

## **RISE OF ICTS IN EDUCATION**

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### **1. INTRODUCTION**

The world has evolved intricately on the basis of information and communication technologies. Every individual on this planet experiences, uses or is impacted by ICTs. This influence of ICTs has greatly influenced education across the globe. Education in the developed nations is embedded with the use and application of ICTs. This is becoming more the case in developing nations and it is hard to argue the fact that the future of education is going to be independent of ICTs. Numerous countries and organizations (European Union, United States, Kenya, India, etc. and NGOs) have understood the importance of education for economic prosperity, and in order to achieve a wide spread dispersion of ICTs is a prerequisite. For example, a researcher in India can read up international publications on the latest research regarding insulin injections and look at clinical trial data from China and come up with novel solutions to make insulin easily available for patients. This was the case by a group of scientists from India's National Institute of Pharmaceutical Education and Research (link – insulin pill). The availability of ICTs to today's youth can help cultivate future scientists, researchers, engineers and world leaders to solve the world's problems. ICTs have become a medium for broadcasting theories and ideas of great minds to inquisitive learners. ICTs have also enabled physically challenged people to both learn and express their ideas.

Stephen Hawking, who has succumb to motor neurone disease and is almost fully paralyzed, has been communicating through a special computer developed by Intel Corporation that recognizes movements in his facial muscles and has improved his communication speed by ten times.(Hawking) In this case, ICT has enabled Stephen Hawking's ingenious theories to reach any human with access to internet and a computer, generating the curiosity to learn more about outer space.Further on, ICTs influence has improved the accessibility of education for special students' education. New systems are being developed to aid different challenges that special students face. A digital audio player was introduced with document structure for visually impaired students. A system was developed with Greek Sign Language videos to correspond to all learning material texts. Speech Perception Assessment and Training System (SPATS) was designed, to aid everyday speaking ability. Other learning tools aid students with motor impairments, Autistic Spectrum Disorders, Dyslexic learners and many other disorders. (S. Drigas & Ioannidou, 2013)

Observing the impact ICTs have had on the various dimensions of education, it is impossible to imagine current or future teaching and learning methodologies without a significant constituent of ICT.Many other evident forms of learning that are powered by ICTs include: web-learning, online learning, distance education, virtual learning, eLearning, virtual classrooms, Computer-based training (CBT), Computer-supported collaborative learning (CSCL), digital training, eLibraries, e-assessment tools, e-portfolio, simulation software etc.

### **2. APPLICATIONS OF ICTS IN EDUCATION**

Globalization, technological advancements and the ever expanding knowledge base has dramatic impact on the learning methodologies adopted worldwide. This has lead to stunning effects of ICTs in Education; making it difficult to measure the length and breadth of ICTs influence on education. However, the dimensions of ICTs' spread can be marked viz. across different educational sectors, modes of learning and the numerous contexts of teaching and learning paradigms. ICTs driven educational systems are highly diversified. ICTs are embedded as part of the regular educational framework, general purpose learning resources, educational applications and tools driven by the internet or mobile technologies etc.

More than ever, ICT systems are being tightly integrated with the regular educational framework. Most schools in developed and soon catching up institutions in developing countries are using their own systems that interact and collaborate with all the stakeholders involved. These systems impact the administrative functions, teaching methodologies, classrooms, assessments, students' portfolio management, libraries, laboratories etc. The OECD (Organization for economic Co-operation and Development) (Punie, Zinnbauer, & Cabrera, 2008) has identified four levels of based on the use of eLearning methodologies in formal school education:

- Web-supplemented courses – which is class room based teaching aided by online course notes, lectures and use of other links to online resources
- Web-dependent courses – these type of courses require students to participate online via discussion forums, online assessments, online project work along with class room learning
- Mixed mode courses – in this type class room learning is significantly reduced by online learning and other web-dependent course functionalities but with minimal face –to-face interaction

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- Fully online courses – students are offered courses that do not require any class room presence, courses are accessible from anywhere and operate on a complete self-study mode.

A conceptual framework has been developed by UNESCO (Guide to Measuring Information and Communication Technologies (ICT) in Education, 2009); information needs form the backbone for accessing the level of penetration of ICT in education systems. The policy making process and progress monitoring are based on where a country falls on the graph. Countries at their early stages of ICT implementation such as Kenya, Greece, have more information needs as compared to countries that have longer experience using technology in education such as UK, Germany, India, etc. Whereas some other countries need to focus on hardware and software accessibility to support computer based educational systems. The research findings show that, countries in advanced stages of ICT use have more complex priorities such as pedagogical innovation, adaptive and inclusive curriculum, organizational change, sustainable technical support, and continued staff development. The figure 1 below shows the graph of information requirements versus ICT integration into the education system.

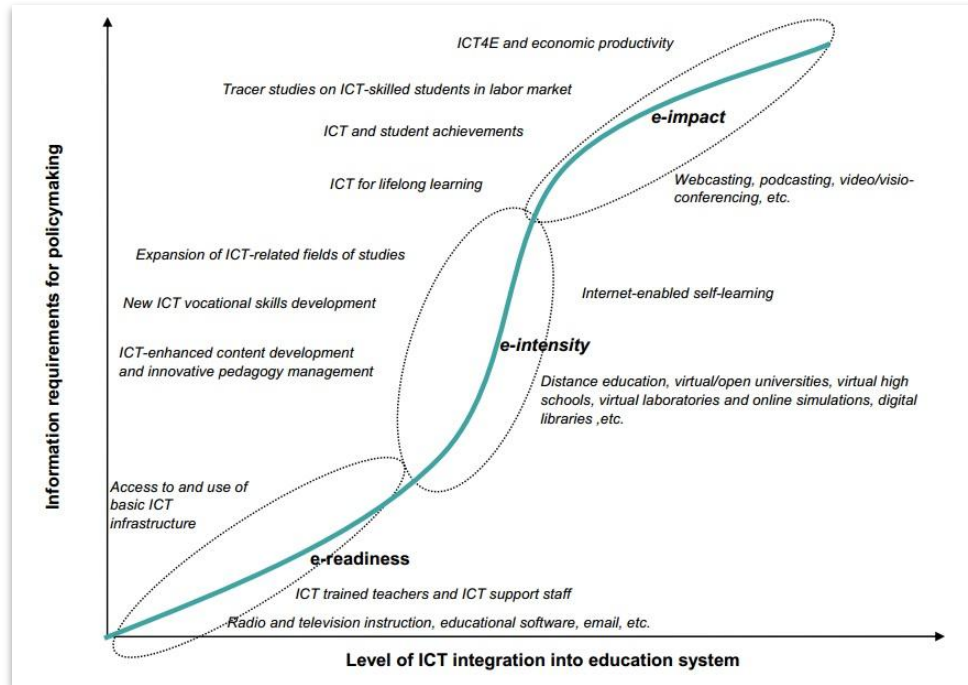


Figure 1: Information needs at different levels of ICT use in education (Source: UNESCO)

The common framework designed for ICT in education considers the following entities: school factors, system factors, teacher characteristics, pedagogical practices, ICT impacted pedagogical practices, student characteristics and learning outcomes. This model takes into consideration all the factors that are bound together to impact the culture of ICT in that country's education system. The Figure 2 below depicts the framework and illustrates the connectivity between the entities. But a more practical approach is suggested for implementation as there are more complexities involved. Some of the other influential factors include, ICT facilities, updated curriculum, teacher training programs, usage of ICT in teaching and learning and learners' performance evaluation. Figure 3 describes this cyclical interdependence of the entities in the system.

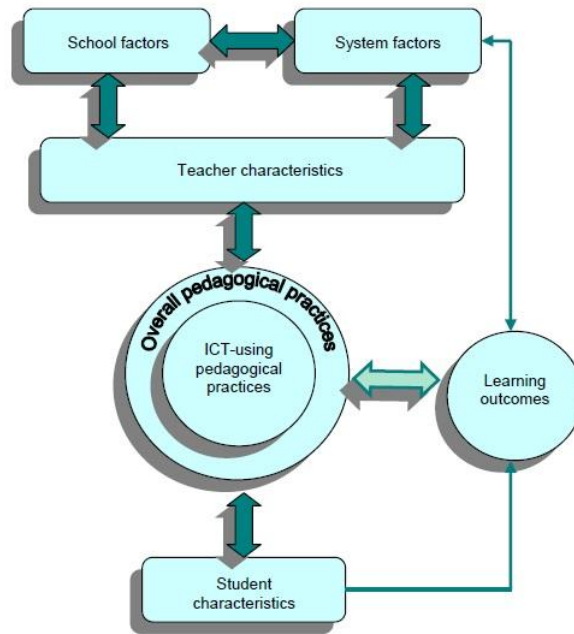


Figure 2: Conceptual Framework for ICT in Education (Source: SITES<sup>2</sup> 2006 Study)

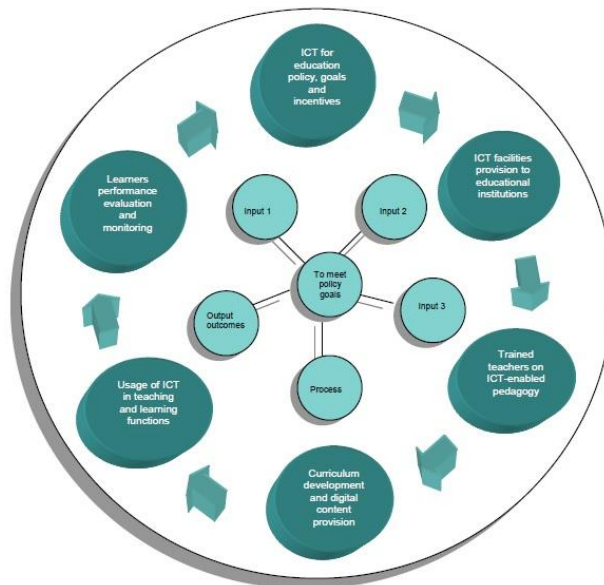


Figure 3: Operational Framework for ICT in Education (Source: UNESCO)

On the other hand, the non-conventional learning structures like online resources are in fact catching up as powerful resources of learning. A simple internet search delivers a wide spectrum of educational resources. Online resources such as Khan Academy are valuable as offer in-depth self-learning tools for students online. Students from across the globe who have access to basic internet can benefit from these services. This framework proves highly versatile and beneficial to students either at a primary or elementary level or working professionals.

Digital equipments such as tablets and mobile devices are quickly taking over the PC culture. Research has proven that the Apple iPad has been the most rapidly adopted digital device in recent times (Alyahya & Gall, 2012). Statistics from this research have shown that more than 1.5 million iPads are specifically used in education. The study gives a glimpse into the

<sup>2</sup> SITES- Second Information Technology in Education is one of the first organizations to conduct a sample based assessment of ICTs use in education. They covered numerous countries in various rounds of analysis. SITES 2006 include the following countries: Australia, Canada (Alberta and Ontario), Chile, China (Taipei), Denmark, Estonia, Finland, France, Hong Kong Special Administrative Region of China, Israel, Italy, Japan, Lithuania, Norway, Russian Federation (Moscow), Singapore, Slovakia, Slovenia, South Africa, Spain (Catalonia), Thailand. (Second Information Technology in Education Study 2006, 2006)

future of ICT in education. In parallel social media is also developing fiercely impacting and changing the way the world operates. Social media as an educational tool is equally influential. It promotes discussion between teachers and students, harnesses exchange of ideas and encourages student engagement in learning activities. For example, Facebook and Twitter have become important mediums to share ideas, collaborate for events and projects. Inquisitive learners can communicate to bright minds across the globe using Twitter. Another important application is improved employment opportunities. With LinkedIn, students now have the ability to establish their professional sphere where a resume can be posted and shared and connectivity between job seekers and employers is established.

Penetration of ICTs in education has opened up novel venues for education. In general, kids are technological more adept at using new gadgets and technologies that are still very foreign to the older segment of the population. In the last decade, there has also been a significant improvement in the performance of students who use ICTs to aid their learning process as well (Punie, Zinnbauer, & Cabrera, 2008). The global access of educational resources has a definitive bearing on the rise of literacy rates across the world. Singapore and Finland are some countries that are excessively spending their national funds to assess the impact ICT has on their literacy rates. Although, most research findings have not proven an accurate picture of the level of ICT's impact specifically, the impact in general is definitely positive (Punie, Zinnbauer, & Cabrera, 2008).

### 3. FUTURE OF ICTs IN EDUCATION

The increasing awareness of the need for technology in education is a promising factor for the utilization, growth and expanse of ICTs in education. As our communication channels are moving towards complete digitization, the world's new knowledge library will be nested in the internet. Teaching and learning processes will potentially speed up and widen further as the technological progress is improving in most countries worldwide. This brings us to consider the numerous challenges that need to be addressed for the advancements of ICTs in education to grow steeply.

These factors include:

- Technology Infrastructure- the necessary wiring and networking to support internet connectivity within the country and to the world grid is crucial.
- Educational Infrastructure - a educational system needs to support the incorporation of ICT as part of their pedagogical practices and learning tools
- Availability of digital instruments/ equipments – these include both the network instruments as well as computer, laptops, tablets and mobile devices
- Standardization of communication – Although globalization is connecting the globe, communication barriers need to be eliminated for information flow by standardizing communication media
- Partnership for connectivity– to connect the different ecosystems of networks to improve information flow
- Equal Opportunity to Content –access to educational resources
  - Elimination of the educational divide and educational system biases
  - Improved access for physically challenged students
  - Improved access for underprivileged students

For example, Juliana Rotich<sup>3</sup> and her group (Rotich) have come up with the new technology called the BRCK (BRCK) which connects to the nearest cellular network when the ever fluctuating internet connectivity goes down. Surprisingly, cellular seems to be a more stable network than the internet in Kenya. Thus fundamental infrastructure and networking issues could deeply impede access to educational resources even if they are available online. Similarly, changes in the educational infrastructure in developing and under-developed nations are also bringing a paradigm shift in the way education is imparted. ICTs can embed in the educational process and bring transformation in the pedagogical practices. The future of teaching will include simulation and visualization in all courses and real time interaction to discuss the theories involved.

The future of education can be envisaged as an intelligent platform driven by ubiquitous computing and Ambient Intelligence (AmI) (Punie, Zinnbauer, & Cabrera, 2008). In cases of multilingual populations, ICT can bring invaluable contributions with automated translators. In an article for Visions 2020: Transforming Education and Training Through Advanced Technologies, a report released by the US government, Randy Pausch<sup>4</sup> talks about the future technologies in the field of education (Pausch). He says that in general cognitive modeling will take preference for students' understanding of concepts. A biofeedback mechanism will be used to help children with behavioral disorders. Telepresence will aid education by helping students to be present anywhere they like and collaborate with other schools and students around the globe. There are many

<sup>3</sup> Juliana Rotich is a tech entrepreneur who is the co-founder and executive director of Ushahidi, a nonprofit tech company in Africa. The company develops open-source software for information collection, interactive mapping and data curation.

<sup>4</sup> Randy Pausch is a Professor of Computer Science, Human-Computer Interaction, and Design at Carnegie Mellon, where he is the co-director of CMU's Entertainment Technology Center (ETC). He was a National Science Foundation Presidential Young Investigator and a Lilly Foundation Teaching Fellow. He has consulted with Walt Disney Imagineering on the user interface design and testing of interactive theme park attractions, and with Google on user interface issues. He is the director of the Alice project, which makes it possible for high school children to author interactive virtual reality worlds.

more innovative applications of ICTs in terms of adventure learning where students can experience science by being inside a virtual reality force feedback exoskeleton (Visions 2020: Transforming education and Training Through Advanced Technologies). With the development of communication and media, the applications are innumerable and the results are astounding.

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