

ICT, Education and Digital Divide in Developing Countries

Tahereh Saheb
General Applied and Scientific University, Tehran

Abstract

Information Communication Technologies are the core of a new life that has made a new entity, the Information Society with a specific education system. From this viewpoint the Information Society and the way of learning is deemed to be as different from ancient, industrial and agricultural epochs. Since the 1950's, the advent of computers brought high hopes of the power of technology to revolutionize and ameliorate education systems. In this article we have tried to analysis how ICT and digital revolution have influenced education system by focusing on the advantages of new system of learning that has been produced by new information and communication technologies. At the end of article we have elucidated digital divide and key factors to bridge the digital divide between developing countries and developed ones. Keywords: Education, Developed and Developing countries, Digital divide, Information Society, Information Communication Technologies and Internet.

Introduction

Comparing our world today especially with the world one hundred years ago will reveal marvelous and amazing advances in science, trade, health care, transportation, and countless other areas. But if we were to juxtapose the classroom of a hundred years ago with an average classroom today especially those in developing countries, we would perceive it immediately; students lined up in rows, paper and pencil in hand; a teacher at the blackboard jotting down important facts; students furiously copying all that is written and said, expecting to memorize the facts and spit them out on an exam. While much has been changed by the advances of science and technology, education and the way that students learn and teachers teach have remained largely unchanged especially those in developing countries [1].

Access to information and communication technologies is the crucial issue to a sustainable agenda of socio-economic development. Access to new technologies will furnish vital knowledge inputs into the productive measures of developing countries, especially those who are rural and poor. In communities where digital technologies are in abundance, they have changed the way the adults and children relate to and interact with each other and with institutions such as banks, businesses, governments, libraries and schools.

In this article we will discuss the advantages of information communication technologies and digital gap between developed and developing countries but before elucidating those concepts, a short history of education are summarized.

History of Education Systems

By turning back to the Stone Age, amazing changes in education systems will become manifest. Before the invention of reading and writing, people lived in an atmosphere in which they struggled to endure natural forces, animals, and other humans. To endure, preliterate people developed skills that grew into cultural and educational patterns. For a particular group's culture to continue into the future, people had to disseminate it from adults to children. The earliest educational processes involved sharing information about gathering food and providing shelter; making weapons and other tools; learning language; and acquiring the values, behavior, and religious rites or practices of a given culture.

Parents, elders, and priests by informal education have taught children the skills and roles they would need as adults. These lessons eventually formed the moral codes that governed behavior. Since they lived before the invention of writing, preliterate people used an oral tradition, or story telling, to transmit their culture and history from one generation to the next. But who wrote first?

Sumerians are believed to be the first to have invented the art of writing. After Sumerians the Egyptians commenced writing shortly after 3000 BC and According to Egyptian mythology, Thoth was the creator of writing. Education and writing were interdependent in ancient Egypt. Literacy was the first step in attaining knowledge. However Education was limited and narrow in scope. Only rich males had access to education. Education was almost always limited to religion. Center of education was the city of Heliopolis." [2]

In China this has been accepted that during the rule of Huang Ti (The Yellow Emperor), there was an ancient sage by the name of Ts'ang Chieh, who was attributed the inventor of writing but the origins of Chinese writing are obscure and debated. Some people believe that the rebus principle was borrowed through the trade routes from Sumeria to China-which would be an example of stimulus diffusion. There is no direct evidence for this, although there was contact through western China. Many believe that the ancient Chinese hit upon the writing principle completely independently. The earliest known form of true writing in China dates from the Shang dynasty, 1200BC-1045BC., which dates considerably later than for Sumerian writing. But it is entirely possible that pictographic signs had begun to be used as sound symbols in China long before that. Just as in Sumeria, ancient pictograms and ideograms came to be used to denote syllables of sound rather than to depict concepts [3].

In ancient Rome the goal of education was to be an effective speaker. The school day began before sunrise, as did all work in Rome. Students brought candles to use until daybreak. No one knows how long the school year actually was; it probably varied from school to school. However, one thing was uniform - the school began each year on the 24th of March. In early Roman days, a Roman boy's education took place at home. If his father could read and write, he taught his son to do the same. The father instructed his sons in Roman law, history, customs, and physical training, to prepare for war. Reverence for the gods, respect for law, obedience to authority, and truthfulness were the most important lessons to be taught. Girls were taught by their mother. Girls learned to spin, weave, and sew. Children, in poorer homes, did not have slaves to teach them; they were taught by their parents in early Roman days [4].

So as we saw during that long period no separation was established between life and education, between places where to live and places where to be educated. It was only with the invention of writing that a new kind of education arose, first in Egypt and Babylonia and later in Greece, which gave rise to schools since the work of teaching was now too skilled to be carried out at home.

During agricultural and industrial age the concepts of education became different form ancient times.

Concepts of education in agricultural age were as below:

- 9-month school year (kids had to help farm during the summer)
- 7-hour school day (kids had to be home before dark to do their farm chores)

And in industrial age were as so:

- 50-minute class periods (modeled after a moving assembly line)
- Grade levels, K-12 (modeled after stations on an assembly line)

Simply put, education system in information age has slight alteration and just some sort of education systems has become popular solely in developed countries. Developing countries are still suffering from digital gap. They can't keep up with the changes in socio-economic system during the twentieth century. So an up-to-date education system should be consistent with current socio-economic system that has named information society, which means it should be based on concepts from information and consumer services.

What are the features of information Society that education systems must commensurate with it?

"The information society is a new kind of society. Specific to this kind of society is the central position information technology has for production and economy. Information society is seen as successor to

industrial society. Closely related concepts are post-industrial society (Daniel Bell), post-Fordism, post-modern society, knowledge society, Telematic Society, Information Revolution, and informational society [5].

As we told in information society, applications of information and communications technologies (ICT) are making dramatic changes in economic and social development that these tectonic economic and social changes have been characterized by terms such as “knowledge economy” and “learning society”, conveying the notion that knowledge and learning are now at the core of economic productivity and social development. Nowadays information communication technologies are the nervous system of contemporary society, transmitting and distributing sensory and control information, and interconnecting myriad interdependent units. These technologies consists *Electronic Mass Media* such as Cable Television, pay Television Services, Interactive Television, Wireless Cable Systems, Streaming Media, Radio broadcasting , Direct Broadcast Satellite, *Computers and Consumer Electronic* such as Multimedia computers Video Games, The Internet and the World Wide Web, Office Technologies, Internet Commerce, Virtual and Augmented Reality, Home video and Digital Audio and *Technology and Satellite technologies* such as Local and Long Distance Telephony, Broadband Networks, Residential Gateways and Home Networks, Satellite Communication, Distance Learning , Wireless Telephony, Video conferencing[6].

Critical analysis of the history of ICT in learning shows four major phases in the history of using computers in education that we have elucidated the third and fourth phases in III section.

- Late 1970s-early 1980s: Programming, drill and practice;
- Late 1980s-early 1990s: Computer-based training (CBT) with multimedia;
- Early 1990s: Internet-based training (IBT);
- Late 1990s-early 2000: e-learning [7]

INFORMATION COMMUNICATION TECHNOLOGIES AND THEIR ADVANTAGES

In the early 1990, researchers were investigating the impacts of computers on education, teaching and learning. Computers were supposed as a phenomenal new implement, able to enrich the resources available for teaching and pertinent software and through a more individualized way of learning. But the development of information communication technologies brought major and profound changes across the whole society and education. Information is now digitalized, information technologies process digitalized information and communication technologies transport digitalized information.

Alexander and McKenzie (1998) state that the major ‘benefits of online distance education are an improved quality of learning; an improved productivity of learning; an improved access to learning; and an improved student attitude to learning’. One of the advantages of new online distance education is interacting with others and gaining a more sophisticated and global understanding of complex international issues[8]. One of the other advantages of online distance education is lifelong learning that has been more accessible for all people. ‘Lifelong learning has been perceived as both a social ideal, involving personal growth and active citizenship, and an economic necessity in a knowledge economy... (That) requires people to undertake continual retraining and the acquisition of new skills in response to technological and structural economic changes,’ [9]

Some common features of the new education system (called E-learning, distance learning, internet based learning or web based learning) that has been created by information communication technologies are:

- One can digitalize texts, images, sound, videos, leading to multimedia digitalized information.
- One can access any kind of information anywhere in the world in a few seconds.
- Digitalized information is more accessible, more interactive, easier to access, transport, store and

process.

- Students are more active and self-directed in the learning environment
- Educational opportunities are close to home
- Students receive exposure to telecommunication technologies
- They can access to internet-rich learning environment
- They have opportunities to develop technology competencies
- They can contact with students in other locations all over the world
- They have opportunities to participate in online national and international events
- They can develop stronger relationships with classmates
- Students can determine time and place of "class time"
- They can access to global resources and experts
- Their interaction with classmates will increase.

DIGITAL DIVIDE IN DEVELOPING COUNTRIES

Despite rapid increases to information communication technologies in developed countries, there exists a digital divide between, rich, poor, urban, and rural/remote areas in developing countries (see table 1) The challenge of expanding the telecommunications network in developing countries to reach the whole population needs to overcome two separate 'gaps'. ... These gaps are:

- The market efficiency gap and the access gap [10].

Kofi Anan, UN secretary general also in his message for the World Telecommunication day -May 17th 2004- emphasized on digital divide between countries:

TABLE I

World Internet Users and Population Stats

World Regions	Population (2005 Est.)	Internet Usage, Latest Data	Usage Growth 2000- 2005	World Users %
<u>Africa</u>	896,721,874	16,174,600	258.3 %	1.7 %
<u>Asia</u>	3,622,994,130	323,756,956	183.2 %	34.5 %
<u>Europe</u>	731,018,523	269,036,096	161.0 %	28.7 %
Middle East	260,814,179	21,770,700	311.9 %	2.3 %
<u>North America</u>	328,387,059	223,392,807	106.7 %	23.8 %

<u>Latin America/Caribbean</u>	546,723,509	68,130,804	277.1 %	7.3 %
Oceania/ Australian	33,443,448	16,448,966	115.9 %	1.8 %
World Total	6,420,102,72	938,710,929	160.0 %	100.0

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

Today, many people could not imagine daily life without the use of increasingly sophisticated information and communication technologies (ICTs), from television and radio to the mobile telephone and the Internet. Yet for millions of people in the world's poorest countries, there remains a "digital divide" excluding them from the benefits of ICTs [11].

Digital divide term that become popular among concerned parties, such as scholars, policy makers, and advocacy groups, in the late 1990's , is used to describe the growing gap, or social exclusion, between those who have access to the new services of the information society, and those who do not. This can be for a number of reasons: access to education or training, lack of money to buy the required equipment, or lack of access because of the problems obtaining the required communications links or services to get online. Some states have produced good research than others. Although accessing to Internet is not the only criteria and other factors such as the quality of connection and auxiliary services, processing speed and other capabilities of the computer used must be considered [12].It is clear that developed nations with the resources to invest in and develop ICT Infrastructure are reaping enormous benefits from the information age, while developing nations are trailing along at a much slower pace. There are many challenges faced by governments, political leaders, and business entrepreneurs around the world especially in developing countries. Governments, industries, non-government organizations and policy makers have made little progress in expanding internet connectivity so internet is distributed unequally across nations.

Data on table 2 that are from the International Telecommunication Union's (ITU) World telecommunication Development shows that in the early twenty-first century so far the benefits of the internet have failed to reach most of the poorer nations in Sub-Saharan Africa, South Asia and Middle East. The gap between the information -rich and poor countries has sharply increased in the emergent years of this new technology [13]. International organizations have sounded the alarm too. The Organization for Economic Co-operation and Development, OECD warned that affluent states at the cutting edge of technological change have reinforces their lead in the new knowledge economy but so far the benefits of the internet have not yet trickled down so far to Southern, Central and Eastern Europe, let alone to the poorest areas in Sub-Saharan Africa, Latin America and South-east Asia [14].

TABLE 2

Internet Total monthly price, % of monthly World Internet

	Users 1000	per20 People	HoursGNI of use \$	per capita \$	Secure servers number
	2003 a	2003 b	2003		2004 c
East Asia and	68	31	66.1		1139

pacific

Europe and central Asia	161	26	39.5	2950
Latin America and Carib	106	33	30.0	4657
Middle East and N.Africa	48	31	29.9	194
South Asia	10	30	58.6	541
Sub-Saharan Africa	20	64	268.8	1019

Source: 2005 World Development Indicators

As we observed developing countries are suffering from the dearth of Information Communication Technologies infrastructure and consequently the benefits of them in education systems. But how can developing countries bridge the digital divide? In the first stage authorities in developing countries must identify the barriers then attempt to eliminate them, in that case they can bridge the digital divide that exists between them and developed countries.

If we want to identify barriers of internet use, optimistically as Kofi Anan did (2001) there are three barriers: *price of Internet access*, *a shortage of infrastructure* and *language*. Although we can name other some barriers such as:

Social and Legal Constraints, including censorship and denial of access: There are a number of countries who attempt to strictly control access to the Internet and to Internet resources. The systems used to enforce such constraints, most notably proxy servers, inevitably affect the performance and currency of available data, and inevitably limit the breadth of available information, the range of resources accessed, and the number of people who have access to even that data which has not been proscribed. Many authoritarian regimes translate a long and successful history of control over other information and communication technologies into strong control of internet development within their borders. Potential challenges to the state may arise from Internet use in several areas: the mass public, civil society, the economy, and the international community. Authoritarian states will likely respond to these challenges with a variety of reactive measures: restricting Internet access, filtering content, monitoring on-line behavior, or even prohibiting Internet use entirely, for example restrictions in internet use in China, Cuba, Burma, The United Arab Emirates, Vietnam, and Iran [15]. The restrictions on access to the technology raise the question of whether the development of the information society and its impact on the private, working and public lives of people requires democracy to be underpinned with 'communication rights'-for example, the right to communicate with fellow citizens privately and without interference using the internet .In order:

Internet users are people with access to the world wide network. Total monthly price refers to the sum of ISP and telephone usage charges for 20 hours of use and as percentage of monthly GNI per capita. Secure servers are servers using encryption technology in internet transactions to exercise such rights it would be necessary in a democratic society to ensure access to the means of communication [16]. Internet Total monthly price, % of monthly World Internet

Source: 2005 World Development Indicators Basic Infrastructure, Network Infrastructure and connectivity

Basic infrastructure includes buildings and power resources; many countries lack power generation and distribution facilities adequate to running computers or Network Infrastructures except in large cities, and access can be limited and/or sporadic even there. Solutions involving the use of small scale local power generation (solar power and fuel cells) are becoming increasingly workable, but a high bandwidth Network Infrastructure often depend on the backbone provided by a power infrastructure.

The Internet is built on a complex layering of data networks, with a variety of top level Network Service Providers (NSPs) interconnecting a wide variety of localized networks, including schools, business, governments, and local Internet Service Providers (ISPs). Individual local ISPs will provide end users and smaller businesses with one or more of a variety of connectivity options, including dial-up modem access, broadband cable network access, radio frequency network access, and others. End users and small businesses will, in many cases, use this connectivity to connect multiple machines to the Internet via a local area network (LAN).

We noticed that disparities in information communication technologies access among socio-economic groups are growing in developing countries. In particular, developed countries are unevenly distributed in internet use and the urban poor have very limited access. In addition, the digital divide between developed and developing countries are also expanding.

Conclusion

While the developed countries has been moving expeditiously towards knowledge society where the difficult to keep pace, they are endeavoring and struggling with the economies, political affairs and human resources to prevail over difficulties and bridge the digital divide that is predominating in the contemporary society and is threatening the future of new generations. Nevertheless there are many barriers, we observe that ICT has become a powerful tool for education; it can be used for the professional development of teachers, by reducing the isolation of many teachers and students in rural schools and by enhancing every learning environment with a variety of resources available worldwide. ICT in the schools of developing countries can represent a unique opportunity for many youngsters who do not have access to technology in their homes or in their community to exercise new skills and learn how to use information appliances that will be required when they enter the world force or pursue further studies. Investing in ICT and its role in education especially in developing countries is an significant and delicate decision because of the relative large amount of money that need to be spent for many years to provide reasonable infrastructure to access to the technology for millions of youngsters and hundreds of thousands of teachers and their communities.

So the internet and related technologies, generally information communication technologies, can provide information and tools that extend the fastest and newest ways of learning and can establish new kinds of education systems that will foster learning in an interactive, digitalized and hypertext atmosphere and this will be vital task of all the countries over the world to prepare these infrastructures that are useful for both students and teachers.

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About the Author

Tahereh Saheb is a professor at General Applied and Scientific University, Number14, in Iran. She is the head of Water and Wastewater Company news Web site group in Tehran province (www.thr-ww.com). She is also reporter for energy ministry news Web site and Iranian Public Relations Association. She is translator and editor of MEHR_E_AB monthly magazine, a journal in water and wastewater industry