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Strengthening Role of Information and Communication Technology in Global Society

Vitthalrao B. Khyade [a], Rajashri Vivekanand Khyade [b]

[a] *Sericulture Unit, Malegaon Sheti Farm, Agricultural Development Trust Baramati, Shardanagar, (Malegaon Khurd) Post Box No - 35, Baramati, Pune 413 115, Maharashtra, India; Head, Department of Zoology Shardabai Pawar Mahila Mahavidyalaya, Shardanagar, Tal. Baramati, Dist. Pune – 413115, India.*

[b] *Shrikrupa Residence, Teachers Society, Malegaon Colony Tal. Baramati, Dist. Pune – 413115, India.*

Abstract

Humans have been storing, retrieving, manipulating, and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC, but the term *information technology* in its modern sense first appeared in a 1958 article published in the *Harvard Business Review*; authors Harold J. Leavitt and Thomas L. Whisler commented that "the new technology does not yet have a single established name. We shall call it information technology (IT)." Their definition consists of three categories: techniques for processing, the application of statistical and mathematical methods to decision-making, and the simulation of higher-order thinking through computer programs. The term is commonly used as a synonym for computers and computer networks, but it also encompasses other information distribution technologies such as television and telephones. Several products or services within an economy are associated with information technology, including computer hardware, software, electronics, semiconductors, internet, telecom equipment, and e-commerce. Based on the storage and processing technologies employed, it is possible to distinguish four distinct phases of IT development: pre-mechanical (3000 BC – 1450 AD), mechanical (1450–1840), electromechanical (1840–1940), and electronic (1940–present). This article focuses on the most recent period (electronic), which began in about 1940. Girls in ICT Day initiative is a global effort to encourage girls and young women to consider studies and careers in information and communication technologies (ICT). The Space Communications and Navigation Program at NASA Glenn has partnered with Hyland Software and the Great Lakes Science Center to provide hands-on coding activities, networking with professionals, and an opportunity to explore future careers in the ICT field.

Keywords: Information Communication Technologies; Research Productivity; E-databases; school improvement; information and communication technologies; teaching and learning processes; educational innovation

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INTRODUCTION

Information and communication technology (ICT) is another/extensional term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information (Murray, James, 2011).

The term *ICT* is also used to refer to the 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 telephone network with the computer network system using a single unified system of cabling, signal distribution and management.

However, definition, as the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. The broadness of ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form, e.g. personal computers, digital television, email, robots. For clarity, Zuppo provided an ICT hierarchy where all levels of the hierarchy "contain some degree of commonality in that they are related to technologies that facilitate the transfer of information and various types of electronically mediated communications" (Zuppo, Colrain M. , 2016). Skills Framework for the Information Age is one of many models for describing and managing competencies for ICT professionals for the 21st century. The phrase "information and communication technologies" has been used by academic researchers since the 1980s, and the abbreviation *ICT* became popular after it was used in a report to the UK government by Dennis Stevenson in 1997(Kim, H., Seo, J., & Park, H. , 2008), and in the revised National Curriculum for England, Wales and Northern Ireland in 2000. But in 2012, the Royal Society recommended that *ICT* should no longer be used in British schools "as it has attracted too many negative connotations", (Mahapatra, M. ,1985), and with effect from 2014 the National Curriculum uses the word *computing,* which reflects the addition of computer programming into the curriculum.

Variations of the phrase have spread worldwide, with the United Nations creating a "United Nations Information and Communication Technologies Task Force" and an internal "Office of Information and Communications Technology" (Ndahi, H. , 2003).

MONETIZATION FOR IT

The money spent on IT worldwide has been most recently estimated as US $3.5 trillion and is currently growing at 5% per year, doubling every 15 years. The 2014 IT budget of US federal government is nearly $82 billion. IT costs, as a percentage of corporate revenue, have grown 50% since 2002, putting a strain on IT budgets. When looking at current companies' IT budgets, 75% are recurrent costs, used to "keep the lights on" in the IT department, and 25% are cost of new initiatives for technology development (Nzwilli, M. F. N. , 2009).

The average IT budget has the following breakdown:

- 31% personnel costs (internal)
- 29% software costs (external/purchasing category)
- 26% hardware costs (external/purchasing category)
- 14% costs of external service providers (external/services). (Nzwilli, M. F. N. , 2009).

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TECHNOLOGICAL CAPACITY

The world's technological capacity to store information grew from 2.6 (optimally compressed) exabytes in 1986 to 15.8 in 1993, over 54.5 in 2000, and to 295 (optimally compressed) exabytes in 2007, and some 5 zettabytes in 2014. This is the informational equivalent to 1.25 stacks of CD-ROM from the earth to the moon in 2007, and the equivalent of 4,500 stacks of printed books from the earth to the sun in 2014. The world's technological capacity to receive information through one-way broadcast networks was 432 exabytes of (optimally compressed) information in 1986, 715 (optimally compressed) exabytes in 1993, 1.2 (optimally compressed) zettabytes in 2000, and 1.9 zettabytes in 2007. The world's effective capacity to exchange information through two-way telecommunication networks was 281 petabytes of (optimally compressed) information in 1986, 471 petabytes in 1993, 2.2 (optimally compressed) exabytes in 2000, 65 (optimally compressed) exabytes in 2007, and some 100 exabytes in 2014.[15] The world's technological capacity to compute information with humanly guided general-purpose computers grew from 3.0 × 10^8 MIPS in 1986, to 6.4 x 10^12 MIPS in 2007 (Rehman, A., 2014).

ICT DEVELPOMENT INDEX (IDI)

The ICT Development Index (IDI) is an index published by the United Nations International Telecommunication Union based on internationally agreed information and communication technologies (ICT) indicators. This makes it a valuable tool for benchmarking the most important indicators for measuring the information society. The IDI is a standard tool that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries. The ICT Development Index is based on 11 ICT indicators, grouped in three clusters: access, use and skills.

The ICT Development Index ranks and compares the level of ICT use and access across the various countries around the world (Shaikh, Z., A., & Khoja, S. A. , 2011). In 2014 ITU (International Telecommunications Union) released the latest rankings of the IDI, with Denmark attaining the top spot, followed by South Korea. The top 30 countries in the rankings include most high-income countries where quality of life is higher than average, which includes countries from Europe and other regions such as "Australia, Bahrain, Canada, Japan, Macao (China), New Zealand, Singapore and the United States; almost all countries surveyed improved their IDI ranking this year" (Swain, D. K., and Panda, K. C. , 2009).

WORLD SUMMIT ON INFORMATION SOCIETY (WSIS)

On 21 December 2001, the United Nations General Assembly approved Resolution 56/183, endorsing the holding of the World Summit on the Information Society (WSIS) to discuss the opportunities and challenges facing today's information society (Tahira, M, Alias, R.A. & Ameen, K. , 2013). According to this resolution, the General Assembly related the Summit to the United Nations Millennium Declaration's goal of implementing ICT to achieve Millennium Development Goals. It also emphasized a multi-stakeholder approach to achieve these goals, using all stakeholders including civil society and the private sector, in addition to governments.

To help anchor and expand ICT to every habitable part of the world, "2015 is the deadline for achievements of the UN Millennium Development Goals (MDGs), which global leaders agreed upon in the year 2000" (Tahira, M. (2008).

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ICT IN EDUCATION

Nowadays the role of Information and Communication Technology (ICT), in the education sector plays an important role, especially in the process of empowering the technology into the educational activities. Education sector can be the most effective sector to anticipate and eliminate the negative impact of ICT. Technology in another side can be the most effective way to increase the student's knowledge.

The use of ICT in education adds value to teaching and learning, by enhancing the effectiveness of learning. It added a dimension to learning that was not previously available. After the inception of ICT in schools, students found learning in a technology enhanced environment more stimulating and engaging than in a traditional classroom environment

Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, proved that an increase in student exposure to educational ICT through curriculum integration has a significant and positive impact on student achievement, especially in terms of "Knowledge" ; "Comprehension"; Practical skill" and "Presentation skill" in subject areas such as mathematics, science, and social study.

Information and Communication Technology can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration. UNESCO takes a holistic and comprehensive approach to promoting ICT in education. Access, inclusion and quality are among the main challenges they can address. The Organization's Intersectral Platform for ICT in education focuses on these issues through the joint work of three of its sectors: Communication & Information, Education and Science (Albert Sangrà & Mercedes González-Sanmamed, 2010).

Despite the power of computers to enhance and reform teaching and learning practices, improper implementation is a widespread issue beyond the reach of increased funding and technological advances with little evidence that teachers and tutors are properly integrating ICT into everyday learning. Intrinsic barriers such as a belief in more traditional teaching practices and individual attitudes towards computers in education as well as the teachers own comfort with computers and their ability to use them all as result in varying effectiveness in the integration of ICT in the classroom (Warraich, N.F. & Kanwal, A. , 2010).

ICT KEY STONE OF EVERYDAY LIFE

In modern society ICT is ever-present, with over three billion people having access to the Internet. With approximately 8 out of 10 Internet users owning a smartphone, information and data are increasing by leaps and bounds. This rapid growth, especially in developing countries, has led ICT to become a keystone of everyday life, in which life without some facet of technology renders most of clerical, work and routine tasks dysfunctional. The most recent authoritative data, released in 2014, shows "that Internet use continues to grow steadily, at 6.6% globally in 2014 (3.3% in developed countries, 8.7% in the developing world); the number of Internet users in developing countries has doubled in five years (2009-2014), with two thirds of all people online now living in the developing world" (Warraich, N.F. & Tahira, M. , 2009 ; Wilson, T.D. , 2004).

However, hurdles are still at large. "Of the 4.3 billion people not yet using the Internet, 90% live in developing countries. In the world's 42 Least Connected Countries (LCCs), which are home to 2.5 billion people, access to ICTs remains largely out of reach, particularly for these countries' large rural

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populations." ICT has yet to penetrate the remote areas of some countries, with many developing countries dearth of any type of Internet. This also includes the availability of telephone lines, particularly the availability of cellular coverage, and other forms of electronic transmission of data. The latest "Measuring the Information Society Report" cautiously stated that the increase in the aforementioned cellular data coverage is ostensible, as "many users have multiple subscriptions, with global growth figures sometimes translating into little real improvement in the level of connectivity of those at the very bottom of the pyramid; an estimated 450 million people worldwide live in places which are still out of reach of mobile cellular service (Zainab, *et al* , 2012).

According to the Measuring the Information Society Report (2015), favorably, the gap between the access to the Internet and mobile coverage has decreased substantially in the last fifteen years, in which "2015 [was] the deadline for achievements of the UN Millennium Development Goals (MDGs), which global leaders agreed upon in the year 2000, and the new data show ICT progress and highlight remaining gaps." ICT continues to take on new form, with nanotechnology set to usher in a new wave of ICT electronics and gadgets. ICT newest editions into the modern electronic world include smart watches, such as the Apple Watch, smart wristbands such as the Nike+ Fuel Band, and smart TVs such as Google TV. With desktops soon becoming part of a bygone era, and laptops becoming the preferred method of computing, ICT continues to insinuate and alter itself in the ever-changing globe. Information communication technologies play a role in facilitating accelerated pluralism in new social movements today. The internet according to Bruce Bimber is "accelerating the process of issue group formation and action" and coined the term accelerated pluralism to explain this new phenomena. ICTs are tools for "enabling social movement leaders and empowering dictators" in effect promoting societal change. ICTs can be used to garner grassroots support for a cause due to the internet allowing for political discourse and direct interventions with state policy.

CONCLUSION

World Summit on the Information Society (WSIS), the international community agreed a common vision to build a 'people - centred, inclusive and development - oriented Information Society,' and established ten targets that were intended to measure progress towards that vision. In December 2015, the United Nations General Assembly completed its ten-year review of the implementation of WSIS outcomes. This review takes place in the context of the United Nations' 2030 Agenda for Sustainable Development, adopted in September 2015, which includes sustainable development goals (SDGs) aimed at enhancing economic prosperity, social welfare and environmental sustainability over the next fifteen years. The proportion of the global population covered by mobile-cellular networks is now over 95 per cent, while the number of mobile-cellular subscriptions has risen from 2.2 billion in 2005 to an estimated 7.1 billion in 2015. Growth in mobile-cellular penetration worldwide has slowed as the number of subscriptions approaches that of global population, though there is still some way to go in achieving universal mobile access and usage in developing countries. There has been a slow but steady decline in the number of fixed-telephone subscriptions worldwide, from 1.25 billion in 2005 to an estimated 1.06 billion in 2015, partly due to fixed-mobile substitution. The number of mobile-broadband subscriptions worldwide has grown from 0.8 billion in 2010 to an estimated 3.5 billion in 2015, though the number of fixed-broadband subscriptions has risen much more slowly, to an estimated 0.8 billion todays. The number of Internet users has also grown rapidly, and is now estimated at over 40 per cent of the world's population.

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