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Research Article

Information and Communication Technology (ICT) and Its Applications in Telecommunications

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ABSTRACT: We live in the age of information. The development and proliferation of electronically communicated information has accelerated economic and social change across all areas of human activity worldwide and it continues to do so at a rapid pace. While the use of information and communications technology (ICT) and telecommunication remains concentrated largely in the developed world, ICT and telecommunication diffusion is beginning to reach developing countries, including poor rural areas, bringing with it high hopes of positive development outcomes. Yet although technological innovations, such as cellular telephones and wireless broadband access, are playing an important role in building ICT and telecommunication levels globally, strong inequality still remains. The rapid growth of ICTs and telecommunication in developing countries is partly a result of very low initial access, and therefore in absolute terms developing countries are still well behind the developed world in access to ICTs and telecommunication. Statistics shows that total telephone access in South Asia and Sub-Saharan Africa grew by an average of 22 and 17 percent per year, respectively, from 1990 to 2003, but their current levels of access are still just 6.2 and 5.8 percent. Inequality of access is even greater within developing countries, especially between urban and rural areas, where the digital divide continues to widen.

Keyword: Information and Communication Technology, Telecommunication

1. INTRODUCTION

Information and communications technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. ICT permeates the business environment, it underpins the success of modern corporations, and it provides governments with an efficient infrastructure. According to 2009 World Bank report, it was found that for every 10 percent increase in high speed internet connections, there is a 1.3 percent increase in economic growth. The impact of ICTs is also seen in their creative and cost-efficient use in basic sectors, such as education, health, and agriculture, among others.

Telecommunication is now considered an infrastructure essential to a country's economic development and competitiveness. Apart from facilitating communication and various economic activities, telecommunications is an economic sector in itself. The mobile phone boom worldwide has created jobs and generated income for the government, operators, manufacturers, service providers, and application/content developers. In developing countries, mobile phones serve as the universal access tool, especially for their low-income populations. ICT consists of IT as well as telecommunication, broadcast media, all types of audio and video processing and transmission and network based control and monitoring functions[1-5.] The expression was first used in 1997 in a report by Dennis Stevenson to the UK government and promoted by the new National Curriculum documents for the UK in 2000.

The term ICT is now also used to refer to the merging (convergence) of audio-visual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the audio-visual, building management and telephone network with the computer network system using a single unified system of cabling, signal distribution and management. This in turn has spurred the growth of organizations with the term ICT in their names to indicate their specialization in the process of merging the different network systems.

2. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND ITS APPL ICAT IO NS

ICT applications are useful in numerous instances to facilitate the developments of various aspects of the society. This section will rely on [6] Mansell and When, (1998), to examine some of these aspects:

2.1. Public Administration: Public administration is a key aspect of civil society and it includes a range of services to citizens and industry. It provides various functions that enhance the social, economic and political developments of the citizenry. Most importantly, it provides public information that is useful to the community at large[7-8.]

ICTs facilitate these public administration activities. For instance, e-Government, a concept that defines a situation where government activities and public information can be made available uses ICTs. In South Africa the government has expressed the intention of transforming itself into an e-government where information can be accessed at any time by phone or by Internet, with public Internet kiosks provided for universal access. These kiosks are called the Public Information Terminals and there are 300 public information terminals (PIT) installed at post offices around the country. The South African Minister of Communication notes that:

The Public Information Terminal, or PIT, entails the installation of Internet kiosks in post offices around the country. The kiosks will provide instant access to the Internet, e-mail, government and educational services as well as e-commerce. The link to government websites, for example, will provide information on aspects of

regulation, legislation, welfare, support, grants and rebates. Interactive directories of various tertiary institutions will also be available. The PIT is a practical example of how ICT can be used in public administration [9-12].

The advent of new ICTs brought a lot of new assumptions about radical changes in our society. In the context of the arrival of a new society, public administration was supposed to witness (and to address or implement) changes at different levels, such as:

- Citizenship (citizens becoming participants in governance or even a shift to e-democracy).
- The nature of public service jobs (in terms of skills, work processes and job design).
- Organizational changes (from a hierarchical to more horizontal structure, to network or even virtual organizations); and
- The entire government (from classic bureaucracy to New Public Management and to network and digital governance).Technological change cannot be judged outside the social, economic and political frameworks[13].

The massive change in our society cannot be explained only by technological (especially ICT) factors. Excluding other factors may help us predict easier (but not more accurately) future evolutions but as a scientific effort it is a bad practice. Much of the assumptions about technological change came from hasty generalizations[14]. The changing Nature of some collective actions, jobs in certain areas of the economy or organizations were considered as optimal (and necessary) paths for the entire society (from individual to national levels).

Public administration reforms are far from being a consequence of new technologies. Moreover public administration reforms do not embed ICTs and do not have a happy marriage with e-government.

2.2. Urban and Rural Development: The rapid development of information and communication technologies has greatly accelerated economic globalization. The 21st century is a century of global urbanization and cities will play an increasingly important role in a country or region. The ongoing ICT evolution reshapes and regroups traditional cities and transforms their social and economic bases enormously. Just like industrial development completely changed the spatial structure of cities in the agricultural society, the progress of information and communication technologies is the key element of the transformation of modern cities. Information and telecommunication technology, as the choice of a future city, holds out the promises of a better life [15-16.]

The Rural development in a country is one of the most important factors for growth of the country economy. The present strategy of rural development mainly focuses on poverty alleviation, better livelihood, provision of basic amenities and infrastructure facilities. Application of ICT is a paradigm shift to the traditional approaches that the government has been using past so many decades. With the use of ICT, government renders services and information to the public using electronic means. With the rising awareness amongst the citizens and their better experiences with the private sector– the demand for better services on the part of government departments became more pronounced. The infusion of Information and Communication Technology (ICT) is playing a prominent role in strengthening such a demand.

ICT applications are useful in facilitating development programmes in many countries. These technologies help in supporting economic and social developments. [6]Mansell and Wehn note that "*diverse current and historical data sets on health, education, water supplies, sanitation, and population growth and movement can be captured, collated, manipulated, and presented*" They also note that "*economic development can be fostered by tele-working and tele-services in some of the developing countries*" (ibid.). The establishment of telecentres in rural communities can facilitate economic empowerment. Mobile telephony can also help rural challenges that can come along.

Combining ICT in Rural Development can not only speed up the development process but it can also fill the gaps between the educationally and technologically backward and forward sections of the society.

Several e-governance projects have attempted to improve the reach, enhance the base, minimize the processing costs, increasing transparency and reduce the cycle times. Introduction of computers, e-commerce is some of the initiatives by the government that has up to an extent been able to bring the rural population in contact with the information technology. The opportunities of ICT application in rural development are immense at the same time the government will also be facing some challenges also.

2.3. Transport: Transport/ICT infrastructure is indispensable for a democratic governance of the country[17-20]. Moreover, "Transport/ICT" encompasses the entire process of planning, funding, and building physical facilities, administrating and managing them, monitoring their effectiveness, as well as building the institutions and organizations to regulate and sanction the efficient provision of transport and information services for public interest. Transport and ICT services help people's security and social stability, improve productivity and income distribution, support peoples' quality of life directly or indirectly, and enhance the opportunity for people to make use of their potential[21]. Transport and ICT services could be only partially supplied by the market transactions[22]. In some cases, they could not be supplied at all in the market economy. Therefore, Transport/ICT infrastructure is an indispensable public device to craft "good governance" of the world, nations, and local communities, as well as a mechanism to help people enjoy cultural and humane lives[22].

In the transport sector, ICT applications can be used to improve road, air and rail transportation. ICT applications are noticeable in the air transport control, monitoring of freight and the day-to-day transport system. For example, the development of smart cards helps facilitate the smooth operations of the transport system. These operations include payment for parking metres, identification of authorized parking space occupants.

Types of Transportation Infrastructure and Decentralization

Road: In nationwide network type infrastructure such as trunk road networks, the issue is the division of roles between central and local government. On the other hand, in local area network type infrastructure such as rural roads, participation by and reflection of the needs of beneficiaries also become important. Division of role between central and local governments is associated with classification of roads according to their function and service coverage of the corresponding supervisory agency. How to distribute road-related funds to finance maintenance is also an issue.

Railway: In nationwide network type infrastructure such as national railways network, horizontal unbundling depending on the railway project service type or area based division of service provider has been implemented as a sector reform. This does not match with the decentralization concept of administrative organization stated here. Transport facilities of interurban railway, urban railway, and local railway are provided either by public sector unit which owns railway facilities in the case of horizontal unbundling or by railway organization serving the respective area in the case of area based division. On the other hand, transport service is either operated by public corporation affiliated to the central government as a part of national standard service or by the other organization, which solely operates at the local railway service area. Thus, it cannot be categorically described that the service provision is done by municipality or by local government affiliated organization. An issue in the transport service provision is that how to provide efficient and high quality services by reflecting user's needs (including both passengers and cargo).

Port and Airport: Similar to roads, in the case of port and airport, the central government operates and maintains major ports and airports, which function as the nodes of major maritime and air traffic. In other ports and airports, local government plays a large role in constructing, operating and maintaining the facility, by providing investment funds and by operating the facility by itself. Therefore, the issue relates to how to

divide the coverage of responsibilities and funding in panning, building, operating, and maintenance between central and local governments.

Transport Service Provision: When the transport sector is deregulated parallel to decentralization, local government faces the problems of how to promote entry of private sector and how to develop local transport industry, as targeted service area of transport service is limited for urban and local transport (subway and bus) services. In such case, local government takes over the role of central government, which has been traditionally assured, by the central government such as developing the comprehensive urban transportation strategy and planning and maintenance of each transport mode.

2.4. Impact of ICTS on the Pharmaceutical: The big stories in ICT development are not of particular breakthrough technologies, but rather those of rapid and continuous improvement in price performance of Computing and communications, the explosion of bandwidth capacity in fixed and mobile networks, and the emergence and development of the internet and internet-based applications. Perhaps the most important development is the convergence of technologies, which is opening up new possibilities in a number of fields (e.g. bioinformatics) [23-26.]

Impact of ICTs on the pharmaceutical industry: Over recent years the drug discovery pipeline has been a concern for many in the pharmaceutical industry. Escalating costs, increasing complexity and a dwindling population of drug candidates suggest that traditional R&D methods are unlikely to produce enough breakthrough drugs to ensure industry growth. The convergence of information and bio-technologies is already revolutionizing drug discovery and design and may radically alter the economics of the drug discovery over the coming years. In a detailed analysis of the potential economic impacts of genomics and genetics on the pharmaceutical industry's R&D pipeline, Tollerman et al[27] stressed the importance of ICTs. They suggested that prior to the genomics 'revolution' developing a new drug cost an average of around USD 880 million and took 15 years from start to finish. By applying genomics technologies, they suggested that companies could realize average savings of around USD 300 million and 2 years on drug development. Longer term, genetics technologies could save up to USD 420 million per drug and between 0.7 and1.6 years. None of this would be possible without ICTs.

Less revolutionary, but nonetheless significant impacts for the pharmaceutical industry[28-31] are available from the further application of ICTs to the:

- substitution of *in silico* for *in vitro* and *in vivo* testing;
- operation and management of clinical trials (eg. e-recruitment);
- monitoring post-launch usage and outcomes;
- Marketing and distribution of pharmaceuticals (eg. 'cyber-detailing');
- implementation of integrated e-commerce and supply chain management systems in healthcare supplies;
- development of internet health 'portals' and healthcare information for both medical Practitioners and patients; and
- Further development of electronic prescription and clinical decision support systems.

Impact of ICTs on the healthcare industry: There is an enormous range of opportunities for significant cost reductions, service enhancements and behavioural change through what is often broadly referred to as 'e-health'.

- **Payers:** The major impact of ICTs on payers will be the ability to manage the system in order to better account for expenditures, to manage the flow of funds and contain costs. There will be strong motivation to adopt systems which enable payers to track expenditures and exercise control over the

processes of referral and prescription – the initiators of health services. From the payers' perspective, ICTs are tools for demand management and cost containment.

- **Providers:** It is clear that the entire healthcare system could reap significant gains from

an integrated approach to supply chain management that includes the entire range of hospital and medical supplies and linkages to other players in the healthcare system. Electronic scheduling and patient management systems could improve scheduling of tests and procedures, and thereby reduce the length of hospital stays and reduce the need for multiple visits. Linking insurers, healthcare providers, financial institutions and consumers into claiming and payments systems also has the potential to reduce significantly administrative costs and improve quality of service. There are already some examples of leading-edge activities, but for many progresses towards realising these benefits has been relatively slow.

- **Practitioners:** From the perspective of individual medical practitioners, knowledge enrichment or education, practice administration, and clinical tools are among the most important ICT applications. Knowledge enrichment and practice administration systems are widely used, but the adoption of clinical tools has been relatively slow because of the complexity of such applications and a range of doctor concerns (eg. patient privacy and security of patient records, the possibility that the tools will generate activities that are not billable and/or reimbursable, the cost of integrating clinical tools with current systems, the difficulty of use and possible interruptions to workflow and doctor patient
- **Patients:** ICTs are altering the relationship and balance of power between patients and providers, leading to more empowered consumers and enhanced self, home and community care capabilities. Perhaps the greatest change in the patient-provider relationship will be brought about by the use of internet by patients. two types of information will be particularly important – information about managing health and chronic disease, and information about provider quality and cost.2 With the rise of more informed consumers, there will be increasing scope for stakeholders to influence healthcare behaviour, prescription, treatment and referral decisions and compliance through patients, as well as through doctors.

ICT applications are becoming valuable resources in the medical field. They support efficient exchange of information between health professionals, they enable transfer of patient records between sites and they can improve clinical effectiveness, continuity, and quality of care by health professionals ICT applications facilitate telemedicine - "*the use of ICTs to provide medical demand independent of person-to-person contact*" . Telemedicine provides medical service to people in geographically diverse settings: at home and in isolated places or in emergencies. An example of the impact of ICTs on medicine is the recent operation that was performed at the Chris Hani Baragwaneth Hospital. Separated by 8917km, two surgeons made South African medical history when they jointly performed an operation on a two-year-old. Dr Bob Banieghbal at Chris Hani Baragwaneth Hospital in Soweto and Professor Benno Ure at his offices in Hannover, Germany, made use of the latest advancement in surgery - the telementoring system, 'Socrates' - to perform a laparoscopic surgery. 'Socrates' works by linking surgeons in the operating room with colleagues anywhere in the world. A voice-controlled robotic arm (Aesop) positions and holds an endoscope (a minute camera used to view internal organs) which is inserted into the patient via the navel

Special Needs (For the Physically Challenged): For many people with physical disabilities, ICTs can be extremely useful in providing access to communication, education and open up opportunities for them. The use of Braille keyboards and printers can help alleviate some common literacy and numeracy problems for visually impaired or blind people. Most telecommunications infrastructures are now being designed with the capabilities of meeting the special needs of the physically challenged. For instance, the Short Message Service (SMS) can be used to send and receive messaged by the hearing impaired, the voice activated dialing service can be used by visually impaired.

2.5. Education: The education sector is arguably one major area that ICTs are playing remarkable a role. These technologies help in facilitating learnship and exchange of educational materials. ICTs are helping library professionals store and manage academic information. Libraries have migrated from the traditional Dewey cataloguing system to an on-line system, which is a web-based cataloguing and search application. The online learning system is another web-based application that is revolutionalising the learning platform of education. This system compliments the traditional face-to face teaching and learning format. In the on-line system, students can access class notes, submit assignment and also join a discussion group with other learners.

3. OTHER AREA OF ICT APPLICATIONS CAN BE SUMMARIZE BASED ON TABLE BELOW

For most businesses, there are a variety of requirements for information. Senior managers need information to help with their business planning. Middle management need more detailed information to help them monitor and control business activities. Employees with operational roles need information to help them carry out their duties.

As a result, businesses tend to have several "information systems" operating at the same time. This revision note highlights the main categories of information system and provides some examples to help you distinguish between them.

The main kinds of information and communication technologies in business are described briefly below:

Information System	Description
Executive Support Systems	An **Executive Support System ("ESS")** is designed to help senior management make strategic decisions. It gathers, analyses and summarises the key internal and external information used in the business. A good way to think about an ESS is to imagine the senior management team in an aircraft cockpit - with the instrument panel showing them the status of all the key business activities. ESS typically involve lots of data analysis and modelling tools such as "what-if" analysis to help strategic decision-making.
Management Information Systems	A **management information system ("MIS")** is mainly concerned with internal sources of information. MIS usually take data from the transaction processing systems (see below) and summarise it into a series of management reports. MIS reports tend to be used by middle management and operational supervisors.
Decision-Support Systems	Decision-support systems ("DSS") are specifically designed to help management make decisions in situations where there is uncertainty about the possible outcomes of those decisions. DSS comprise tools and techniques to help gather relevant information and analyze the options and alternatives. DSS often involves use of complex spreadsheet and databases to create "what-if" models.

Knowledge Management Systems	Knowledge Management Systems ("KMS") exist to help businesses create and share information. These are typically used in a business where employees create new knowledge and expertise - which can then be shared by other people in the organization to create further commercial opportunities. Good examples include firms of lawyers, accountants and management consultants. KMS are built around systems which allow efficient categorization and distribution of knowledge. For example, the knowledge itself might be contained in word processing documents, spreadsheets, PowerPoint presentations. Internet pages or whatever. To share the knowledge, a KMS would use group collaboration systems such as an intranet.
Transaction Processing Systems	As the name implies, Transaction Processing Systems ("TPS") are designed to process routine transactions efficiently and accurately. A business will have several (sometimes many) TPS; for example: - Billing systems to send invoices to customers - Systems to calculate the weekly and monthly payroll and tax payments - Production and purchasing systems to calculate raw material requirements - Stock control systems to process all movements into, within and out of the business
Office Automation Systems	Office Automation Systems are systems that try to improve the productivity of employees who need to process data and information. Perhaps the best example is the wide range of software systems that exist to improve the productivity of employees working in an office (e.g. Microsoft Office XP) or systems that allow employees to work from home or whilst on the move.

4. TELECOMMUNICATION

Telecommunication is the transmission of information over significant distances to communicate. In earlier times, telecommunications involved the use of visual signals, such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs, or audio messages via coded drumbeats, lung-blown horns, or sent by loud whistles, for example. In the modern age of electricity and electronics, telecommunications now also includes the use of electrical devices such as the telegraph, telephone, and teleprinter, as well as the use of radio and microwave communications, as well as fiber optics and their associated electronics, plus the use of the orbiting satellites and the Internet.

A revolution in wireless telecommunications began in the first decade of the 20th century with pioneering developments in wireless radio communications by Nikola Tesla and Guglielmo Marconi. Marconi won the Nobel Prize in Physics in 1909 for his efforts. Other highly notable pioneering inventors and developers in the field of electrical and electronic telecommunications include Charles Wheatstone and Samuel Morse (telegraph), Alexander Graham Bell (telephone), Edwin Armstrong, and Lee de Forest (radio), as well as John Logie Baird and Philo Farnsworth (television).

The world's effective capacity to exchange information through two-way telecommunication networks grew from 281 petabytes of (optimally compressed) information in 1986, to 471 petabytes in 1993, to 2.2 (optimally compressed) exabytes in 2000, and to 65 (optimally compressed) exabytes in 2007. This is the informational equivalent of 2 newspaper pages per person per day in 1986, and 6 entire newspapers per person per day by 2007. Given this growth, telecommunications play an increasingly important role in the

world economy and the worldwide telecommunication industry's revenue was estimated to be $3.85 trillion in 2008. The service revenue of the global telecommunications industry was estimated to be $1.7 trillion in 2008, and is expected to touch $2.7 trillion by 2013.

4.1. Telecommunication Networks: A communications network is a collection of transmitters, receivers, and communications channels that send messages to one another. Some digital communications networks contain one or more routers that work together to transmit information to the correct user. An analog communications network consists of one or more switches that establish a connection between two or more users. For both types of network, repeaters may be necessary to amplify or recreate the signal when it is being transmitted over long distances. This is to combat attenuation that can render the signal indistinguishable from the noise.

4.2. Communication Channels: The term "channel" has two different meanings. In one meaning, a channel is the physical medium that carries a signal between the transmitter and the receiver. Examples of this include the atmosphere for sound communications, glass optical fibers for some kinds of optical communications, coaxial cables for communications by way of the voltages and electric currents in them, and free space for communications using visible light, infrared waves, ultraviolet light, and radio waves. This last channel is called the "free space channel". The sending of radio waves from one place to another has nothing to do with the presence or absence of an atmosphere between the two. Radio waves travel through a perfect vacuum just as easily as they travel through air, fog, clouds, or any other kind of gas besides air.

The other meaning of the term "channel" in telecommunications is seen in the phrase communications channel, which is a subdivision of a transmission medium so that it can be used to send multiple streams of information simultaneously. For example, one radio station can broadcast radio waves into free space at frequencies in the neighborhood of 94.5 MHz (megahertz) while another radio station can simultaneously broadcast radio waves at frequencies in the neighborhood of 96.1 MHz. Each radio station would transmit radio waves over a frequency bandwidth of about 180 kHz (kilohertz), centered at frequencies such as the above, which are called the "carrier frequencies". Each station in this example is separated from its adjacent stations by 200 kHz, and the difference between 200 kHz and 180 kHz (20 kHz) is an engineering allowance for the imperfections in the communication system.In the example above, the "free space channel" has been divided into communications channels according to frequencies, and each channel is assigned a separate frequency bandwidth in which to broadcast radio waves. This system of dividing the medium into channels according to frequency is called "frequency-division multiplexing" (FDM).

Another way of dividing a communications medium into channels is to allocate each sender a recurring segment of time (a "time slot", for example, 20 milliseconds out of each second), and to allow each sender to send messages only within its own time slot. This method of dividing the medium into communication channels is called "time-division multiplexing" (TDM), and is used in optical fiber communication. Some radio communication systems use TDM within an allocated FDM channel. Hence, these systems use a hybrid of TDM and FDM.

4.3. Modulation[32-37]: The shaping of a signal to convey information is known as modulation. Modulation can be used to represent a digital message as an analog waveform. This is commonly called "keying" – a term derived from the older use of Morse Code in telecommunications – and several keying techniques exist (these include phase-shift keying, frequency-shift keying, and amplitude-shift keying). The "Bluetooth" system, for example, uses phase-shift keying to exchange information between various devices. In addition, there are combinations of phase-shift keying and amplitude-shift keying which is called (in the jargon of the field) "quadrature amplitude modulation" (QAM) that are used in high-capacity digital radio communication systems.Modulation can also be used to transmit the information of low-frequency analog signals at higher frequencies. This is helpful because low-frequency analog signals cannot be effectively transmitted over free

space. Hence the information from a low-frequency analog signal must be impressed into a higher-frequency signal (known as the "carrier wave") before transmission. There are several different modulation schemes available to achieve this [two of the most basic being amplitude modulation (AM) and frequency modulation (FM)]. An example of this process is a disc jockey's voice being impressed into a 96 MHz carrier wave using frequency modulation (the voice would then be received on a radio as the channel "96 FM").[31] In addition, modulation has the advantage of being about to use frequency division multiplexing (FDM).

4.4. Society and Telecommunication: Telecommunication has a significant social, cultural and economic impact on modern society. In 2008, estimates placed the telecommunication industry's revenue at $3.85 trillion or just under 3 percent of the gross world product . The impact of telecommunication on society will be discussed majorly based on its economic impact and social impact.

5. ECONOMIC IMPACT

On the microeconomic scale, companies have used telecommunications to help build global business empires. This is self-evident in the case of online retailer Amazon.com but, according to academic Edward Lenert, even the conventional retailer Wal-Mart has benefited from better telecommunication infrastructure compared to its competitors. In cities throughout the world, home owners use their telephones to order and arrange a variety of home services ranging from pizza deliveries to electricians. Even relatively poor communities have been noted to use telecommunication to their advantage. In Bangladesh's Narshingdi district, isolated villagers use cellular phones to speak directly to wholesalers and arrange a better price for their goods. In Côte d'Ivoire, coffee growers share mobile phones to follow hourly variations in coffee prices and sell at the best price.

On the macroeconomic scale, Lars-Hendrik Röller and Leonard Waverman suggested a causal link between good telecommunication infrastructure and economic growth. Few dispute the existence of a correlation although some argue it is wrong to view the relationship as causal.

Because of the economic benefits of good telecommunication infrastructure, there is increasing worry about the inequitable access to telecommunication services amongst various countries of the world—this is known as the digital divide. A 2003 survey by the International Telecommunication Union (ITU) revealed that roughly a third of countries have fewer than one mobile subscription for every 20 people and one-third of countries have fewer than one land-line telephone subscription for every 20 people. In terms of Internet access, roughly half of all countries have fewer than one out of 20 people with Internet access. From this information, as well as educational data, the ITU was able to compile an index that measures the overall ability of citizens to access and use information and communication technologies. Using this measure, Sweden, Denmark and Iceland received the highest ranking while the African countries Nigeria, Burkina Faso and Mali received the lowest.

6. SOCIAL IMPACT

Telecommunication has played a significant role in social relationships. Nevertheless devices like the telephone system were originally advertised with an emphasis on the practical dimensions of the device (such as the ability to conduct business or order home services) as opposed to the social dimensions. It was not until the late 1920s and 1930s that the social dimensions of the device became a prominent theme in telephone advertisements. New promotions started appealing to consumers' emotions, stressing the importance of social conversations and staying connected to family and friends.

Since then the role that telecommunications has played in social relations has become increasingly important. In recent years, the popularity of social networking sites has increased dramatically. These sites allow users to communicate with each other as well as post photographs, events and profiles for others to see. The

profiles can list a person's age, interests, sexual preference and relationship status. In this way, these sites can play important role in everything from organizing social engagements to courtship.

Prior to social networking sites, technologies like short message service (SMS) and the telephone also had a significant impact on social interactions. In 2000, market research group Ipsos MORI reported that 81% of 15 to 24 year-old SMS users in the United Kingdom had used the service to coordinate social arrangements and 42% to flirt.

7. CONCLUSION

ICT is nowadays more and more integrated into other sectors of economy. It has become part of their business. Consequently ICT professionals have to have more versatile skills profiles. ICT sector needs multitalented professionals in the near future. They have to master ICT broadly, but they also have to have some narrower fields' expertise of their own. In addition it is desirable that they have good business skills. Besides right education new ICT professionals have to have right attitude and willingness to learn new things. In other branches than ICT these issues are emphasized. ICT professionals have to be able to understand business perspective and they have to be able explain technical terms to non technical people and change their technical vocabulary to suit listeners' background.

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