Government for development

ICT can aptly be used to transform the relations of government agencies with citizens. It is quite common that villagers face harassment and discomfort and must travel for any official work to be done. For a daily wage labourer, a day's value is indescribable, and there is no guarantee that their work will be done in the government office, given that public officials enjoy a monopoly over the relevant official records. In such cases, introducing ICT can offer increased transparency, less corruption, zero monopoly, access to information disclosure and increased responsiveness by public officials. One can access information related to land or any public document through ICT-enabled service centres. Gyandoot, a government-owned computer network, has been trying to help rural people have easy access to government data since 2000. It was launched in the Dhar District of Madhya Pradesh. Through this service, people can not only track business details of wholesale markets but can also lodge complaints about their problems.

Dairy Information Services Kiosk (DISK)

We mentioned earlier that rural farmers are victims of lack of information and ignorance. They may be unaware of the latest market values, crop facts, weather conditions, etc. In such cases, ICT can solve the problems of low-income people, offering them scopes of entrepreneurship and connecting them to bigger markets. The Dairy Information Services Kiosk, an initiative of the National Dairy Development Board (NDDB), can be cited as a case study. These systems, equipped with electronic weights and electronic fat testing machines, ensured fair prices for farmers who sell milk to dairy cooperatives, introduced reasonable milk collection methods, and enabled instant payments to farmers based on the quality and quantity of milk delivered. It introduced transparency and faster processing.

Bhoomi: Online Delivery of Land Titles in Karnataka

It is an initiative by the Department of Revenue in Karnataka. It has computerised approximately 20 million land ownership records for 7 million

farmers in the state. These records will not only improve the system but will mostly benefit the farmers by enabling them to obtain bank loans with essential documents without delay. With the Internet-enabled central database, land records are easy to access at kiosk seven in remote areas.

7.3.2 Challenges

Despite the prospects mentioned above, ICT is not a solution for all development challenges in rural areas as it alone cannot bring all desired changes. Some of the major challenges that can hinder the application of ICT in rural areas are –

- The foremost problem is illiteracy. Around 40% of India's population is illiterate, and none of the strategies of modern economics can apply in such a scenario.
- Insufficient electricity supply and constant power breakdowns are other major issues in rural areas.
- Less active users, i.e., the number of people using ICT in rural areas, are small and suffer from connectivity issues.
- Lack of technical resources for supporting rural people as not many people want to work in the rural areas where there are shortages of facilities and prosperity.
- Lack of timely interventions or implementation of funds for technological growth at the grass root levels.

7.3.3 Ways of Overcoming the ICT Challenges

In a developing country like India, the role of government can play the primary role of presenting a vision for the future by implementing ICT so that all sectors can benefit from it. It is important to develop the existing infrastructure and logical network, and at the same time, improved interconnections at regional and national levels are also required. The challenges of information highways are technological, and some ways through which such challenges can be handled are as follows –

- Designing interfaces for letting access to information to illiterate rural masses and making them self-sufficient
- Development of internet access line and network
- Increase in the extension of telecommunication networks in rural areas.
- Improvement of strategies for the elimination of illiteracy
- Increase in the number of ICT access providers in rural areas.
- Development and establishment of telecentres
- Increased investment and funding in the ICT sector
- Training of technical activists in rural areas

Check Your Progress: 2

ICT and Rural Development

Note: 1) Use the space provided below for your Answers.

2) Compare your answers with those given at the end of this Unit.

1. Discuss the challenges faced by governments in implementing ICT projects in rural India.

.....
.....
.....
.....

2. Explore the potential applications of ICT in rural development?

.....
.....
.....
.....

3. Analyse the role of ICT projects in rural India through case studies. What insights can be gained from these case studies?

.....
.....
.....
.....

7.4 LET US SUM UP

In this Unit, we have learnt that communication is the most important component for development and how effective ICT is in supporting highly influential approaches to human development and freedom, specifically in rural areas. We noticed that harnessing ICTs in rural areas is meant to develop improved solutions to issues like poverty reduction, economic growth, equity, and social injustice. Information and communication technology represents a medium for rural people to surmount their conditions. ICT has the potential to modernise and promote sustainability and development in the agricultural sector. We also discussed how computerisation records are a big issue and the success of ICT applications in rural development. It can also improve the basic amenities and sectors like health, education, food security, etc. ICTs play an imperative role in the development and promotion of rural livelihoods.

7.5 FURTHER READINGS

1. Blum, M. L., Cofini, F., & Sulaiman, V. R. (2020). MODULE 7: ICTs in Rural Advisory Systems and Services. Agricultural extension in transition worldwide: Policies and strategies for reform, 115. <https://www.fao.org/documents/card/en/c/ca8199en>

2. Foko, T. E., Mahwai, N. J., & Phiri, C. A. (2020). Lessons from the field: What researchers learned from evaluating ICT platforms for rural development and education. *The Journal of Community Informatics*, 16, 141-153.
<https://openjournals.uwaterloo.ca/index.php/JoCI/article/download/3470/4572/>
3. Hanson, W., & Heeks, R. (2020). Impact of ICTs-in-agriculture on rural resilience in developing countries. *Development Informatics Working Paper*, (84). <https://www.niccd.org/wp-content/uploads/2020/01/DIWkPpr84.pdf>
4. Khan, N., Siddiqui, B. N., Khan, N., Khan, F., Ullah, N., Ihtisham, M., ... & Muhammad, S. (2020). Analyzing mobile phone usage in agricultural modernization and rural development. *International Journal of Agricultural Extension*, 8(2), 139-147. <https://esciencepress.net/journals/index.php/IJAE/article/viewFile/3255/1711>
5. Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, 54, 360-371. https://pure.rug.nl/ws/portalfiles/portal/48596127/1_s2.0_S0743016715300176_main.pdf
6. Salanti, V. K., & Raju, T. S. (2020). Education Policy and ICT for Rural Development in India. *Rural Development in India: A Socio-Economic View*, 203.
7. Venkatesh, V., Sykes, T., & Zhang, X. (2020). ICT for development in rural India: A longitudinal study of women's health outcomes. *MIS quarterly*, 44(2), 605-629. <https://vtechworks.lib.vt.edu/server/api/core/bitstreams/7d120535-06a5-49c1-9e04-e98d090166d7/content>

7.6 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1:

1. Integrating ICT in rural areas profoundly impacts sectors like education, healthcare, agriculture, and governance. Telemedicine, for instance, facilitates remote consultations, diagnosis, and treatment, addressing the healthcare access gap in remote regions. Similarly, e-agriculture platforms provide real-time market information, empowering farmers to make informed decisions about crop sales and prices. Moreover, e-governance initiatives streamline service delivery processes, reducing bureaucratic hurdles for rural residents. These ICT interventions not only bridge information disparities but also optimise resource allocation, fostering sustainable development in rural communities by enhancing productivity and efficiency.
2. The learning outcomes of studying ICT in rural development encompass a comprehensive understanding of its transformative potential. This includes recognizing ICT's capacity to address specific challenges faced

by rural communities, such as limited access to essential services and information. By evaluating the applicability of ICT solutions in diverse rural contexts, individuals can develop nuanced strategies tailored to local needs. Moreover, proposing solutions to implementation challenges equips learners with the skills to navigate practical obstacles and ensure the successful integration of ICT for rural development. Ultimately, these learning outcomes empower individuals to contribute effectively to improving the quality of life for rural populations through technology-driven initiatives.

3. Focusing on sectors like rural development deepens our understanding of ICT's impact on local communities by highlighting the unique challenges and opportunities within these contexts. Unlike broad discussions on national development, sector-specific analyses allow for a more nuanced examination of how ICT interventions interact with existing socio-economic structures in rural areas. By tailoring technology solutions to address specific needs and priorities identified within the rural development sector, we can maximise the effectiveness and relevance of these interventions. This targeted approach ensures that ICT initiatives resonate with local communities and contribute meaningfully to their socio-economic advancement, ultimately fostering inclusive and sustainable development in rural regions.

Check Your Progress 2:

1. Implementing ICT projects in rural areas presents various challenges, including limited infrastructure, low digital literacy rates, and connectivity issues. These challenges can hinder the effective deployment and utilisation of technology, undermining the potential benefits for rural development. To address infrastructure gaps, governments and stakeholders must invest in expanding broadband connectivity and upgrading digital infrastructure in rural areas. Additionally, digital literacy programs should be implemented to enhance the skills of rural residents, enabling them to effectively utilise ICT tools and platforms. Furthermore, partnerships with the private sector can facilitate innovative solutions and sustainable business models for delivering ICT services in rural communities. By addressing these challenges through targeted strategies and collaborative efforts, stakeholders can ensure the successful integration of ICT for rural development, unlocking its transformative potential to uplift rural populations.
2. ICT applications in rural development, such as telemedicine and e-agriculture, play a crucial role in enhancing access to essential services and fostering socio-economic empowerment in rural communities. Telemedicine initiatives leverage technology to overcome geographical barriers, enabling remote consultations, diagnosis, and treatment for rural residents. Similarly, e-agriculture platforms provide farmers with access to real-time market information, weather forecasts, and agricultural best practices, empowering them to make informed decisions and improve productivity. Additionally, ICT-enabled financial services facilitate

access to credit, savings, and insurance products, supporting agricultural livelihoods and rural entrepreneurship. By leveraging ICT to bridge information gaps, promote knowledge sharing, and empower rural communities, these initiatives contribute to inclusive and sustainable development in rural areas, ultimately enhancing the quality of life for rural populations.

3. Case studies of ICT projects in rural India offer valuable insights into both successful and unsuccessful interventions, providing valuable lessons for future initiatives. By analysing these case studies, stakeholders can identify best practices, key challenges, and factors influencing the effectiveness of ICT interventions in rural development. Successful case studies highlight innovative approaches, strong partnerships, and community engagement strategies that have contributed to positive outcomes. Conversely, unsuccessful case studies shed light on common pitfalls, such as inadequate infrastructure, limited stakeholder participation, and insufficient sustainability planning. By learning from both successes and failures, stakeholders can refine their strategies, adopt evidence-based approaches, and tailor interventions to local contexts, ultimately improving the effectiveness and impact of ICT projects in rural development.

UNIT 8 ICT AND ENVIRONMENT SUSTAINABILITY

Structure

- 8.0 Introduction
 - 8.1 Learning Outcomes
 - 8.2 Understanding ICT and its Lifecycle Impact on Environment
 - 8.2.1 ICT in the Production Phase
 - 8.2.2 ICT in the Use Phase
 - 8.2.3 ICT in the Disposal Phase
 - 8.3 Key Pillars of Sustainable Development
 - 8.3.1 Ecology
 - 8.3.2 Economics
 - 8.3.3 Ethics
 - 8.4 Green ICT and its Need for Environment Sustainability
 - 8.4.1 ICT Innovations and Sustainable Solutions
 - 8.4.2 Smart Cities and Sustainable Transportation
 - 8.4.3 Energy Efficiency and Green Computing
 - 8.4.4 Smart Grids and Energy Management
 - 8.4.5 Remote Collaboration and Telecommuting
 - 8.4.6 Environmental Monitoring and Management
 - 8.4.7 Precision Agriculture
 - 8.4.8 E-Waste Management
 - 8.4.9 Climate Modelling and Prediction
 - 8.5 Role of Governments, Policy, and Regulations
 - 8.6 Role of Corporate Sector in Achieving Sustainable Development Through ICT
 - 8.7 Understanding International Frameworks Related to ICT and Environmental Sustainability
 - 8.8 Case Studies and Best Practices
 - 8.9 Innovation and Entrepreneurship in Developing ICT Solutions for Environmental Sustainability
 - 8.10 Ethics and Social Responsibility
 - 8.11 Let Us Sum Up
 - 8.12 Keywords
 - 8.13 Further Readings
 - 8.14 Check Your Progress: Possible Answers
-

8.0 INTRODUCTION

Have you ever wondered how your online activities impact the environment? Alternatively, when you discard an electronic device, you contribute to the

surging e-waste. Even by searching a single query in the Google search engine, you are releasing 0.2 grams of CO₂ into the atmosphere (Hölzle, 2009).

However, it is worth mentioning that you alone are not to be blamed. Maybe the technology and the device were designed in such a way that it would impact the climate. Planned obsolescence and the disposable nature of older technologies in the advent of new technologies are making the impact of the ICT sector on climate very much visible.

Though this impact is minuscule compared to other sectors' carbon emissions, such as manufacturing, energy, transportation, and aviation, the increasing penetration of digital devices and heavy dependence on IT cannot be ignored.

The ICT sector's carbon footprint currently stands at nearly 2 per cent of the global average. It could be further reduced by over 80 per cent if all electricity consumed came from renewable energy sources or devices were switched less frequently.

If used well, digital technologies can also help decarbonise other sectors. Smart use of ICT can reduce the impact on other sectors by up to 16 per cent or more (Hankel, 2014).

Integrating ICT to create solutions that enhance resource efficiency and reduce environmental impact can contribute to a more sustainable, resilient future and environmental sustainability.

In this Unit, we will learn the interrelationship between the ICT and environment sustainability from multiple stakeholders' perspectives.

8.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the meaning of ICT and sustainable development;
- Know about Green ICT, its pros and cons, transformations and challenges, and the need for its integration;
- Identify the role of different stakeholders in adopting sustainable development and
- Learn about the future development roadmap through Green ICT and our role.

8.2 UNDERSTANDING ICT AND ITS LIFECYCLE IMPACT ON ENVIRONMENT

Information and communication technology (ICT) is a broad term that encompasses communication devices and applications such as radio, television, cellular phones, computer hardware, software, satellite systems, and associated services like videoconferencing and distance learning. Different studies employ varied terms like "ICT," "ICT products," "ICT solutions," "ICT goods," and "ICT services."

European statistics (Eurostat, 2016) defines "ICT" as all technical means for handling information and supporting communication. The OECD (2011) uses the term "ICT products and services," covering various categories. ICT can be categorised broadly in two ways: as ICT solutions (in terms of products and services) and as ICT societies, where ICT plays a vital role in societal life and development, considering all ICT solutions.

Many scientific studies propose that ICT can facilitate the transition to a less material-intensive economy, promoting sustainability (Hilty et al., 2011). The Smarter2020 report (GeSi, 2012) outlines ICT's potential role in reducing future energy use and climate change impact through digitalisation, dematerialisation, data collection, communication, systems integration, demobilisation, mass customisation, intelligent operation, and soft transformation and optimisation processes across various sectors.

However, ICT usage also has various implications. The environmental impacts of ICT can be categorised into different orders. As per Berkhout and Hertin (2001), there are direct, indirect, and structural/behavioural effects.

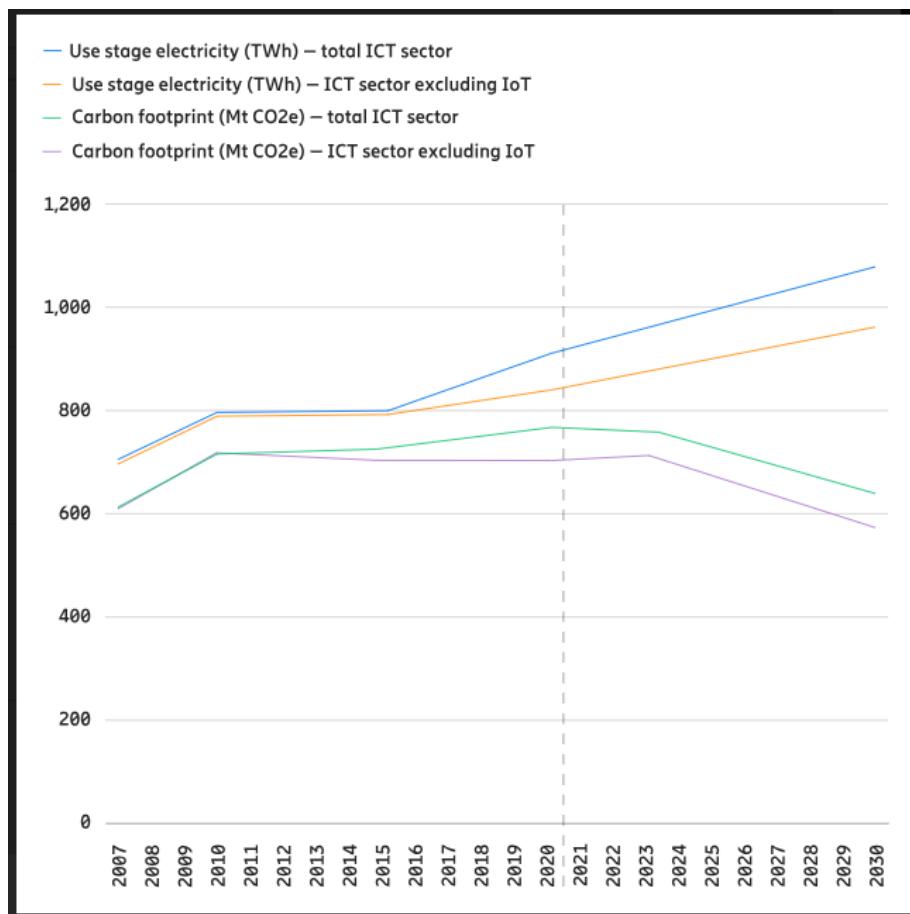


Figure 8.1: ICT sector development 2007–2020 and forecast to 2030

Source: ericsson.com/mobility-report.

Direct effects are negative effects that arise from the manufacturing, use, and disposal of ICT devices, such as e-waste and resource depletion.

Indirect effects: These effects are both negative and positive. They result from ICT applications, such as dematerialisation and efficiency gains. E.g. travel substitution transportation optimisation and cultural homogenisation.

Behavioural/ Structural effects: These are related to lifestyle and structural changes caused by ICT, encompassing both positive and negative aspects, including the rebound effect. The overall demand for that service may increase as ICT improves efficiency, reducing resource consumption or environmental impact per Unit of service (e.g., energy-efficient devices). In the context of ICT, increased efficiency might lead to more extensive use and, consequently, a potential increase in resource consumption. This is also known as Jevons' Paradox, named after the economist William Stanley Jevons.

Some other examples are changed communication patterns, information overload, digital addiction, the digital divide, job losses, and the shift to the service economy. These changes reshape how we lead our lives on a societal level.

Apart from these factors, using information and communication technology (ICT) contributes to its carbon footprint. The carbon footprint concept extends beyond the electricity consumption of ICT products, encompassing the greenhouse gas emissions linked to the energy and materials utilised across the entire product life cycle. This encompasses acquiring raw materials, production and assembly, transportation, operational use, and end-of-life treatment. Notably, the indirect consequences of ICT usage are not accounted for in the carbon footprint calculation despite frequently being more substantial than the footprint itself.

The life cycle of Information and Communication Technology (ICT) products (PCs, computer screens, mobile phone networks, fixed-line networks, components like ICs and batteries) and "green data centres" (that store, manage and distribute data) consists of three phases: **production, use, and end of life**, with the **design phase** influencing the life cycle substantially.

Each phase has its life cycle. Each phase has environmental impacts in terms of consumption of materials and energy. The major energy consumption is primarily in the use phase. This perspective is criticised for oversimplification due to the following reasons:

- The mix of electricity sources matters for energy generation.
- Phases beyond usage might be more crucial.
- Other environmental effects may be more significant than just energy consumption.

8.2.1 ICT in the Production Phase

Early studies on the ecological impacts of computers highlight the significance of the production phase compared to the usage phase. A recent study on desktop PC production in China [Eugster et al., 2007] found that the energy demand for producing a PC equal about three years of typical usage.

The usage phase takes roughly six years to balance out the production phase. This comparison becomes even more favourable for the usage phase if the energy supply includes a significant share of non-fossil sources (e.g., hydro,

wind, or solar power). The production of integrated circuits and parts with precious metals is the most energy-intensive aspect of PC production. Assembling the parts has a comparatively minor environmental impact.

The production phase of Information and Communication Technology (ICT) has a substantial environmental impact, involving resource consumption, energy use, and waste generation. Let us glance over some examples illustrating the environmental impact of ICT production:

High Energy Consumption in Manufacturing Processes: The production of integrated circuits (ICs) and semiconductor chips, essential components in electronic devices, involves complex manufacturing processes requiring high energy consumption and various chemicals.

Mining for Rare Earth Metals: The extraction of rare earth metals, such as neodymium, used in producing magnets for hard drives and other electronic components, contributes to habitat destruction and environmental pollution. Rare earth mining is associated with soil and water contamination.

E-waste Generation: The production phase contributes to the generation of electronic waste (e-waste). Improper disposal and recycling of electronic components lead to environmental pollution. For instance, improper disposal of printed circuit boards can release harmful substances like lead and brominated flame retardants into the environment.

Carbon Emissions: The energy-intensive processes involved in manufacturing ICT components, including devices like computers and smartphones, contribute to carbon emissions. Using fossil fuels in manufacturing plants increases the carbon footprint of ICT products.

Packaging Materials Impact: The packaging materials used to transport and protect ICT products contribute to their environmental impact. Excessive use of non-biodegradable packaging materials adds to the overall ecological footprint.

Global Supply Chain Impact: The global nature of ICT supply chains involves transporting components across long distances, contributing to carbon emissions. The transportation of raw materials and finished products also adds to the environmental impact.

Water Usage: Water is a crucial resource in the production phase, particularly in semiconductor manufacturing. Water-intensive processes, such as cleaning and cooling, can lead to water scarcity issues in certain regions.

Chemical Usage: Electronic device production involves using various chemicals, including solvents and cleaning agents. Inappropriate disposal or mishandling of these chemicals can contaminate soil and water.

Addressing these environmental impacts through sustainable practices, such as eco-friendly manufacturing processes, responsible sourcing of raw materials, and effective e-waste management and recycling initiatives, is important.

8.2.2 ICT in the Use Phase

In the use phase, an ICT product provides its service to the user. Life Cycle Assessment (LCA) studies measure environmental impact based on a functional unit, like "1 hour of PC use." Considering its substantial production impact, the key environmentally relevant factor during ICT use is the device's useful life. Using a device for a more extended period, say six years instead of three, reduces the production impact per functional Unit by half.

Generally, the longevity of ICT devices matters more than their power consumption during use. However, in cases like servers running 24/7, energy consumption during use becomes crucial. Short software innovation cycles can harm hardware life, negatively impacting the environment. Extracting precious metals, especially gold, for electronics significantly contributes to their overall environmental impact. The use phase of Information and Communication Technology (ICT) products involves their operation and energy consumption during normal usage. Here are some examples illustrating the environmental impact of ICT in the use phase:

Energy Consumption: The operation of ICT devices, such as computers, smartphones, and servers, requires a significant amount of energy. For instance, data centres that host online services consume vast amounts of electricity.

Carbon Emissions: The electricity used to power ICT devices often comes from fossil fuel-based sources. This contributes to carbon emissions and exacerbates climate change. The carbon footprint depends on the energy mix of the devices used in the region.

Electronic Waste (E-waste): The use phase contributes to electronic waste generation, especially when devices become obsolete or are discarded. Devices with short lifespans or those that are not easily upgradable contribute to a faster turnover of electronic products.

Phantom Energy Consumption: Many ICT devices, such as phantom or standby power, consume energy even when not used actively. For instance, leaving a computer or television on standby mode can consume unnecessary energy over time.

Internet Infrastructure Impact: The use of online services, streaming platforms, and cloud computing contributes to the overall energy consumption of the Internet infrastructure. Data transmission, storage, and processing in data centres have environmental implications.

Short Device Lifespan: The relatively short lifespan of some ICT devices, driven by rapid technological advancements and changing consumer preferences, can result in more frequent replacements. This leads to increased production-related environmental impacts and e-waste.

Cooling Systems: High-performance ICT equipment, especially in data centres, requires extensive cooling systems to prevent overheating. These cooling systems consume additional energy, contributing to the overall environmental impact.

Resource Depletion: Using certain minerals and metals in ICT devices, such as coltan in smartphones, can contribute to resource depletion. Unsustainable mining practices for these materials can lead to environmental degradation.

Emission from Network Infrastructure: Example: Telecommunication networks, including mobile networks and broadband, contribute to energy consumption and emissions. The energy usage of base stations and data transmission contribute to the overall impact.

Addressing the environmental impact in the use phase involves promoting energy efficiency, designing products for longevity and upgradability, and encouraging responsible consumer behaviour, such as proper disposal and recycling of electronic devices.



Fig.8.2

Delhi-based Namo E-waste Management, a recycler cum PRO (Producer Responsibility Organisation), extracts metals such as aluminium, copper, brass and zinc from e-waste products that include computers, motherboards, mobile phones, and server boards (source Indian Express).

8.2.3 ICT in the Disposal Phase

The disposal phase of an ICT product, often called the end-of-life phase, involves properly discarding or recycling the product. During this phase, the environmental impact is influenced by the methods used for disposal. Examples of ICT environment impact in the disposal phase include:

Improper E-Waste Disposal: Discarding electronic devices in landfills without proper recycling leads to leaching of hazardous materials into soil and water, posing environmental and health risks.

Informal E-Waste Recycling: Unregulated recycling practices, common in some developing countries, lead to health hazards for workers and environmental pollution due to inadequate processing methods.

Recycling electronic waste is a significant and growing concern globally due to the increasing volume of Waste Electrical and Electronic Equipment (WEEE). Despite methodological challenges in assessing environmental impacts, recycling e-waste is environmentally beneficial, saving around 20-25% of the energy consumed in the production phase by recovering metals. However, the environmental benefits are contingent on proper recycling processes, and informal recycling, prevalent in some emerging economies, poses health and environmental risks. Many countries implement WEEE recycling systems, but challenges arise when integrating ICT products into everyday objects, creating new recycling challenges. There is a vast informal industry in India which recycles WEEE mainly to recover gold and copper. It is deemed profitable if the health and environmental impacts are not accounted for.



Figure 8.3: Shows the extraction of copper from printed wiring boards in a typical backyard company with 12 workers in Delhi. This company recovers 1-2 tons of copper per month [Widmer et al., 2005].

8.3 KEY PILLARS OF SUSTAINABLE DEVELOPMENT

As Ismail Serageldin (2006) states, "Sustainability is giving future generations as many opportunities as, if not more than, we have had ourselves."

Sustainable development is a holistic approach that integrates economic, social, and environmental considerations to create a balanced and enduring future. It refers to a mode of growth or progress that meets the needs of the present without compromising the ability of future generations to meet their own needs. It encompasses:

8.3.1 Ecology

Environmental Protection is the most important pillar. It acknowledges a responsibility to care for and protect the environment by implementing practices that ensure the sustainable use of natural resources.

It aims to protect and preserve the natural environment, biodiversity, and ecosystems for current and future generations. It involves sustainable resource management, conservation efforts, pollution reduction, and measures to combat climate change.

8.3.2 Economics

We cannot thrive without Economic Sustainability. It focuses on promoting economic growth that is inclusive, equitable, and contributes to the overall well-being of society. Emphasises responsible and sustainable business practices, fair trade, and the efficient use of resources to support long-term economic viability and foster innovation and adopting practices that enhance economic resilience.

However, creating eco-friendly products or services is challenging because they often support the same market-driven system they aim to improve. This is called "The Paradox of Green Consumerism".

The world emphasises sustaining economic growth, but many argue that continuous growth is incompatible with environmental well-being. When green initiatives operate within existing market structures, there is concern that they may reach a point where they cannot effectively lead us towards a truly sustainable future.

8.3.3 Ethics

Ethics are crucial in the context of sustainability. They provide guiding principles and moral standards that help individuals and organisations make decisions aligned with sustainable practices. They set a moral compass and ensure that actions taken for sustainability are not merely short-term solutions but contribute to the long-term well-being of individuals, communities, and the environment.

Ethics recognises the impact of human activities on the environment and takes responsibility for minimising negative effects. They hold individuals, organisations, and governments accountable for their environmental actions.

Ethical consideration encourages individuals to make ethical choices in their consumption patterns and supports environmentally friendly products and practices. It concentrates on ensuring social equity, justice, and ethical well-being for all members of society. It addresses poverty, education, healthcare, human rights, and social inclusion to create a just and cohesive community.

It fosters intergenerational responsibility, considering the needs of present and future generations in decision-making. Strive for a balanced and harmonious coexistence with the environment. Enhance Global Cooperation: Recognising the interconnectedness of global challenges.

It encourages collaboration and cooperation among nations to address shared sustainability goals. It also encourages transparency by providing clear and accurate information about environmental practices. This allows stakeholders to make informed decisions and hold entities accountable. It promotes community engagement by involving communities in decision-making processes related to environmental sustainability. It respects and considers local knowledge and values.

Check Your Progress: 1

Note: 1) Use the space provided below for your answers

2) Compare your answers with those given at the end of this Unit.

1. Design a Green ICT initiative for a local community or organisation. Consider aspects such as energy efficiency, waste reduction, and sustainable practices. Additionally, discuss how this Green ICT initiative aligns with broader environmental sustainability goals.

.....
.....
.....
.....

8.4 GREEN ICT AND ITS NEED FOR ENVIRONMENT SUSTAINABILITY

Historically, technology, including IT, has acted as a "force multiplier," allowing humans to achieve more significant impact with less effort, similar to the invention of agricultural implements or powerful weapons. ICT effectively compresses time by storing vast information, modelling the past, predicting the future, and synchronising human activities. It also compresses space through long-distance communication and global mapping and facilitates the worldwide transportation of goods and people. Additionally, ICT simplifies complexity by enhancing memory, performing calculations, and establishing cooperation standards.

In human institutions, ICT serves as a bridge between different scales, providing individuals with accessible information about institution-scale phenomena. It enables institutions to make informed decisions based on expert opinions, computational simulations, modelling, and visualisation. By connecting human, institutional, and environmental scales, IT empowers individuals to impact environmental concerns through institutional mediation.

The intersection of environmental issues and ICT is known as Green ICT. The term "Green" here signifies an awareness of the environmental impact of human activities, symbolised by the colour of plant leaves. It helps to make all aspects of society greener, including IT itself.

It explores the potential for ICT to address global ecosystem issues. While technology has historically contributed to environmental issues, Green ICT focuses on mitigating these problems and promoting sustainable living.

It thrives on converging two prominent trends: the growing global concern for environmental issues and the swift expansion of information and communication technology (ICT).

The first trend involves an increasing awareness of environmental issues. The second trend focuses on the widespread proliferation of ICT globally. Once a rarity, mobile phones are now owned by over half of the world's population.

Green IT's primary goal is to spread information about environmental concerns and enable individuals and organisations to adopt best practices. Existing examples of environmental ICT systems include smart energy grids and systems optimising hybrid car engines, as well as GPS and online mapping software. Green IT promotes efficient travel and reduces CO₂ emissions.

Green ICT can be categorised along the axis of "personal" and "institutional" applications.

- Personal IT systems empower individuals and small groups to enhance their understanding and response to environmental concerns.
- Institutional IT systems extend this impact to larger organisations, including corporations, governments, NGOs, and universities.

These two forms of Green IT work together to address environmental challenges and promote sustainability.

However, we should not forget that Green ICT is not a panacea. It may be able to help, but it is not a magic wand. "Technology will not save the world; people will. New forms of IT, different from growth technologies, will help to solve the current untenable issues" (Tomlinson, 2010).

8.4.1 ICT Innovations and Sustainable Solutions

The potential opportunities in ICT and Sustainable Solutions are significant. Information and Communication Technology (ICT) can extend healthcare services to remote rural areas, enhance the efficiency of electricity grids, and optimise traffic flow. ICT solutions, incorporating technologies like IoT, machine learning, and automation, hold substantial promise for globally reducing carbon emissions across various sectors and industries. Current ICT solutions are estimated to have the potential to decrease global carbon emissions by up to 15 per cent, equivalent to about one-third of the crucial emission reduction target by 2030.

The advent of new technologies such as 5G, IoT, and AI will create additional possibilities for emission reduction. Realising these opportunities and avoiding adverse use will be crucial in the world's efforts to limit global warming.

Integrating Information and Communication Technology (ICT) in various domains contributes to sustainable solutions and environmental conservation. Key applications include the implementation of IoT (Internet of Things) devices for smart city technologies, optimisation of renewable energy integration, digital platforms for circular economy practices, blockchain for supply chain transparency, AI-driven environmental monitoring, eco-friendly computing, digital twins for sustainability, precision agriculture with drones and sensors, ICT in conservation using remote sensing and satellite imaging, and the incorporation of ICT in green transportation solutions for traffic optimisation and promoting sustainable modes of transportation.

Check Your Progress: 2

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit

1. To support sustainable development, what role can ICT play in promoting inclusive and equitable access to education, healthcare, and other essential services, particularly in developing regions?

.....
.....
.....
.....

8.4.2 Smart Cities and Sustainable Transportation

"Smart Cities" have emerged globally due to rapid urban growth, rural-urban migration, and socio-economic divides. "smart" is synonymous with connected, resilient, intelligent, or digital communities.

Key components of smart cities include interoperability, sustainability, city-wide connectivity, security, adequate transportation, and public-private partnerships.

India is rapidly adopting the concept as its urban population is expected to contribute significantly to its GDP. Smart cities incorporate competition, capital, and sustainability, providing good infrastructure and open access to amenities.

The environment plays a critical role in urban safety and greenery. Urbanisation and climate change are converging, posing threats to urban regions globally. Despite challenges, cities have the potential to be centres of attraction for social and economic development.

Resilience in urban societies depends on factors like climate, land use, human values, and policies. Climate-resilient smart cities require disaster-resistant infrastructure and response capacities.

Smart cities focus on becoming citizen-centric and environmentally friendly through technology. Smart city technologies using IoT (Internet of Things) devices and sensors can increase efficiency in planning, implementation, energy consumption, waste management, transportation, and urban planning.

Transportation systems with ICT integration can help optimise traffic flow, reduce emissions, and promote sustainable modes of transportation, such as electric vehicles and shared mobility services.

8.4.3 Energy Efficiency and Green Computing

Energy efficiency and green computing are essential aspects of sustainable IT practices. One example of energy efficiency in computing is the implementation of virtualisation technologies. Virtualisation allows a single physical server to run multiple virtual machines, each operating as an independent server. This helps optimise server resources, reduce the need for

additional physical servers, and consequently lower energy consumption.

Green computing also involves using energy-efficient hardware components. For instance, companies and data centres may opt for energy-efficient processors, solid-state drives (SSDs) that consume less power than traditional hard disk drives (HDDs), and energy-efficient power supplies.

Moreover, cloud computing services contribute to energy efficiency by consolidating data centres and enabling resource-sharing among multiple users. Cloud providers optimise server utilisation, leading to lower energy consumption per user.

Additionally, power management features in computers and data centres, such as dynamic voltage and frequency scaling (DVFS), help adjust the power usage based on the workload. This ensures that systems consume only the necessary power at any given time.

These examples showcase how energy efficiency and green computing practices can significantly reduce the environmental impact of IT operations.

8.4.4 Smart Grids and Energy Management

Smart grids and energy management systems are crucial in optimising energy distribution and consumption. Here are examples of their applications:

Advanced Metering Infrastructure (AMI): Smart meters are deployed to collect real-time data on energy consumption. Consumers can monitor and manage their energy usage more efficiently, and utilities can gain insights into load forecasting and grid optimisation.

Demand Response Programs are automated systems that adjust energy usage in response to demand fluctuations or price signals. They reduce peak demand, enhance grid stability, and allow consumers to save on energy costs by adjusting consumption during peak times.

Grid Automation: Utilises sensors, communication networks, and control systems to automate grid operations. It improves grid reliability, reduces outage durations, and enhances the integration of renewable energy sources.

Distributed Energy Resources (DERs) Integration: Integrates renewable energy sources, energy storage, and electric vehicles into the grid. It maximises the use of clean energy, improves grid resilience, and allows for better management of distributed energy generation.

Energy Storage Systems: Batteries and other storage technologies store excess energy during low-demand periods and for use during high-demand periods. This balances supply and demand, supports intermittent renewable sources, and enhances grid stability.

Home Energy Management Systems (HEMS) are smart devices and systems that allow homeowners to monitor and control their energy usage. They enable consumers to make informed decisions, optimise energy consumption, and save on electricity bills.

Grid Analytics:

Electric Vehicle (EV) Charging Management: Smart charging infrastructure that optimises the charging process for electric vehicles.

8.4.5 Remote Collaboration and Telecommuting

Remote collaboration and telecommuting have become integral components of modern work culture, especially with the advancement of Information and Communication Technology (ICT). Here are some examples illustrating the application of remote collaboration and telecommuting:

Video Conferencing Platforms reduce the need for physical presence, enhance communication, and enable real-time collaboration. For example, Zoom, Microsoft Teams, and Cisco Webex facilitate virtual face-to-face meetings, fostering collaboration among remote teams.

Cloud-Based Project Management Tools: These tools facilitate remote coordination, ensure transparent workflow management, and keep team members on the same page. Tools like Asana, Trello, and Jira provide centralised platforms for project management, allowing teams to collaborate on tasks and projects.

Document Collaboration Platforms enhance document sharing and editing, support version control, and ensure seamless collaboration on shared files. For example, Google Workspace, Microsoft 365, and Dropbox enable real-time collaboration on documents, spreadsheets, and presentations.

Virtual Whiteboards facilitate visual collaboration, allow remote ideation sessions, and ensure team engagement in creative processes. Tools like Miro and Microsoft Whiteboard offer digital brainstorming and collaborative drawing platforms.

Instant Messaging and Team Chat Apps: These apps support quick communication, reduce email overload, and enhance team connectivity regardless of physical location. For example, apps like Slack, Microsoft Teams, and Telegram provide teams with real-time messaging and collaboration channels.

Telecommuting Software Suites: Assists in monitoring productivity, ensures accountability in remote work, and provides insights into team performance. For example, software suites like Remote HQ and Hubstaff offer various tools for time tracking, virtual collaboration, and remote team management.

Augmented Reality (AR) for Remote Assistance: Facilitates remote troubleshooting, improves training processes, and supports hands-on tasks without physical presence. For example, AR tools like Microsoft HoloLens enable remote experts to assist by overlaying digital information onto physical objects.

Virtual Reality (VR) for Team Building: Enhances team bonding, offers immersive experiences, and creates virtual environments for collaborative activities. For example, VR platforms like AltspaceVR and Engage VR provide virtual team meetings and social interaction spaces.

8.4.6 Environmental Monitoring and Management

Environmental monitoring uses technology to track and manage diverse aspects of the environment, involving collecting, analysing, and interpreting data to understand and respond to environmental changes. Examples include air and water quality monitoring systems, remote sensing satellites, smart grids for energy efficiency, wildlife tracking systems, and noise pollution monitoring devices. Some other examples are:

- The application of technology in environmental monitoring aims to oversee and regulate different facets of the environment by gathering, analysing, and interpreting data to comprehend and address environmental shifts.
- Systems measuring air quality employ sensors to detect pollutants, delivering real-time air quality data for swift intervention in worsening conditions.
- Devices monitoring water quality, equipped with sensors, ensure the safety of water bodies by identifying pollutants.
- Satellites with sensors capture data on land use, deforestation, and vegetation changes, facilitating large-scale environmental monitoring.
- Smart grids integrate technology for real-time monitoring and management of energy consumption, boosting distribution efficiency and reducing environmental impact.
- Wildlife tracking systems utilise GPS and sensors to monitor wildlife movements, aiding conservation efforts and ecological understanding.
- Devices measuring noise levels in urban areas identify sources of noise pollution, enabling the implementation of mitigation measures.

8.4.7 Precision Agriculture

Precision Agriculture, also known as precision farming or precision ag, uses advanced technologies to optimise farming practices. It employs information technology, sensors, and data analytics to enhance agriculture's efficiency, productivity, and sustainability. The primary goal is to enable precise decision-making in crop management, resource utilisation, and overall farm operations.

Examples of Precision Agriculture Technologies:

- **Satellite Imagery:** Uses satellite data to monitor crop health, identify potential issues, and assess overall field conditions, aiding farmers in making data-driven decisions.
- **GPS-guided Equipment:** Implements GPS technology for accurate navigation and control of farm machinery during planting, fertilising, and harvesting, minimising resource wastage.
- **Sensor Technology:** Utilises sensors to collect real-time data on soil moisture, nutrient levels, and crop health. The data is analysed to optimise irrigation, fertilisation, and pest control strategies.

- **Drones:** These are deployed for aerial crop monitoring and provide high-resolution imagery. They facilitate quick and detailed assessments of large agricultural areas and aid in early problem identification.
- **Automated Machinery:** Incorporates automated and robotic machinery for planting, weeding, and harvesting tasks. This reduces labour requirements and enhances precision in field operations.

8.4.8 E-Waste Management

E-waste management involves appropriately handling and disposing of electronic waste, such as computers and mobile phones, to mitigate environmental and health risks. The process includes organised collection from various sources, safe transportation to processing facilities, sorting, recycling valuable materials, and properly disposing of hazardous components. Secure data destruction is essential for data security before recycling.

Challenges include informal recycling practices in developing countries, the impact of rapid technological advances on recycling infrastructure, and a lack of consumer awareness. Effective e-waste management offers benefits such as resource recovery, environmental protection, energy conservation, and job creation in formal management systems.

E-waste management is vital for addressing environmental and health challenges linked to electronic waste. Practices like proper collection, recycling, and awareness contribute to resource conservation and environmental sustainability.

8.4.9 Climate Modelling and Prediction

Climate modelling and prediction use sophisticated computational models to replicate Earth's climate system and forecast forthcoming climatic conditions. These models amalgamate diverse elements such as atmospheric, oceanic, and land processes while considering anthropogenic influences. They are essential for comprehending climate dynamics, evaluating potential impacts, and guiding strategies for mitigating and adapting to climate change.

Its essential components are:

Replication of Climate Processes: Climate models replicate intricate interactions among the atmosphere, oceans, land surfaces, and ice, capturing the dynamics of climate processes.

Anthropogenic Influences: Models factor in human activities like greenhouse gas emissions and land-use changes, significantly influencing the climate.

Forecasting and Anticipating: Climate models offer forecasts of future climate scenarios, aiding scientists, and policymakers in anticipating changes and planning accordingly.

Analysis of Uncertainty and Sensitivity: Scientists perform analyses to comprehend the limitations and reliability of model predictions through uncertainty and sensitivity assessments, considering various input parameters.

Global and Regional Modelling: Models operate on global and regional scales, providing insights into broader climatic trends and localised impacts.

Verification and Validation: Model outputs undergo verification and validation against observational data to enhance accuracy and reliability.

Climate modelling faces significant challenges, including the complexity of addressing numerous interconnected factors, demanding substantial computational resources. Uncertainties within models arise from incomplete data, limited understanding of specific processes, and the intricate nature of Earth's climate system. Predicting regional impacts remains challenging due to the complexities of local climatic variations, and ongoing efforts focus on enhancing the spatial and temporal resolution for more detailed and accurate predictions.

Applications: Climate models are crucial guides in policy development related to climate change mitigation and adaptation. They are vital in planning resilient infrastructure capable of withstanding future climate-related challenges. Understanding climate impacts contributes significantly to effective ecosystem management, aiding biodiversity conservation and natural resource preservation. Climate modelling is instrumental in assessing risks associated with extreme weather events, sea-level rise, and other climate-related phenomena.

Climate modelling and prediction are pivotal in comprehending, anticipating, and addressing Earth's climate system intricacies, thereby facilitating sustainable decision-making and adaptation efforts.

8.5 ROLE OF GOVERNMENTS, POLICY, AND REGULATIONS

Governments play a pivotal role in addressing environmental challenges through legislative and regulatory measures. They institute laws covering emission standards, waste disposal guidelines, and conservation measures, establishing a legal foundation for sustainable practices and penalising harmful activities. The formulation of proactive policies delineates the government's stance on environmental sustainability, guiding decision-making across sectors like energy, transportation, waste management, and natural resource conservation.

Incentive programs, such as tax credits and subsidies, encourage eco-friendly practices among businesses and individuals. These incentives aim to promote sustainability, especially in renewable energy projects and energy-efficient technologies. Recognising the global nature of environmental issues, governments engage in international cooperation, participating in agreements focused on climate change, biodiversity conservation, and pollution control.

Governments are responsible for monitoring and enforcing compliance with environmental regulations, employing robust mechanisms like inspections and penalties to ensure adherence. They also play a crucial role in raising public awareness through education campaigns, informing the public about the importance of conservation, recycling, and reducing carbon footprints.

Additionally, governments invest in research and development initiatives to advance sustainable technologies, providing funding and support for innovations in renewable energy, eco-friendly materials, and sustainable agriculture. In summary, governments establish regulatory frameworks and incentivise, monitor, and enforce practices aligned with ecological well-being. Their multifaceted role extends to raising public awareness and supporting research for a more sustainable future.

Some of the ICT initiatives taken by the Indian government. National Digital Library (NDL), E-PGPathshala, e-Adhyayan, Shodhganaga platform, e-ShodhSindhu platform, e-yantra, FOSSEE ((Free/Libre and Open-Source Software for Education), Spoken Tutorial portal, Digi Locker, PMJDY, PAHAL

8.6 ROLE OF CORPORATE SECTOR IN ACHIEVING SUSTAINABLE DEVELOPMENT THROUGH ICT

The corporate sector drives sustainable development by integrating Information and Communication Technology (ICT). Key aspects include:

- **Innovation and Technology Adoption:** Corporations innovate with smart technologies, IoT, and data analytics to manage resources and monitor environmental conditions.
- **Operational Efficiency:** ICT enables streamlined processes, data-driven decisions, and lower resource consumption, enhancing operational efficiency.
- **Supply Chain Sustainability:** Through ICT, such as blockchain, corporations ensure transparent and sustainable supply chains, promote ethical sourcing, and reduce environmental impact.
- **Renewable Energy Integration:** Many invest in renewable energy solutions and use ICT for smart grids, energy management, and real-time monitoring.
- **Remote Work and Telecommuting:** ICT tools facilitate remote work, reducing commuting and carbon emissions and enhancing work-life balance.
- **Environmental Monitoring and Reporting:** ICT enables corporations to monitor and report environmental impact, aiding in continuous improvement strategies.
- **Data-driven Sustainability Reporting:** Corporations use ICT to collect, analyse, and report sustainability data, promoting accountability and responsible business behaviour.
- **Eco-friendly Product Design:** ICT optimises materials and manufacturing processes for eco-friendly design.
- **Corporate Social Responsibility:** ICT enhances CSR initiatives through community support, education investment, and technology-driven social impact projects.

- **Collaboration and Partnerships:** Corporations collaborate within and beyond industries, leveraging ICT for communication, knowledge-sharing, and impactful sustainability initiatives.

Examples:

- Tesla utilises ICT for smart grid solutions, optimising energy consumption in electric vehicles.
- IKEA uses blockchain for supply chain transparency, ensuring ethical sourcing of materials.
- Google employs remote work tools like Google Workspace, reducing carbon emissions from commuting.
- Apple employs data analytics to monitor carbon emissions across its supply chain, informing sustainability strategies.
- Unilever leverages ICT for sustainable product design, incorporating recycled materials in packaging.

8.7 UNDERSTANDING INTERNATIONAL FRAMEWORKS RELATED TO ICT AND ENVIRONMENTAL SUSTAINABILITY

International frameworks in Information and Communication Technology (ICT) and environmental sustainability aim to guide global efforts towards a more eco-friendly and responsible use of technology. Key frameworks include:

United Nations Sustainable Development Goals (SDGs):

- SDGs encompass environmental sustainability goals, recognising ICT as an enabler.
SDG 7 emphasises affordable and clean energy, utilising ICT for smart grids and energy-efficient technologies.

ITU-T Recommendations:

- ITU provides recommendations for using ICT to achieve environmental sustainability.
It recommends methodologies for assessing the environmental impact of ICT.

ISO 14001 - Environmental Management Systems:

- ISO 14001 sets criteria for environmental management systems.
Organisations use ISO 14001 to manage environmental aspects, including ICT-related.

ICLEI - Local Governments for Sustainability:

- ICLEI guides local governments in sustainable development and integration of ICT.
Cities use ICT in smart city initiatives to optimise resource use and reduce environmental impact.

Green ICT Initiative by GeSI:

- GeSI promotes ICT for environmental and social sustainability.
- GeSI's Green ICT toolkit aids companies in assessing and improving the sustainability of their ICT practices.

The Global e-Sustainability Initiative (GeSI):

GeSI works on initiatives highlighting the role of ICT in sustainable development.

- Example: GeSI collaborates on tools like the "Digital with Purpose" report, emphasising ICT's positive impact on sustainability.

Climate Savers Computing Initiative:

- Focuses on improving energy efficiency in computers and servers.

Companies like Google and Intel commit to reducing ICT-related carbon emissions.

Circular Economy Action Plan by the European Union:

It aims to make products more sustainable and reduce waste, emphasising ICT.

Implementation of circular economy practices in designing and disposing of electronic devices.

These frameworks offer guidelines, standards, and initiatives for aligning ICT practices with global environmental sustainability goals. Organisations and governments can leverage these frameworks to shape policies, strategies, and actions for more sustainable ICT use.

8.8 CASE STUDIES AND BEST PRACTICES

Few Best Practices and Case Studies in the Field of ICT and Innovation.

1) Aadhaar (India):

- *Aadhaar, India's biometric identification system, is a noteworthy ICT initiative that provides residents with a unique identity to facilitate efficient service delivery and reduce fraud.*
- *The Aadhaar system streamlined government services, improved subsidy distribution, and enhanced financial inclusion.*

2) Aarogya Setu App (India):

- *The Aarogya Setu app, launched by the Indian government, was crucial in tracing contacts and providing COVID-19-related information.*
- *It showcased the use of technology for public health initiatives during the pandemic.*

3) UPI (India):

- *Unified Payments Interface (UPI) revolutionised digital payments in India, enabling seamless, real-time bank transactions through mobile devices.*

- *UPI's success led to a surge in digital transactions, promoting a cashless economy and fostering financial inclusion.*

4) Bharti Airtel's Mobile Services (India):

- *Airtel's mobile services connect people across India. They leveraged technological advancements to offer reliable and affordable mobile communication.*
- *Airtel's growth and innovative services showcase the impact of ICT in expanding connectivity and bridging communication gaps.*

5) Smart Cities Mission (India):

- *India's Smart Cities Mission focuses on using ICT for urban development, aiming to enhance infrastructure, improve services, and promote sustainability in selected cities.*
- *Projects in cities like Pune and Bhubaneswar demonstrate the implementation of smart technologies for efficient waste management, traffic control, and citizen services.*

6) E-Government in Estonia:

- *Estonia excelled in e-government, providing digital public services and e-residency options, showcasing streamlined governance through digital platforms.*
- *Estonia's digital services, including e-residency and e-governance, illustrate how ICT enhances government efficiency and citizen engagement.*

7) Silicon Valley Tech Innovation:

- *Silicon Valley in the United States is a global hub for tech innovation, with companies like Apple, Google, and Facebook continuously innovating and transforming the use of ICT.*
- *The success stories of Silicon Valley companies highlight the impact of fostering an innovation ecosystem, attracting talent, and driving economic growth.*

8) South Korea's 5G Deployment:

- *South Korea has led 5G deployment, transforming communication with ultra-fast internet speeds and low latency.*
- *The rapid adoption of 5G in South Korea showcases ICT's potential to revolutionise connectivity and enable emerging technologies.*

9) M-Pesa in Kenya:

- *By leveraging ICT, m-Pesa, a mobile money service in Kenya, we have transformed financial transactions, especially in rural areas.*
- *M-Pesa's success demonstrates the impact of innovative mobile solutions in enhancing financial inclusion and accessibility.*

These case studies exemplify how ICT and innovation contribute to societal development, economic growth, and improved services, providing valuable examples for sustainable development globally.

Check Your Progress: 3

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit

1. Explain why these best practices are considered exemplary and how they contribute to the society's overall efficiency, sustainability, or innovation.

.....
.....
.....
.....

8.9 INNOVATION AND ENTREPRENEURSHIP IN DEVELOPING ICT SOLUTIONS FOR ENVIRONMENTAL SUSTAINABILITY

Technology innovation continuously propels the creation of eco-friendly ICT solutions. Entrepreneurs recognise opportunities in emerging technologies and develop sustainable products and services to address environmental challenges.

- **Renewable Energy Integration:** Innovative ICT solutions emerge, integrating renewable energy sources to enhance power consumption sustainability. Entrepreneurial start-ups focus on providing renewable energy solutions for data centres or promoting energy-efficient devices.
- **Smart Infrastructure:** Innovation drives the creation of smart grids, intelligent transportation systems, and connected infrastructure, optimising resource use. Entrepreneurs establish companies specialising in developing and implementing smart city solutions for enhanced sustainability.
- **IoT and Environmental Monitoring:** Innovation leveraging the Internet of Things (IoT) enables real-time environmental monitoring and data collection. Entrepreneurs respond by developing IoT devices and platforms to monitor air quality, water usage, and various environmental parameters.
- **Circular Economy Solutions:** Innovative design focuses on ICT products aligned with the circular economy, emphasising reuse and recycling. Entrepreneurs launch businesses refurbishing electronic devices or promoting sustainable e-waste management.
- **Data Analytics for Sustainability:** Innovation employs data analytics to optimise resource use, reduce waste, and enhance overall sustainability. Entrepreneurs develop analytics platforms for businesses to measure and improve their environmental impact.
- **Collaboration Platforms:** Innovation leads to creating collaborative platforms, which enable organisations to work together on sustainability

initiatives. Entrepreneurs establish businesses that facilitate collaboration for shared sustainability goals.

- **Educational and Awareness Tools:** This company produces tools and technologies for environmental education and awareness. Entrepreneurs create platforms that engage users in sustainable practices and provide information on eco-friendly choices.
- **Remote Work Solutions:** Innovation supports the development of technologies for remote work, reducing the need for commuting and associated environmental impact. Entrepreneurs offer virtual collaboration solutions, decreasing traditional office-based work's ecological footprint.
- **Policy and Advocacy Platforms:** Innovation creates ICT platforms to influence and support environmental policies and advocacy. Entrepreneurs establish businesses focused on influencing policymakers and promoting sustainable practices.

8.10 ETHICS AND SOCIAL RESPONSIBILITY

Ethics in environmental sustainability is crucial for creating a world where human activities harmonise with nature, fostering a healthy and resilient planet for current and future generations. It involves a commitment to ethical decision-making, accountability, and a shared responsibility for the well-being of the Earth and its ecosystems.

1. **Stewardship:** Acknowledging a responsibility to care for and protect the environment.
2. **Responsibility:** Recognising the impact of human activities on the environment and taking responsibility for minimising adverse effects.
3. **Justice and Equity:** Ensuring fair distribution of environmental benefits and burdens and addressing environmental issues with consideration for vulnerable and marginalised communities.
4. **Intergenerational Equity:** Considering the needs and rights of future generations in current decision-making.
5. **Transparency:** Providing clear and accurate information about environmental practices.
6. **Conservation and Biodiversity:** Supporting conservation efforts to protect biodiversity and avoid actions contributing to species or ecosystems' loss.
7. **Corporate Social Responsibility (CSR)** involves integrating ethical environmental practices into business operations and balancing economic interests with social and environmental responsibilities.
8. **Community Engagement:** Involving communities in decision-making processes related to environmental sustainability.
9. **Global Cooperation:** Recognising that environmental challenges often transcend national borders and promoting international collaboration to address global sustainability issues.

10. **Ethical Consumption:** Encouraging individuals to make ethical consumption patterns and supporting environmentally friendly products and practices.

Check Your Progress: 4

- Note:** 1) Use the space provided below for your answers.
2) Compare your answers with those given at the end of this Unit
1. Choose a recent innovation in Information and Communication Technology (ICT) that has significantly impacted society.

.....
.....
.....
.....

8.11 LET US SUM UP

“Technology is neither good nor bad; nor is it neutral. It is the use that makes it good or bad” Melvin Kranzberg.

In conclusion, we can say that integrating Information and Communication Technology (ICT) with sustainability initiatives is imperative for addressing environmental challenges and fostering a more resilient and eco-friendly future. As evidenced by best practices and case studies, ICT innovations are pivotal in streamlining services, promoting financial inclusion, enhancing connectivity, and contributing to urban development. International frameworks guide aligning ICT practices with global sustainability goals. The COVID-19 pandemic has further underscored the significance of digital solutions in crisis response and management.

8.12 KEYWORDS

Green data centre: A green data centre is a facility that stores, manages, and distributes data while minimising environmental impact and maximising energy efficiency.

Carbon footprint: A carbon footprint is a value that compares the amount of greenhouse gases that a person, product, company, or country releases into the atmosphere. It measures the impact of an activity.

Digital twin: A digital twin is a digital model of an intended or actual real-world physical product, system, or process that serves as its indistinguishable digital counterpart for practical purposes, such as simulation, integration, testing, monitoring, and maintenance.

Blockchain is a method of recording information that makes it impossible or difficult for the system to be changed, hacked, or manipulated. Blockchain technology is applied to supply chains to ensure transparency and traceability, especially in industries like food, where consumers can trace the origin of products.

8.13 FURTHER READINGS

1. Berry, M., Hazen, B., MacIntyre, R., & Flamm, R. (1996). Lucas: A system for modelling land-use
2. Change. Computational Science and Engineering, 3(1), 24–35.
3. Bregman, J. I., & Lenormand, S. (1966). The pollution paradox. New York: Spartan Books.
4. Bruce, M. (2009, January). Greening of the Internet economy—Conference. Retrieved from <http://greeninternet.calit2.net/>
6. Eurostat. (2016). Glossary: Information and communication technology (ICT). Eurostat 2016. Available from <http://ec.europa.eu/eurostat/statisticsexplained/index.php/Glossary:ICT>
7. Hilty, Lorenz & Hischier, Roland & Ruddy, Thomas & Som, Claudia. (2008). Informatics and the Life Cycle of Products.
8. Several LCA studies on PCs [Atlantic Consulting & IPU, 1998; von Geibler et al., 2003; Hikwama, 2005; Eugster et al., 2007]
9. Hilty, L. M., & Aebischer, B. (2014). ICT innovations for sustainability. Springer.
10. Hu, W. (2012). Sustainable ICTs and management systems for green computing.
11. Just a moment... (n.d.). Retrieved from <https://www.ericsson.com/en/reports-and-papers/industrylab/reports/a-quick-guide-to-your-digital-carbon-footprint>
12. Mishra, R., Kumari, C., Krishna, P., & Dubey, A. (2022). Smart Cities for Sustainable Development: An Overview. 10.1007/978-981-16-7410-5_1.
13. Tomlinson, B. (2012). *Greening through IT: Information technology for environmental sustainability*. MIT Press
14. *The ITU new initiatives programme: Ubiquitous network societies*. (2005).

8.14 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. Give real-life examples of the following:
 - a) Energy Efficiency
 - b) Waste Reduction
 - c) Sustainable Practices
 - d) Alignment with Environmental Sustainability Goals
 - e) Carbon Footprint Reduction
 - f) Resource Conservation

- g) Community Engagement
- h) Long-Term Environmental Impact
- i) Sustainable Tech Connect

Check Your Progress: 2

1. ICT catalyses inclusive and equitable access to education, healthcare, and essential services in developing regions. By overcoming geographical barriers, fostering connectivity, and providing digital solutions, ICT contributes significantly to sustainable development goals by ensuring everyone can access vital services and opportunities regardless of location.

Check Your Progress: 3

1. For example, Aarogya Setu's best practices are exemplary, including efficient contact tracing, sustainability in pandemic management, innovation in digital health solutions, privacy measures, community engagement, and integration with public health initiatives. The app demonstrates how ICT innovations can effectively contribute to public health, especially during a crisis, while addressing concerns related to privacy and fostering community participation.

Check Your Progress: 4

1. The recent innovation in Information and Communication Technology (ICT) that has significantly impacted society is the widespread adoption and advancement of 5G technology.

5G provides ultra-fast internet connectivity, significantly enhancing download and upload speeds compared to its predecessors. This has transformed how people access and share information, fostering a more connected society. 5G technology has profoundly impacted society, influencing connectivity, technological advancements, healthcare, the economy, and global interactions. Its widespread adoption marks a significant milestone in the evolution of ICT, shaping how people live, work, and communicate in the digital age.

Block

3

ICT: APPROACHES AND APPLICATIONS

UNIT 9

ICT for Open Learning

UNIT 10

ICT for Disability

UNIT 11

ICT for Agriculture

BLOCK 3 INTRODUCTION: ICT: APPROACHES AND APPLICATION

This Block takes you to three domain-specific cases to understand the role of ICT in development. This Block covers education, specifically lifelong learning, disability, and agriculture as the sampled domain areas to understand the core thematic areas of this course. For any developing country, skill enhancement, supporting the marginalised communities and the role of technology in age-old human practices. With that understanding, this Block takes you to the three crucial areas within the context of technological interventions for empowerment.

Unit 9 - ICT for Open Learning. In this Unit, we will explore the dynamic world of Information and Communication Technologies (ICTs) and their profound impact on open learning systems. From traditional classrooms to open and distance learning (ODL), ICTs play a pivotal role in shaping learning environments. We will explore the evolution of ODL alongside advancements in ICTs, examine current practices, and envision future prospects.

Unit 10 - ICT for Disability, where we will discuss the transformative realm of ICT for Disability. This Unit explores how technology catalyses inclusivity, empowering individuals with disabilities to lead more independent and fulfilling lives. From assistive devices to universal accessibility, we unravel the terminologies and historical evolution shaping this dynamic field. Amidst the current global reliance on technology, we uncover its pivotal role in bridging gaps and enhancing rehabilitation services. Also, this Unit discusses the present and future landscapes of ICT for disability, unlocking opportunities for societal contribution and empowerment.

Unit 11 - Information and Communication Technology (ICT) and Agriculture. Farmers face challenges in adapting as our world evolves with market liberalisation and globalisation. This Unit explores the critical role of ICT in addressing farmers' increasing demand for timely and accurate information. We explore the growth of ICT, government support, innovative models, and the impact of ICT-based initiatives on agriculture. You will understand the constraints, challenges, and strategies for effective ICT utilisation in rural areas.

This Block will enlighten you on the role of technology in specific areas that are considered important sections of any social setting.

UNIT 9 ICT FOR OPEN LEARNING

Structure

- 9.0 Introduction
- 9.1 Learning Outcomes
- 9.2 Using Technologies in ODL
- 9.3 Generations of ODL and Technology Integration
- 9.4 ICT Integration in ODL
 - 9.4.1 ICTs in Supplementary Role in ODL
 - 9.4.2 ICTs in Complementary Role in ODL
 - 9.4.3 Integration of ICT
 - 9.4.3.1 Model Of ICT Integration
- 9.5 Present Practices
 - 9.5.1 Teleconferencing and Radio Conferencing
 - 9.5.2 Online Web-Support
 - 9.5.3 Social Media Blending
 - 9.5.4 App Based Support
 - 9.5.5 SWAYAMPRABHA
 - 9.5.6 MOOCs including SWAYAM
- 9.6 ICT for Administrative Support
 - 9.6.1 ICT for e –Governance
 - 9.6.2 ICTs for Assessment and Evaluation
- 9.7 Future prospects
 - 9.7.1 Badges and Credit Bank
 - 9.7.2 Rolling Admissions
 - 9.7.3 Fully Online Programmes
 - 9.7.4 Online Home-Based Assessment
 - 9.7.5 AR and VR
 - 9.7.6 Blockchain in Higher Education
- 9.8 Let Us Sum Up
- 9.9 Further Readings
- 9.10 Check Your Progress: Possible Answers

9.0 INTRODUCTION

Information and Communication Technologies (ICTs) have been integrated largely in today's education. From school to higher education, ICTs have their interference and utility everywhere in formal and non-formal education systems. Open and Distance learning (ODL) has also grown a lot along with growth in ICTs and has moved towards ODeL (Open and Distance e-learning). The present unit is an attempt to highlight the growth and development of the Open and Distance learning (ODL) system, ICTs, and ways of ICT integration in ODL. The unit will reflect on recent practices of

ICT integration in ODL and discuss future perspectives on technology integration.

9.1 LEARNING OUTCOMES

After completing this unit, you should be able to:

- Identify the role of various technologies in open and distance learning;
 - Enlist the transformational shifts in technologies across the generations of ODL;
 - Compare multiple models of ICT integration in ODL;
 - Examine the effectiveness of present ICT practices in ODL and
 - Predict the future of ODL with increasing ICT intervention.
-

9.2 USING TECHNOLOGIES IN ODL

Open and Distance learning (ODL) has undergone various transformations since its inception. The initial model of correspondence education in the early 60s was entirely different from the current ICT-driven model. If you go through multiple generations of ODL, you will conclude how ICT interventions have forced ODL to change itself and walk with technology. Due to greater flexibility in pedagogy, mode of delivery and inclusive nature of ODL, adaptation to the emerging ICT interventions is comparatively more straightforward here. As ODL deals with the education of the masses, it also opens opportunities to use a variety of media and technology. Go through various aspects of the ODL system. You will see that technology in ODL is not only limited to the delivery of content or increasing interaction with learners but also plays an equally important role in various support services, examinations, governance, etc. In the coming sections of the Unit, you will get an opportunity to explore all such aspects of ODL, where technology has made its place and has a window to adapt future technologies.

9.3 GENERATIONS OF ODL AND TECHNOLOGY INTEGRATION

To understand the growth and development of the Open and Distance learning (ODL) system and how technology has been integrated into ODL, you need to explore the generation of ODL suggested by various practitioners. Generations of ODL have been indicated from three main perspectives: technology, pedagogy, and organisational (Aoki, 2012). In the present unit, the focus will remain on the technological perspective only.

You all will agree that the term 'distance' (used in the initial days of ODL) has been replaced and is being dominated by the term 'Open' now as it gives openness and flexibility and has filled the gap between teacher and learner using technology. Earlier discussions, such as Peters's (1994), have discussed three generations of ODL. This was the era before Web 2.0. In such discussions, the first generation was referred to the traditional correspondence education, where the printed text was delivered to learners using postal services, followed by a face-to-face examination. There was

hardly any teacher/tutor intervention. With the emergence of radio and television, the second generation was started, where print had remained the primary medium of delivery along with some supportive role of instructions through radio and television.

If we consider the impact of technology interventions, the two classifications suggested by Taylor (2001) and Moore and Kearsley (2005) seem more appropriate to discuss.

Generations of ODL, as suggested by Taylor (2001)

Taylor (2001), in his article 'Fifth Generation of Distance Education', suggested five generations of open and distance learning.

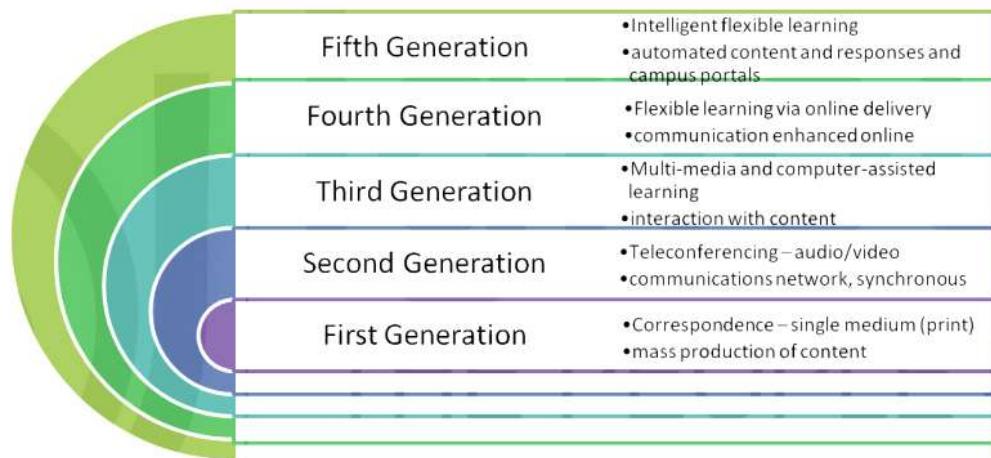


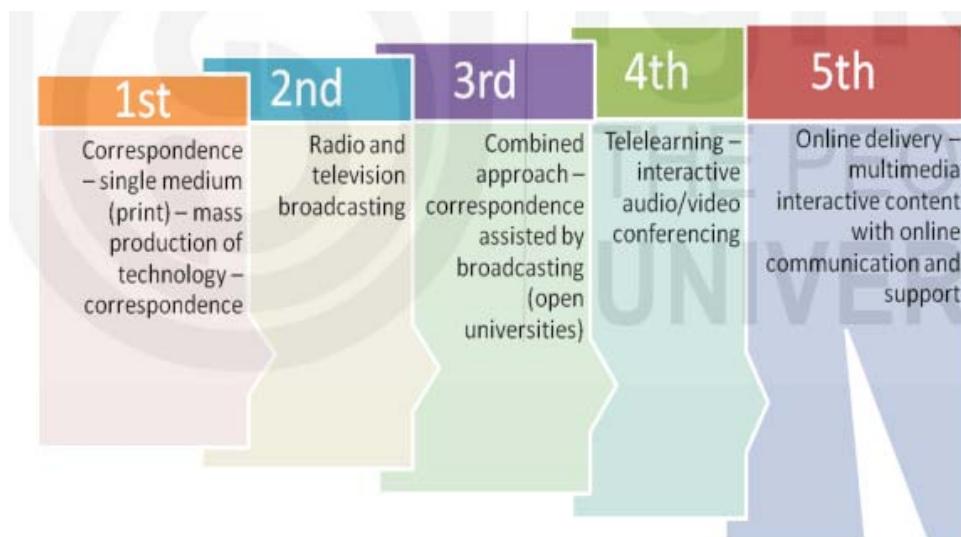
Figure 9.1: Generation of ODL (Tylor, 2001)

- The classification suggested by Tylor indicates that in **the first generation** of ODL, the print self-learning material was the medium of instruction. Learners were using Print technology to read the content, and there was no/minimal opportunity for any interaction between learner and teacher. This was when the term 'correspondence education' was more popular. Dedicated open universities had not emerged, and many dual-mode institutions/universities were in operation.
- With the entry of radio and television, **the Second Generation** of ODL started, and a shift from 'Correspondence' to 'Distance' education was observed. Technology integration has touched a new high with the experiment purposes radio and television has education. However, most of the time, the role of radio and television remained complementary or supplementary in most cases. Interaction with learners has started through counselling using these media. Also, the curriculum-based recorded programmes were broadcasted/telecasted.
- The Third Generation of ICT integration belongs to the infusion of computer-based education in ODL. Computer-assisted learning (CAL) packages, using multimedia, CD-ROM, etc., have started to integrate with traditional print-based material along with radio/television. Television also moved from terrestrial to satellite-based telecast in this generation, which opened new avenues and made better reach possible.
- With the advancement of web 2.0 tools, interactivity increases in the

Fourth Generation of ODL. Online content delivery started in this generation; online interactivity and two-way communication between teacher and learner were critical features. Another shift in this generation was that ICT has reached a more profound level, and its role from complementary/supplementary to ICT-based material has changed.

- The Fifth Generation has seen a lot of influence from intelligent learning solutions. Online courses have started in this generation. Audio/video and e-text were all available in the same place in a dedicated web space. The open education resources (OER) movement has started. The use of social media to increase interactivity and support services has begun.

If you go through the above discussion, you can see how technology integration has influenced the growth and development of ODL in every generation. If you read literature, you may find many other classifications of the generations, too. One such was proposed by Moore and Kearsley (2005). Here is its brief diagrammatic representation:



Source: Heydenrych and Prinsloo (2010)

Figure 9.2: Generations of ODL (Moore and Kearsley, 2005)

This discussion about the use of ICT in ODL through different generations will help you understand that with the advancement of technology, models of integrating technology in ODL have also grown. After discussing various generations of ODL concerning ICT integration, it seems imperative that we discuss how ICT has been incorporated into ODL.

Check Your Progress: 1

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this unit.

- 1) Technology for interaction was introduced in which generation of ODL?

.....
.....
.....

- 2) What changes web 2.0 has brought in the ODL system?

.....

.....

.....

.....

9.4 ICT INTEGRATION IN ODL

When you analyse the ways in which ICT has been used with Open and Distance Learning, you will find that it has changed with time. Initially, it was supplementary; later, it became complementary, then integrated, and now Online. In other words, you can say that initially, there were ICT-supplemented practices; later, these became ICT-supplied, followed by ICT-mediated, and now, we are witnessing ICT-driven ODL practices. Let us discuss these one by one.

9.4.1 ICTs in Supplementary Role in ODL

If you go through the initial practices where ICTs were used in ODL, you will find that ICTs were not part of the core curriculum or pedagogy. Print-based material was considered self-contained and was the main medium of instruction. In the second generation, when Radio and Television emerged, audio-video programs were used to supplement teaching-learning. For a long time, there was a standard practice to develop one or two audio/video programmes on any topic of importance from the whole course curriculum and provide these to learners for additional learning materials. The course content in the text and audio/video was often similar. This was when many resources in programme production were not available with open universities/institutions. ICTs were also being used to supplement tutor-learning interaction in terms of radio-counselling or teleconferencing, but these practices were also additional to traditional counselling sessions at study centres.

9.4.2 ICTs in Complementary Role in ODL

In the third generation of ICT integration in ODL, practices changed. The importance of audio/visual material and interactivity has been accepted worldwide. ICT-based learning material has become an important part of pedagogy, and broadcasting has become an integral part of teaching-learning. Content planning has started considering the media and technology to be used, and there were experiments in ODL universities, where content developed using audio/video programmes and interaction through radio-counselling and teleconferencing have started complimenting the traditional print-based material. The chances of repetition of the content are reduced as, at the time of planning, curriculum developers started planning the content to be delivered through different media, but till now, the real integration was missing as audio/video and print material were delivering the designated content.

9.4.3 Integration in ODL

When you think about integration, you need to consider how it is different from the supplementary and complementary role of ICTs in ODL. Integration of ICTs in ODL means practices, where ICTs have become equal partners with traditional print mediums, and curriculum developers have started thinking, planning, and integrating ICTs within the curriculum and pedagogical practices.

How to integrate ICTs in teaching and learning effectively is a key concern. Various models of integration have been developed by various researchers and practitioners. You need to explore a few important ones.

9.4.3.1 Model of ICT Integration

SAMR Model of Technology Integration

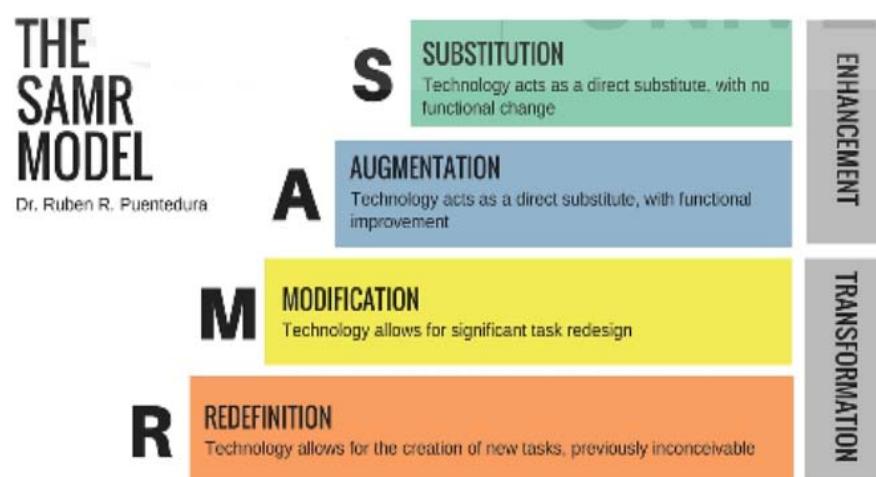


Image Credit: Lefflerd, CC BY-SA 4.0, Wikimedia Commons

Figure 9.3: SAMR Model

The SAMR framework was developed by Ruben Puentedura to explain the ways of integrating technologies in teaching-learning. The letters "SAMR" stand for Substitution, Augmentation, Modification, and Redefinition, in which substitution is the lowest level of integration and substitution is at the highest level.

Substitution

If a tutor plans to replace the traditional print-based content with any ICT content, and it emerges as a direct replacement, this comes under substitution. For example, if in a unit of ODL print material, there are five important sections, the unit writer replaces one or two sections with a video, audio or web link and asks the learner to go through those resources. The self-check exercise and quiz are also linked with the ICT resource suggested. Sometimes, it can be a Word file, excel sheet or PPT.

Augmentation

This is also a kind of direct replacement but to enhance the learning experience by augmenting technology for enhancing productivity and potential of the learner. Here learners are asked to augment their learning with various web-links, video-clips, etc. so that they can learn better.

The important point to be noted in substitution and augmentation is that the structure of the unit's design has not changed. These are to enhance the learning experience. In the next two levels, there is a shift from enhancement to transformation, i.e., for integrating ICTs, the whole unit/lesson design and learning outcomes also change.

Modification

Here, \ the whole design of the unit/lesson is changed along with learning outcomes, keeping in mind the learners and available technology. Sometimes, learners are also given the opportunity to create their own graphics, presentations, video/audio, etc, based on their experiences. Modification also helps contextualise the learning experiences. Sometimes, when learners are asked to present, they develop something new by using existing ICT resources and adding their own creations to it.

Redefinition

This is the highest level of the SAMR model. This basically focuses on strategies to transform learner's experiences by using technology. Curriculum planners and content developers give such a shape to the content that it seems impossible to complete the unit/lesson and tasks without using ICTs. A variety of ICTs are interwoven in the lesson design. It gives a unique learning experience to the learners. The use of a variety of ICTs helps to deal with learners with different learning styles, and teaching-learning becomes more inclusive.

TPACK Framework for Technology Integration

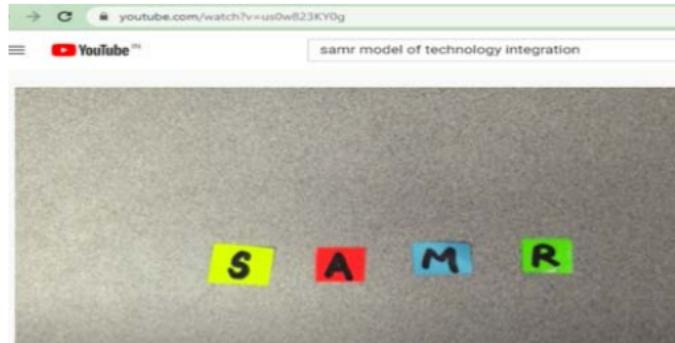
This framework was suggested by Mishra and Koehler (2006); they added Technological Knowledge (TK) to the Pedagogical Content Knowledge (PCK) model developed by Shulman in the 80s. The new framework is the Technological Pedagogical Content Knowledge (TPCK or TPACK) framework. Mishra & Koehler (2006) define technological content knowledge (TCK) as "... the knowledge about the manner in which technology and content are reciprocally related". It represents the knowledge required to identify and select technology tools and resources in a particular content area. TPK, in essence, is the knowledge that helps teachers maximise a particular technology's affordances to support a pedagogical strategy or model. Mishra and Koehler (2006) describe TPACK as:

...the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones (p. 1029).

To read more details, following web link can be explored:

<https://sites.google.com/a/msad60.org/technology-is-learning/samr-model>

Here is one video, which can be accessed to understand the SAMR Model:



Link for the video: <https://www.youtube.com/watch?v=us0w823KY0g>

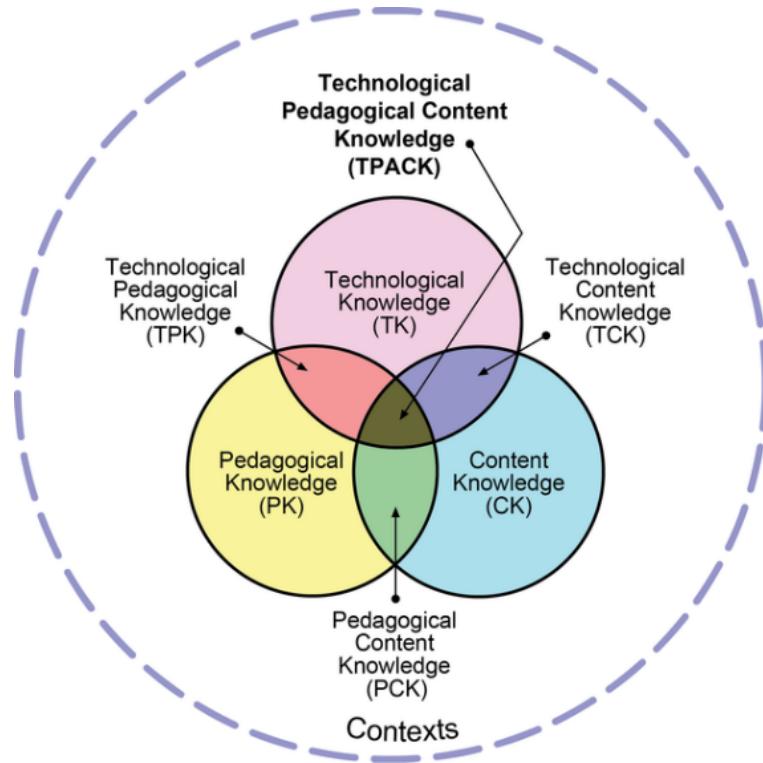


Image Credit: Matthew Koehler, CC0, via Wikimedia Commons

Figure 9.4: TPACK Model

This model facilitates planners and teachers' having a holistic picture of all three aspects, i.e., Technology, pedagogy, and Content. All three dimensions are planned together to give learners better learning experiences. The nature of the content, the appropriate pedagogy to deliver the content, and the best technology available to deal with the content effectively are planned together in this framework.

TIM: Technology Integration Matrix

The Technology Integration Matrix(TIM) provides a framework for describing and targeting the use of technology to enhance learning. In this model, five levels of technology integration are suggested, i.e., entry, adoption, adaptation, infusion, and transformation; these levels are associated with five key interdependent characteristics, i.e., active, collaborative, constructive, authentic, and goal directed. To facilitate a meaningful learning

environment, these five characteristics and the five levels of technology integration create a matrix of 25 cells, as illustrated below.



The Technology Integration Matrix Table of Summary Descriptors

The Technology Integration Matrix (TIM) provides a framework for describing and targeting the use of technology to enhance learning. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, collaborative, constructive, authentic, and goal-directed. These characteristics are associated with five levels of technology integration: entry, adoption, adaptation, infusion, and transformation. Together, the five characteristics of meaningful learning environments and five levels of technology integration create a matrix of 25 cells, as illustrated below.

		LEVELS OF TECHNOLOGY INTEGRATION				
		ENTRY LEVEL	ADOPTION LEVEL	ADAPTATION LEVEL	INFUSION LEVEL	TRANSFORMATION LEVEL
CHARACTERISTICS OF THE LEARNING ENVIRONMENT						
ACTIVE LEARNING <small>Students are actively engaged in using technology as a tool rather than passively receiving information from the technology.</small>	Active Entry <small>Information passively received</small>	Active Adoption <small>Conventional, procedural use of tools</small>	Active Adaptation <small>Conventional independent use of tools; some student choice and exploration</small>	Active Infusion <small>Choice of tools and regular, self-directed use</small>	Active Transformation <small>Extensive and unconventional use of tools</small>	
COLLABORATIVE LEARNING <small>Students use technology tools to collaborate with others rather than working individually at all times.</small>	Collaborative Entry <small>Individual student use of technology tools</small>	Collaborative Adoption <small>Collaborative use of tools in conventional ways</small>	Collaborative Adaptation <small>Collaborative use of tools; some student choice and exploration</small>	Collaborative Infusion <small>Choice of tools and regular use for collaboration</small>	Collaborative Transformation <small>Collaboration with peers, outside experts, and others in ways that may not be possible without technology</small>	
CONSTRUCTIVE LEARNING <small>Students use technology tools to connect new information to their prior knowledge rather than to passively receive information.</small>	Constructive Entry <small>Information delivered to students</small>	Constructive Adoption <small>Guided, conventional use for building knowledge</small>	Constructive Adaptation <small>Independent use for building knowledge; some student choice and exploration</small>	Constructive Infusion <small>Choice and regular use for building knowledge</small>	Constructive Transformation <small>Extensive and unconventional use of technology tools to build knowledge</small>	
AUTHENTIC LEARNING <small>Students use technology tools to link learning activities to the world beyond the instructional setting rather than working on decontextualized assignments.</small>	Authentic Entry <small>Technology use unrelated to the world outside of the instructional setting</small>	Authentic Adoption <small>Guided use in activities with some meaningful context</small>	Authentic Adaptation <small>Independent use in activities connected to students' lives; some student choice and exploration</small>	Authentic Infusion <small>Choice of tools and regular use in meaningful activities</small>	Authentic Transformation <small>Innovative use for higher-order learning activities connected to the world beyond the instructional setting</small>	
GOAL-DIRECTED LEARNING <small>Students use technology tools to set goals, plan activities, monitor progress, and evaluate results rather than simply completing assignments without reflection.</small>	Goal-Directed Entry <small>Directions given; step-by-step task monitoring</small>	Goal-Directed Adoption <small>Conventional and procedural use of tools to plan or monitor</small>	Goal-Directed Adaptation <small>Purposful use of tools to plan and monitor; some student choice and exploration</small>	Goal-Directed Infusion <small>Flexible and seamless use of tools to plan and monitor</small>	Goal-Directed Transformation <small>Extensive and higher-order use of tools to plan and monitor</small>	

The Technology Integration Matrix was developed by the Florida Center for Instructional Technology at the University of South Florida, College of Education. For more information, example videos, and related professional development resources, visit <http://mytechmatrix.org>. This page may be reproduced by schools and districts for professional development and pre-service instruction. All other use requires written permission from FCIT. © 2005-2019 University of South Florida

Source: <https://fcit.usf.edu/matrix/tim-descriptors/>

Figure 9.5: TIM Matrix

This brief discussion on various models of technology integration will help you develop your understanding of how ODL integration takes place in learning. The ODL system has also emerged with time and adopted multiple models based on the nature and requirements of the academic programme. To better understand the technology used in ODL systems, we will try to examine various practices worldwide.

Check Your Progress: 2

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this unit.

- What are the differences between ICT's supplementary and complementary role in ODL?

2. How does TPACK help in better planning and transactions of content in ODL?

9.5 PRESENT PRACTICES

To understand the use of information communication technologies (ICTs) in open and distance learning, it is essential to know about the parties in the system. In the era of Web 3.0 technologies, the traditional blending of audio/video with print SLM or support from radio and television has not lost its relevance yet. It is being used effectively to facilitate learning in the ODL system. However, new technologies have also emerged and are being used to enhance the learning experiences of ODL learners. You can develop a fair understanding of these practices after going through the details of some of these:

Teleconferencing and Radio-conferencing

The use of radio and television for learner support is the key feature of ODL practices. If you look at the practices in IGNOU, **Gyanvani FM Radio stations and DD-Gyandarshan** as a television channel have proved their worth nationwide. Millions of students used the programmes available through these mediums to enhance their learning. Along with recorded programmes, these two platforms are used effectively for counselling.

Teleconferencing

Teleconferencing connects several users in different places electronically to interact through audio-video or computer technology. The technology is very useful in the ODL system as it links learners and teachers for teaching-learning purposes. In teleconferencing, there are mainly teaching ends and several learning ends. The teaching end is a studio with an uplink facility. In the case of Indira Gandhi National Open University (IGNOU), the studio of Electronic Media Production Centre (EMPC) serves as the teaching end, from where programmes are being uplinked to satellite and the learning ends are centres having downlink facility/DTH with television set as well as telephone talkback system.

In the case of IGNOU, all the Regional Centres and several Study Centres serve as learning ends. Learners can also watch the live sessions from their homes as all major DTH operators carry its Gyan Darshan Channel, through which the teleconferencing sessions reach them. Distance learners of IGNOU

came to these learning ends and interacted with the resource persons at the teaching end. IGNOU has been using teleconferencing since October 1993.



Figure 9.6: Teleconferencing at Gyandarshan

Radio Counselling

Radio is one of the most common and cheap media available in India. Though it started as analogue technology and operated on analogue modes using frequency modulation, it now uses digital technology. Messages through radio can reach millions of people at the same time. It is also being used to broadcast educational programmes for teaching-learning purposes and with two-way communication between the teacher and learners, popularly known as interactive radio instruction or **interactive radio counselling (IRC)**. In the interactive radio counselling sessions, teachers/experts sit in the studio, and learners can interact with them using a tele-calling facility, web-based interactions, etc. “IGNOU’s Gyan Vani (GV) FM Radio was conceived in 2001 as a network of educational FM Radio Channels operating from various cities in the country. With an aim to enhance and supplement the teaching-learning process, each GV Station has a

range of about 60 kms and covers an entire city/town including the adjoining rural areas.” (IGNOU, 2020).



Figure 9.7: Radio-Counselling at GyanVani

9.5.1 Online Web-support

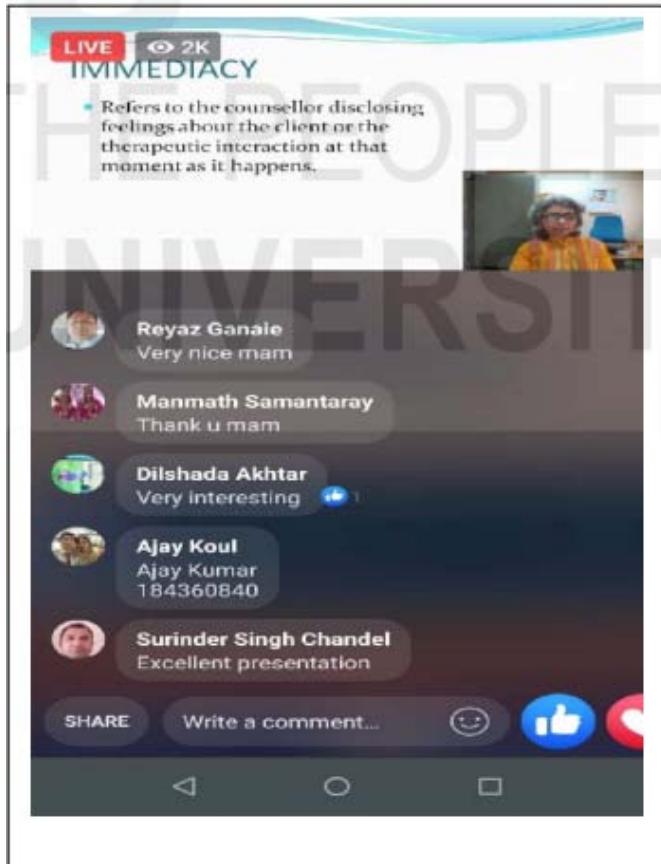
Along with traditional audio-video support, online web support has emerged as a good tool in ODL. It has decreased the gap between teachers and learners and enhanced the opportunity for greater academic interaction and administrative support. Websites, e-mails, and Google Groups are available to support the learners. Learning material on repositories like e-Gyankosh, online web radio Gyandhara, support through chat boats, e-conferencing, etc., are facilities that help learners a lot.



A screenshot of a web browser showing the eGyanKosh login interface. The header includes the Indira Gandhi National Open University logo and the eGyanKosh logo. A search bar with "Advanced Search" and a "Go" button is visible. The main content area is titled "Log In to eGyanKosh". It features a "New User? Click Here to Register" link. A "Login to eGyanKosh Account" form is centered, containing fields for "EmailID" and "Password", and a "Log In" button. At the bottom of the form, there is a link "Have you forgotten your password?".

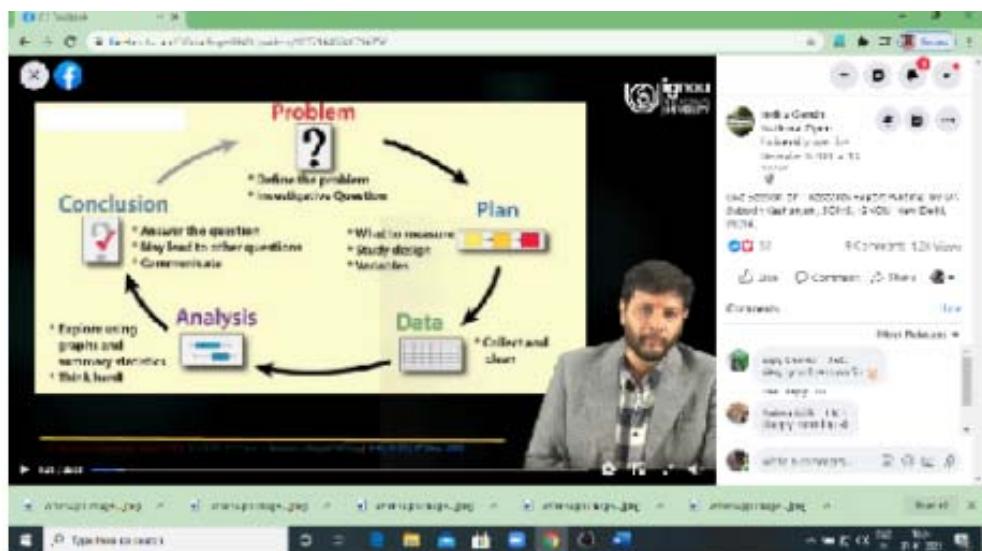
9.5.2 Social Media Blending

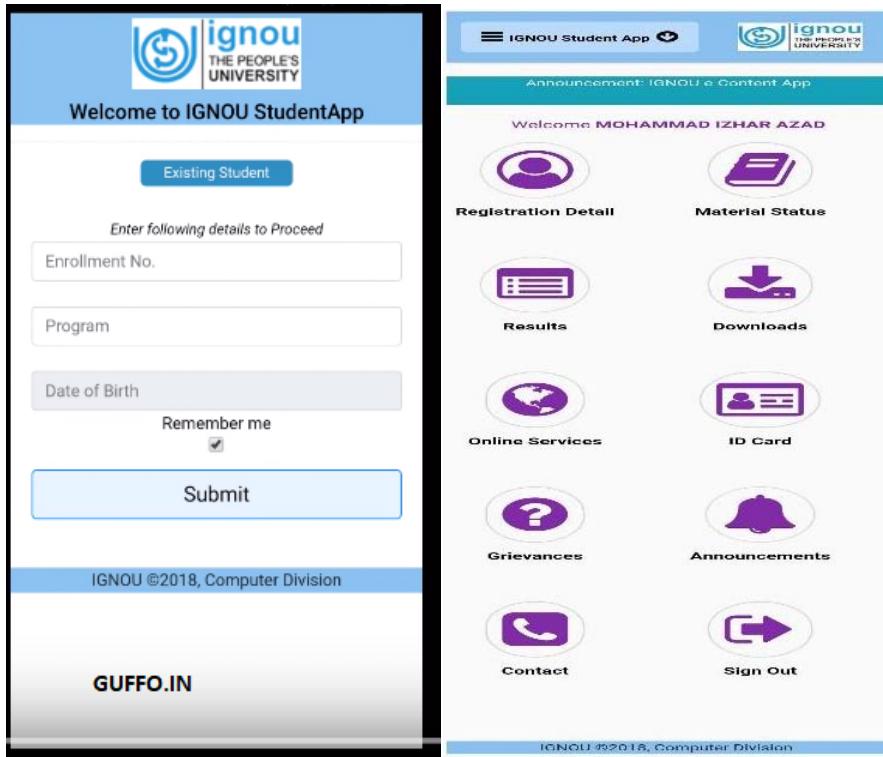
With social media's increased penetration and reach among learners, its educational use has become very prominent. WhatsApp-based support, Telegram groups, Facebook Live sessions, etc., are examples of increasing interaction between teachers and learners. These also help reach learners, resolve their day-to-day issues, provide content support, etc. Large groups of learners are sometimes given learning support/training sessions through these platforms.



9.5.3 App Based Support

IGNOU and many other open universities and institutions have also started offering app-based support to learners. This helps learners have 24/7 support for facilities, content, etc. IGNOU has developed its student app, which facilitates learners' knowledge about their enrolment status, assignments, grade card status, etc. Similarly, it has also developed its e-content app through which anyone can access its content available with eGyankosh.

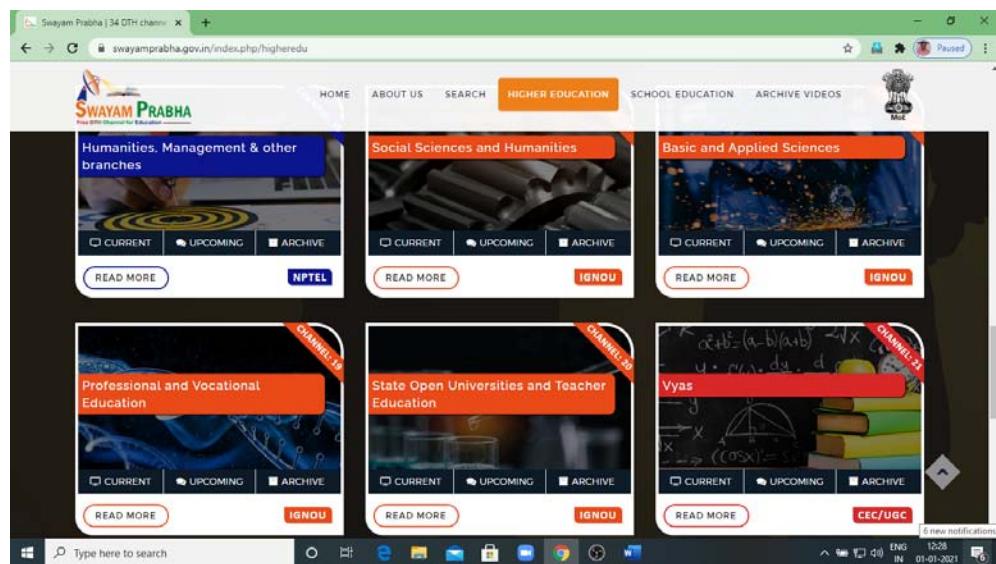
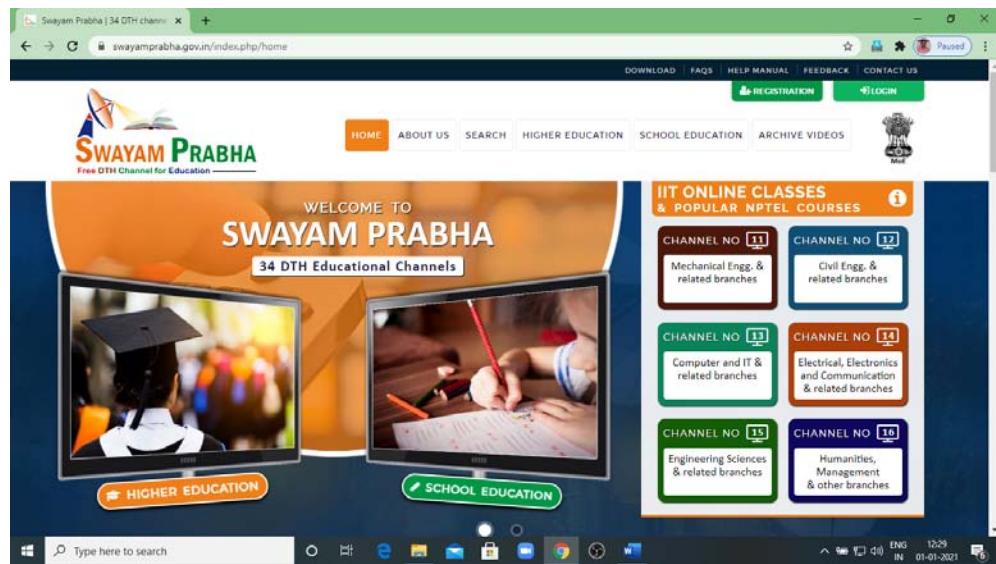




9.5.4 SWAYAMPRAHBA

In 2017, the Government of India launched The SWAYAM PRABHA project to facilitate learning through television. Currently, it is a group of 34 DTH channels devoted to telecasting high-quality educational programmes on a 24/7 basis using the GSAT-15 satellite. Every day, there will be new content for at least (4) hours, which will be repeated five more times a day, allowing the students to choose the time of their convenience. The channels

are uplinked from BISAG, Gandhinagar. NPTEL, IITs, UGC, CEC, IGNOU, NCERT and NIOS provide the content. The INFLIBNET Centre maintains the web portal. IGNOU also has four channels in the project and facilitates learning for learners from various schools of study/disciplines. One channel for state-open universities allows all state-open universities to telecast video programmes for their learners, even in regional languages. This project has a lot of potential to facilitate learners with television-based instructions.



9.5.5 MOOCs Including SWAYAM

MOOC is the new buzzword in educational scenarios now. It stands for Massive Open Online Courses (MOOC). MOOC has bridged the gap between ODL and conventional universities and given learners beyond any geographical or administrative boundary the opportunity to learn about will and choice. Many popular MOOC platforms, like Coursera, Edx, Futurelearn, etc., worldwide, and SWAYAM has emerged as an Indian MOOC platform. The government of India initiated SWAYAM in 2016 as a MOOC platform for Indian universities and institutions.

SWAYAM is designed to achieve the three cardinal principles of Education Policy: access, equity, and quality. This effort aims to take the best teaching and learning resources to all, including the most disadvantaged. SWAYAM

seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy. This is done through a platform that facilitates hosting all the courses taught in classrooms from Class 9 till post-graduation to be accessed by anyone, anywhere, at any time. All the courses are interactive, prepared by the best teachers in the country, and available free of cost to any learner. More than 1,000 specially chosen faculty and teachers from across the country have participated in preparing these courses.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lectures, (2) specially prepared reading material that can be downloaded/printed, (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing doubts. Steps have been taken to enrich the learning experience by using audio-video and multimedia and state-of-the-art pedagogy/technology. To ensure that the best quality content is produced and delivered, nine National Coordinators have been appointed. IGNOU is one of these. IGNOU has offered more than 100 courses on SWAYAM, ranging from certificate to post-graduate level courses.

BES 123: Learning and Teaching
By Dr. Gaurav Singh | Indira Gandhi National Open University

The course "Learning and Teaching" focuses on developing an understanding of psychological and socio-cultural perspective of learning, learning theories and factors facilitating learning. This course is facilitating trainee teachers in identifying appropriate learning strategies for facilitating construction of knowledge and also helping them reflect on their role as an innovator and action researcher. The course will be offered in 16 weeks (04 months). e-text, videos and discussion forum will be essential part. Each week, one live session will be organized in synchronous mode for interaction and resolving the doubt followed by a weekend quiz. One compulsory assignment and term-end examination will be part of formal assessment for the course.

Learners enrolled: 8133

COURSE LAYOUT

Learning and Teaching	
Week 1	Understanding Learning

SUMMARY

Course Status : Ongoing
Course Type : Core
Duration : 16 weeks
Start Date : 01 Jul 2020
End Date :

Many states open universities/ODL institutions have developed their own mechanism too to facilitate learners using various ICT facilities available with them.

Check Your Progress: 3

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this unit.

- Enlist the present academic practices of use of ICT in ODL?

.....
.....
.....

- What is the difference between SWAYAM and SWAYAMPRAHABHA?

.....
.....

9.6 ICT FOR ADMINISTRATIVE SUPPORT

Along with academic support in ODL institutions, ICTs are also of great use for administrative support services. These can be categorised as ICTs for e-governance, ICTs for Examination, ICTs for material access, ICTs for networking, etc. Let us examine these one by one.

9.6.1 ICT for e-Governance

When we talk about ICT in e-governance, it involves activities like admission, record keeping, resource management, etc. In any ODL institution, there are activities like admissions in different cycles, course selection within a programme, study centre allotment, maintaining records of submissions, communicating with learners/study centres and parents, generating various certificates, analysing multiple data, etc., in which ICT plays an important role. In IGNOU, online admission, data management at regional centres, examination form submission, checking the status of submissions and certificates, etc., are the services that are available online.

The screenshot shows the homepage of the IGNOU Admission Information Bulletin. At the top, there is a navigation bar with links for HOME, REGIONAL CENTERS, ADMISSION FAQ, PROGRAMME INFORMATION, USER GUIDE, Helpdesk, and Sign In. Below the navigation bar, there is a search bar labeled "Search for Programmes...". The main content area is titled "Available Programme's" and displays eight programmatic boxes. Each box contains the program name, duration, and a "Read More" button.

Programme	Duration	Action
ACISE : ADVANCE CERTIFICATE IN INFORMATION SECURITY	0 Year, 6 Months	Read More
ACPDIM : ADVANCED CERTIFICATE IN POWER DISTRIBUTION MANAGEMENT	0 Year, 6 Months	Read More
ACE : Appreciation Course on Environment	0 Year, 3 Months	Read More
ACPSD : Appreciation Course on Population and Sustainable Development	0 Year, 3 Months	Read More
APDF : Awareness Programme on Dairy Farming	0 Year, 2.04 Months	Read More
GST : Awareness Programme on Goods and Services Tax	0 Year, 2.04 Months	Read More
BAG : BACHELOR OF ARTS	3 Years	Read More
BTS : BACHELOR OF ARTS (TOURISM STUDIES)	3 Years	Read More

9.6.2 ICTs for Assessment and Evaluation

In most ODL institutions, ICTs are used to fill out examinations, allot examination centres, download admit cards, etc. But now, the use of ICTs has expanded its horizon. Online delivery of Question papers, Online assessment of answer scripts, computer-based online entrance and term-end examination, Question bank, automated question paper generation, Learning Management System (LMS) based assessment, and computer-based marking are the areas in which ODL institutions have started moving.

9.7 FUTURE PROSPECTS

Till now, you must have developed a fair understanding of the ever-changing face of Open and Distance Learning due to technological interventions. As many new and emerging technologies are knocking on the doors of ODL, there are possibilities for including many new technologies. National Education Policy 2020 has also hinted at it and demands experimentation on new teaching-learning models through various institutions. Many have already started on a pilot basis; many are in the pipeline. The following

discussion will help develop a basic understanding of upcoming technologies that can be part of ODL in the coming days.

9.7.1 Badges and Credit Bank

Badges and Academic Credit banks are the future of technology-enabled education. Many open universities, like UKOU, have already started the concept of badges. The National Education Policy 2020 in India has also advocated the establishment of Academic Back of Credits (ABC).

Digital or online badges are provided to learners to help them accomplish a particular skill or course or attain competency. These badges generally talk about learners' proficiency levels in a particular area. As institutions give these and are available for verification by employers, these enhance changes in employability, too. These are great tools for professional development and life-long learning. As per recommendations of NEP-2020, UGC has rolled out a plan to establish the Academic Bank of Credit (ABC) to facilitate student mobility across the education system. It will bring more flexibility and openness in higher education scenarios. One learner can accumulate credits from any institution by doing a course. Once his/her accumulated academic credits become equivalent to a diploma/degree, he/she can claim that from an institution. This will bring a new era of collaboration and learning that will go beyond the boundaries of only one college/university.

9.7.2 Rolling Admissions

As the future of ODL is credit-based and course-based learning will be promoted now, a learner may not require admission at a particular time (like January/July). A learner can join any course at any time, complete it, and accumulate credit. Choices will be there for the subject domain as well as for timing. Anytime, anywhere learning, a motto of the ODL system, will be encouraged more. This will also open the opportunity for on-demand examinations. As a learner completes a course, he/she can demand an examination for that course. With the penetration of technology in the examination system, it will be possible to organise the computer-based examinations of any learner as per his/her choice.

9.7.3 Fully Online Programmes

Currently, most online courses are either single non-credit/credit or course-based learning approaches being practised and promoted. However, there are possibilities in the future of fully standalone online programmes with multiple courses. University Grants Commission (UGC) has already rolled out the norms of online programmes in 2020. IGNOU has started offering fully online programmes, from certificate to master's level. In the future, many such programmes will be offered. Experiments are going on for programmes that require hands-on or practical components, too; there are possibilities for such programmes also in online mode.

9.7.4 Online Home-based Assessment

Experiments in this new mode of examination have also started. With the use of emerging technologies, the present system of computer-based

examination, in which a learner has to go to a designated place/centre for a proctored examination, will also change shortly. There are technologies to detect the presence of any other person in the room, such as retina scan and eye movement, lip reading, face recognition, room temperature change with the presence of another person, etc. These technologies will be used for home-based online examination by integrating technologies in Artificial Intelligence (AI) based applications.

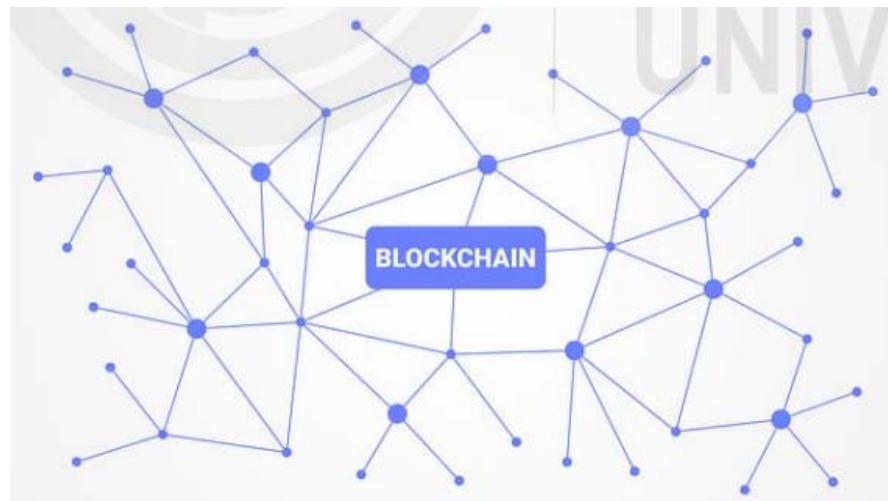
9.7.5 AR and VR

Augmented reality (AR) and Virtual Reality (VR) are the future of online education. With the integration of AR/VR, the learning experiences will be enhanced for learners. AR/VR-based headsets will be the future of classrooms and ODL study centres. The AR/VR will enhance the learning experiences of the learners. In areas like vocational/skill-based higher education, AR/VR will be a great help. In fields like medical education and nursing, immersive technologies have already started. Vocational training in engineering and technology, as well as new media and art applications, are the areas where AR/VR will be in the future.



9.7.6 Blockchain in Higher Education

Blockchain technology is also an emerging disruption in higher education, which has its distinct benefits in ODL. "The most promising use case for blockchain in higher education is to transform the "record keeping" of degrees, certificates, and diplomas" (Moore, 2019).



There are many benefits of Blockchain in education like improving record keeping, improving employability and verification of records by employer, emerging as a new market of cloud-based storage, accumulation of badges and facilitating in earning diploma/degree, facilitating flexible and choice-based learning, reducing the cost of record generation, keeping, and procuring, etc.

Check Your Progress: 4

Note: 1) Use the space below for your answers.

2) Compare your answers with those given at the end of this unit.

1. Explore the internet and find out the emerging technologies which can be used in ODL in near future.

.....
.....
.....
.....

9.8 LET US SUM UP

The unit has started with a discussion on the role of Information and Communication Technology (ICT) for Open and Distance Learning (ODL) systems. ICT interventions have forced ODL to change itself and walk with technology. The discussion moved towards Generations of ODL, which have been suggested from three main perspectives: technology, pedagogical, and organisational. The unit discusses in detail two classifications of generations suggested by Tylor (2001) and Moore and Kearsley (2005). How ICTs have been integrated into the ODL was also discussed progressively. Modes of ICT integration, from supplementary to complementary to true integration, have been discussed. Some models of ICT integration, like SMART, TPACK, and SIM Matrix, were discussed in the unit to give you an understanding of how ICT integration can help teach ODL learners. The unit has highlighted various present practices like teleconferencing, radio-conferencing, web support, SWAYAM and SWAYAMPRAHABHA, also in brief. ICTs are being used not only for academic support but also for administrative support in ODL. The role of ICTs in resource management, financial management, examination, etc., has been discussed in the unit. At the end of the unit, future possibilities of using ICTs in ODL have also been discussed briefly.

9.9 REFERENCES AND SUGGESTED READINGS

1. Aoki, K. (2012). Generations of Distance Education: Technologies, Pedagogies, and Organizations, Procedia - Social and Behavioral Sciences, 55, 1183 – 1187, <https://core.ac.uk/download/pdf/82595361.pdf>
2. Heydenrych, J. F. and Prinsloo, P. (2010). Revisiting the five generations of distance education: Quo vadis? Progressio 32 (1), pp 5–26

3. Hofer, M. and Grandgenett, N. (2012). TPACK Development in Teacher Education: A Longitudinal Study of Preservice Teachers in a Secondary M.A.Ed. Program, *Journal of Research on Technology in Education*, 45 (01), 83-106. <https://files.eric.ed.gov/fulltext/EJ991840.pdf>
4. Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. doi:10.1111/j.1467-9620.2006.00684.x
5. Moore, S. (2019, Oct. 16). 4 Ways Blockchain Will Transform Higher Education, Smarter With Gartner, <https://www.gartner.com/smarterwithgartner/4-ways-blockchain-will-transform-higher-education/#:~:text=Improve%20record%20keeping-,The%20most%20 promising%20use%20case%20for%20blockchain%20in%20higher%20 education,an%20intermediary%20to%20verify%20them>.
6. Singh, N. (2018). ICTs for education management, BESE-135 Information and Communication Technology, SOE, IGNOU, <http://www.egyankosh.ac.in/bitstream/123456789/46325/1/Unit-13.pdf>
7. Taylor, J., 2001, 'Fifth generation distance education', *e-Journal of Instructional Science and Technology (e-JIST)* 4(1), 1-14

9.10 CHECK YOU PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. Interactive technologies were introduced in the third generation of ODL.
2. Answer the question based on your understanding of section 9.4.

Check Your Progress: 2

1. In a supplementary role, ICTs supplement the teaching-learning on ODL, mainly through print-based material. If a learner does not use the ICT support, he/she is not at a loss for content. In contrast, in a complementary role, the use of ICTs is planned so that content is developed using audio/video programmes, and interaction through radio-counselling and teleconferencing has started complimenting the traditional print-based material.
2. Answer based on your understanding of the framework developed while reading about it.

Check Your Progress: 3

1. Enlist based on discussion help in section 9.6.
2. SWAYAM is an online learning portal on which various institutions offer online MOOC courses for learners, whereas SWAYAMPRAHBA is a bouquet of 34 DTH television channels to support teaching-learning.

Check Your Progress: 4

1. Explore the internet and write the answer.

UNIT 10 ICT FOR DISABILITY

Structure

10.0 Introduction

10.1 Learning Outcomes

10.2 ICT for Persons with Disabilities

 10.2.1 Terminologies

 10.2.1.1 Information Technology (IT)

 10.2.1.2 Assistive Devices (AD)

 10.2.1.3 Assistive Technology (AT)

 10.2.1.4 Information and Communication Technology (ICT)

 10.2.1.5 Universal Accessibility

 10.2.2 History of Assistive Technology

 10.2.2.1 Benefits of Information and Communication Technology (ICT)

10.3 Present and Future of ICT

 10.3.1 The Present Scenario

 10.3.2 The Future

10.4 ICT for Various Types of Disabilities

 10.4.1 Technology used at the Institution Level for Instruction

 10.4.1.1 Online Education

 10.4.1.2 Radio Programmes

 10.4.1.3 Teleconferencing

 10.4.1.4 Web conferencing

 10.4.1.5 Mobile phone-based education

 10.4.1.6 E-Resources

 10.4.1.7 Television

 10.4.2 Technology Used at Individual Level

 10.4.2.1 Technology for Persons with Intellectual Disability

 10.4.2.2 Technology for Persons with Locomotor Impairment and Cerebral Palsy

 10.4.2.3 Technology for Persons with Hearing Impairment

 10.4.2.4 Technology for Persons with Visual Impairment

 10.4.2.5 Technology for Persons with Autism

10.5 Let Us Sum Up

10.6 Further Readings

10.7 Check Your Progress Questions: Possible Answers

10.0 INTRODUCTION

Technology has the potential to impact the lives of persons with disabilities significantly. It can enable them to compensate for physical or functional limitations and, as a result, enhance their social and economic inclusion in society. Technology helps persons with disabilities to live an independent life to a great extent. Assistive technology provides greater independence to persons with disabilities by enabling them to perform tasks they could not

accomplish or had much difficulty doing earlier.

The recent pandemic has forced various people to use technology extensively. Only technology connects us to the outside world; most of us have been using it to compensate for physical contact. Many organisations/companies have allowed employees to work from home. Schools teach children through technology at their homes, and NGOs provide the beneficiaries counselling and other online support.

The rehabilitation services provided to persons with disabilities can be improved with the help of new advanced technologies. Considering the needs and demands of persons with disabilities, many new technological solutions exist. The effective use of these technologies can enhance the functional capabilities of persons with disabilities, and in turn, they can contribute effectively to society.

This unit will discuss the various technologies useful for persons with disabilities.

10.1 LEARNING OUTCOMES

After completing this unit, you should be able to

- Describe the benefits and limitations of ICT for persons with disabilities;
- Analyse the emerging trends related to ICT for persons with disabilities;
- Discuss various types of ICT used at institutional level for persons with disabilities; and
- Enumerate various types of technologies available for individual use for persons with disabilities.

10.2 ICT FOR PERSONS WITH DISABILITIES

Various Governments, non-government organisations and individuals have taken initiatives to develop technologies after considering the needs of persons with disabilities. They have not only developed these technologies after research but have also adapted several technologies developed in other countries to suit local needs.

10.2.1 Terminologies

Several terminologies are used interchangeably for technology, so let us discuss some of them.

10.2.1.1 Information Technology (IT)

Wikipedia defines information technology (IT) as "The use of computers to store, retrieve, transmit and manipulate data or information in various forms".

10.2.1.2 Assistive Devices (AD)

The term assistive device has been applied to a wide range of highly specialised mechanical, electronic, and computer-based consumer tools that are now commonly used in rehabilitation and education settings.

10.2.1.3 Assistive Technology (AT)

ICT for Disability

Assistive technology refers to any tool, item or product used to enhance, preserve, or increase the competencies and abilities of individuals with disabilities to their potential.

10.2.1.4 Information and Communication Technology (ICT)

Information and Communication Technology is a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information. ICT is a technology that supports activities involving information, such as gathering, processing, storing, and presenting data. These activities increasingly involve collaboration and communication; hence, information technology has become ICT.

10.2.1.5 Universal Accessibility

Universal accessibility means making a device, product, website, or building usable to a larger number of people irrespective of their language, gender, height, or abilities, bringing the concerned subject within reach of a maximum number of people.

10.2.2 History of Assistive Technology

Assistive technology is a tool or a device that helps persons with disabilities in doing their activities and enhancing their capabilities; it can be a simple device or a technological tool that can help persons with disabilities. Let's look into the history of the development of assistive technology. We can say that in 1808, Pellegrino Turri invented the typewriter to help his childhood friend Contessa Fantoni in the early stages of blindness so that he could write with the help of it. Since then, many other attempts have been made to strengthen assistance for persons with disabilities. Louis Braille developed a language based on a tactile writing system for people who were blind in 1921. This language is called Braille. Braille has greatly impacted the lives of persons with disabilities and has helped them tremendously.

The invention of the telephone was also a big contribution to helping individuals communicate with each other from a long distance. This device was combined with a text telephone, a telecommunication device for people who are deaf or hard of hearing that enabled them to communicate with people from long distances. Televisions, remote controls, talking calculators, talking watches, speech recognition systems, etc., have made the lives of persons with disabilities easier.

10.2.2.1 Benefits of Information and Communication Technology (ICT)

ICT has brought enormous change in the lives of persons with disabilities because of the enabling effect of technology. Now, people talk about the potential of persons with disabilities instead of their limitations, and they are seen as productive partners in every segment of society. Some of the benefits of ICT are the following.

1. Promotion of equal opportunities

2. Improved communication
3. Movement and mobility are increased.
4. Participation in the community is enhanced.
5. Increased independence in various spheres like home, school, college, community, markets, workplace, etc.
6. Persons with disabilities become self-reliant.
7. Participation of persons with disabilities in the various activities at home, school and workplace is increased, and the full potential of persons with disabilities is utilised.
8. Persons with disabilities feel self-motivated.
9. Persons with disabilities feel more accountable.
10. Persons with disabilities get more opportunities to interact and communicate with others.
11. Self-respect and confidence of persons with disabilities are enhanced.
12. The use of technology helps in improving writing and organisational skills.
13. Technology helps them learn through their preferred mode, i.e. visual or auditory.
14. Technology facilitates the sharing of resources, expertise and learning material among users.
15. The accessibility is higher when technology is used.
16. Employment opportunities for persons with disabilities are increased by the use of technology.
17. Persons with disabilities can participate in sports and recreation with the help of technology.

Check Your Progress: 1

Note: 1) Use the space given below for your answers.

2) Check your answers with those given at the end of the unit.

1. Define Information and Communication Technology in your own words.

.....
.....
.....
.....
.....

2. What is universal accessibility?

.....
.....
.....
.....
.....

3. Name any two technologies developed to assist persons with disabilities in their early years.

ICT for Disability

.....
.....
.....
.....
.....
.....
.....
.....

4. List five benefits of ICT.

.....
.....
.....
.....
.....
.....
.....

10.3 PRESENT AND FUTURE OF ICT

We adopted the rights-based approach in India after signing the UN Convention on the Rights of Persons with Disabilities in 2006. The Rights of Persons with Disabilities Act 2016 has compulsorily adopted this approach and emphasised that the rights of persons with disabilities should be protected. They should be treated with equity and equality in each sphere of life. Consequently, it has been envisaged that all measures should be taken to ensure the full and effective participation of persons with disabilities in various places. We must respect their differences, accept them, and provide equal opportunities to live a healthy life. Technology is a great leveller for giving equal opportunities to persons with disabilities, as appropriate assistive technology enables them to work effectively. Persons with visual impairment can read with the help of JAWS software. They can access the online library through it, and the online material available in an accessible format enables them to do their studies or work. Similarly, there are other technologies available to persons with different disabilities. We will discuss them later in this unit.

10.3.1 The Present Scenario

Developing ICT for all kinds of disabilities is a huge task that needs research and innovation. In India, around 70% of the population lives in rural areas, which makes providing technological intervention for such a diverse group of people very difficult. After the enactment of the Rights of Persons with Disabilities Act 2016, 21 types of disabilities have been identified, and most of the persons having these disabilities require assistive devices to help them in their daily living skills or vocational skills. Various initiatives taken by government or non-government organisations for research and development of assistive devices have contributed to improving the quality of life of persons with disabilities. They have not only developed technology for persons with disabilities but have also been able to adapt the technologies developed in other countries to suit the local needs of India. The government provides these technological devices to eligible persons without any cost

under the ADIP scheme; apart from this, these devices are also available in the market.

Children with intellectual disabilities often like to use computers provided the software in the computer is suited to their slow pace. They enjoy working on it, and the technology enhances their capacity by gainfully engaging them through various tasks or games. Several games are available to provide them with instructions, such as simulations, demonstrations, problem-solving, and discovery learning.

Persons with visual impairment find technology very convenient, as they can read, write, walk, or do various activities with the help of technology. Multiple technologies are available to help them in mobility, education, or daily living activities, i.e., smart cane, screen magnifiers, screen readers, Braille printers, Braille embossers, talking diaries, talking calculators, talking ATMs, etc.

The telephone was one of the first technological devices developed for people with hearing impairment. Alexander Graham Bell invented the phone to help his wife, who had a hearing disability. Individual FM systems, Loop induction systems, speech processing software, computer-assisted remote transcription, captioning, and various alerting devices are available for people with hearing impairment.

Similarly, there are numerous other devices to help persons with locomotor disability and cerebral palsy. For persons with autism, communication skills are critical, and there are few devices available to assist them. Nowadays, app-based support is also provided to persons with disabilities; Sense International India and Samsung recently developed a mobile app named Good Vibes for persons with deaf-blindness to help them communicate with their caregivers and family members.

10.3.2 The Future

In the last few years, there has been a revolution in technology. Artificial intelligence has been key to this sector, but when a technology is developed, very few companies think about the accessibility of this technology to persons with disabilities. It is high time that, as a country, we think about universal accessibility of the technologies being developed for various areas of life; inclusiveness of the technologies will enhance the capabilities of persons with disabilities to a great extent. If we take the example of persons with deaf blindness, there is hardly any device developed in India to support them. Persons with deaf-blindness have a unique condition – a combination of visual and hearing impairment. Although the degree of deafness or blindness varies, the combination of dual sensory loss leads to unique problems in an individual's capability for communication, mobility, and ability to access information. The technological intervention with the help of an app can allow them to communicate with their caregivers and family members. Keeping this in mind, recently, Sense International India joined hands with Samsung to develop a communication tool for the deaf-blind. This two-way communication app allows the deaf-blind to send and receive messages to friends, family, or anybody else through their smartphone. More

such initiatives must be taken to meet the needs of persons with various disabilities.

Recently, the world has witnessed the COVID-19 Pandemic, resulting in all educational institutions providing educational support to their students with the help of ICT. Mobile phones have been used extensively, and teachers use various platforms to teach children from their homes. Although our educational system was not prepared to teach the students through mobiles or computers despite all the difficulties, they have been doing this for the last few months. In this situation, it is very difficult for persons with disabilities and their families to cope with the lack of accessibility to suit their individual needs. This is the right time when, as a country, we think about the various needs of children/individuals with or without disabilities; the pedagogy also needs to be aligned to suit the needs of all children.

There is a need to emphasise massive online open courseware (MOOCS) that can enable a person with or without disability to learn at their own pace or place. Gaming has also emerged as a powerful tool. Judicious use of accessible gaming will help persons with disabilities for leisure, personalised virtual teachers, automated assessment, and evaluation, etc. Mobile technology is also assisting persons with visual impairment, hearing impairment and other disabilities; more such initiatives largely need to be taken to develop universally accessible technologies for persons with disabilities.

Check Your Progress: 2

Note: 1) Use the space given below for your answers.

2) Check your answers with those given at the end of the unit.

1. The rights-based approach means
2. Good Vibes app is developed by and To help individuals with
3. Two technological devices beneficial for persons with visual impairment are and
4. Loop induction system is beneficial for persons with

10.4 ICT FOR VARIOUS TYPES OF DISABILITIES

ICT is used to support persons with disabilities; when it is used in educational institutions following the principles of universal accessibility, it helps students with disabilities tremendously, and they are included in all the activities of that institution. Similarly, when a website is designed with universal accessibility, the needs of persons with disabilities are ensured. When planning a course/lecture/discussion/visual aids/video tapes/printed material and practical/field work, accessibility for students with disabilities is considered. In that case, it helps in their inclusion and largely learning. Distance learning programmes that incorporate universal accessibility features help students with diverse needs to learn at their own pace.

Technology is used to provide accessible education to students with disabilities at the institutional and personal levels. This means the technology is used by a bigger system, i.e., a university or a college, to support the educational needs of students enrolled in various programs, including students with disabilities. On the other hand, the technology that helps an individual compensate for his or her limitation or restriction in one or more areas is used at the personal level. Let us discuss this in brief.

10.4.1 Technology Used at the Institution Level for Instruction

With the help of technology, education can be more open and accessible to all the students enrolled in a particular program, especially students with disabilities. With the help of these technologies, support can be provided to students with disabilities in their teaching-learning process.

10.4.1.1 Online Education

Online education is very convenient for students with disabilities as they can learn from the convenience of their homes, and the use of accessible software enables them to compensate for their inability. In online programmes, there is a scope to learn at a flexible time and pace. If students with disabilities are provided with accessible content, they will benefit greatly from it.

10.4.1.2 Radio Programmes

Various educational institutes use radio programmes to provide education. Some institutions have community radio channels, whereas others can access FM or Gyanvani channels. Students with disabilities benefit enormously from these programmes. IGNOU has a Gyanvani programme that offers interactive radio counselling to the students, which enables them to interact with their teachers at the ease of their home. Radio programs are not accessible to students with hearing impairments as they cannot hear the discussions. Students with speech impairment will also be unable to participate because of their speech problems. Therefore, while planning educational support for diverse learners, alternative modes for supporting students with other disabilities should be considered. In this case, students with speech and hearing impairments can be provided with a facility for live chats or support through telecommunication devices for deaf students.

10.4.1.3 Teleconferencing

Teleconferencing facilities enrich the learning experiences of all students enrolled in any educational programme, provided the needs of students with disabilities are considered before planning these programmes. To suit the needs of a diverse group of learners, the teleconferencing programme can be made in universally accessible formats. Captioning and sign language interpretation are built into a program, as well as live discussions and PowerPoint presentations.

10.4.1.4 Web conferencing

Web conferencing can also be planned by adding sign language interpretation, captioning audio recordings or descriptive captions/descriptive narrations, etc., to suit the needs of individuals with various disabilities.

10.4.1.5 Mobile phone-based education

ICT for Disability

Smartphones have become integral to everyone's life in this technological era. Judicious use of mobile applications can provide quality learning experiences to students with disabilities, as they can learn from their educational institute's mobile application-based content. IGNOU has also developed a mobile application, 'IGNOU e-Content', to enable the learners to access its learning material through their mobile phones. The learners can access their course material from anywhere at their convenience.

10.4.1.6 E-Resources

The availability of e-resources in accessible form is very beneficial to students with disabilities; accessible libraries having content in e-Pub format or other formats suitable for persons with disabilities are providing enormous support to students with disabilities, i.e. Sugamya Pustakalaya and Bookshare. IGNOU has also developed a digital educational resources repository of self-learning materials for its programmes. The e-Gyankosh repository has all the instructional material and video programmes developed by IGNOU and provides open access to all. E-Gyankosh is very popular among students with disabilities, regardless of their enrolment in IGNOU.

10.4.1.7 Television

Television is a powerful tool for educating learners with disabilities at their doorstep. Several educational channels provide learning facilities in subjects ranging from primary to higher education. Gyandarshan is one such channel in IGNOU that offers various programmes across all disciplines to cater to the needs of a wide range of viewers in higher education. It benefits the learners of the formal education system and other stakeholders. Learners with disabilities find it very useful for their studies.

10.4.2 Technology Used at Individual Level

Persons with disabilities use various technologies to accomplish multiple tasks per their needs. They are discussed here for the benefit of our learners.

10.4.2.1 Technology for Persons with Intellectual Disability

Technology can compensate for the functional limitations of an individual. Persons with intellectual disability should be introduced to the technology as early as possible. The teachers need to provide them with these devices in all settings, including home, school, work, and recreation. Because these children have limitations in their mental functioning, there should be consistency in the technology available, how it is used, and the instructional method for operating the device. When a child is being taught a new technology, their previous learning needs to be considered. The purpose of instruction is to provide them with interactive experiences to promote learning among them. Several instructional programs for children with intellectual disability are drill and practice, instructional games, tutorials, simulations, demonstrations, problem-solving, discovery learning, etc.

Usually, persons with intellectual disabilities are provided with instructions with the help of technology. There are several technologies for daily living

skills for persons with intellectual disabilities, such as electronic planners, reminding them about the various tasks they must do at a particular time. When the child feels lonely, they can be given a talking doll or any other toy. Soothers are objects that help them to stay calm and engaged, i.e., electronic devices that can make sounds or anything as simple as a small soft toy or a small pebble that can be kept in the pocket. The video-based instructional system can help them learn functional life skills such as grocery shopping, writing a cheque using an ATM, etc.

Technology for assessing children with intellectual disabilities has also been developed, wherein integrated assessment in detail and records of each child can be kept in the assessment tool. Media Lab Asia, in collaboration with C-DAC, has developed (Punarjani) a software tool to equip teachers for the progress assessment and evaluation of children with intellectual disabilities.

10.4.2.2 Technology for Persons with Locomotor Impairment and Cerebral Palsy

Cerebral Palsy is a group of non-progressive conditions of a person characterised by abnormal motor control posture resulting from brain injuries incurred during the prenatal perinatal or infant period of development. Due to problems in movement, these children face many problems in their lives. Many persons with cerebral palsy have slight impairment, whereas others have serious problems that cause them to have difficulty in performing even the most common task. Technological intervention will help them overcome these problems and live independently as much as possible.

Persons with Cerebral Palsy with mobility impairment will need devices that can help them to get around. They can use these devices for their studies or in the workplace. A wheelchair is the main device for the mobility of children with cerebral palsy or locomotor disability. Nowadays, electronic wheelchairs are available at reasonable prices, better than manual wheelchairs. If the individual cannot use the wheelchairs, they can be modified with a provision of switches that come in a wide variety. Sometimes, they are shaped like a button, hand, or foot operated or operated by the waving of a hand, etc. These switches can be selected depending on the condition of the individual.

The most common form of human communication is speech. Children with Cerebral Palsy, in some cases, are unable to speak, or in some cases, they are not able to communicate effectively with their speech. In this case, they may need a non-speech mode of communication as an alternative to spoken language. They need alternative modes of communication; therefore, a few alternative and augmentative communication (AAC) devices have been developed to use non-speech modes to support these students. AAC is an integrated group of components that includes the symbols, aids, strategies, and techniques individuals use to enhance communication. In this system, multiple communication components are available. Some of these devices have been developed indigenously, whereas others have been adopted from other countries. The devices developed in foreign countries are dedicated communication devices, alpha talkers, walker talkers, digital augmentative communicators, canon communicators, voids, and board maker software. In

contrast, Sanyog, Gup Shup, pictorial communication software, Aditi, draw, and voice output communication aids are developed in India. These devices effectively assist children with limited or no communication with their families and caregivers.

Several other devices help children with cerebral palsy and locomotor disability in their daily activities. These include computers, mobile phones, voice recognition, switches, adaptive keyboards, touch-sensitive screens, and infrared sensors with pneumatic switches.

10.4.2.3 Technology for Persons with Hearing Impairment

Persons with Hearing Impairment are those with hearing loss, and because of that, they cannot process linguistic information through auditory channels with or without amplification. They may be able to hear some sounds but may not be able to distinguish words. Some other people may not be able to hear sounds at all. For these people, prompts such as alarms, beeps and spoken messages can be an issue of concern as they cannot hear. An assistive listening device helps enhance a person's hearing capacity. Apart from these devices, telecommunication devices have been developed to assist people with severe hearing impairment. As mentioned earlier, the first technological device designed for persons with hearing impairment was the telephone, which Alexander Graham Bell originally invented to help his wife, who had a hearing disability. The advancement of technology has led to the development of a wide range of modern assistive listening and telecommunication devices that help students with hearing impairment participate more effectively in various areas of life.

Telecommunication devices allow users to use a keyboard to type and receive messages over the phone. Mobile phones are widely used to communicate through SMS or other messages. An individual FM system is used to educate persons with hearing impairment. It is an assistive listening device that improves the sound-noise ratio for one person by using a remote microphone near the sound source. A basic FM system consists of two units, a transmitter and a receiver and is like having an individual radio station that transmits and receives on a single frequency. These systems are useful in classroom lectures, restaurants, theatres, public meeting places, corporate conference rooms, and other large gathering areas.

Sound enhancement technology devices transmit sounds from the source to the receiver by improving the signal-to-noise ratio. These devices are designed to deliver the sound directly to the listener, who has direct control over the intensity of sound. This technology enhances the auditory signal during group communication, one-to-one, or audio-video situations. Sound enhancement devices include FM, infrared, hardware, and induction loop systems.

A hearing aid is an amplifier that helps the person listen to a sound with minimum distortion by increasing the intensity of the sound. The role of hearing aids is to increase the sound level so that a person with hearing impairment can detect and use auditory signals. A hearing aid is an electronic device that amplifies sound to a degree and in a manner that will enable a

person with hearing impairment to utilise remaining hearing capacity effectively. There are two types of hearing aids: individual hearing aids and other group hearing aids.

There are technologies available for assessing hearing impairment in the audio lab. The software packages allow the users to record the speech signal and graphically add the same to prepare the test words. Some of the devices used for assessment are speech processing software, visual reinforcement audiometry, pure tone audiometers, speech audiometry, speech trainers, and visual aids.

Several devices are available to provide support services for persons with hearing impairment in their daily lives. Computer-assisted remote transcription allows a stenographer to transcribe a meeting remotely. Captioning means adding text to a visual display that helps convert spoken words into text. In many programmes on television, captioning is available; live speech captioning is another type of captioning that provides accessibility to live programmes and speeches to persons with a hearing impairment. In an educational setting, this technology is very beneficial for students with hearing impairment as the speech is typed simultaneously by a stenographer, and the text will be displayed on a screen. Alerting devices listen to the sounds on behalf of persons with hearing impairment and draw their attention to the sound source by generating a visual signal. An example is a doorbell that makes a low sound and a flashlight; similarly, in a telephone, vibration or a flashlight is used.

They widely use telecommunication devices for people who are deaf or hard of hearing to make or receive a phone call. These devices are generally attached to telephones, and they have a small keyboard for typing and a screen to display an incoming or outgoing message. These devices can be connected to a printer to have a copy of a conversation. To use telecommunication devices, the users must type the messages they want to convey; the written text will be automatically converted into speech and transmitted over the phone to another user. It converts the messages back into text form. These technologies are helpful for students with hearing impairment to interact with each other and other stakeholders.

10.4.2.4 Technology for Persons with Visual Impairment

ICT advancement has increased the quality of life of persons with visual impairment, and the application of technology has significantly enhanced their education. Modern technology has given unique experiences to persons with visual impairment to understand the unseen world through non-visual media. In this digital era, mobile phones, computers, iPads, scanners, and the internet have allowed them to fly out of their boundaries and interact with the world. They can obtain information on any topic with the help of the internet, which was earlier difficult for them to get either in Braille or from other sources. The availability of e-books, e-newspapers and e-resources has helped them tremendously.

To reduce the limitations for students with disabilities, several efforts are required, such as curriculum adaptation, training in plus curriculum, and

providing modified teaching-learning materials and access to technologies suitable for them. Several technologies help them with mobility, and they can go to the desired places without any dependence on others; some of these are - white cane fitted with laser, sonic guide, touch traffic light signal, path sounder, Mowat sensor, mobility assisting software and smart cane. All these devices help persons with visual impairments move around independently.

Several technological solutions help persons with visual impairment in their education. These are - close circuit television, large print computers, screen magnifiers, screen readers, Braille embossers, referable Braille displays, optical character recognition, e-books, audiobooks, digitally accessible information systems (DAISY), text browsers, voice browsers, audio devices, Braille note takers, talking calculator, electronic Brailler, internet, mobile phones etc.

Numerous technological devices help persons with visual impairment with their life skills. These are – the Braille printing system, handy Braille, talking diary, talking watch, talking toolbox, talking alarm clock, talking colour detector, talking measuring tap, talking kitchen scale, talking microwave oven, talking ATM etc. With the help of these devices, persons with visual impairment can undertake their daily living activities at home, in the workplace, in the market, in recreation centres, and the community at large. They do not need to depend on others for routine activities related to various areas. The need is to initially provide them with proper orientation and mobility training to be aware of their surroundings and the places they must frequently go. The devices mentioned above will help them tremendously in various settings.

10.4.2.5 Technology for Persons with Autism

Technology plays a very important role in the benefit of persons with autism. Autism is a developmental disorder characterised by a triad of impairments in social interaction, verbal and nonverbal communication and repetitive interests or patterns of behaviour. It is a developmental disability that onsets in the early years and causes serious problems or delays in different areas of development in children. They cannot relate to others and may show abnormal interests in objects, may not maintain eye contact with others, remain aloof and asocial, resist change, and insist on sameness.

Interventions for children with autism must be provided to enhance their verbal and non-verbal communication, social interaction, leisure, and play activities for their holistic development. With the help of technology, they can become participative and enhance their adaptive skills. Devices like talk pad, language master, voice output communication aid, audio taping, saying, autism my voice communicator, first then visual schedule, my pictures talk, Pocatello, speech journal, etc. are devices that help them in communication with their environment.

A person with autism finds difficulty in focusing attention. As a result, learning becomes difficult for them. Technology helps them learn as they are often interested in and attentive to videos and the use of computers. The selection of appropriate technology will help enhance their academic

achievements; a few technology-based devices are video tapping, computers, LCD projectors, autism bundles, etc. There is various other software available for educational purposes.

Persons with autism have difficulty in social interaction, and they pay less attention to social stimuli, smile and do not look directly at another person. They have significantly less or no eye contact, and the use of appropriate technology can help them to enhance their social skills; a few of them are – big mack, audio tapping, visual impact, symtrend ADL, tool factory beep, injuring child development game suite, sound beginnings and touch it transport etc.

Check Your Progress: 3

Note: 1) Use the space given below for your answers.

2) Check your answers with those given at the end of the unit.

1. How can educational institutions provide instructions to persons with disabilities by using technology?

.....
.....
.....

2. Write two benefits of mobile phones for the education of persons with disabilities.

.....
.....
.....

3. Name any two devices used by persons with hearing impairment.

.....
.....
.....

4. How will a video-based instructional system help persons with intellectual disability?

.....
.....
.....

10.5 LET US SUM UP

In this unit, we discussed the various technologies used for persons with disabilities, various terminologies used interchangeably for technology, and the benefits of technology.

We traced the history of assistive technologies and discussed the present scenario regarding the technologies in the country. We also discussed the future of technology for our country.

Technologies benefit persons with disabilities, and various educational institutions use these to effectively support students. We discussed the various types of technologies that various institutions are using to instruct students and how they can help students with disabilities.

Several technologies help persons with disabilities individually to accomplish various tasks. We discussed such technologies available for persons with intellectual disability, persons with locomotor disability and cerebral palsy, persons with hearing impairment, persons with visual impairment and persons with autism.

To sum up, technology plays a very important role in the lives of persons with disabilities. It offers immense possibilities for their education and daily living skills. The use of appropriate technology can empower persons with disabilities and help them become productive members of society.

10.6 FURTHER READINGS

1. Broadband India Forum. (n.d.). White Paper on ICT Accessibility for Persons with Disabilities. [White paper]. https://www.broadbandindiaforum.com/images/WP_on_ICT_Accessibility_for_Persons_with_Disabilities.pdf
2. Frehe, P., & Hoppe, H. U. (2008). Enhancing Collaboration through Instant Messaging Tools: A Language-Centered Approach. CEUR Workshop Proceedings, 3446, 17-26. <https://ceur-ws.org/Vol-3446/Paper3.pdf>
3. Global Partnership for Education. (n.d.). Bridging Divides: The Role of Inclusive Technology for Learners with Disabilities. <https://www.globalpartnership.org/blog/bridging-divides-role-inclusive-technology-learners-disabilities>
4. International Telecommunication Union. (n.d.). Accessibility to ICT. <https://www.itu.int/en/mediacentre/backgrounder/Pages/accessibility-to-ict.aspx>
5. Ranjan, A., & Luthra, A. (2021). Social Media and Mental Health during COVID-19: Role of Psychological Capital. *Information, Communication & Society*, 24(10), 1425-1440. <https://www.tandfonline.com/doi/full/10.1080/17483107.2021.2008530>
6. United Nations Human Rights Office of the High Commissioner. (2022, May). Inclusive Education and ICTs: Factsheet. https://www.ohchr.org/sites/default/files/2022-05/DigitalAge2_Factsheet_EN_ICT-Inclusive-Education2022.pdf
7. United Nations Sustainable Development Group. (2021, March 3). ICT & Digital Accessibility: Brief on Disability Inclusion. <https://unsdg.un.org/sites/default/files/2021-04/ICT-Digital%20Accessibility-BOS-Disability%20Inclusion-Practice%20Note-20210303.pdf>
8. World Bank. (n.d.). ICTs and Persons with Disabilities: The Global Divide. <https://openknowledge.worldbank.org/server/api/core/bitstreams/ef7fd554-8359-50f9-9718-7161545dbc54/content>

9. Singh, J.P. (2003). *Technology for the blind concept and context*. New Delhi: Kanishka Publishers, Distributor
10. Narasimhan, N. *e-Accessibility Policy Handbook for Persons with Disabilities*: Based Upon the ITU-G3ict e-Accessibility Policy Toolkit for Persons with Disabilities. Mumbai: Hemkunt Publishers (P) Ltd.
11. Hemlata (2014). *Technology for Inclusion of Persons with Disabilities*. New Delhi: Kanishka Publishers, Distributors.

10.7 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. Information and Communication Technology is a set of technological tools used to communicate, create, spread, store, and manage information.
2. Universal Accessibility means a material website or building is made so that many people can use it without any hindrance and will be equally useful for all.
3. Typewriter and telephone
4. By promoting equal opportunities, improved communication, and enhanced community participation, persons with disabilities become self-reliant and their confidence increases.

Check Your Progress: 2

1. Persons with disabilities are treated equally in each sphere of life, and their differences are respected.
2. Sense International India and Samsung, deaf blindness.
3. Smart cane, Screen Readers
4. Hearing Impairment

Check Your Progress: 3

1. Educational Institutions can very effectively provide instructions to students with disabilities through radio programmes, mobile apps, web conferencing, e-resources, teleconferencing, television programmes, etc.
2. i) Study material can be accessed from anywhere
ii) Students can be provided continuous support by the teacher through smartphones
3. Hearing aid and induction loop system

It will provide them with an interactive experience and will enhance their functional limitations to some extent.

UNIT 11 ICT FOR AGRICULTURAL DEVELOPMENT

Structure

- 11.0 Introduction
 - 11.1 Learning Outcomes
 - 11.2 ICT Perspectives in Agricultural Education
 - 11.3 ICT to Strengthen Agricultural Research
 - 11.4 ICT Perspectives in Agricultural Extension
 - 11.5 Challenges in Agricultural Information Technology
 - 11.6 Let Us Sum Up
 - 11.7 Further Readings
 - 11.8 Check Your Progress: Possible Answers
-

11.0 INTRODUCTION

Information and better communication are critical requirements for sustainable agricultural development. Modern communication technologies, when applied to conditions in rural areas, can help improve communication, increase participation, disseminate information, and share knowledge and skills.

A range of communication technologies have been used to meet the information needs of the rural population, including radio, television, newspapers, and books. Nowadays, the Internet is a new tool with the potential to contribute to rural development. The Internet enables rural communities to receive information and assistance from other development organisations and offers two-way communication opportunities.

ICT can also support the bottom-up articulation of development needs and perceptions and thus help in reducing the isolation of rural communities with government planners, development planners, development agencies, researchers, and technical experts; encourage community participation in decision-making and help agricultural researchers, technicians, farmers, and others in sharing information. New information and communication technologies are generating possibilities to solve problems of rural poverty inequality, bridging the gap between the information-rich and information-poor and supporting sustainable development in rural areas.

Agricultural ICT is the new global level wave. Private and public sectors engaged in agriculture, consultancy, marketing enterprises, hybrid plants, fertiliser industry, pesticide, seed, floriculture, medical plants industry, farm equipment manufacturers and drugs are developing Agricultural Information and Communication Technology divisions to provide new avenues and research output.

11.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the significance of information and communication technologies (ICT) in agricultural education, research, and extension.
- Analyse the potential of ICT tools and platforms in strengthening agricultural research, knowledge sharing, and community participation for sustainable rural development.
- Identify and evaluate the challenges of implementing ICT in agricultural information technology and propose strategies to address them effectively.

11.2 ICT PERSPECTIVES IN AGRICULTURAL EDUCATION

1. **ICT to be a global agriculturist:** Under the changing economic and industrial growth dynamics, agriculture has to undergo changes with new approaches. Therefore, an experiential system in agriculture has a strong potential for imparting better training to agricultural technocrats with a high level of skill in combination with the modern outlook and management capacity. To prepare the agricultural graduates for the new millennium, the agricultural graduates should be given exposure to International Agriculture, World Trade Organisation, Trade Related Intellectual Property Rights, Global Conventions on Climate, Biodiversity and Desertification, Computer Technology and Patent and Trade Literacy. ICT can play an imperative role in giving exposure to agricultural students to be able to compete in the new millennium.
2. **ICT to harness the frontline sciences:** To facilitate agriculturists' knowledge of the frontline sciences, there is a need to train them in the new areas of Biotechnology, Space **Technology**, Renewable Energy Management, Agricultural Economics, and agri-business management. ICT can provide opportunities to scientists and agricultural graduates who are trying to develop agriculture with the help of modern sciences.
3. **ICT to generate job opportunities for agriculturists:** With the expansion of ICT in agriculture, ICT-related jobs could be provided to agricultural graduates. Governments, many NGOs, institutions, and private organisations have started to create websites related to agriculture for Indian farmers. In the creation of farmer-friendly content for agricultural sites, there is wide scope for agricultural graduates to be involved in this business.
4. **ICT to make agricultural education understandable:** Agricultural education includes many sciences. The teacher must present them effectively to make education more interesting and help students understand difficult concepts easily. Many topics like pests and diseases of crops, deficiency of micronutrients in crops, viruses, pathogens, and many other topics cannot be taught with the help of lecture methods unless coupled with the audio-visual form of presentation. Using ICT

through multimedia is the best solution to teach such topics to learners. It is a system by which one can integrate the three senses: visual, audio and tangible. Multimedia, thus, involves the interactive use of images and animation (visual), speech, music (audio), text and data (tangible) on the same screen. Interactive multimedia is computer-centred, and with rapid developments in software capabilities, there are immense potentialities in professional education, especially technical and management education. Computer-aided learning using multimedia is likely to alter learning patterns significantly.

5. **ICT to create Digital Agricultural Libraries:** Libraries, which until recent times were essentially stacking print material, have now begun to acquire electronic media like CD ROMs and multimedia packages. In the coming years, the quantity of electronic material is likely to increase substantially, and it is clear that libraries will have to prepare themselves for conversion to electronic libraries. Such libraries can provide much-diversified information as they make use of information highways and databases.
6. **ICT for the Growth of Distance Agricultural Education:** The major problem faced by the people in most developing and underdeveloped countries is that they have less opportunity for higher education for various reasons. Recognising the need to provide them with higher education, many Universities have offered distance education. Some of the post-diploma and certificate educational programs on agricultural subjects can be run by distance learning. This can be done effectively by offering a learner-friendly way of learning higher distances through information and communication technology.
7. **ICT for Online Agricultural Education:** Online education principally refers to teaching through the Internet or Universities and institutions that offer online courses on their websites. In this case, the students execute all the activities online with the help of the Internet, from taking admissions, attending virtual classrooms, downloading study material through email, and sending feedback through chat, e-mail, or videoconferencing on the computer, etc. This online education process has been made possible only through advancements in information and Communication Technologies.

Check Your Progress: 1

Note: 1) Use the space given below for your answers.

2) Check your answers with those given at the end of the unit.

1. How do modern communication technologies, such as the Internet, contribute to sustainable agricultural development in rural areas?

.....
.....
.....
.....

2. What are the key roles of ICT in agricultural education, research, and extension activities?

.....
.....
.....
.....
.....
.....

11.3 ICT TO STRENGTHEN AGRICULTURAL RESEARCH

- 1. Research Priority:** Under the changing global context, India will be affected by the entire process of agricultural research. Identifying thrust areas of agricultural research will be based on global needs. The talent to differentiate between what is urgent and what is important will be key to success in deciding priorities.
- 2. ICT for Agricultural Scientists:** Many innovative branches of science are being used to develop agriculture. Meteorology, seismology, and biotechnology are good examples. Globally, biotechnology has been emerging as a frontline area of science. Agricultural scientists can use the database available with all biotechnology centres through ICT.
- 3. ICT to receive feedback for research:** With the help of ICT tools like the Internet, teleconferencing, videoconferencing, etc., the feedback of the technology users can be received to decide areas of modification.
- 4. ICT to avoid research duplication:** Agricultural scientists can develop inter-institutional relationships by connecting themselves through information and Communication Technology with other research institutions to avoid duplication of research efforts.
- 5. ICT for agricultural research evidence:** Documentation is evidence or information constituting an account of something that has occurred. It provides information based on the nature of various subjects of agriculture. The documents of the research record play a vital role in guiding and supporting other research workers. Two types of records can be made available on the Internet: textual and non-textual documents. Textual documents present their information exclusively in the form of written text to be read, e.g. books, periodicals, catalogues, statistical compendia, trade publications, patents, etc. Non-textual documents may contain some text, but the important part is presented in some other form, e.g. maps, graphs, diagrams, posters, paintings, photographs, slides, sound tapes, films, videotapes, artistic monuments, and magnetic documents. ICT can play a significant role in research documentation.

6. **ICT in research announcements:** Certain ICT intermediaries, such as Data Centres, Information Centres, and Libraries, allow the producers of agricultural information based on research to first disseminate information to pass on to the end users.

11.4 ICT PERSPECTIVES IN AGRICULTURAL EXTENSION

1. **To Strengthen Extension Management:** Agricultural extension can be managed effectively by five important prerequisites viz 1. Regular training and maintenance of extension workers and functionaries at various levels of specific knowledge and skills; 2. Monitoring and understanding constraints. 3. Strong information, documentation, and publication support; 4. Effective institutional network for synergetic support, 5. Develop national and international linkages. ICT can play a significant role in all these agricultural extension and management prerequisites.
2. **ICT to strengthen elements of agricultural communication:** Agricultural communication is a very challenging job, where ample concern is required among the communicators to handle all communication elements. Many research studies have concluded that expected results do not come out due to a lack of skill in handling all the elements of communication. The use of the Internet can be very convenient in overcoming some of the barriers and strengthening the effectiveness of elements in the present system of agricultural communication, such as 'communicator', message, channel, treatment of message, audience, and feedback. There are other solutions for agricultural communication than the Internet, but it supports all the elements of communication and extension.

11.5 CHALLENGES IN AGRICULTURAL INFORMATION TECHNOLOGY

Farming, a major occupation for the majority of the Indian people, has encouraged the Indian Government to use IT for effective development in agriculture. Despite all these efforts and developments, serious challenges can be overcome if we implement reforms quickly.

1. Agriculture Information Professional Skills

The information society in agriculture lacks professional information skills. A few of these skills are the ability to add value to agricultural information, evaluate agricultural information, and organise and store agricultural information for effective retrieval by users. Also, awareness of technology skills and subject expertise, familiarity with research methods, agricultural knowledge delivery mechanisms and their management, and knowledge of legal, economic, and political aspects of agricultural information are important professional skills required in agricultural information society. Other challenges in agricultural information professionals' skills are methods of disseminating

agricultural information, IT-based agricultural messages presentation, editorial and publication skills and training, education, and consultancy skills.

2. Agricultural Information Management Skills

Agricultural information is considered the most significant resource, and that is why information is also treated as the blood of agricultural management in the context of decision-making. In the absence of awareness regarding various kinds of agricultural management, the information manager cannot enjoy the right benefit of the right information in the undertaken stage of decision-making. Hence, management skills are required by information professionals at various stages of the information cycle. These skills are of utmost importance, which may include understanding the agricultural organisational culture, agricultural project management, change management, agricultural strategic planning, agricultural financial management, human resource management, communication skills, marketing skills, vision, creativity and liaisoning, and negotiating skills.

3. Modern Knowledge of Agriculture Business

Information professionals in agriculture must keep one eye on the present and another on the future. He should not be confined to his subject. Still, considering modern agricultural technological innovations, the availability of better software development tools and better communication techniques, he must continuously update himself. Agricultural information professionals need to know present trends and developments in hardware, software and communication technologies, agricultural information exploration and visualisation, means of preservation of information, Internet, and its efficient use for quick access of desired information, and agricultural technology for intellectual property protection.

4. The challenges of information managers

Agricultural information should remain information rather than misinformation. Incorrect information may have negative consequences, damaging the entire plan or strategy. An agricultural information manager is responsible for creating a useful link between the farmers and the information. When information is mishandled or poorly presented, it loses its value, and the same may cause negative effects on the emotions of its users. To overcome such a situation, the information managers have to analyse the information-seeking behaviour, analyse the information-seeking behaviour, analyse the user's needs from time to time, be aware of the consequences of the misuse of the information and its impact, help the farmers learn the techniques for efficient retrieval of information. In addition to these, he should make the appropriate use of information in a suitable situation., keep a constant watch on the information flow within the agricultural enterprises, evaluate systems and procedures from time to time, review policies from time to time in the light of emerging trends, strike a balance between the existing needs

and changed needs of the system and take necessary steps to implement the expected changes maintaining a balance between supporting and opposing forces.

5. Strategies to sustain

Nowadays, in the information age, we must implement the right techniques for storing, operating, and communicating the desired information with the resources of well-organised retrieval mechanisms. In this regard, the basic principle of reference should be "Right Information for the right user at the right time in the right form" The development of human resources in the information science profession needs to be thought of for the development of existing professionals into potential professionals.

India has incredible prospects in software development. It must amend its policies for information dissemination from time to time considering technological innovations and user's changing needs. For survival in the information age, we need to establish an Information Service Committee to perform important tasks like drawing up the standards and labour division for database design, drawing up network plans and laying technical standards, identifying appropriate software and popularise their applications nationwide, determining standards and protocols for parallel effort in the labour division and cooperation for document acquisition and resource sharing and database contribution.

6. Information infrastructure

Infrastructure is the main component of every system. The same is also applicable to Agricultural Information Systems. Information infrastructure includes accessible networks of telecommunications, computing tools, libraries at organisations and state agricultural universities, information centres at the village level, and similar setups to transport, manipulate, store, and disseminate information efficiently. To determine future demand for infrastructure, it is essential to consider the efficiency of operations and how well the services generated respond to users. There are diverse and unique problems for each sector, and some of the common challenges of information infrastructure development in India are operational inefficiencies, inadequate maintenance, excessive dependence on public and external resources, unresponsiveness to user needs, meagre benefits to people with low incomes and lack of sufficient environmental responsibility.

7. Responsibilities of Development Agencies

Different agencies must come forward and help in their respective areas. Many agencies like the World Bank, FAO, IDRC, and IFAD support expanding Internet services. The Internet is the panacea for removing constraints to agriculture and rural development. Still, it brings all new information resources together and can open new telecommunication channels to rural and farming communities. It offers ways to bridge the gap between the agricultural development community and farmers through dialogue, interaction, new alliances, and interpersonal networks.

8. Proper information policy

There must be an ordinance of governance for every plan. Along the same lines, we should also have an ordinance of governance for information as the most important resource, an Information Policy. Information policy is a broad general plan of action to be adopted by an organisation or government. The legislature or the courts can enact such policies or emerge from international organisations and regulatory bodies. The main objectives of an Information Policy statement are to:

- Identify the user's needs.
- Intensify bibliographical control of all types of information resources.
- Identify the information products and services.
- Development of workforce
- Standardisation in all the components of library and information centres
- Promote international information cooperation.

At present, there are hardly any national library and information services programmes for the development of library and information activities by the union government, state/union territory governments or other agencies in the country. As a result, existing programmes continue to develop uncoordinatedly throughout the country. This national policy can serve as guidelines for developing and improving library and information services in the country in the coming years. The Indian Information Policy must cover all user needs, information resources, manpower, standardisation, etc.

9. Intellectual Property Rights

Intellectual Property Right (IPR) is a general term that covers copyrights, patterns, registered designs, and trademarks. Developed countries demand protection against piracy, while developing countries feel that such protection will prevent the entry of newcomers. The new information society needs a free flow of information, while IPR is a hurdle. The World Trade Organisation (WTO) should treat the IT industry as a priority area and provide requisite facilities, viz. concessional tariffs, and subsidies to developing countries. This may help prevent piracy of IT products and provide global access to electronic information.

Development in modern digital technology has led to a review of the provisions of intellectual property rights both at the national level and in many countries. Developing countries are also catching up with this trend as the value of intellectual property rights is increasingly felt. The following issues must be taken up in this regard:

- Copyright regulations and legislation
- Influence of Internet

- Problems and concerns in cyberspace
- Usage of digital signatures
- Security of information over networks

The Information Society is facing many challenges due to a lack of information Professional Skills, Information Management Skills, and Up-to-date Subject Knowledge. Making available proper information infrastructure, information management techniques, and Intellectual Property Rights (IPRs) will certainly make the Information Society of the 21st century a grand success. We must carry out the suggested strategies to ensure the survival of tomorrow's information society.

Check Your Progress: 1

Note: 1) Use the space given below for your answers.

2) Check your answers with those given at the end of the unit.

1. What are the challenges associated with implementing ICT in agricultural information technology, and how can they be effectively addressed?

.....
.....
.....

2. How does ICT contribute to bridging the gap between information-rich and information-poor communities in rural areas?

.....
.....
.....

3. How can ICT tools and platforms be leveraged to enhance community participation and engagement in sustainable agricultural development?

.....
.....
.....

11.6 LET US SUM UP

ICT-based agricultural information is slowly but surely building up. Policymakers still have a lot of work to do. Many organisations are supporting SAUs in digitising their technical information on the Web. At the same time, research and training organisations, both in public and voluntary sectors, are being supported in building their capacity to digitise the rural and agricultural information and make it available on the WWW. Efforts are being made to connect various districts of our country to the Internet so that the farmers can get all the technical information on the Web sites. If ICT is made available to all Indian villages to benefit from agricultural research, a positive change in the face of rural development will be possible.

11.7 FURTHER READINGS

1. Chaudhuri, B., & Kendall, L. (2021). Collaboration without consensus: Building resilience in sustainable agriculture through ICTs. *The Information Society*, 37(1), 1-19.
2. Mahant, M., Shukla, A., Dixit, S., & Patel, D. (2012). Uses of ICT in Agriculture. *International Journal of Advanced Computer Research*, 2(1), 46.
<https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=eef1a7c053cbf6b783734f69448e5fdeea24d483>
3. Saidu, A., Clarkson, A. M., Adamu, S. H., Mohammed, M., & Jibo, I. (2017). Application of ICT in agriculture: Opportunities and challenges in developing countries. *International Journal of Computer Science and Mathematical Theory*, 3(1), 8-18.
<https://www.iiardjournals.org/get/IJCSMT/VOL.%203%20NO.%201%202017/Application%20of%20ICT.pdf>
4. Singh, S., Ahlawat, S., & Sanwal, S. (2017). Role of ICT in Agriculture: Policy implications. *Oriental Journal of Computer Science and Technology*, 10(3), 691-697. <https://www.computerscijournal.org/vol10no3/role-of-ict-in-agriculture-policy-implications/>
5. Spielman, D., Lecoutere, E., Makhija, S., & Van Campenhout, B. (2021). Information and communications technology (ICT) and agricultural extension in developing countries. *Annual review of resource economics*, 13, 177-201.
6. Tiwari, S. P. (2022). Information and communication technology initiatives for knowledge sharing in agriculture. arXiv preprint arXiv:2202.08649.
<https://arxiv.org/ftp/arxiv/papers/2202/2202.08649.pdf>

11.8 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1:

1. Modern communication technologies, including the Internet, facilitate improved communication, increased participation, information dissemination, and knowledge sharing in rural areas. These technologies enable rural communities to access information from various sources, connect with development organisations, and engage in two-way communication. They also support the bottom-up articulation of development needs, reducing the isolation of rural communities and fostering collaboration with government planners, development agencies, and technical experts. The Internet, in particular, offers opportunities for community participation in decision-making and enhances information sharing among agricultural stakeholders. Overall, modern communication technologies play a crucial role in addressing rural poverty, reducing inequality, and promoting sustainable development in agricultural sectors.

2. ICT plays a pivotal role in agricultural education by providing access to educational resources, facilitating distance learning programs, and enhancing interactive learning experiences. In agricultural research, ICT tools and platforms strengthen knowledge sharing, data collection, analysis, and dissemination, thereby accelerating research outcomes and innovation. Additionally, ICT supports agricultural extension activities by enabling the delivery of timely information, advisory services, and training to farmers, extension workers, and rural communities. Through ICT, extension services can reach remote areas, promote best practices, and foster community engagement for sustainable agricultural development.
3. Information and communication technologies (ICT) empower rural communities by facilitating access to information, fostering communication channels, and enabling participation in decision-making processes and development initiatives. ICT platforms provide rural residents with valuable resources, such as agricultural knowledge, market information, and government policies, empowering them to make informed decisions about their livelihoods. Furthermore, ICT enables two-way communication between rural communities and various stakeholders, including government agencies, development organisations, and technical experts, fostering dialogue, collaboration, and collective action. By leveraging ICT, rural communities can articulate their development needs, voice their concerns, and actively contribute to shaping policies and programs that address their priorities and aspirations.

Check Your Progress 2:

1. Implementing ICT in agricultural information technology faces several challenges, including limited infrastructure, inadequate technical skills, low digital literacy levels, and affordability issues in rural areas. Additionally, concerns regarding data privacy, cybersecurity, and sustainability hinder ICT adoption in agriculture. To address these challenges effectively, stakeholders need to invest in expanding ICT infrastructure, providing training programs to enhance digital skills among agricultural stakeholders, and promoting awareness campaigns to improve digital literacy rates. Moreover, collaborative efforts between governments, private sector entities, and development agencies are essential to ensure equitable access to affordable ICT solutions and overcome barriers to adoption. By addressing these challenges comprehensively, ICT can unleash its full potential in transforming agricultural systems and promoting sustainable rural development.
2. Information and communication technologies (ICT) play a crucial role in bridging the gap between information-rich and information-poor communities in rural areas by providing access to valuable resources and knowledge. Through ICT platforms, rural residents can access a wide range of information related to agriculture, market trends, weather forecasts, and government schemes, empowering them to make informed decisions about their farming practices and livelihoods. Moreover, ICT

facilitates knowledge sharing and capacity building initiatives, enabling information-poor communities to learn from best practices and innovative solutions adopted by their counterparts. By reducing information asymmetry, ICT fosters inclusivity, empowerment, and socio-economic development in rural areas, ultimately bridging the digital divide and promoting equitable access to opportunities and resources.

3. ICT tools and platforms offer various opportunities to enhance community participation and engagement in sustainable agricultural development initiatives. Firstly, digital platforms can facilitate interactive communication channels, allowing stakeholders to exchange ideas, share experiences, and collaborate on projects. Secondly, mobile applications and online forums can enable farmers and rural residents to access extension services, market information, and training materials, promoting continuous learning and capacity building. Thirdly, ICT-enabled participatory approaches, such as crowdsourcing and citizen science initiatives, empower communities to contribute data, insights, and feedback, thereby co-creating knowledge and informing decision-making processes. By leveraging ICT, stakeholders can harness the collective intelligence and creativity of rural communities, fostering ownership, inclusivity, and sustainability in agricultural development efforts.

Block

4

FUTURE OF ICT4D

UNIT 12

Characteristics of Knowledge Society

UNIT 13

Knowledge Society: Developing Countries Perspectives

UNIT 14

E-Governance Policy and Framework

BLOCK 4 INTRODUCTION: FUTURE OF ICT4D

The first three blocks of this course gave a holistic view of the broad spectrum of technological interventions in diverse domain areas. This Block takes you to understand the efforts of various stakeholders in building a knowledge society. What are the opportunities and challenges of creating or strengthening the information society or knowledge society from the developing countries' perspectives? You will understand this focus area through the following units.

Unit 12 - Information/Knowledge Society Characteristics. In this unit, we explain the institutional concepts and dynamics shaping our modern world, driven by information. We will explore the essence of information and its evolution into a knowledge-based society. You will understand the distinctions between key terms such as data, knowledge, and wisdom and grasp their unique roles in shaping our understanding of the world. From exploring the information transfer chain to dissecting the emergence of information and knowledge societies, this Unit offers a comprehensive view of our interconnected digital age.

Unit 13 - Knowledge Society—Developing Countries Perspective. Throughout history, human progress has hinged on knowledge, shaping our understanding of the world, and driving societal evolution. In this Unit, we explore the transformative impact of the Information Society and its emergence. From exploring the dynamics of information economies to dissecting the digital divide, we aim to equip you with insights into the complex interplay between technology, economics, and development.

Unit 14 - E-Governance Policy and Framework. In this Unit, we will explore the dynamic landscape of e-governance, unravelling its intricacies and significance. Also, this Unit covers concepts of Information Technology and Information System Management and the foundation for understanding e-governance workings. Through in-depth discussions on various models, projects, and partnerships, you will learn the complexities and potentials of e-governance in our modern world.

Technology is always a powerful tool, but it needs to be integrated into any societal segment from a holistic approach, considering the various roles and capacities of stakeholders. The success of leveraging technology interventions is based on the broad integration of resources in this process. This course will help you understand the nuances of this relationship.

UNIT 12 INFORMATION / KNOWLEDGE SOCIETY: CHARACTERISTICS

Structure

- 12.0 Introduction
- 12.1 Learning Outcomes
- 12.2 Basic Concepts: Information and Other Related Concepts
- 12.3 Definitions and Interpretations
 - 12.3.1 News
 - 12.3.2 Data
 - 12.3.3 Information
 - 12.3.4 Knowledge
 - 12.3.5 Wisdom
- 12.4 Information Generation Process
 - 12.4.1 Research and Development
 - 12.4.2 Survey and Census
 - 12.4.3 Government Activities
- 12.5 Information Transfer
 - 12.5.1 Information Transfer Chain
- 12.6 Information Types, Requirements and Users
 - 12.6.1 Information for Education
 - 12.6.2 Information for Entertainment
 - 12.6.3 Transaction type of Information
 - 12.6.4 Problem Solving or Decision Support Information
 - 12.6.5 Information Users and Their Requirements
 - 12.6.6 Information and its Impact on Society
- 12.7 Information Society
 - 12.7.1 Definitions and Meaning of Information Society
 - 12.7.2 Factors Determining the Arrival of Information Society
 - 12.7.3 Different Perceptions of Information Society
- 12.8 Knowledge Society
 - 12.8.1 Definition of Knowledge Society
 - 12.8.2 Features of Perfect Knowledge Society
 - 12.8.3 Developing Countries
- 12.9 Let Us Sum Up
- 12.10 Further Readings
- 12.11 Check Your Progress: Possible Answer

12.0 INTRODUCTION

Information has long played, in one fashion or another, a key role in society. We are all consumers of Information. “If physically we are what we eat,

mentally we must be the Information we have absorbed.” Access to information affects our lives in ways that range from economic well-being to privacy rights, from workplace management and monitoring to policy decisions and daily wants to transnational business. With the growth of interactive media and Internet communication, access questions assume greater importance. Access can be understood from the perspective of those without access to information.

Information is generated from all human activities and achievements. Both individuals and corporate bodies are engaged in creating information for some purpose or another. For example, Research and Development activities generate new information, which is used as the basis for bringing forth more information. Likewise, a state (country) with its organs of the legislature, executive and judiciary, business and industry produces large quantities of information, contributing greatly to its growth.

In this Unit, we shall examine the concept and meaning of information and try to understand related terms such as data, knowledge, intelligence, and wisdom.

These words are often used interchangeably in common parlance, although each is different in meaning and use. The Unit explains this aspect with examples. After determining the information needs of a wide range of users, the information transfer process from generators to users is discussed.

The Unit also introduces you to the pervasive nature of information, emphasising its societal significance. It narrates the expansion of modern society into an "Information Society". The factors that have brought about a move from an "Information poor" to an "Information-rich" society are discussed, highlighting their importance.

The changing image of an "Information Society" into a "Knowledge-based Society" is explained by its significant characteristics. To make the contents of this Unit easy for the learners and enhance its utility as a learning tool, self-check exercises with brief answers are provided in the Unit.

12.1 LEARNING OUTCOMES

After completing this Unit, you should be able to:

- Understand the concept of Information and explain the meaning of the term;
- know the related terms to Information such as News, Data, Knowledge, and Wisdom and explain the difference which exists between these concepts and the fact that they cannot be used interchangeably;
- understand that different activities of individuals as well as institutions contribute to the generation and growth of Information;
- explain the ‘Information Transfer Chain’ and the different groups (stakeholders) involved in the transfer process;
- distinguish different Information types, users, and their requirements;
- comprehend the importance of Information and its social impact;

- know the meaning of the concept ‘Information Society’ and the main factors which contribute to its formation; and
- Explain what constitutes a knowledge-based society and its criteria and chief characteristics.

12.2 BASIC CONCEPTS: INFORMATION AND OTHER RELATED CONCEPTS

In this section, let us discuss Information and its related concepts, such as news, data, intelligence, knowledge, and wisdom. It may be noted that despite the importance of information to human welfare, information as “a concept” remains shrouded in loosely defined terminology. The term information has several meanings and is used in several contexts. It is one of the more overused words in the English language. Hence, people have a surprising range of ideas on what information is! Even dictionaries cannot agree on one definition. This diversity in the common usage of the term is because information is essentially intangible. We encounter it only operationally through its subjective effects. Though the layperson uses information and data interchangeably with the information professionals, the distinction between these terms is important. Knowing the precise meaning of information is necessary in library and information science.

First, Let us understand the meaning and definitions provided in important dictionaries and identify any commonality between them.

- i) The Oxford English Dictionary defines it as “that of which one is appraised or told; intelligence, news”.
- ii) The New Webster Dictionary of English Language, 1984 defines information as “News or intelligence communicated by word or in writing; facts or data; knowledge derived from reading or instruction gathered in any way.”
- iii) Random House Dictionary of English Language 1983 states that information is “Knowledge communicated or received concerning a particular fact or circumstances; any knowledge gained through communication, research, instruction.” The RHDEL has also listed two sets of words that are used synonymously with the term information: i.) Data, Facts, Intelligence, Advice and ii.) Information, Knowledge, Wisdom.

The following points can be inferred from the above:

- i) the terms news, data and knowledge contained in the above definitions are relevant to the context of library and information services;
- ii) these terms are related to the term information;
- iii) information is communicated by word of mouth or in writing; and or
- iv) information is derived from reading or instruction or gathered in any other way.

In other words, these statements imply that some people are engaged in communicating information while others are involved in its generation and

use. Hence, there are generators, communicators, and users of information.

In the following paragraphs, let us understand some definitions and interpretations related to the concepts discussed earlier.

12.3 DEFINITIONS AND INTERPRETATIONS

12.3.1 News

It is one of the terms related to information. News contains nascent or current information. It primarily relates to events occurring worldwide and is said to be more episodic and short-lived.

12.3.2 Data

There are numerous definitions of data in the literature. While it is recognised that there are differences between data, information and knowledge, there are no generally accepted definitions, and the boundaries between them depend on the author's perspective. Let us examine what data is and try to understand methods or procedures relating to data conversion into information.

"data" refers to "an individual fact, statistic, or a piece of information, or a group or body of facts, statistics or the like." [Random House Dictionary]. In broad terms, data refers to descriptions of actual states of entities. In other words, it could be a set of facts, events, measurements, opinions, or value judgments, which, as passive descriptive data, comprise the database from which information is derived. Data may describe the performance of a machine, physical process, social group, or business or represent the responses to questions concerning attitudes to a particular matter at a given time. The distinction between data and information could be equated with that between a raw material and a manufactured product. Information can be derived from data when interpreted to produce meaning. Therefore, the interpreter must possess the skills to undertake such a task, and the data available must be appropriate to the user's requirements.

The extent to which data becomes meaningful as information depends on the skills of the recipient and the extent to which he can interpret and apply data. In other words, it must be stated that when data are stored, grouped, analysed, and interpreted, they become information. Information is also derived from data when the latter is used as part of the process, where only a part of available data will be converted to information. Some suggest that information is "smoothed" instead of "raw" data. Smoothing allows users to make decisions more easily than possible with unsmoothed data.

Data may exist in different forms: symbols, letters, tables, pictures, graphs, histograms, etc. The following examples will be helpful to understand the difference between data and information:

- i) The Meteorological Department is responsible for daily atmospheric data collection on weather conditions. These data are presented in quantitative terms, e.g., tables containing rainfall or temperature figures over a period relating to different regions. Such data would be useful to the pilot of an aircraft. He/she may prefer a brief forecast of the weather conditions

based on the tables, which would indicate to him/her whether he/she would face air turbulence on the route. The processed and interpreted data in the form of weather forecasts becomes information for him/her.

- ii) A scientist studying the behaviour of a chemical compound under different physical conditions would observe and record the relevant data provided by the experiments. These data are raw facts and would not convey meaning unless the scientist filters, analyses, integrates, and finally interprets his/her findings. The resultant product then becomes information.

In this way, many examples may illustrate how data becomes information.

12.3.3 Information

“Information is a core term for librarianship and has multiple meanings and different perceptions. In this section, we shall attempt to understand why it is impossible to furnish a single definition for the concept that would satisfy everyone, and the definitions we come across in the literature are contextual in nature and confined to a specific situation or perception. Therefore, it is the writer's responsibility to clearly indicate the intended meaning of the term information. We shall try to analyse some of the definitions available in the literature and understand their significance. Let us start with a broad definition of the term: “Information may be defined as the factual data, ideas and other knowledge emanating from any segment of society that are identified as being of value, sometimes gathered regularly, organised in some fashion, transmitted to others and used in some meaningful fashion.” This definition is by no means meant as an attempt to define the field narrowly or to exclude other definitions. There is a need to consider every aspect of the term, every component of information, to allow others leeway in defining and using the term and, above all, to be as inclusive as possible.” Any definition that serves as a basis for the study of information must consider everything relating to the creation, development, organisation, distribution or transmission, receipt, use, and preservation of information. If the above requirements are fulfilled, such a definition will greatly benefit library and information workers. Now, we will consider some definitions that suit specific disciplines and contexts.

Many information scientists accept the definition “Information is data which is used in decision making.” (Yovits & Ernst, 1969) This definition has several significant derived implications. One is that information is relative quantity- relative to the situation, the time the decision is made, and the decision maker's background. What is important in one situation may not be useful in another. Also, the information valuable to one decision-maker at a particular time may be useless to another or even to the same decision-maker at a different time or situation.

Paisley (1980) suggests two ways of defining information: structurally and functionally. Structurally speaking, information is "an encoding of symbols (for example, letters, numbers, pictures, etc.) into a message communicated through any channel." Functionally speaking, in terms of what it does, Paisley suggests that information denotes “any stimulus that alters

cognitive structure in the receiver something that the receiver already knows is not information. In other words, information is what changes us. Paisley also adds that "information varies in quality, depending on its relevance, timeliness, comprehensiveness, and authoritativeness. Its value depends on not only its quality but also its specificity (distinctness of representation), locality (distinctness of location), equitability (ease of acquisition, including cost) and usability (suitability of form and content for intended use). In other words, much information is of no or low value to particular individuals at any one time. Therefore, we are obliged to develop selectivity.

The UNISIST 1979 document provides a very comprehensive but somewhat difficult definition for the concept information, which is worth noting. According to this UNESCO document, "Information is made up of symbolic elements, communicating scientific and technical knowledge, irrespective of their nature (numerical, textual, graphic, etc.), material carriers (paper print, microform, or machine-readable form) form of presentation, etc. It refers both to the substance or contents of documents and to the physical existence; the term is also used to designate both the message (substance and form) and its communication (act)."

Many significant works now deal with defining and understanding the term information and its many uses and nuances. These are essential not only to an understanding of the term's meaning and various disciplines but also to understanding the history of information. Only a few such works have been referred to in the above discussion to illustrate the point.

12.3.4 Knowledge

Knowledge is an organised statement of facts or ideas presenting a reasoned judgement or an experimental result, which is transmitted to others through a communication medium in some systemic form. Knowledge is subjective and is processed according to a point of view.

Knowledge consists of new judgments (i.e., Research and Scholarship) or presentation of older judgments as exemplified in textbooks, teaching, and learning, and collected as library and archival materials.

It must be clear from the above descriptions of data, information, and knowledge that these concepts are interrelated in the sense that one is the building block of the other. In other words, data is the building block for information, and information is the building block for knowledge.

Much of the confusion arises because these distinctions are ignored in common and popular usage of these words. They are used interchangeably, and information often stands for knowledge or data. However, as library and information professionals, we must understand their distinctions and interrelationships and serve them according to the users' needs.

Data, information, knowledge, and wisdom are the goods acquired and perfected by the mind. They are not of equal value in terms of utility and application. Rather, they ascend in the scale of values, with data having the least value and wisdom the greatest. These concepts constitute valuable

intellectual assets and are the most precious human capital in all development processes.

12.3.5 Wisdom

Wisdom is an individual trait that comes to one through acquiring sound knowledge and related values based on age and experience. This trait, among others, comprises the ability to see far ahead into the future, have a vision of things to come, and make judgments in selecting the right alternatives, among several others available for making a decision. While wisdom is the highest form of knowledge, it cannot be transferred; it is only acquired. Wisdom comes with the application of knowledge.

To conclude, data, information, knowledge, and wisdom can be viewed as a part of a continuum with no clear boundaries.

Check Your Progress: 1

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit.

- 1) Explain the difference between the concepts of data, information, and knowledge.
-
.....
.....
.....

12.4 INFORMATION GENERATION PROCESS

In the earlier sections of this Unit, we learned about the concept of information and its related concepts of data, knowledge, and wisdom. We have understood that "information" is all-pervasive, a basic resource/commodity, power, etc. In this section, we shall try to know:

- i) How is information acquired or generated?
- ii) Who are the producers of information?
- iii) Who are its users? and
- iv) How does it reach from the place of its generation to its place of use?

As has already been stated, information is the product of different human activities and events. Individuals or organisations undertake activities in pursuance of certain objectives. For example, Research and Development organisations produce information. Let us try to understand how this is done.

12.4.1 Research and Development

Research Organisations in science and technology, social sciences and humanities have been established specially to conduct research in their respective fields. Research is a creative activity that contributes to the growth of knowledge for the benefit of society. It is a highly organised activity

worldwide that continuously creates new information. In recent times, there has been a dramatic growth in research organisations and research workers in all branches of knowledge. Governments are allocating more and more funds to conduct research. The progress of a nation is often judged by the percentage of national income spent on research and development(R&D). Research output constitutes a major part of the information handled by libraries and information centres. There has been a large-scale growth of information after the Industrial Revolution. This phenomenon is characterised by the term "information explosion". Academic institutions also conduct research as one of their major tasks besides imparting education.

12.4.2 Survey and Census

There are also organisations which are set up specifically to gather statistical information. They carry out this activity using surveys and censuses.

One of the most important organisations in this respect is the Office of Registrar General, which is responsible for conducting decennial censuses to collect population data that constitute the basic information about the demographic nature of the country. Surveys and censuses are regarded as auxiliary research activities and are one of the sources of information generation.

12.4.3 Government Activities

The government is one of the generators of information. Information gets generated as a by-product of the activities of different government organisations and their agencies. These organisations perform their tasks as a matter of routine. For example, the police department has been established to maintain law and order. It is their routine administrative task. The activities of these departments, in turn, generate information about many burning topics such as dowry deaths, corruption, terrorism and the like. The Planning Commission and State Planning Departments of government have generated enormous information on almost all socio-economic issues. A major part of the information (both statistical and descriptive) needed by social science researchers in academic institutions and decision-makers in governments, businesses, and industry emanates from governmental sources.

Besides the administrative organs of the government, the legislative and judicial bodies also contribute to the growth of information, e.g. the basic sources of legal information are the legislatures, which enact different laws, and the judiciary, which interprets the laws when disputes arise in their implementation and enforcement.

Apart from the government and its agencies, business and industrial organisations generate vital business and industrial information during their regular activities.

Check Your Progress: 2

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit.

- What is meant by Generation of Information? Give a few examples of institutions and organisations that generate information.

.....
.....
.....
.....

12.5 INFORMATION TRANSFER

Implied in one of the definitions of the words “knowledge” and “information” is the concept that an item of knowledge becomes an item of information when it is “set to motion”. When it enters the active process of being communicated or transferred from one or more persons, groups, or organisations (receive). Many people will argue that knowledge, as defined here, has no intrinsic value, but its value will be realised only when it is successfully transferred. Others argue that the value of information cannot be realised until it is actively applied in decision-making. Either of the viewpoints must necessarily concede that value is dependent upon transfer. Thus, information transfer is an important aspect explained in this section.

12.5.1 Information Transfer Chain

The process of flow of information from its source of generation (generator) to its place of use (user) is called information transfer. Before the generated information reaches the user, it passes through certain points known as links. The flow of information from the point of generation to the point of use through all-in-between points (links) forms a chain known as an information transfer chain. The flow of information might follow different paths known as channels. There are many paths through which information may reach the user. The partners in the information transfer chain and the channels through which information reaches the end users are represented in Fig. 12.2.

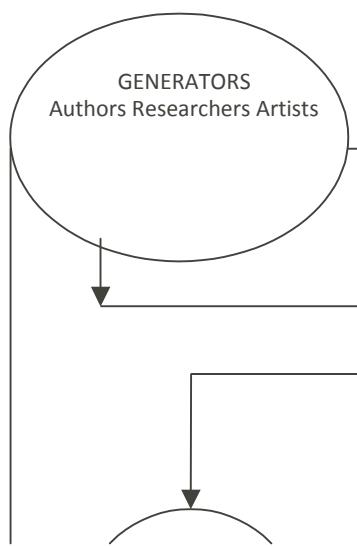


Fig. 12.2: Information Transfer Chain

Check Your Progress: 3

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. What do you understand by the expression “Information Transfer Chain”?

.....
.....
.....
.....

2. Why do researchers need information?

.....
.....
.....
.....

12.6 INFORMATION TYPES, REQUIREMENTS AND USERS

Just as we have seen that the word information has no single universally accepted definition, there is no single way we can classify information. The types of information could be grouped using different criteria depending upon the purpose of such a classification. However, in the broadest sense, information falls into four categories: i) education, ii) entertainment, iii) transaction, and iv) problem-solving or decision-making. Of these four categories, the fourth one is to be considered to be very important.

12.6.1 Information for Education

Students increasingly utilise this category of information in their academic pursuits. Teachers also need this type of information to impart education to their students. Researchers use information based on their research activities. A researcher needs information for three purposes: i) to keep up with the developments in his/her area of specialisation,

ii) to know the state of the art of his/her specialised subject, and iii) to gather specific data and information needed at different stages of his/her research work.

12.6.2 Information for Entertainment

Every individual desire to obtain information relating to entertainment, depending upon the types of entertainment he/she is interested in, such as music, sports, films, etc. Therefore, this type of information forms a part of human existence, and the need for it cannot be underestimated.

12.6.3 Transaction type of Information

Industrial firms and business houses mostly use transactional information. Financial institutions and business houses generate large quantities of transaction information for internal and external use. Marketplace actors use information to make decisions and control processes, while sellers in exchange transactions use information to determine the best price to charge for an item.

12.6.4 Problem Solving or Decision Support Information

According to the definition provided by the Information Industry Association of USA, "Information is the resulting work product when data elements are organised and communicated in a useful form to reduce uncertainty. (e.g., to help to answer a question, to solve a problem, or to form the basis for action)." We must view information within the decision-making process and distinguish among levels and types of information users and how they utilise information. This aspect is discussed in the next section.

12.6.5 Information Users and Their Requirements

User studies like NSF and others have shown substantial differences in information-seeking behaviour and use among professional groups. Distinctions have been identified due to differences in training, personality characteristics, professional requirements, work structure, etc. Each professional group exhibits specific characteristics vis-à-vis its information-seeking behaviour and use. Some of the professional groups are:

i) Scientists, ii) Engineers, and iii) Executives.

i) Scientists

Scientists, as information users, can be characterised as follows:

- they produce documents, and they contribute to the information flow as well as draw on it;
- their work progresses over long periods;
- they are interested in theory and source data;
- they browse literature for idea exploration and formulation;
- they seek comprehensive information and find bibliographies helpful.

ii) Engineers

Engineers as information seekers possess the following characteristics:

- have a focused direction of enquiry;
- their primary object is to produce products;
- They seek reliable answers, not guides to sources of information, and so do not require bibliographies on subjects of interest. They merely require information which will help them in solving their problems;
- they require objective information and

- work within time constraints.

iii) Executives

Executives, especially those people who are policymakers, have different information requirements. Some of the requirements of this group are:

- they rely heavily on evaluated, aggregated data;
- they make a variety of short, medium, and long-term decisions;
- more often, with a good deal of information (70% of information is considered enough), they can solve their decision problems;
- they seek options (alternatives) rather than answers in utilising information;
- subjective (human) judgement plays an important role in executive decision-making processes.

There are undoubtedly additions to these listings as well as exceptions. However, they serve to separate and distinguish and create awareness that not only does each group of professionals require information, but the characteristics and attributes of information are specific to the profession.

12.6.6 Information and its Impact on Society

Information and knowledge are deemed to be social wealth. The benefits of this social wealth should be available to all members of society. This social wealth is available in various physical forms (e.g., books, periodicals, microforms, etc). An ordinary citizen requires a variety of information. The use of information certainly affects one's mental growth and changes one's outlook and lifestyle.

The impact of information and knowledge may also be noticed in several human activities. Some of these are education, Research and Development, Government activities, mass communication, etc. Society has undergone significant changes at various periods of human history, and information use has been cited as one of the most important agents of this change. Three stages are generally identified during societal evolution. These are the agrarian society, the industrial society, and the post-industrial society. In all these societal transformations, information played a vital role. The emergence of post-industrial society in the 20th century is based on technological developments and the revolution in the organisation and processing of information and its subsequent use.

12.7 INFORMATION SOCIETY

Society is a dynamic and open system. Open systems exist in a state of flux, continually reacting and adjusting to changing conditions and development from within and outside the system. Generally, the changes are evolutionary. However, revolutionary factors or influences may sometimes arise, forcing a more abrupt and drastic modification in the social system and resulting in whole-scale transformations in social institutions and relationships.

Scholars, philosophers, and scientists have been predicting such a revolutionary transformation of modern society since the Industrial Revolution was accepted as an example of revolutionary social transformation (Machlup, 1962). There have been many predictions and discussions about the implication of such a transition in several writings across different disciplines. Nevertheless, there has been little consensus on the causes and results of the predicted social revolution. There are almost as many labels for the resulting society as there have been treatments. Though different causes have been identified as transformations, most authors agree that the driving forces behind the social transformation result from the rapid development and diffusion of Information Technologies. The basic aspect that has been emphasised is that information is rapidly becoming an important resource behind the industrial development of the nations. The most appropriate means to depict the process in the community is by the expression "Information Society". However, there is considerable debate on the precise nature of this new "Information Society" concept.

The idea is that the advanced societies are experiencing a transformation to Information Society, economically based on the exploitation of microelectronic, computing and telecommunication technologies. In the following subsections, let us discuss the Information Society concept, its origin, the main factors that determine its arrival, and whether the concept has some basic economic connotation as an Information Economy.

12.7.1 Definitions and Meaning of Information Society

Branscomb (1986) states, "It is a society where the majority of people are engaged in creating, gathering, storing, processing or distributing information".

Manfred Kochen (1987) writes that the simple notion of society in which information rather than material flows constitute most of its "communication and control" exchanges is extended to stress that:

- a) most members generate knowledge by knowledge-based- based procedures that are knowledge-intensive;
- b) information consistently reflects basic social invariants;
- c) Rather than strength and practicality, reason and human values manage conflicts between pressures to conserve invariants and to adopt change.

Having stated all this, Manfred Kochen adds 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 is 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 widespread and until the first information society appears". Ronfeldt (1992) thinks that "Information Society" sees the steady blurring of the boundaries, which presently separate computer hardware, communication systems and satellites, global networks and more". While none of the above-quoted definitions is wrong, they emphasise the fluidity of the present situation,

which suggests that what is likely to emerge- and certainly in the short term- *is a series of parallel information societies between which users switch according to their needs*. The convergences of these separate structures may or may not come according to the type of information society which finally emerges.

Another expert, Martin (1978), maintains that " the term (information society) has come to represent societies at an advanced post-industrial stage, characterised by a high degree of computerisation, large volume of electronic data transmission and an economic profile heavily influenced by the market and employment possibilities of Information Technology".

The Information Society concept closely affinities with Daniel Bell's post-industrial society theory. 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 the socio-economic system, namely, the centrality of theoretical knowledge. The emerging social framework of the Information Society builds upon this base. Information increasingly becomes *a source of added value and, thus, wealth*. A growing portion of workers is employed in the "Information Sphere".

12.7.2 Factors Determining the Arrival of Information Society

When we use Information Society, we usually mean society as a whole. The problem is distinguishing an information society and whether it has arrived. We must listen to the commentators and leaders to perceive the signs around us. The Information Society is a direct consequence of:

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

However, Cawkell opines that the prerequisite 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 Bell, the term refers mainly to the social structure of post-industrial society. It describes a society's characteristics and structure in 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 the computer is used extensively in national-scale projects;
- management-based computerisation in both government and business;
- society-based computerisation in which computers will be used for the

benefit of society as a whole;

- Individual-based computerisation, where each individual has access to the terminal and computer information to solve problems, will allow creativity to flourish in this high-mass knowledge creation society.

In other words, the most advanced stage of the Information Society is a high-mass knowledge creation society.

From the above discussion, a high degree of computerisation, large volumes of electronic data processing and employment of Information Technology with telecommunication-based information service infrastructure are the main criteria that signify whether a society or nation has become an Information Society.

12.7.3 Different Perceptions of Information Society

Even though schemes are possible, we may categorise the literature on the Information Society into broad groups, each representing a unique perspective. In this connection, it is worth noting that Webster distinguishes and presents five different perceptions of the Information Society based on technological, economic, occupational, spatial, and cultural criteria. Let us try to understand these perceptions of the Information Society.

Technological Perception

The most common perspective of the Information Society emphasises spectacular technological innovation. The important idea is that breakthroughs in information processing, storage and transmission have led to the application of Information Technologies (IT) in virtually all areas of society. Although information technology occupies a central role in all the literature on information society, this perspective emphasises the technological infrastructure and excludes other social, economic, and political attributes. Martin provided several scenarios detailing life in the Information Society, especially the spread of digital networks, *which is a 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) has provided the infrastructure supporting the key ingredient of post-industrial society—information. The rapid growth of the Internet appears to bring about precisely this change.

In other words, the technological perspective effectively draws attention to the potential benefits of information technologies for society.

However, with such weighty emphasis on technology, generally removed from a social, cultural, and political context, it cannot provide an adequate foundation for defining the attributes of an Information Society. Also, the problem of measurement and the associated difficulty of stipulating the point on the technological scale at which a society is judged to have entered an information age is surely central to any acceptable definition of a distinctively new type of society. Popular futurists ignore it. 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 be 'industrial' and enter into the "information" category?"

Economic Perception

Some of the authors who write about the Information Society point to the growth of the service sector in the industrialised nations and the decline of employment in manufacturing. For some of the authors, 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 US economy. In Machlup's analysis, industries primarily concerned with the production and distribution of knowledge (Knowledge Industries) were examined separately rather than as a part of the overall service sector. The knowledge industries included 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 40% for the early 1960's) and growing 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 more developed economies. These earlier studies distinguished the knowledge or information sector 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 defined by Machlup. Porat defined information activities as including all resources consumed in producing, processing, and distributing information goods and services. He defined the primary information sector as including all those businesses exchanging information goods and services in the marketplace. In addition, Porat noted that many jobs in other sectors of the economy can be thought of as information work. Nearly every organisation produces processes and distributes information for its internal consumption. Thus, a secondary information sector includes these information activities. Porat estimated that overall information activities accounted 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 the United States as an Information Society. Several authors have attempted to refine and apply Porat's analysis in other contexts (Komatsuzaki, 1986; Schement et al., 1983). This perspective focuses on the economy as the primary attribute of the Information Society. Examining the economic structure alone provides a limited view of the social and cultural implications of information societies.

Also, several critics contend that Porat's classification of information workers needs to be narrower to be meaningful and does little to suggest the social implications of the shift to an Information Society (Bates, 1985). 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. Other types of objections and criticisms exist in Porat's analysis. However, such objections may not entirely invalidate Porat's findings and are not intended to do that.

Marc Porat has been able to distinguish two information sectors, primary and secondary, then consolidate them and separate the non-informational elements of the economy. By re-aggregating national economic statistics, Porat can conclude that the information sector accounts for 46% of the US GNP. "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".

Occupational Perception

Another popular measure of the emergence of an information society is the one that focuses on occupational change. The contention is that we have achieved an information society where the predominant occupations are found in information. In the Information Society, the number of people employed in occupations such as teaching, research, and development and in activities associated with creative industries (media, design, arts) outnumbers those employed in factories. The main characteristic of these people is the high level of education. The occupational definition of information society is often combined with an economic measure. Porat calculated that by the late 1960s, a little under half of the US labour force was to be found in the information sector. Porat connects the growth in economic significance of information with changing occupational patterns. Most identifiers of an Information Society draw on occupational changes as indicators of the approach of a new age, which reflects the introduction of new technologies. In other words, the shift in the distribution of occupations is at the heart of the theory of the Information Society.

Spatial Perception

This perception of the Information Society has a distinctive stress on space. Here, the major emphasis is on the Information Networks that connect locations and, as a result, greatly affect the organisation of time and space. This aspect has been considered an index of the Information Society in recent years. The centrality of information networks linking locations within and between towns, regions, nations, continents, and the entire world is an important consideration from a spatial perspective. In many writings, the technological bases of information networks are emphasised because these networks provide the infrastructure that enables information to be processed and distributed. These developments may lead to an emerging networked

society. The salient idea here is of information circulating along electronic "highways". However, no one has quantified how much information must flow along these routes and at what rate to constitute an Information Society. Though no one can deny that information networks are an important feature of modern societies and facilitate instantaneous communications around the globe; databases can be accessed from any place to any place, so some people would ask, "Why should the presence of networks lead analysts to categorise societies as information economies?". It may be stated that the question of what constitutes a network is serious and raises the problem of distinguishing different levels of networking and how we stipulate a point at which we have entered a Network/Information Society.

Cultural Perception

Developments such as the invention of radio, television, and computers, coupled with the recent advances in telecommunication networks and media technologies, are having a great impact on the lifestyles of people. It is stated that we live in a media-laden society, and the informational features of our world are more thoroughly penetrative now than in earlier times. The informational environment is much more intimate and more constitutive of us. For example, the informational dimensions of the clothes we wear, the styling of our hair and faces, and how we work make one aware that social intercourse nowadays involves more informational content than before. According to Webster,

"contemporary culture is manifested by more heavily information laden than any of its predecessors. We exist in a media-saturated environment that means life is quintessentially about symbolisation, about exchanging and receiving messages about ourselves and others. It is acknowledgement of this explosion of significance many writers conceive of having entered an information society". But no writer attempted to measure this development in quantitative terms and only describe our living in a sea of signs one fuller than at any other epoch. In other words, "we are surrounded by more and more information and less and less meaning".

Reviewing the different definitions of the Information Society, it emerges that they are underdeveloped or imprecise. Whether technological, economic, occupational, spatial, or cultural perspectives, we are confronted with highly problematic notions of what constitutes, and how to distinguish, an Information Society. We must be aware of these difficulties. Though, as a heuristic device, the term Information Society might have some value in helping us to explore and analyse the features of the contemporary world, it cannot be accepted by all as a definitive. In other words, though one may acknowledge that information plays a vital role in contemporary society, one has to remain cautious regarding the information society's scenarios and assert that information has become the chief distinguishing feature of modern times.

Check Your Progress: 4

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. Briefly explain the essence of the “Information Society” concept as reflected in the conceptual analysis of literature.

.....
.....
.....
.....

2. State the attributes of an Information Society.

.....
.....
.....
.....

3. What are the economic implications of an Information Society?

.....
.....
.....

12.8 KNOWLEDGE SOCIETY

Change is the essence of a growing society, and Information and Communication Technologies (ICT) are seen as the facilitators of change. It is a decisively qualitative change in information which marks a break with the past. Information is viewed as a disturber of traditional relationships, alignments, and the future basis of financial, political, and societal power. A new class structure is being created around the wealth of information. Understanding and anticipating the consequences of such a new class structure of society is important both for the First and Third World countries.

From this point of view, the Information Society is regarded as one in which theoretical knowledge takes a preeminent position. Theoretical knowledge is an arresting idea that does, *prima facie*, define a new type of society that hinges on generating and using information/knowledge. If theory is at the point of initiating developments, in contrast to one-time practical demands, then such knowledge could be said to herald a new type of society. However, the major difficulty with this notion is defining with precision what theoretical knowledge means. Theory evokes abstract and generalisable rules, laws, and procedures. Advances in knowledge have resulted in their codification in the form of texts learned and used by the would-be practitioners, and their experiences would be integrated into the body of knowledge. If we state that we now inhabit a knowledge society, knowledge has become constitutive of how we live.

12.8.1 Definition of Knowledge Society

“The transformation of existing societal structures – by knowledge as a core resource for economic growth, employment and as a factor of production, constitutes the criteria for designating advanced modern society as a “Knowledge Society”.

In a “Knowledge Society”, the traditional measures of competitiveness, such as labour costs, resource endowments and infrastructure, are replaced by new dimensions (indicators) such as patents, research, and development (R&D), and availability of (or capability to afford) knowledge workers. In other words, knowledge exists in the people's minds. It becomes a productivity factor when such knowledge is combined with capital, labour, existing (recorded) knowledge and other inputs to produce goods and services.

The people of developed countries are very much conscious of the pivotal role of information/knowledge and exploit this resource for developmental activities. The human brain is a valued resource in such countries. The new trend is the transformation of global economies into knowledge-based economies. It may be mentioned here that transforming global economies to knowledge economies does not guarantee economic growth with “equity” either within or between nations, and a gap will exist between knowledge-rich and knowledge-poor countries. This is because knowledge, despite its public good characteristics, becomes a much-valued resource to be possessed and harnessed for economic benefits. Further, the value accrued to individual users through the availability of information differs for different people as they are not conscious of absorbing the available information.

Suppose we desire to create an equitable knowledge society. In that case, we must strive towards a perfect society where all forms of knowledge are recognised and valued, especially from where they originate, and benefit that society. In other words, it is a dynamic process in which not only the people who access the information and knowledge will be the beneficiaries but also the probable users.

12.8.2 Features of Perfect Knowledge Society

In a perfect knowledge society, all people have:

- open and timely access to information and knowledge
- the capacity to absorb and interpret information
- Avenues and opportunities to use knowledge for informed decision-making and transformation to a higher quality of life.

12.8.3 Developing Countries

As part of economic history, the knowledge era has unfolded remarkably. Consequently, most basic tools for creating and managing wealth have lagged far behind the need. This is true of most of the developing countries. Knowledge has become the cornerstone of wealth creation in a knowledge society. Intellectual capital comprises three primary types of capital: human, structural, and customer. Of these, human capital is the most important.

Developing countries need to recognise and value their human resources capital and capitalise on it to amass a wealth of knowledge that works for the poor and promotes social equality. The wealth of knowledge will enable developing countries to emerge as strong economies independent of low-cost labour, increasing productivity and income. Therefore, it is necessary to open avenues for knowledge incubation to be supplemented by capacity-building support and enabling policy frameworks. These policy frameworks are intended to provide opportunities for people to use the power of knowledge to advance their growth.

Check Your Progress: 5

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this Unit.

1. Discuss the important characteristics of “Knowledge Society”.

.....
.....
.....
.....

2. What steps should the developing nations take to progress towards a knowledge society?

.....
.....
.....
.....

12.9 LET US SUM UP

In this Unit, an attempt has been made to explain the basic facets of information and its related concepts. The difficulties associated with defining the term precisely have been discussed. Concepts like the Information Generation Process and Information Transfer Chain have been briefly described and explained. The significance of information and its impact on society have been discussed to help you understand the importance of information and its use in modern society.

The concept of Information Society and its different ramifications, including the main factors responsible for its formation, have been analysed and briefly explained to you. The technological, economic, occupational, spatial, and cultural aspects influencing the formation of the Information Society have been described. The meaning of what constitutes a Knowledge Society and the centrality of theoretical knowledge in such a society has been briefly introduced to you. The concept of a Knowledge-based economy and how developing countries must strive to recognise and value ‘human resources capital’ to transform into knowledge economies has also been briefly discussed.

By studying the contents of this Unit, you will be able to understand the vital role of information/knowledge wealth in modern society in enhancing the nation's economy.

12.10 FURTHER READINGS

1. Bates, B. J. (1985). *Evolving to an Information Society: Issues and Problems*. Paper Presented at the International Communication Association Conference, San Francisco, CA.
2. Bell, D. (1973). *The Coming of Post-industrial Society: A Venture in Social Forecasting*. New York: Basic Books.
3. Bell, D. (1979). The Social Framework of Information Society. In: Dertouzos,
4. M. L. and Moses, J. (eds). *Computer Age: A Twenty-Year View*. Cambridge, MSS: MIT Press, 163–211.
5. Branscomb, A. (1986). Law and Culture in the Information Society. *Information Society*. 4(4), 279–311.
6. Branscomb, A. (1994). *Who Owns Information? From Privacy to Public Access*. Basic Books: New York.
7. Cawkell, A.E. (1987). *Evolution of an Information Society*. London: ASLIB.
8. Katz, R.L. (1988). *Information Society: An International Perspective*. New York: Praeger.
9. Kochen, M. (1987). *A New Concept of Information Society*. London: ASLIB, 141-54.
10. Komatsuzaki, S. (1986). An Economic Impact of Informationisation. *Keo Communication Review*. 7, March. 13–24.
11. Lyon, D. (1988). *Information Society: Issues and Illusions*. Cambridge: Polity Press.
12. Machlup, F. (1962). *The Production and Distribution of Knowledge in the USA*. New Jersey: Princeton University.
13. Martin, W. J. *The Global Information Society*. 2nd rev. Ed. London: ASLIB Gower, 1–16.
14. Porat, MU (1977). *The Information Economy: Definition and Measurement*. Washington: US Department of Commerce.
15. Schematic, J.R., (et. al). (1983). The Information Society in California: Social Factors Influencing its Emergence. *Telecommunications Policy*. 7(1), 64-72.
16. Stevens, N. (1986). The History of Information. *Advances in Librarianship*. 14, 1–48.
17. Sweeney, G.P. (ed.) (1982). *Information and the Transformation of Society*. North Holland: Amsterdam.
18. Toffler, A. (1996). *Powershift: Knowledge, Wealth, and Violence at the Edge of 21st Century*. New York: Bantam.

19. Umaseo, T. (1963). On Information Industries. *Hoseo Asahi*. January. 4–17.
20. Webster, F. (1996). The Information Society: Conceptions and Critique. In :
21. *Encyclopaedia of Library and Information Science*. New York: Dekker, vol.58(21). 74-112.
22. Webster, F. (1999). Knowledgeability and Democracy in an Information Age.
23. *Library Review*. 48(8), 373-83.
24. Webster, F. (2002). *Theories of the Information Society*. 2nd ed. London: Routledge.

12.11 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. Information is a popular and most used word in the English language. Many writers have attempted to define the concept, so the term has many definitions in the literature. However, there is not one agreed-upon definition that is acceptable to all. Each definition gives the concept its contextual meaning depending upon the author's subject specialisation and the use to which it is put.

Information is made up of symbolic and descriptive elements that communicate knowledge. It refers to the substance or contents of documents and their physical existence; the term is also used to designate both the message (substance and form) and its communication. A distinction is generally made between raw information (namely facts, concepts, and representation) and the documents in which it is recorded.

Though the two terms data and information are commonly used interchangeably, one for the other, there is a difference between the two. For example, data are discrete and unorganised pieces of information. Data becomes information when these pieces are processed, interpreted, and presented in an organised or logical form for better understanding and analysis, leading to valid inferences.

Knowledge is an organised body of information that can be used as the basis of further knowledge. Information which removes uncertainty and brings about change in concepts is considered to be knowledge. The other related terms for information are facts, intelligence, and wisdom.

Check Your Progress: 2

1. Generation of Information: Information results from different human activities and events. Activities are undertaken by individuals and organisations with definite objectives. On the other hand, events are things that occur, happen, or take place.

All intellectual activities pursued and systematically completed give rise to useful information. R&D activity is such an activity. Research and

development organisations in science, technology, social sciences, and humanities have been established to conduct research. Research in any subject is a creative activity and contributes to the growth of existing knowledge to benefit society. Research is a highly organised activity worldwide that continuously creates large quantities of information. Academic institutions such as universities and colleges also undertake research as part of their educational programmes and contribute to the growth of information and knowledge.

Government activities and organisations that collect statistical information are also involved in generating and producing information. The entire activity relating to the production of information is known as the generation of information. In other words, the generation of information means the creation of information. This is accomplished both by individuals and organisations. The table given below indicates some of the organisations which generate information.

Sl. No.	Organisations Institutions
i)	The Meteorology department
ii)	Reserve Bank India
iii)	Research Organisation Like the National Chemical Laboratory

Check Your Progress: 3

1. In the definition of the words "Information" and "knowledge" is hidden or implicit, the concept that an item of knowledge becomes an item of information when it is "*set in motion*" when information enters the active process of being communicated or transferred from one or more persons, groups, or organisations (sender) to one or more other persons, groups, or organisations (receiver). Many argue that knowledge or information has no *intrinsic value*. Its value will be realised when it is successfully transferred or communicated.

Information transfer refers to sending information from a source (sender) to the receiver. In other words, it goes from the generator to the user. This can be done with the help of different channels or paths. The different points through which information passes before it reaches the end user are known as links. When interconnected, they form a chain known as the information transfer chain or information transfer model. Figure 2.2 on page no. 35 depicts the process of information transfer from the generator to the user through different links which form a chain.

Check Your Progress: 4

1. Everybody needs information for some purpose or the other. Researchers (or scientists) need information for three purposes;
 - i) to keep up with new developments taking place in their areas of interest and specialisation;
 - ii) to get acquainted with the state- of- the art of the subject;

- iii) to collect specific data and information needed at different stages of their work.

Keeping up with current developments is one of the key factors for success in the career of a research worker. This activity not only updates his/her knowledge but also stimulates his/her thought process and often suggests new ideas and methods of experiments.

Before a researcher decides on a new project, he/she needs to undertake a thorough literature search, i.e., he/she must examine the various documents containing information on the topic. He/she does this to get acquainted with the state of the area's knowledge and identify gaps and shortcomings, thus assessing further scope of work in that area. Information will also help him/her to avoid duplication in research. Thus, a research worker always requires information, though the nature of the information required may change occasionally.

2. Several scholars, scientists, and philosophers have predicted a revolutionary transformation of modern industrial society. Many causes have been identified and attributed as the driving force behind such a transformation. However, most people opine that "information" is the defining feature of the modern world. We are told that we have entered an information age and are rapidly moving towards a "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.

The "Information Society" concept envisions the transition of an Industrialised Society into one in which information—in its broadest and most diverse forms—is the key driving force.

Two major factors underlying the Information Society's claims. First, society is becoming increasingly centred on information handling, processing, storage, and dissemination using microelectronics-based technologies made available through the convergence of computers with telecommunications, namely ICT. Second, this shift is reflected in an emerging occupational structure in which the "information workers" category has become predominant. In other words, the Information Society appears to be an outcome of technological and economic changes.

Attributes of an Information Society are:

- i) Shift from an industrial economy to an information economy. That is to say that in an industrial economy, capital is the strategic resource, while in an Information Economy, information becomes the strategic resource;
- ii) a telecommunication-based information service infrastructure;
- iii) a high degree of computerisation, 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.

3. Economic Implications of Information Society:

Different dimensions might characterise Information Society. One of these relates to the economic structure. We come across several references in literature to the economic implications of the Information Society.

The state of information in the economy generally has pervasive effects on its functioning. It greatly impacts sectors that provide information products and services, such as the press, television, radio, film libraries, and other information providers.

Machlup initiated studies analysing the growth of the "knowledge Sector" in the US economy. The knowledge industry includes the educational system, media, communication, libraries, information, and research institutions. Machlup found that this sector's contribution to the Gross National Product (GNP) was 40% in the early 1960s and is growing at a rate higher than that of 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 Machlup. According to Porat, information activities include all resources consumed in producing, processing, and distributing information goods and services. Porat estimated that these activities amounted to 45 % of the GNP in 1967.

In conclusion, the contribution of the information sector to successful economic function is beyond doubt. However, this is not the same as saying that information has become a primary output of all developed economies. We may say that we are moving towards information Economies. However, we are not wholly dependent on producing, selling, and exporting information goods and services to preserve our economic well-being.

Check Your Progress: 5

1. Characteristics of Knowledge Society

One of the most popular themes discussed in general literature for more than a decade has been that technologically advanced economies are moving beyond industrial capitalism to information that will bring profound changes in the form and structure of the economic system.

Economists long ago recognised that the most important resource determining the economic efficiency of any economy, industry, productive process, or household is *information and its effective communication*. Information's characteristics define the state of knowledge that underlies all economic processes and decision-making structures.

The transformation of societal structures – by knowledge as a core resource for economic growth and employment and as a factor of production- constitutes the main criteria for designating a modern society

as a “Knowledge Society”. In a knowledge society, the traditional measures of competitiveness, such as labour costs, resource endowments, and infrastructure, get superseded by new dimensions such as patents, research and development, and availability of knowledge workers. In a perfect knowledge society, all people have:

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

2. Knowledge exists in people's minds, and when combined with capital, labour, existing knowledge, and other inputs, it produces goods and services and thus becomes a factor of productivity. Many developed nations have realised this fact and have transformed into knowledge-based economies where conventional raw materials and physical labour (Brute-force economy) are being replaced by a brain-force economy. Developing nations need to recognise and value their human resources capital and capitalise on it to amass a wealth of knowledge that works for the poor and promotes social equality. The wealth of knowledge, in turn, will create opportunities for developing countries to emerge from dependence on low-cost labour as a source of comparative advantage, increasing productivity and incomes. Avenues need to be created for knowledge incubation (growth) to be supplemented by capacity-building support and enabling policy frameworks that provide opportunities for people to use the power of knowledge to improve their growth.

UNIT 13 KNOWLEDGE SOCIETY: DEVELOPING COUNTRIES PERSPECTIVE

Structure

- 13.0 Introduction
- 13.1 Learning Outcomes
- 13.2 Information Society and Knowledge Society
 - 13.2.1 Information Economy and Wealth of Nations
 - 13.2.2 Digitally Empowered society and knowledge economy
- 13.3 Characteristics of Change: Some Indicators
 - 13.3.1 Production to Demand-based Economy
 - 13.3.2 Mass Society and De-massification
 - 13.3.3 Technology, Innovation and Workforce Changes
- 13.4 Information Access: International and National Aspects
 - 13.4.1 International Flow of Information
 - 13.4.2 ICT and Development
- 13.5 Digital Divide
 - 13.5.1 Data security
- 13.6 Economics and Policy Issues
- 13.7 Let Us Sum Up
- 13.8 Keywords
- 13.9 Further Readings
- 13.10 Check Your Progress: Possible Answers

13.0 INTRODUCTION

Human beings have changed the course of nature in the name of development for many centuries. Our earth has been exploited and contaminated by the end products of industrialisation and globalisation. These two concepts were proudly celebrated and highlighted by every human for being able to live an enhanced and developed life. All these developments became possible when humans used their knowledge, which played a crucial role in evolving us and enabling the development of our lifestyle. Knowledge differentiated us from our cousins – the apes- and aided in creativity, logic, and critical thinking when deciding right and wrong. There is a big debate on defining knowledge by various philosophers over thousands of years, but the essentials of knowledge reveal its nature. Knowledge is something we know already or the complex ideas we try to learn. Plato defined knowledge as attainable, which is the truth; Socrates says it is the awareness of one's ignorance, which possibly be the truth, and Aristotle believed knowledge must be objectively true and necessary. Knowledge serves as a foundation for effective communication between human beings. The ability to communicate verbally was one of the major reasons for the evolution and development of humans.

Human communication uses a combination of verbal and non-verbal cues, alphabets, codes, and various symbols. For the past two centuries, electronic communication helped us to communicate faster, and it evolved to the recent technology of the Internet and social media.

13.1 LEARNING OUTCOMES

After completing this Unit, you should be able to;

- Understand the relationship between the Information Society and the Knowledge Society
- Know the types of economy and access to knowledge.
- Understand Agrarian, Industrial, Information/Knowledge, and Internet economies.
- Understand international and national aspects of knowledge access.
- Assess information needs for national development, especially in developing countries.
- Assess the cost of information support in developing countries.
- Understand international cooperation in information.
- Analyse technology transfer communication cost and its impact on developing economies.
- Understand information support for development planning, including rural planning.
- Understand the digital divide and its attempts to bridge it.

13.2 INFORMATION SOCIETY AND KNOWLEDGE SOCIETY

13.2.1 Information Economy and Wealth of Nations

'Information is power' is an adage. There are several historical examples when an information-rich society, advanced in technology and industrial development, with the capacity to produce an abundance of material wealth, had become predatory and arrogated to itself the control of and dominance over other societies, eventually turned self-destructive. Therefore, in recent years, the issue of 'Which is it knowledge or information?' has arisen from the point of contribution to real sustained societal benefits. Hence, the associated terms Knowledge Society and Information Society are also used.

The scope of the terms 'Information Economy' and 'Economics of Information' indicate that they are related and not mutually exclusive. However, in their scope, they can be differentiated. The former concept relates to the macro-level (cf. agrarian economy and industrial economy) to a country as a whole; the latter, on the other hand, is more applicable to the micro-level, dealing with, for example, the efficiency or input/output ratio of a specific information service, such as selective dissemination of information, online access, etc. The relationship between the wealth of nations and the information economy impacts various factors such as globalisation, Human

capital development and overall infrastructure that fosters growth and wealth.

British economist Adam Smith wrote that a nation may lose its physical material wealth. Still, if it could save and retain the knowledge by which such material wealth was produced, it would be possible to create it again. Still, if the knowledge produced by material wealth were lost or destroyed, everything would be lost. The growth of a knowledge-based society will bring about fundamental changes in the production, distribution, and exchange of information, and almost every social and cultural institution will change in some way.

The 20th century is called the Information Age, which experienced a rapid shift from traditional methods of communication to electronic and Digital methods. The invention of the Internet is seen as one of the greatest of all, as it allows us to communicate faster and more efficiently. Internet technology has contributed to the knowledge society through enhanced applications such as Web 2.0, enabling unbound possibilities of creating and sharing, unrestricted time, and physical constraints in accessing information.

13.2.2 Digitally Empowered Society and Knowledge Economy

In today's techno-centric world, Digital literacy and competency are essential to accessing information and the knowledge economy. However, digital tools are not yet fully accessible to millions of people. Digital literacy consumes digital communication tools, applications, and networks to access information in a knowledge society. The Internet has transformed from a medium of information dissemination to a platform of content creation, reproduction and sharing, enabling users to create, reproduce and gain information. Globalisation and other technological developments have paved the way for digital information flow, but knowledge may have yet to reach many people. Without Knowledge dispersal to the right receivers, the digital divide is the greatest challenge in underdeveloped and developing countries. Many researchers have argued across disciplines that knowledge plays a major role in sustainable development.

UNESCO aimed to foster knowledge societies by providing access to information with the help of technologies for economic development and intercultural dialogue. Countries like Estonia, Singapore, and South Korea have implemented a comprehensive e-governance system enabling citizens to include digital signatures in documents, and smart cities have high-speed internet facilities. In 2015, the Indian government initiated the Digital India programme to transform our nation into a digitally empowered society and knowledge economy. The program focused on digital infrastructure, digital literacy, and digitalised payments to utilise the power of digital technologies for the nation's development. However, there are challenges in this programme, such as the digital divide, data theft and privacy issues.

Check Your Progress: 1

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

- 1) Discuss the role of knowledge in human evolution.

.....
.....
.....
.....
.....

- 2) Explain the role of Digital empowerment in development.

.....
.....
.....
.....
.....

13.3 CHARACTERISTICS OF CHANGE: SOME INDICATORS

13.3.1 Production to Demand-based Economy

For centuries, human beings have depended on nature to provide for most of their needs, so the production level determines the level of consumption. Applying knowledge, especially scientific, technical, and managerial, to development has changed that scenario.

One characteristic of the change is the increasing proportion of returns to a given effort and investment (a value-added return) and a subtle shift in the axis of economics from a supply base to a demand base. A demand-based economy now experiences a shift from a production-based economy to a demand-driven approach that focuses on consumers' preferences and needs. Understanding consumer behaviours is essential for strategic decision-making in the business environment. The dependent nature of humans has changed over time, with knowledge application shifting from supply-based to demand-based, which has enabled the mass production of demands from society. Knowledge-based economy indicators reduce environmental deterioration by transforming demand culture with the help of technology. Technology helps people's lives by improving the quality and ease of access to various applications and modernisations and educating society. Education thus enhances productivity and creativity, facilitating knowledge efficiency.

13.3.2 Mass Society and De-massification

Mass Society and De-massification concepts are widely used in cultural studies and sociology to illustrate cultural patterns and social structures. Urbanisation and industrialisation crafted a social condition of homogeneity among people. Problems of modern societies arise from their growing complexity, that is, multiple interactions and interdependence, thanks in large measure to developments in ICTs and transportation. The resolution of the problem calls for formulating appropriate policies, creating political and administrative structures responsive to the new scales of social demands, and developing more comprehensive, secular, and integrated goals that diverse people can share. The characteristics of Mass society include mass

production, consumption, centralisation of power, making the public consume similar products on a mass scale, and generalisation in opinions created by Mass media.

The main characteristic of a second-wave industrial economy is the mass production of large quantities of goods using machines that repeat rapidly predefined actions. The third-wave information economy is characterised by information-intensive, robotised manufacturing systems capable of endless, cheap variations and customised end-products to meet customers' special needs and micro-markets. This enables small, specialised units to compete with larger general production units or obtain contracts from the latter to produce value-added products and services. Smaller units, like those in developing countries, can create niche markets. All these are changing the nature of market competition and mail-ordering systems. It is revolutionising and de-massifying production and distribution systems. De-Massification involves customising and personalising products and services based on individual/customer needs and preferences. The concept extended its arms when the Internet and digital technologies were invented. Decentralised applications and network platforms like social media enable customers to access information and content based on their needs and preferences.

13.3.3 Technology, Innovation and Workforce Changes

In an information economy, the main trade items are information and data, the products of the information industry, hardware and software, and related knowledge and expertise. More enterprises can access data and information about their competitors and customers. Customers can access and receive information about competing firms and their products and services. Loyalty, trust, and open communications will reshape the nature of customer and supplier contracts; suppliers will draw directly on information held in databases by their customers, working closely and seamlessly as an in-house supplier now does. Electronic mail and billing systems will reduce the cost of transactions.

With a global reach for communicating electronically, distance will not be a determinant of markets and costs. Enterprises organise certain types of work in shifts according to the time zones – Australia and East Asia, Europe, and America, such that work on a project or a product can go on almost round the clock in different countries. Add to this the profit from wage differential, for example, in developing countries with abundant skill and expertise. Thanks to the networks, clients can receive customised products and value-added services when and where they want. Gartner Glossary highlighted the impact of digital technologies in the Industrial Revolution and mentioned it as the fourth Industrial Revolution leading to the rise of small industrial businesses. Gartner Glossary defined digitalisation as using digital technologies to transform business models and generate revenue.

With affordable digital devices and reduced Internet costs, India is experiencing a digital revolution. According to the MSME (Ministry of Micro, Small and Medium Enterprises) report for 2021-2022, our country has 30 million small and medium enterprises (SMEs). The SME sector is growing at 8% per year, and by 2026, 12 million people will be involved in

small-scale enterprises. The Digital India programme facilitated a growth in digital payments through UPI (Unified Payment Interface).

The workforce challenges are poor infrastructure and insufficient training in accessing digital technologies. In 2016, the IFC (International Finance Corporation) reported a massive finance demand gap in SME sectors. It also recommends reforming our educational system to provide skill development and upskilling programmes to meet current industry needs. One of the most important challenges is data security. Due to poor infrastructure and inadequate financial support, digital technologies are prone to cyber-attacks.

Check Your Progress: 2

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. Discuss the status of Digital India towards development.

.....
.....
.....
.....

13.4 INFORMATION ACCESS: INTERNATIONAL AND NATIONAL ASPECTS

13.4.1 International Flow of Information

Knowledge is embodied in people, in things natural and man-made, and documents and other media. Scientific, technical, and managerial knowledge is a key input to socio-economic development. Therefore, knowledgeable persons, intellectuals, and scholars are a nation's most valuable resources and assets. Investments for developing this resource, the best basis for sustainable long-term national development, should receive top priority in any national development plan. Developing countries majorly rely on technical knowledge for their economic development, but the information systems in their information systems lack the technological advancements to access and analyse information. These developing countries benefit from the information accessed from developed countries, better understanding their countries' resources. Information flows across cultures, nations ignoring traditional borders and leading to a change through the major forms of

- Digital technologies
- Media and other entertainment tools
- News channels
- Participatory journalism applications

13.4.2 ICT and Development

Information and Communication Technology (ICT) uses computing and telecommunication technologies to facilitate information creation, collection,

transmission, and storage. These technologies include computing, wired, and wireless technologies to support various communication technologies. ICT has enhanced the pace of learning and knowledge creation, boosted productivity, and accelerated the economy.

The role of ICT in development is fundamental as it transforms society and leads to growth. The Asian Development Bank (ADB) emphasises that ICT for development is not just digitalisation or technological improvement but is about educating the communities for inclusive growth, innovation, and improved well-being.

Check Your Progress: 3

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. How do ICT tools transform society?

.....

.....

.....

.....

13.5 DIGITAL DIVIDE

In the 20th century, the term Digital Divide was coined to define the divide between individuals who own a telephone and who do not. After the invention of the Internet, the same term was used to describe individuals with and without digital and Internet access. The digital divide in underdeveloped and developing countries is characterised by unequal access to the Internet and bandwidth inequality. In 2023, more than 692 million internet users were in India, of which 67 per cent are from urban and 31 per cent from the rural population. According to the Centre for Monitoring Indian Economy (CMIE) report, Indian women are 33 % less likely to access the Internet than men.

The harsh reality of the enormous digital divide hit us hard during the pandemic; a significant issue in various sectors, such as education, healthcare, and the economy, was evident despite continuous efforts under the Digital India programme. Disparities in accessing online education, limited resources for e-learning, and a lack of digitised library resources have made the pandemic a difficult situation for students. This divide is often caused by poverty, lack of infrastructure, and cultural expectations. Women and girls in our country and worldwide can harness ICT's potential to improve their lives and communities and participate in policy decisions.

13.5.1 Data Security

The process involves protecting digitised information in any digital device, including hardware, software, and storage devices, against cyber-attacks, insider threats, data thefts, etc. Data security is essential in international and national organisations to protect data from theft, breaches, and financial and reputational loss. Governments of a few countries have implemented

censorship and information filters. Changes in work culture, such as telecommuting, working for multiple organisations simultaneously, and forming virtual teams and online meetings, had become inevitable post-pandemic. These changes offer advantages to the family and individual but also disadvantages depending on socio-economic and technological development, the nature of work, and existing work culture and habits. IT developments are happening at a pace that leaves little time for national authorities, managers, and decision-makers to understand and evaluate their impact on the country's social, political, economic, and cultural fabric. Privacy and confidentiality of information; freedom of access to and publication of information; sovereignty and conflicts vis à vis nation-states; intellectual property and business law-related matters; trade-in information services across national borders; and activities of transnational corporations in technology transfer and information services. To determine the extent of economic and political vulnerability caused by a country's heavy reliance on external information, information services, and technologies and to reduce such dependence if necessary.

Check Your Progress: 4

- Note:** 1) Use the space below for your answer.
2) Compare your answers with those given at the end of this Unit.

1. Discuss the consequences of the Digital Divide.

.....
.....
.....
.....
.....

13.6 ECONOMICS AND POLICY ISSUES

Economics and policy issues play an important role in the development of any society. Information is not merely an input resource for effective socio-economic development planning; ensuring the optimal allocation and utilisation of all other resources is essential. Despite this vital characteristic of information about development planning, very few national development plans of developing countries have an information chapter, not even a separate budget line. Even within sectoral plans, one may not find a separate budget line for information. However, 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. National development planning should recognise the information sector, like other economic sectors like agriculture, industry, science and technology, education, and culture. This will integrate information infrastructure development plans, understand the mutual influences between information and other sectors, provide data for the information economy, and formulate guidelines for apportioning national resources among information sector elements and other sectors. The level of information handling capability is a socio-economic indicator. Criteria for allocating resources for

producing, processing, distributing, and accessing transient information, such as commercial or stock market information, should be developed. Priority among information demands should be based on a country's socio-economic and cultural contexts and developmental stages. Economists can help develop a suitable classification of information processes once the concept of an information sector is accepted. Many considerations support policymaking towards development; they are:

- Achieving and maintaining a stable economy through structural reforms
- Reducing poverty through sustained economic growth and education
- Investing in Infrastructure development and innovation
- Increasing sustainable small and medium-scale business environment
- Upskilling programmes to be included in school-level education.
- Creating fair labour market opportunities
- RTE (Right to Education) and RTI (Right to Information) ensure a more transparent governing system and inclusive development by decreasing the disparities.

The right to information is a fundamental human right that influences information system design, networking, outsourcing, virtual team formation, and joint research. However, information processes operate imperfectly, and access to information does not equal all classes. The capacity for effective use of information differs significantly among individuals, classes, and nations. The use of information also depends on the environment, such as R&D, higher education, industrialisation, and commerce. The appropriateness of information accessed also influences the use of information. Efficient and effective use of information in a country also depends on the level of infrastructure development, which may vary within and among countries.

Check Your Progress: 5

Note: 1) Use the space below for your answer.

2) Compare your answers with those given at the end of this Unit.

1. Discuss the considerations that support policymaking towards development.

.....

.....

.....

.....

13.7 LET US SUM UP

Knowledge has played a crucial role in human evolution, fostering creativity, logic, and decision-making. The evolution of communication from verbal to electronic interactions has revolutionised societal interactions. Information Economy and the Economics of Information are related but differ in scope.

The Internet has facilitated a shift towards a knowledge society, impacting factors like globalisation, human capital development, and infrastructure. Initiatives like UNESCO's aim to foster knowledge societies and Digital India highlight the role of digital empowerment in development. Changes include shifting from a production-based to a demand-based economy, with mass society focusing on customisation and personalisation. Digital technologies, media, news channels, and participatory journalism facilitate information access at the international level. However, the digital divide persists, posing access to digital tools and knowledge challenges. The consequences of the digital divide include disparities in education, healthcare, and the economy. Data security is essential to protect against cyber threats, and economic and policy issues focus on stability, poverty reduction, infrastructure investment, and fair labour market opportunities.

13.8 KEYWORDS

Idea: The product of thinking, reflecting, imagining, etc., got by the intellect by integrating with the aid of logic, a selection from the apperception mass, and/or what is directly apprehended by intuition and deposited in the memory (Ranganathan, 1967). Alternative term: Concept.

Knowledge is the totality of ideas conserved by humans. In this sense, Knowledge is equivalent to the connotation of the term 'Universe of Ideas' (Ranganathan, 1967).

Information: Information is "organised data which are (or rather can be) communicated" (Porat, 1977). Knowledge is information that has been assimilated, "appropriated", or has been meaningfully aggregated into a reservoir of facts and concepts that can be applied. WordNet defines 'Information' as a collection of facts from which conclusions may be drawn and knowledge acquired through study experience or instruction. Ranganathan defines information as an idea communicated by others or obtained by personal study and investigation. He adds, 'Knowledge and information are sometimes treated as synonyms. (Ranganathan, 1967).

Communication: 'To communicate' is derived from 'to commune', which means to share. Information is the message carried through the communication medium (human or machine) by a communicative action. The communication process helps move, transfer, and circulate information from the point of its generation, recording, or location to the point of its potential use.

Development: Development is the bridge between the hopes and aspirations of a people on the one hand and the realities of the world on the other. In this context, information and knowledge are the pillars of that bridge. Sustaining development is not a question of information or knowledge; both are required. "Development, even economic development is a knowledge-based process." (Boulding, 1966)

Energy Axis: The investments in and undertakings for identifying energy sources, energy generation, storage, processing, transfer, use, and conservation (and the related economics and geopolitics).

Information: Communication Axis The investments in and undertakings for the generation, recording, storage, processing, accessing, communication, and use of information (and the related economics and geopolitics).

Poverty Index: The index measures the percentage of households in a country deprived in three dimensions: monetary poverty, education, and basic infrastructure services, providing a comprehensive picture of poverty.

13.9 FURTHER READINGS

1. Bank, A. D. (2010). *Information and Communication Technology for Development*. Asian Development Bank. <https://www.adb.org/publications/information-and-communication-technology-development>
2. Bornman, E. (2017). *The international flow of information: Theories and discourses*. <https://doi.org/10.13140/RG.2.2.29262.87361>
3. Bortnick, J. (n.d.-a). International Information Flow: The Developing World Perspective.
4. Crandall, R. W. (2001). The Digital Divide: Bridging the Divide Naturally. Brookings Review. Winter, pp. 38–41.
5. Duff, A.S. (1997). Some Post-war Models of the Information Chain. *Journal of Librarianship and Information Science*.29,179-87.
6. Equity, Growth and Participation: The Information Age. (1993). *Journal of The Society For International Development*. 3(3).
7. Florina, C. (2001). Crossing the Digital Divide. *Executive Excellence*. 4 January, pp. 2–3.
8. Hammond, A., L. (2001). Digitally Empowered Development: The Growing Gap. *Foreign Affairs*. 80(2), 96–102,
9. Knowledge societies: *The way forward to build a better world*. UNESCO. https://en.unesco.org/70years/knowledge_societies_way_forward_better_world
10. Lehrer, K. (1990). Theory of knowledge. Westview Press.
11. Perkins, K. M. (2012). Sustainability and Innovation: Creating Change that Engages the Workforce. *The Journal of Corporate Citizenship*, 46, 175–187.
12. Safrankova, J. M., Sikyr, M., & Skypalova, R. (2020). Innovations in Workforce Management: Challenges in the Fourth Industrial Revolution. *Marketing and Management of Innovations*, 2, 85–94. <https://doi.org/10.21272/mmi.2020.2-06>
13. Singer, B. D. (1973). Mass Society, Mass Media, and the Transformation of Minority Identity. *The British Journal of Sociology*, 24(2), 140–150. <https://doi.org/10.2307/588374>.

13.10 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. Discuss the role of knowledge in human evolution.

Knowledge significantly influences human evolution, shaping both biologically and culturally. Early humans demonstrated cognitive abilities through tool use and innovation, leading to the development of sophisticated tools. Cultural transmission of knowledge about tool-making and use facilitated efficient sharing and transfer, fostering social cohesion. Knowledge within communities, such as hunting techniques and medicinal plant use, contributed to group survival. Environmental knowledge enabled adaptation to ecosystems, while technology and innovation led to advancements in tools and agriculture.

2. Explain the role of Digital empowerment in development.

Digital empowerment is crucial for societal development, contributing to economic, social, and cultural progress. It involves using digital technologies to enhance individuals' capabilities and engage in the digital landscape. Access to digital tools is essential, but challenges persist in ensuring full accessibility. Digital literacy is essential in a knowledge society. Initiatives like UNESCO and national programs like Digital India emphasise the importance of digital empowerment. Still, challenges like the digital divide, data theft, and privacy need to be addressed for inclusive development.

Check Your Progress: 2

1. Discuss the status of Digital India in terms of development.

The Digital India initiative launched in 2015, aimed to transform India into a digitally empowered society and knowledge economy. Key achievements include expanding internet access, enhancing digital literacy, promoting e-governance, and digital payments. Other key achievements include cybersecurity, rural connectivity, digitising health records, developing smart cities, and launching the MyGov platform for citizen participation in governance.

Check Your Progress: 3

1. How do ICT tools transform society?

ICT tools have revolutionised society by accelerating learning, boosting productivity, enabling global communication, and transforming work culture. They provide access to vast information, facilitating knowledge creation, collaboration, and streamlining processes. They break down geographical barriers, fostering global partnerships and work continuity. ICT tools also democratise access to information, allowing smaller units to compete with larger ones. Digital India initiatives, like UPI, support SMEs in India. However, challenges like poor infrastructure, insufficient training, and data security persist.

Check Your Progress: 4

1. Discuss the consequences of the Digital Divide.

The digital divide, characterised by unequal access to digital tools and the Internet, significantly impacts education, healthcare, and the economy. It exacerbates existing inequalities, particularly in underserved communities, and has been exacerbated by the pandemic. Economic disparities are also exacerbated, as individuals without adequate digital literacy miss out on opportunities for online employment, digital entrepreneurship, and e-commerce. The digital divide also deepens social and cultural divides, and workforce challenges arise due to limited digital access and skills. Gender disparities are also a concern.

Check Your Progress: 5

1. Discuss the considerations that support policy-making for development.
 - Achieving and maintaining a stable economy through structural reforms
 - Reducing poverty through sustained economic growth and education
 - Investing in Infrastructure development and innovation
 - Increasing sustainable small and medium-scale business environment
 - Upskilling programmes to be included in school-level education.
 - Creating fair labour market opportunities
 - RTE (Right to Education) and RTI (Right to Information) ensure a more transparent governing system and inclusive development by decreasing the disparities.

The right to information is a fundamental human right that influences information system design, networking, outsourcing, virtual team formation, and joint research. However, information processes operate imperfectly, and access to information does not equal all classes. The capacity for effective use of information differs significantly among individuals, classes, and nations. The use of information also depends on the environment, such as R&D, higher education, industrialisation, and commerce. The appropriateness of information accessed also influences the use of information. Efficient and effective use of information in a country also depends on the level of infrastructure development, which may vary within and among countries.

UNIT 14 E-GOVERNANCE POLICY AND FRAMEWORK

Structure

- 14.0 Introduction
 - 14.1 Learning Outcomes
 - 14.2 Introduction to Information Technology
 - 14.3 Principles of Information System Management
 - 14.4 Introduction to e-Governance and Digital Transformation, Meaning, Definition, Benefits & Limitations
 - 14.5 History of E-Governance
 - 14.6 Benefits of E-Governance
 - 14.7 Models of E-Governance – Weidner’s Dissemination model, Critical Flow Model, Comparative Analysis Model, Interactive Service Model, Mobilisation and Lobbying Model
 - 14.8 E-Governance Projects and Public-Private Partnerships
 - 14.9 Digital Divide- Meaning, Definition, Parameters, Types, Causes, Bridging Digital Divide
 - 14.10 Opportunities and Challenges of E-Governance
 - 14.11 Let Us Sum Up
 - 14.12 Key Words
 - 14.13 Further Reading
 - 14.14 Check Your Progress: Possible Answers
-

14.0 INTRODUCTION

This unit is concerned with acquainting the learners with some of the pertinent concepts related to e-governance, how it works, and the broad areas under which it functions. The challenges of e-governance considering the different political arrangements and technological borders will be assessed, and the learners can deliver ideas of its functionality. It will also lead to an understanding of Information Technology and Information System Management.

Again, to get a proper overview of the subject matter, we need to understand the different models of e-governance and their theoretical perspectives. Learners will be able to distinguish between projects and public-private partnerships and gain knowledge on the digital divide and the challenges in a changing world.

14.1 LEARNING OUTCOMES

After completing this unit, you should be able to

- Identify the concepts and objectives of studying e-governance;

- Discuss the subject matter, nature and scope of Information technology and E-governance;
 - Describe the theoretical concepts of E-governance;
 - Discuss the factors and challenges of the digital divide; and
 - Connect the challenges and opportunities of e-governance.
-

14.2 INTRODUCTION TO INFORMATION TECHNOLOGY

The mechanism and software used to generate, accumulate, transfer, manipulate, and exhibit data and information are collectively called information technology, or IT. In a literal sense, IT is vital to the Information Age and relates to all aspects of communications and computing.

History and evolution of information technology

The last ten years of the 20th century were the best and the worst for public service education. The abacus in Babylonia in the fourth century BC is usually discussed when discussing the history of those devices intended to count objects and generate data. However, the Atanasoff-Berry Computer (ABC), the first electrical digital computer in history, 1942 marked the beginning of computing and IT in the United States. Computers did not replace conventional accounting and record-keeping practices until after World War II, despite ABC's reintroduction and the Electronic Numerical Integrator Analyzer and Computer (ENIAC) deployment to help with firing table preparation.

Soon after the transistors replaced vacuum tubes in the 1950s, computer reliability rose, the hardware and software evolved, and their evolutionary paths were slightly different in the past. Electrical engineers created the hardware, and every new generation of computing technology was adapted and used in industry and government. The creation of software applications has a history that parallels various noteworthy management changes in the public sector and marks the beginning of the growth of management reporting. The technology combined began to advance the public sector beyond data processing in the 1960s, initiating a different e-government era.

14.3 PRINCIPLES OF INFORMATION SYSTEM MANAGEMENT

The gradual evolution from Information Technology to Information System Management led to a massive shift in the structure and function of E-Governance. Information System Management refers to any framework of software that facilitates the collection, storage, organisation, and distribution of information. Information management encompasses a series of organisational activities related to acquiring, storing, and distributing information to stakeholders.

14.4 INTRODUCTION TO E-GOVERNANCE AND DIGITAL TRANSFORMATION

Administrative machinery is conducted through information technology or digital intervention called e-governance. The term governance originates from an ancient Greek word, “Kebernon,” meaning steering. Governing in current use means directing, regulating, and manipulating from a position of authority. In 2002, The UN addressed e-Governance and signified five categories for measuring progress towards e-Governance.

1. Emerging online presence: Sites providing reliable information
2. Enhanced Online Presence: Increasing quantity of webpages providing dynamic content
3. Interactive Web presence: Electronic exchanges between users and governments
4. Transactional Web presence: Services like payments (taxes) and purchases (licences)
5. A fully integrated online presence that combines services, information, and exchanges

14.5 HISTORY OF E-GOVERNANCE IN INDIA

The Indian government founded the Department of Electronics in the 1970s, and the National Informatics Centre (NIC) was established in 1977, marking the beginning of the country's transition to electronic governance. Government offices had computers by the 1980s; however, they were just used for drafting. Eventually, this expanded to include internal government applications in various administrative fields, system monitoring, growth, and information and technology to manage data-intensive tasks like tax administration, elections, and censuses. E-Governance can be of different types depending on the type of governmental structure as well as the

a. **Government to Customer (G2C):**

E-Governance is to provide ICT organisation consistently and effectively to inhabitants. This establishes a link between the government and people utilising the technology.

b. **Government To Employees (G2E)**

E-Governance to Employee partnership (G2E) is the online association between online instruments, sources, information, and products that support communication between the government and its companies.

c. **Government To Government (G2G)**

Government-to-government (G2G) is the access to common information and data framework between administration offices, divisions, or associations. It improves access sharing and information retention.

d. **Government To Business (G2B)**

This is primarily determined by how professionally the work with state

bodies of various levels is organised and how well the government bodies build the processes. The government-to-business (G2B) model implies that it is designed to support and develop businesses from the government's side.

14.6 BENEFITS OF GOVERNANCE

E-Governance has several benefits as it has its hindsight. In a country like India, e-governance can have several benefits. Primary among them are automation issues. To put it together, some of the leading points are:

Automation: It leads to the improvisation of clerical functions, which are also error-free to a considerable extent.

Informatisation: E-governance leads to clarity in steady information-flow processes. For example, it can store, access, and archive most information.

Prompt decision-making: Because of the automation of processes and the application of accurate facts, there is fast delivery because of prompt decision-making, communication, and implementation.

Cost efficient: The Governance that emanates from the ICT-moderated process tends to be cheaper, producing the same outputs at a lower total cost.

Quality gains: Governance works better by producing the same outputs at the exact total cost but to a higher quality standard.

Check Your Progress: 1

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this unit.

1. Write about the history of e-Governance in India.

.....

2. What are the benefits of e-Governance? Substantiate with examples.

.....

14.7 MODELS OF E-GOVERNANCE WEIDNER'S DISSEMINATION MODE, CRITICAL FLOW MODEL

a. Weidner's Dissemination model

E-Governance functions differently, considering the outcome's expected nature and the beneficiaries involved. One such model is Weidner's

Dissemination model. This model establishes the conditions of prior preference, particularly in the case of legal or judicial decision-making, and this is primarily used to influence decisions by setting up precedence. Most commonly, this e-governance model assesses the performance of a particular public servant, ministry, or government. By promoting background know-how, this model provides rationality for the future course of action. This model also provides a precursor for future courses of action, picking up from the e-government guiding principles and procedures in the past. ICT unlocks access to local knowledge and global products at a meagre cost. This model provides information on predecessor governments' or electoral candidates' performance by sharing their work records in their constituencies. This model offers room for strong arguments emanating from the analysis.

b. Critical flow model of e-governance

The critical flow model is based on disseminating crucial information to the targeted people through convergent media or ICT. This emphasises the data's relevance and the necessity of using it. This remains functional in both private and public domains. The key idea of this model is to promote transparency to implement good governance. It tries to diminish the element of time and distance and minimise the abuse of power by the government. The model can work in areas like availing policies commissioned by the government to the people, acquiring research studies, and processing inquiry reports. There could be other advantages, such as obtaining records of human rights violations and criminal impeachment against government officials to concerned citizens and non-governmental organisations and facilitating information on the corruption of government officials or ministries to the electoral bodies or any relevant governing council. The model may not work properly in instances where the government bodies do not encourage public contributions and criticise all information of a critical nature or maintain tight control over all information and remain available to only a few top levels of the government.

c. Comparative Analysis model

The Comparative Knowledge Model, becoming increasingly popular, is one of the most used yet fundamental models for emerging nations. By comparing instances of poor governance with those of good administration and then examining the various facets of bad governance and its effects on the populace, the model can be utilised to empower individuals. The concept is predicated on using ICT for information exploration and comparison with existing information sets, whether in the public or private domain. The result is discussions and strategic learning. For example, if a certain sum of money can be used to create "5" schools in village "A," why can the same amount of money only be used to establish "2" schools in village "B"?

d. Interactive Service model

The governance-to-citizen Government model is another name for the interactive-service system of governance. This paradigm, which allows

for direct public participation in the digital governing process, is an amalgam of several e-government models. This concept uses ICT to integrate everyone into a knowledge network, providing interactive communication media. G2C2G entirely takes advantage of ICT's potential to use it for increased efficiency and transparency, participation in government operations, and cost and time savings in the decision-making process. Through this concept, citizens can access all government services since it establishes a channel for tasks like filing tax returns, communicating concerns, and government procurement, to name a few.

e. **Mobilisation and lobbying model**

It is the most popular e-governance paradigm and has consistently aided civil society organisations in influencing international decision-making processes, particularly in poor nations.

The mobilisation model's foundation is the strategic, focused flow of information intended to fortify action and forge powerful allies. It takes a proactive stance in creating online communities that encourage active information exchange and sharing common ideals. The strength of this model and the resources and ideas brought together through virtual networks is the diversity of these virtual communities. The lobbying strategy can successfully surmount institutional, regional, and administrative obstacles to compel strict action.

14.8 E-GOVERNANCE PROJECTS AND PUBLIC-PRIVATE PARTNERSHIP

Public-private partnerships are collaborations between the public and private sectors to create, organise, fund, build, and/or manage projects customarily considered to be under the purview of the government sector. As the PPP model becomes more widely accepted, it quickly spreads to every aspect of public life, including ICT.

Public-private partnerships in E-governance can

- a. We enhance communication between public entities, intergovernmental organisations, private businesses, and international relationships.
- b. Ensured high-quality services are expected.
- c. Enhancing government services necessitates the use of improved processes or systems.
- d. Improve governance and transparency.
- e. Giving government employees more authority at the implementation and administrative levels

Check Your Progress: 2

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this unit.

1. Write about the Weidner's Dissemination model. How is it relevant for government functioning?

.....

.....

.....

.....

.....

.....

.....

2. Discuss the significance of the critical flow model. What are the advantages of this model?

.....

.....

.....

.....

.....

.....

14.9 DIGITAL DIVIDE: MEANING, DEFINITION, PARAMETERS, CAUSES

The Digital Divide refers to the division of technological privileges between the haves and the have-nots. While this divide works on technology, it also has other core elements in modern times.

Material access: The core element of the digital divide is based on physical access to personal computers and the Internet among demographic categories that are obvious in this respect: income, education, age, sex, and ethnicity.

Usability access: Regarding digital technology, the core difference is between the 'have-nots' and the element of usability. Despite the concept of usability, it is rather significant to understand that most communities do not understand the applicability of digital technology despite access to it. Some studies have found that the refusal to use computers and get connected to the Internet was:

- no need or significant usage opportunities;
- no time or liking;
- rejection of the medium (the Internet and computer games as 'dangerous' media);
- lack of money;

Skills access

After acquiring the motivation to use computers and some kind of physical access to them, one has to learn to manage the hardware and software. According to the model in Fig. 1, the problem of a lack of skills might appear here. This problem is framed with terms such as 'computer, information or multimedia literacy' and 'computer skills' or 'information capital.'

Usage access

Actual usage of digital media is the final stage and ultimate goal of the total appropriation process of technology, which is called access in this article.

Having sufficient motivation, physical access, and skills to apply digital media are necessary but not sufficient conditions for actual use. Usage has its grounds or determinants. As a dependent factor, it can be measured in at least four ways:

1. usage time;
2. usage applications and diversity;
3. broadband or narrowband use;
4. more or less active or creative use.

Bridging Digital Divide

Over one billion people live in India, and 70% do so in villages. According to the report published by the National Survey of India, the literacy rate of India is 77.7 per cent, with males being 84.70 % and women being 70.30%. Even though the information and communication technology (ICT) sector is robust and expanding quickly, access to ICTs is still quite limited, especially in rural areas. Some requirements must be met for every revolution to occur. India has not yet created the supportive atmosphere needed for the digital revolution. The infrastructure is the primary bottleneck. Infrastructure factors like energy and IT restrict access to technologies. As of 2023, while the infrastructure has developed considerably, there are still jarring gaps in the skills available to utilise the resources and in some significant pockets, there are psychological barriers that limit the application of the apps. The major areas which need to be addressed are.

- a. Infrastructural knowledge
- b. Breaking the psychological qualms over applying IT
- c. Creating a fertile ground for skill development

14.10 OPPORTUNITIES AND CHALLENGE OF E-GOVERNANCE IN INDIA

Building Infrastructures: Significant efforts would need to be made to gather the resources required for this difficult task. Governments could organise computer leasing agreements as a means of addressing the issue. This would lower the initial large capital expenditures.

Improved Connectivity: Creating total connectivity across all ministries and departments will enable the efficient speed of the Internet to be used for transferring files and paperwork instead of manual labour. Databases from different departments must be interoperable for this to be truly successful. For citizens to benefit from IT daily, interoperability of e-governance projects is crucial.

Information flow: Information flow is smooth when provided to the public in a language they can comprehend and feel at ease with, typically the native tongue. Since technology exists, translating text from English into other languages is possible. As a result, the issue is controllable as long as there is sufficient drive to complete this difficult task.

Breaking the stereotypes: Getting government workers accustomed to working exclusively manually to adopt a new perspective. This is a significant task that requires careful planning and perseverance. It is necessary to arrange training sessions, workshops, and seminars to raise awareness among staff members at all levels.

Creating Cyber awareness: Disseminating cyber laws to the public as soon as feasible to grant IT systems information documents the same legal standing as papers currently kept on paper and

Encouraging power infrastructures: Encouraging electricity infrastructures and all-weather surface transportation systems to close the digital divide in India between rural and urban areas.

Check Your Progress: 3

Note: 1) Use the space provided below for your answers.

2) Compare your answers with those given at the end of this unit.

1. Elaborate on the digital divide and its different types.

.....
.....
.....

2. What are the essential Opportunities and Challenges of E-Governance in India?

.....
.....
.....

14.11 LET US SUM UP

In this unit, we have discussed the key features of E-governance and its characteristics. We have analysed the different types of e-government, the history and evolution of its course, and the areas maintained by e-government. The unit has defined the concepts of Digital Divide and the different challenges and opportunities that arise from it. It has also discussed the areas of public-private collaboration in terms of e-government and the various dimensions of e-government.

14.12 KEYWORDS

E-filing: Electronic filing is the way to submit assessment forms over the web utilising tax preparation software that has been pre-approved by a significant expense authority, for example, the IRS or the Canada Revenue agency.

E-voting: Electronic voting utilises electronic voting to deal with throwing and tallying votes.

‘SMART Governance: The future of public services, increased efficiency,

group engagement, interactive work, and ongoing improvement through creativity are all referred to as "smart governance."

E-participation: E-participation is "the process of involving citizens in policy and decision-making through ICTs to make public administration inclusive, collaborative, deliberative, and participatory for intrinsic and instrumental ends."

E-participation: E-participation is defined as "the process of engaging citizens through ICTs in policy and decision-making to make public administration participatory, inclusive, collaborative and deliberative for intrinsic and instrumental end."

14.13 FURTHER READING

1. Chinn, M. D. (2003). The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet.
2. Heeks, R. (2001). Understanding E-Governance for development. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3540058>
3. Hildreth, W. B., Miller, G. J., & Rabin, J. (2006). Handbook of public administration (3rd ed.). CRC Press
4. Kaliannan, M., Awang, H., & Raman, M. (2007). Technology adoption in the public sector. *Proceedings of the 1st international conference on Theory and practice of electronic governance*. <https://doi.org/10.1145/1328057.1328103>
5. Marche, S., & McNiven, J. D. (2003). E-government and E-governance: The future isn't what it used to be. *Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration*, 20(1), 74-86. <https://doi.org/10.1111/j.1936-4490.2003.tb00306.x>
6. Monga, A. (2008). E-government in India: Opportunities and challenges, JOAAG, Vol. 3. No. 2
7. Nath, V. (2000). *Digital governance*. <https://www.cddc.vt.edu/digitalgov/gov-e-comparative-model.html>
8. Sumathy, M. (2020). *A Handbook of E-Governance*. Abhijit Publications, New Delhi.
9. Rao, S. S. (2005). Bridging the digital divide: Efforts in India. *Telematics and Informatics*, 22(4), 361-375. <https://doi.org/10.1016/j.tele.2005.01.007>

14.14 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress: 1

1. In the 1970s, the government of India established the Department of Electronics, followed by the National Informatics Centre (NIC) in 1977, thereby initiating the process of e-governance in India. By the 1980s, government offices were equipped with computers but were limited to

drafting. Eventually, this spread out to in-house government applications in diverse administration areas, system monitoring, expansion and the application of information and technology to administer data-intensive functions related to elections, census, tax administration, etc.

2. E-Governance has several benefits as it has its hindsight. In a country like India, e-governance can have several benefits. Primary among them are automation issues. To put it together, some of the leading points are:

Automation: It leads to the improvisation of clerical functions.

Informatisation: E-governance leads to clarity in steady information-flow processes. For example, it can store, access, and archive most information.

Prompt decision-making: Because of the automation of processes and the application of accurate facts, there is fast delivery because of prompt decision-making, communication, and implementation.

Cost efficient: The Governance that emanates from the ICT-moderated process tends to be cheaper, producing the same outputs at a lower total cost.

3. **Quality gains:** Governance that works better: producing the same outputs at the exact total cost at the same time, but to a higher quality standard.

Check Your Progress: 2

1. E-Governance functions differently, considering the outcome's expected nature and the beneficiaries involved. One such model is Weidner's Dissemination model. This model establishes the conditions of prior preference, particularly in the case of legal or judicial decision-making, and this is primarily used to influence decisions by setting up precedence. Most commonly, this e-governance model assesses the performance of a particular public servant, ministry, or government. By promoting background know-how, this model provides rationality for the future course of action. This model also provides a precursor for future courses of action, picking up from the e-government guiding principles and procedures in the past. ICT unlocks access to local knowledge and global products at a meagre cost. This model provides information on predecessor governments' or electoral candidates' performance by sharing their work records in their constituencies. This model offers room for strong arguments emanating from the analysis.
2. The critical flow model is based on disseminating crucial information to the targeted people through convergent media or ICT. This emphasises the data's relevance and the necessity of using it. This remains functional in both private and public domains. The key idea of this model is to promote transparency to implement good governance. It tries to diminish the element of time and distance and minimise the abuse of power by the government. The model can work in areas like availing policies commissioned by the government to the people, acquiring research

studies, and processing inquiry reports. There could be other advantages, such as obtaining records of human rights violations and criminal impeachment against government officials to concerned citizens and non-governmental organisations. Facilitating information on the corruption of government officials or ministries to the electoral bodies or any relevant governing council

Check Your Progress: 3

1. The Digital Divide refers to the division of technological privileges between the haves and the have-nots. While this divide works on technology, it also has other core elements in modern times.

Material access: The core element of the digital divide is based on physical access to personal computers and the Internet among demographic categories that are obvious in this respect: income, education, age, sex, and ethnicity.

Usability access

The core difference between digital technology and 'have-nots' is the element of usability. Despite the concept of usability, it is rather significant to understand that most communities do not understand the applicability of digital technology despite access to it. Some studies have found that the refusal to use computers and get connected to the Internet was:

- no need or significant usage opportunities;
- no time or liking;
- rejection of the medium (the Internet and computer games as 'dangerous' media);
- lack of money;

Skills access

After acquiring the motivation to use computers and some kind of physical access to them, one has to learn to manage the hardware and software. According to the model in Fig. 1, the problem of a lack of skills might appear here. This problem is framed with terms such as 'computer, information or multimedia literacy' and 'computer skills' or 'information capital.'

Usage access

Actual usage of digital media is the final stage and goal of the total appropriation process of technology, which is called access in this article. Having sufficient motivation, physical access, and skills to apply digital media are necessary but not sufficient conditions for actual use. Usage has its grounds or determinants. As a dependent factor, it can be measured in at least four ways:

1. usage time;
2. usage applications and diversity;

3. broadband or narrowband use;
 4. more or less active or creative use
2. **Building Infrastructures:** Significant efforts would need to be made to gather the resources needed for this difficult task. Governments could organise computer leasing agreements to address the issue, lowering the initial large capital expenditures.
3. **Improved Connectivity:** Creating total connectivity across all ministries and departments will enable the Internet to transfer files and paperwork efficiently in place of manual labour. Databases from different departments must be interoperable for this to be truly successful. For citizens to benefit from IT daily, interoperability of e-governance projects is crucial.
4. **Information flow:** Information flow is smooth when provided to the public in a language they can comprehend and feel at ease with, typically the native tongue. Since technology exists, translating text from English into other languages is possible. As a result, the issue is controllable as long as there is sufficient drive to complete this difficult task.
5. **Breaking the stereotypes:** Getting government workers accustomed to working exclusively manually to adopt a new perspective. This is a significant task that requires careful planning and perseverance. It is necessary to arrange training sessions, workshops, and seminars to raise awareness among staff members at all levels.
6. **Creating Cyber awareness:** Disseminating cyber laws to the public as soon as feasible to grant IT systems information documents the same legal standing as papers currently kept on paper and
7. **Encouraging power infrastructures:** Encouraging electricity infrastructures and all-weather surface transportation systems to close the digital divide in India between rural and urban areas.