

## ICT: POSITIVE IMPACTS IN HIGHER EDUCATION

Vishal Sharma

*Assistant Professor, Department Of Computer Science and IT,  
DAV College, Jalandhar  
[vishalorsharma@gmail.com](mailto:vishalorsharma@gmail.com)*

### Abstract

In developing nations, where higher education is laden with grave challenges at various levels, there is an ever increasing pressure of viewing technological possibilities in the context of educational setup. India's higher education system in the world is massive, and has been growing consistently. In 2013, India had 727 universities, over 35,000 colleges and nearly 14,000 stand-alone institutions. Higher education, in particular, bears immense significance for the nation as a powerful tool to build knowledge-based society of the 21st century. India is developing as a knowledge economy and it has to work in sync with the support of Information Communication Technologies (ICT). The use of ICT has fundamentally transformed the working of education over the past 2 decades. The use of ICT in education lends itself to more student-centered learning that often creates tensions for some teachers and students, but with the world moving rapidly towards digital media and information, the role of ICT in education is becoming more and more relevant and will continue to grow and develop in the 21st century. The use of ICT can make learning more engaging thereby enhancing the quality of education by supplementing the traditional chalk and talk method of teaching. ICT, if used creatively, can make a huge impact in terms of teaching and learning, helping students' acquire 21st century skills like digital literacy, innovative thinking, creativity, sound reasoning and effective communication. ICT acts as an enabler for quality and market-responsive learning in higher education. However, with higher education in India inundated by the challenges of inadequate technology access and inequity coupled with economic considerations and technological know-how, there is a need to see, how ICT can actually proliferate the students and how it can cultivate change. In regard to this, the paper reviews certain important issues related with the effective implementation of ICTs in Higher Education and provides suggestions to address certain challenges that would help in the implementation of ICTs in Higher education thereby enhancing the quality of education concurrently. The paper also suggests that ICT in higher education is not just a technique for educational development but a means of socio-economic growth of the nation.

**Keywords:** *ICT, Higher Education, knowledge economy, socio-economic growth.*

### 1. Introduction

India is next only to USA and China, with more than 500 universities and around 30000 colleges. With the government realizing that India's strength lies in education, higher education has gained significance in the country's changing policy landscape during the last decade or so. India is



developing as a knowledge economy and it has to work in sync with the support of Information Communication Technologies (ICT). ICT-enabled education in such a huge system requires high quality multi-media enriched content in different disciplines for various courses including its multilingual conversion, capacity building of teachers and students in ICT skills and state-of-the-art infrastructure along with networking and internet connectivity via Virtual Private Network (VPN) / broadband connectivity for disseminating the content with affordable access devices so as to maximize the reach. National Mission on Education through ICT (NMEICT) is a major initiative of the Govt. of India, in this direction with an aim to leverage the potential of ICT in providing high quality personalized and interactive content, free of cost, to one and all. With the use of powerful information and communication technologies such as open source, satellite technology, local language interfaces, easy to use human-computer interfaces and digital libraries and so on with a long-term plan to reach the remotest of the villages, India is consistently marching ahead in its cause.

## 2. Transformation in Higher Education Sector

Tremendous increase in institutional capacity has been witnessed by the Higher Education sector in India post-independence. In comparison with the time of Independence of India in 1947, when there were only 20 Universities and 500 Colleges in the country with 2,10,000 students enrolled in higher education institutions, the numbers stand at 659 universities, 33,023 colleges and 25.9 million students for the academic year 2011-2012 as shown in the Table 1. India is second in the world, in terms of enrollment of students after China; third being USA [2]. This remarkable increase was made possible mainly due to the large number of private institutions of higher education coming up which account for more than 60 % of higher education institutions with nearly 60% of the total number of students enrolled [2]. The Indian Government has set the ambitious target of increasing the current Gross Enrollment Ratio (GER) from 15% to 30% by 2020.

Table 1: Higher Education Sector

Higher Education Institutions	Academic year 2011-12
<b>Universities</b>	<b>659</b>
Central Universities	152
State Universities	316
Private Universities	191
<b>Colleges</b>	<b>33,023</b>
Central	669
State	13,024
Private	19,930

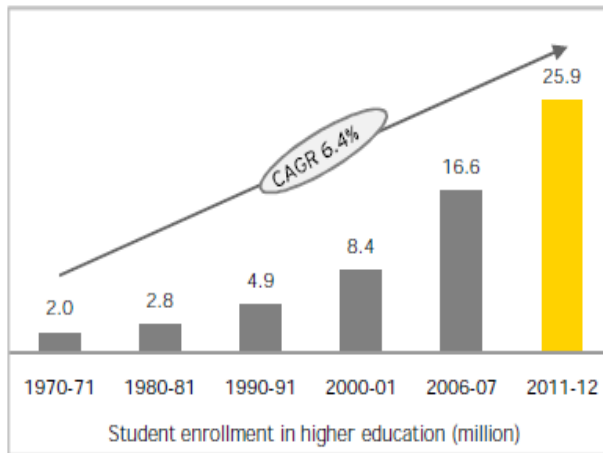
### 2.1 Growth in Universities, Colleges and Student Enrolment

The gross enrolment ratio (GER) in higher education stands at 18.8%, as per the all India survey on higher education released by MHRD. Investments from both the public and private sectors is

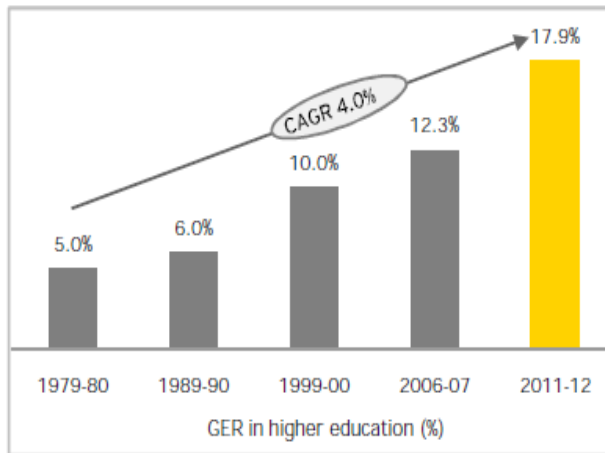


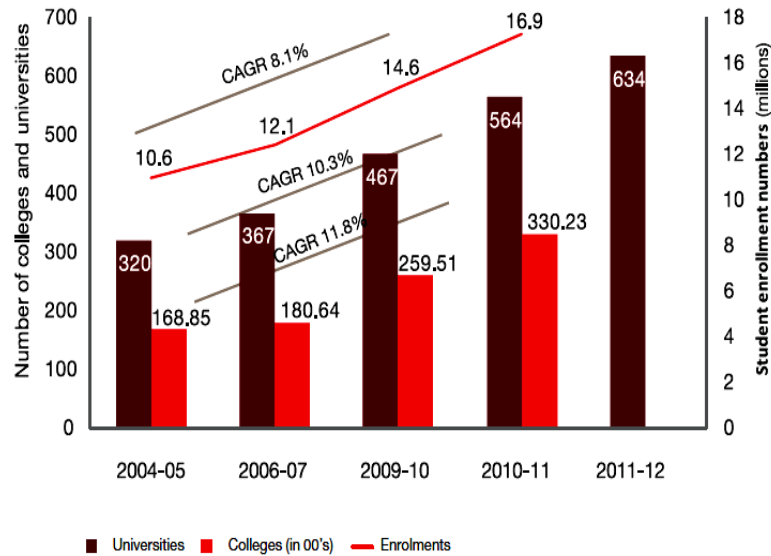
indicated in the education sector by a comparison of the growth patterns of the rising number of universities and institutes on the one hand and the increasing student enrolments on the other as shown in the graphs. For instance, the number of institutes has nearly doubled from 16,800 to 33,000 at a CAGR of more than 11% between 2004-05 and 2011-12. The student enrolment numbers, during the same period, have also increased from 10.6 million to 16.9 million at a CAGR of 8%. However, despite a significant growth in enrollments, the GER in higher education in India is still lower than the world average (24%), and much lower than that of developed nations (58%). Clearly, there is a long way to go to achieve the GER target set by the MHRD of 30% (by 2020) [2]. By 2030, India will be amongst the youngest nations in the world and the already existing challenges for Indian higher education – access, equity and quality – will only be greatly exacerbated unless we significantly transform our higher education model [2]. Today, the median age of India’s 1.5 billion strong population is a mere 32; a good ten years lower than most other nations in the world. With its working age population surpassing 950 million, India is the largest contributor to the global workforce in current times. It is no surprise then that, India has emerged to be the world’s third largest economy- an achievement underpinned, no doubt, by its unique demographic advantage, but also a prospect that would not have translated into reality if not for the country’s pioneering reforms in university education over the past 20 years. India has remarkably transformed its higher education landscape by creating widespread access to low-cost high-quality university education for students of all levels, over the last two decades. India has not only bettered its enrollment numbers but has dramatically enhanced its learning outcomes with a student-centric learning-driven model of education.

**Student enrollment in HEIs has grown 12 times in the last four decades**



**GER in higher education has reached close to 18% in 2011-12**





Source: NMC Horizon Report 2013

### 3. Impact of ICT in Higher Education

‘Technology is a form of human cultural activity that applies the principles of science and mechanics to the solution of problems.. It includes the resources, tools, processes, personnel, and systems developed to perform tasks and create immediate particular, and personal and/or competitive advantages in a given ecological, economic, and social context’ according to Bush (McOmber, 1999). ICT is defined as ‘any technology used to support information gathering, processing, distribution and use’ (Beckinsale and Ram, 2006). ICT refers to ‘Information’, ‘Communications’ and ‘Technology’. While most ICT-related studies have been obsessed with the ‘Technology’ component such as infrastructure, networks and connectivity, the ‘Information’ and ‘Communications’ components have been overshadowed despite their primary importance in this grouping. The technology component only comes to play because it has the potential to support and enable the preceding conditions of information and communications through a combination of technologies to disseminate knowledge. Underpinning these dynamics is the integral role of people as agents for ICT development, since technology is borne out of specific cultural contexts, time and place.

Information and Communication Technology (ICT) is basically an umbrella term that encompasses all communication technologies such as internet, wireless networks, cell phones, satellite communications, digital television etc. that provide access to information. The growth of information technology (IT) such as computers and the Internet continue to change our everyday life. In higher education, the implementation of information and communication technologies (ICTs) has become a necessary fashion all over the campus. During the past few decades, ICT has provided

society with a vast array of new communication capabilities and has fundamentally changed the way we live now. We find a world of difference in the practices and procedures of various fields such as medicine, tourism, banking, business, engineering, etc. as they operate now in comparison to how they operated two decades ago. In contrast, the impact of ICT on education in India, however, has been far less and slow. The introduction of ICT into universities clearly changes the way education is conducted and also paves a way for a new pedagogical approach, where students are expected to play a more active role than before by focusing on the crucial issues of how people communicate and learn in electronic environment. ICT in learning depends on effective communication of human knowledge, which may either occur in synchronous or asynchronous and blended learning situation as the case may be. The role of Information and Communications Technology (ICT) in human development has received growing attention among development practitioners, policy makers, government and civil society in recent years due to the growing proliferation of the Internet, convergence in IT and telecommunications technologies and increasing globalization. While issues of access and the adoption of new ICTs have tended to revolve around utopian themes of empowerment and the development potential of ICT, it has also raised the accompanying issue of digital divide and the challenges for developing countries to participate in the global information society [11]. ICT is viewed as a factor that can promote quality distance education. (Johnson, 2007) points out that communication is a fundamental act of the education process. Hence, to enhance quality in open and distance learning, proper attention must be given to information and communication technology. In education, ICT can be viewed as the application of digital equipment to all aspects of teaching and learning. It involves a combination of technologies for collecting, storing, processing, communicating and delivering of information related to teaching and learning processes.

Table 2: Four Main Rationales for Introducing ICT in Education

Rationale	Basis
Social	Perceived role that technology now plays in society and the need for familiarizing students with technology.
Vocational	Preparing students for jobs that require skills in technology.
Catalytic	Utility of technology to improve performance and effectiveness in teaching, management and many other social activities.
Pedagogical	To utilize technology in enhancing learning, flexibility and efficiency in curriculum delivery.

Importance of education in almost all walks of life has increased with the support of information and communication technologies (ICT). During the past 20 years, the use of ICT has fundamentally changed the working of education. The government is spending a lot of money on ICT in the higher



education sector, the National Mission on Education is emphasizing on the role of ICT in increasing the enrolment ratio in higher education.

### 3.1 ICT and Education

The major teaching and learning challenges facing higher education revolve around student diversity, which includes, amongst others, diversity in students' academic preparedness, language and schooling background. Education is perhaps the most strategic area of intervention for the empowerment of girls and women in any society and the use of information and communication technologies (ICTs) as an educational tool in the promotion of women's advancement has immense potential. The application of ICTs as a tool for effective enhancement of learning, teaching and education management covers the entire spectrum of education from early childhood development, primary, secondary, tertiary, basic education and further education and training. Integrating ICT in teaching and learning is high on the educational reform agenda. Often ICT is seen as indispensable tool to fully participate in the knowledge society. It is assumed that ICT brings revolutionary change in teaching methodologies. The innovation lies not per se in the introduction and use of ICT, but in its role as a contributor towards a student-centered form of teaching and learning.

The Information and Communication Technology (ICT) curriculum provides a broad perspective on the nature of technology, how to use and apply a variety of technologies, and the impact of ICT on self and society. Technology is about the ways things are done; the processes, tools and techniques that alter human activity. ICT is about the new ways in which people can communicate, inquire, make decisions and solve problems. It is the processes, tools and techniques for:

- Gathering and identifying information
- Classifying and organizing
- Summarizing and synthesizing
- Analyzing and evaluating
- Speculating and predicting

Upgrading and enhancing the quality of education and mode of instruction is a vital concern, primarily at the time of the expansion and development of education. ICTs can improve the quality of education in a number of ways: By augmenting student enthusiasm and commitment, by making possible the acquirement of fundamental skills and by improving teacher training. ICTs are also tools which enable and bring about transformation which, when used properly, can encourage the shift to an environment, which is learner centered. ICTs which can be in the form of videos, television and also computer multimedia software, that merges sound, transcripts and multicolored moving imagery, with the available content making it stimulating, thought provoking and reliable that will keep the student interested in the learning process. The use of online pedagogy within universities and management institutes is increasing. The introduction of the Wi-Fi system too has





led to the growth of hi-tech education system, where accessibility and accountability of subject matter is made readily available to the students. The students can now study and comprehend the related information at their own convenient time.

### 3.2 ICT and Research

Applications of ICTs are particularly powerful and uncontroversial in higher education's research function. Four areas are particularly important: The steady increases in bandwidth and computing power available have made it possible to conduct complex calculations on large data sets. Communication links make it possible for research teams to be spread across the world instead of being concentrated in a single institution.

The combination of communications and digital libraries is equalizing access to academic resources, greatly enriching research possibilities for smaller institutions and those outside the big cities. Taking full advantage of these trends to create new dynamics in research requires national policies for ICTs in higher education and the establishment of joint information systems linking all higher education institutions.

The most straightforward use of ICTs in research is in data processing. The unprecedented growth in bandwidth and computing power provide opportunities for analyzing/processing huge amounts of data and performing complex computations on them in a manner that is extremely fast, accurate and reliable.

Another important dimension of ICTs in research is the use of online full text databases and online research libraries/virtual libraries providing researchers with online access to the contents of hundreds of thousands of books from major publishing houses, research reports, and peer-reviewed articles in electronic journals. ICT has also played a major role in university and industry partnership in Europe. The University of Minnesota's MBBNet (a web portal of the state's virtual biomedical and bioscience community) in collaboration with Zurich Med Net (a web based information source covering 400 universities, companies and institute) offers links to more than 1,300 organizations in the area of technology transfer.

### 3.3 ICT and Teaching

Academics have taken to the use of computer in teaching much more readily than they adopted earlier audio-visual media. This is because the strength of computers is their power to manipulate words and symbols. There is a trend to introduce e-Learning or online learning both in courses taught on campus and in distance learning. Distance education and e-Learning are not necessarily the same thing and can have very different cost structures. Whether e-Learning improves quality or reduce cost depends on the particular circumstances. ICTs in general and e-Learning in particular have reduced the barriers to entry to the higher education business. Countries and those aspiring to



create new HEIs can learn from the failures of a number of virtual universities. They reveal that ICTs should be introduced in a systematic manner that brings clarity to the business model through cost-benefit analyses. ICT according to a number of commentators, enhance teaching, learning, and research, both from the constructivist and instructivist theories of learning.

In many countries, demand for higher education far outstrips supply and Governments and institutions are turning more and more to the use of ICTs to bridge the access gap. It is too early to say whether the role of ICTs in the teaching function of higher education is truly transformative, or whether it is simply a repackaging of previous pedagogy. ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies—scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people.

Effectiveness, cost, equity, and sustainability are four broad intertwined issues which must be addressed when considering the overall impact of the use of ICTs in education. The educational effectiveness of ICTs depends on how they are used and for what purpose. And like any other educational tool or mode of educational delivery, ICTs do not work for everyone, everywhere in the same way.

#### **4. Technology Enabled Learning Initiatives in Indian HE System**

The Indian higher education system has undergone massive expansion to become the largest in the world enrolling over 70 million students. Such expansion would have been unimaginable without the extensive use of ICT tools. In short, technology has been nothing short of disruptive for Indian higher education, solving for three of India's pressing problems – access, equity and quality - at once. Government and educational institutions are looking for innovative ways to increase access to higher education and improve the quality of their programmes and courses in a bid to improve their competitiveness. Given the resource and physical constraints in expanding the conventional education infrastructure, the government is increasingly looking at technology as a means for expanding access as well as maintaining quality. While the positive impact of information and communication technology (ICT) in the areas of delivery and collaboration has been long established, higher educational institutes are increasingly experiencing the benefits of using IT tools





for student and administrative management [5]. The various technology enabled learning initiatives taken by Government of India are discussed below:

**4.1 NMEICT:** The National Mission on Education through Information and Communication Technology (ICT) has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in teaching and learning process for the benefit of all the learners in Higher Education Institutions in any time anywhere mode. The three cardinal principles of Education Policy viz., access, equity and quality could be served well by providing connectivity to all colleges and universities, providing low cost and affordable access cum computing devices to students and teachers and providing high quality e-content free of cost to all learners in the country. NMEICT encompasses all the three elements. The Mission has two major components: (a) providing connectivity, along with provision for access devices, to institutions and learners; (b) Content generation. It plans to focus on appropriate pedagogy for e-learning, providing facility of performing experiments through virtual laboratories, on-line testing and certification, on-line availability of teachers to guide and mentor learners, utilization of available Education Satellite (EduSAT) and Direct to Home (DTH) platforms, training and empowerment of teachers to effectively use the new method of teaching learning etc.

**4.2 SAKSHAT:** It is envisaged as one stop education portal to facilitate lifelong learning of the students, teachers and those in employments or in pursuit of knowledge free of cost to them. The portal is expected to be the main delivery platform for the contents developed under the National Mission on Education through ICT (NMEICT).

**4.3 Consortium of Educational Communication (CEC):** CEC has been tasked for e-content generation. In phase-I, e-content for 19 UG subjects and in phase-II e-content for 68 subjects will be generated by the CEC in collaboration with its media centers. For 77 PG subjects, e-content generation activity has been assigned to University Grants Commission (UGC). The process of content creation has been initiated for 72 subjects.

**4.4 Low Cost Access-cum-Computing Devices (LCAD):** Even the best e-content cannot have a significant impact unless it reaches the vast majority of learners with ease, as and when they demand it. The Mission has funded the development of Ultra Low Cost Computing Devices to enable students, wherever they may be, access to education content. The advanced version of low cost tablet called Aakash-2 was launched on the occasion of National Education Day i.e. 11th November, 2012. As compared with Aakash-1 launched in October 2011, this advanced version has a processor which is about 3 times faster, memory which is twice as large, and capacitive touch screen as compared to resistive touch screen.

**4.5 Talk to a Teacher:** Under Talk to a Teacher project sanctioned to IIT, Bombay A-VIEW developed by Amrita Vishwa Vidyapeetham is being used as the collaboration tool for the National Teacher Empowerment Program. Prof. Deepak Phatak, IIT Bombay, leads the National Teacher Empowerment Program using A-VIEW to train thousands of college teachers across the nation.



Virtual Lab does not require any additional infrastructural setup for conducting experiments at user premises. One computer terminal with broadband Internet connectivity is all that is needed to perform the experiments remotely. Over hundred Virtual Labs are currently ready for use and available at one common website [www.vlab.co.in](http://www.vlab.co.in). since Feb 2012. Over 50,000 students, (in approximately 150 colleges) have used the Virtual Labs and have provided user feedback.

**4.6 Educational Resource Planning (ERP):** NMEICT has initiated a project called ERP mission with IIT Kanpur as lead institute. Other partners in this project are AMU Aligarh, AVV Kochi, DEI Agra, IGNOU Delhi, IIT Roorkee, JMI Delhi, NIT Hamirpur, and SMVDU Jammu, The objectives of the project is to build, deploy and manage web based software system for use of Indian academic institutes. IIT Kanpur had developed an LMS called Brihaspati which is a learning management system. It was decided that the whole ERP system can be built around it. With the help of other institutes, the other modules have been identified and each partner institute is developing one or more of these subsystems. Currently following modules like multi-institutional architecture (Brihaspati-3), MHRD Multisite Grant Management System (MGMS), Data Visualization System, Project Management System, Online admission system, system for payroll generation, e-portfolio, Web Housing Management System are available and are being further enhanced.

## 5. CONCLUSION

The importance of education and acceptability of ICT as a social necessity has been increasing, in the current environment-conscious world. Social acceptability of information and communication tools is necessary to improve the mobility in the society and increase the pitch for equity and social justice. Education as a qualitative development is not confined within the classroom structure. The modern tools of ICT such as e-learning and online practice of learning and getting information are much sought after by the students as well as by the institutions.

ICT- enabled education can do wonders that no one can imagine and help pave way for the creation of virtual universities in the long run. ICT can also significantly contribute in efficiently managing the governance in the universities and colleges. ICT, if used creatively, can make a big difference in the way teachers teach and students learn and can help students acquire 21st century skills like digital literacy, innovative thinking, creativity, sound reasoning and effective communication. ICT-enabled education can also be a solution to the growing demands for enrolments in higher education in India and thus help increase the gross enrolment ratio (GER) which at present is very low ( about 12%) as compared to the world average of 23%. Major factors contributing to this digital divide include quality and cost of physical infrastructure, lack of knowledge about full capabilities of ICT and lack of availability of high quality content uniformly across the country. One can transform this digital divide into a digital opportunity by giving top priority to the development of ICT and telecommunication infrastructure (computers with internet access and broadband connectivity) in order to provide universal and affordable access to information to people and institutions in all geographical areas of the country.



## 6. References

- [1] Beckinsale M. and Ram M (2006), Delivering ICT to ethnic minority businesses: an action-research approach, *Environment and Planning C: Government and Policy* 24(6), 847 – 867.
- [2] British Council, *Understanding India: The future of higher education and opportunities for international cooperation*
- [3] Confederation of Indian Industry (CCI), *Taking Stock: A sector wide scan of Higher Education in India*, 2012.
- [4] Cross, M. & Adam, F. (2007), ICT Policies and Strategies in Higher Education in South Africa: National and Institutional Pathways, *Higher Education Policy* 20(1), 73-95.
- [5] Department of School Education and Literacy, Department of Higher Education, Ministry of Human Resource Development, Government of India, *Annual Report 2013-14*.
- [6] FICCI & EY: *Higher Education in India: Twelfth Five Year Plan (2012-2017) and beyond*
- [7] FICCI Higher Education Summit, *Education in India: Vision 2030*, Summit 2013.
- [8] Indrajit Bhattacharya, Kumal Sharma, *India in the knowledge economy: An electronic paradigm*, *Asian Journal of Distance Education*, Vol5, Issue 1, 40-53, 2007.
- [9] Johnson, O. A. (2007), *Enhancing Quality in Higher Education through Information and Communication Technology in Nigeria*.
- [10] J. B. Babalola, Akpan, G. O., Ayeni, A. O. & Adedeji, S. O. (Ed.), *Access, Equity and Quality in Higher Education: NAEAP Publication*.
- [11] Kavitha T C, D Ashok (2014), *ICT: An Enabler and a Catalyst to Nurture Service Quality in Higher Education- A Review: International Journal of Emerging Research in Management & Technology (Volume-4, Issue-2) ,38-43*
- [12] N D Oye, N A Iahad, Zaraib A B Rabin, *A Model of ICY acceptance and use for teachers in higher education institutions*, *International Journal of Computer Science & Communication Networks*, Vol 1(1), September-October 2011.
- [13] *NMC Horizon Report, 2013 Higher Education Report, 2013*
- [14] Sukanta Sarkar (2012) *The Role of Information and Communication Technology (ICT) in Higher Education for the 21st Century*, *The Science Probe* Vol. 1 No. 1, 30-40

