

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT

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OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

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CONCLUSIONS

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ICT DEVELOPMENTS IN HIGHER EDUCATION IN INDIA: THE ROAD MAP AHEAD**DR. M. K. SINGH****DIRECTOR****UNIVERSITY DEPARTMENT OF MANAGEMENT****VINOBA BHAVE UNIVERSITY****HAZARIBAG****DR. SONAL SHARMA****ASST. PROFESSOR****DEPARTMENT OF COMMERCE****P.G.D.A.V. COLLEGE****UNIVERSITY OF DELHI****NEW DELHI****ABSTRACT**

ICT come as a revolutionary effect on the educational sector in particular and higher education in general. It makes the world a small village. It bridges the gap between teaching, learning and research. Use of ICT resources make education widely available at reduced cost. This paper focuses on how ICT impact on higher education sector in India in terms of infrastructural requirements, funding requirements, organizational change, acceptance by teachers, students and university administration, and performance. 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. India is developing as a knowledge economy and it cannot function without the support of ICT. The gap between demand and supply of higher education has necessitated the governments and institutions to formulate the policies for the better use of ICT.

KEYWORDS

Information and Communication Technology, Higher Education, Gross Enrollment Ratio, Five Year Plan, E-Infrastructure.

INTRODUCTION

ICT act as a potentially powerful tool to realize the objective of providing education whether formal or informal to each and every section of the society which includes rural populations, groups which excluded from education due to cultural and social reasons such as ethnic minorities, girls and women, person with disabilities and others for a reason of cost and time at a reduced cost. ICT can be use of the following:

- ICTs for Information Processing- Computers and Related Technology
- ICTs for Information Dissemination- Internet, Television, Radio, Mobile Phones, I-Pad, Telecommunication
- ICTs for Information Delivery- Computers, Internet, Multimedia, Television, Radio, Telecommunications

Education is one of the vital sectors of Indian economy and for the development of this sector ICT come up as an important tool. ICT is one of the major developments in the area of education in particular and higher education in general. ICT has changed the prevailing system of education in India by E-learning and modern instructional methods in place of traditional instructional methods. ICT plays a transformational role in achieving the key socio-economic objective of the government pertinent to education. Education sector is the foundation for the development of human capital and industrial growth. ICT helps for augmenting growth in this sector. Keeping this objective in mind govt. of India brought out major policy changes to provide a boost to higher education sector through ICT initiative NME-ICT to increase gross enrollment ratio (GER) in higher education. ICT has changed the infrastructure requirements of higher educational institutions. This paper highlights the role of ICT in higher education as a driver of change and likely challenges behind use of ICTs, ICT policy in higher education, the road map ahead and the conclusion and recommendations for the policy makers and heads of the institutions.

NEED FOR ICT IN EDUCATION

- 1) **Literacy Rate:** The overall literacy rate in the country, as per the 2011 census, was 74.04%. This implies that we do not even have the formal means to know about the talents of the remaining 25.96 % of the population, let alone try to nurture their talents. This is a very high under utilization of the nation's human resources.
- 2) **Rate of Growth in the Number of Educational Institutions:** Indian higher education system is one of the largest in the world. There were only 20 universities and 500 colleges with 0.1 million students at the time India attained independence. This has increased to 634 universities and university-level institutions and 33,023 colleges as on December 2011. But still this number is not able to meet the growing demand of education. ICT acts as an enabler to make available knowledge resources to every learner as per his/her convenience.
- 3) **Enrolment of Students:** The growth of student enrolment in higher education from 8399 ('000') in 2000-01 to 16975('000') in 2010-11. At this rate of growth, to achieve the objective of optimum utilization of human resources it is better to adopt ICT model of teaching and learning.

ROLE OF ICT IN HIGHER EDUCATION

- It improves the quality of teaching through or by the use of word processing tool.
- It enables access to real world information through the web.
- It facilitates collaborative learning.
- It encourages independent learning by removing the hindrance of place and time. We can also called it convenient learning.
- It also provides reliable and up-to-date information.
- It allows students as well as teacher to produce high quality research by use of ICT tools.
- It develops communication skills and motivated students to participate in learning activities.
- It makes teaching and learning interesting and effective.

ICT INITIATIVES IN EDUCATION IN INDIA

- **NATIONAL MISSION ON EDUCATION THROUGH ICT**

Ministry of Human Resource & Development, Govt. of India has launched the National Mission on Education through Information and Communication Technology (NME-ICT) Project. The vision is to convert India's demographic advantage into a knowledge powerhouse by nurturing and honing our working

population into knowledge or knowledge enabled working population. Under this project, MHRD wishes to impart training to more than 1 lakh teachers from 20,000 colleges across India on basic Information and Communication Technology (ICT) tools and build capacity for use of IT in day to day teaching.

The objectives of the National Mission on Education through ICT shall include:

- Building connectivity and knowledge network among and within institutions of higher learning in the country with a view of achieving critical mass of researchers in any given field;
- Spreading digital literacy for teacher empowerment;
- Development of knowledge modules having the right content to take care of the aspirations of academic community and to address to the personalized needs of the learners;
- Standardization and quality assurance of e-content to make them world class;
- Research in the field of pedagogy for development of efficient learning modules for disparate groups of learners;
- Making available of e-knowledge contents, free of cost to Indians;
- Experimentation and field trial in the area of performance optimization of low cost access devices for use of ICT in education;
- Providing support for the creation of Virtual Technological University;
- Identification and nurturing of talent;
- Certification of competencies of the human resources acquired either through formal or non-formal means and the evolution of a legal framework for it; and
- Developing and maintaining the database with the profiles of our human resources.

COMPONENTS

The Mission has two major components:

(a) Providing connectivity, along with provision for access devices, to institutions and learners;

(b) Content generation

It aims to extend computer infrastructure and connectivity to over 18000 colleges in the country including each of the departments of nearly 400 universities/deemed universities and institutions of national importance as a part of its motto to provide connectivity upto last mile. Therefore, the Mission, in addition to utilize the connectivity network of BSNL/MTNL and other providers, shall explore the possibility to provide connectivity utilizing Very Small Aperture Terminal (VSAT), Very Personal Network (VPN) and EduSat channels.

MICROSOFT INITIATIVE TOWARDS NME-ICT "SAKSHAM"

Ministry of Human Resource & Development, Govt. of India has launched the **National Mission on Education through Information and Communication Technology (NME-ICT)** Project. The vision is to convert India's demographic advantage into a knowledge powerhouse by nurturing and honing our working population into knowledge or knowledge enabled working population.

Under this project, MHRD wishes to impart training to more than 1 lakh teachers from 20,000 colleges across India on basic Information and Communication Technology (ICT) tools and build capacity for use of IT in day to day teaching. Aligning with the objectives of NMEICT, Microsoft is implementing a pilot ICT training program, Saksham, at six universities across India. Microsoft is conducting a FREE "Microsoft Saksham – Teacher Empowerment" program for the teachers. These teachers have been selected across various disciplines and shall be groomed to be a Champion on ICT skills.

As an end result, the teachers would be motivated to build a content repository that would allow them to share their ideas, research projects leverage all the available knowledge resources for finding useful examples and case studies and enable them to collaborate with other teachers and with their mentors.

The SAKSHAM Portal www.saksham-ms.in, is an online resource which allows the SAKSHAM champions to access content, form communities, build content repositories, leverage knowledge and actively share ideas and projects. Champions also have the facility to create their own training batches on Saksham portal and thus extend the online community of new ICT champions. Microsoft plans to recognize those ICT champions who successfully reach out and mentor other educators and students. Microsoft welcomes the educators from University into its fold and the SAKSHAM fraternity, which represents an empowered, critical mass of dedicated experts in every field, working in a networked manner to bridge the digital divide and accomplish MHRD's NME-ICT vision.

- Eklavya initiative: Uses Internet and television to promote distance learning (EKLAVYA Technology Channel, India, 2007).
- IIT-Kanpur has developed Brihaspati, an open source, freeware e-learning platform that is available to all for enhancing existing learning environments in their institutions through their campus networks (Bhattacharya and Sharma, 2007).
- One Laptop per Child (OLPC) in Maharashtra (One Laptop per Child, 2007).
- IIT-Bombay has started the program of CDEEP (Centre for Distance Engineering Education Programme) as emulated classroom interaction through the use of real time interactive satellite technology (Centre for Distance Engineering Education Programme, India, 2007).
- Premier institutions like IIM-Calcutta have entered into a strategic alliance with NIIT for providing programmes through virtual classrooms.

E-INFRASTRUCTURE DEVELOPMENTS IN INDIA

E-Infrastructure will be the key enabler for the information and knowledge society. E-Infrastructure comprises tools, facilities and resources that are needed for advanced collaboration and includes integration of various technologies such as Internet broadband channels, computing power, bandwidth provisioning, data storage, grid based resource sharing etc. To sustain the growth of Information & Communication Technologies (ICT) and to meet the challenges of globalization leading to highly competitive markets, there is a continuing need to invest in quality infrastructure, promote R&D efforts, create intellectual property in communications, Internet and broadband technologies, and address the related policy issues.

SOME OF THE INITIATIVES OF DIT IN THIS AREA INCLUDE

ESTABLISHMENT OF BIO IT PARK

The E-infrastructure Division is striving to promote Bio-IT activities in the country, Professional manpower creation in Bio IT field, R&D development in Bio-IT area, Knowledge sharing with national & international companies. So far, only two States Karnataka and Tamil Nadu have expressed interest to set up Bio-IT Facility. Process is currently underway to set up a Bio-IT facility in Bangalore.

INFORMATION TECHNOLOGY INVESTMENT REGIONS (ITIR)

Information Technology Investment Regions (ITIR) scheme has been notified in the Gazette of India under which each State in India can set up an integrated township for facilitating growth of IT/BPO and Sunrise Industries with world class infrastructure in India.

TRANS EURASIA INFORMATION NETWORK - PHASE 3 (TEIN3) UNDER EU CO-OPERATION

Trans Eurasia Information Network Phase-3 (TEIN3) is being set up under India EU Cooperation on Information Society Technologies (IST) Programme, to link ERNET India with European Research Network GEANT Network in Europe through collaboration between ERNET and Delivery of Advanced Network Technology to Europe Limited (DANTE) to produce a reliable and efficient connectivity between the two research communities so that the various network resources can be shared.

ICT VOCATIONAL CENTERS FOR SKILL CREATION FOR THE CHILDREN WITH DISABILITIES IN THE AREA OF INFORMATION TECHNOLOGY

20 ICT Vocational Centers for training the physically challenged children were set up in Phase-I. The less privileged children in the proximity of these centers have learnt ICT skills enabling them to seek employment and earn livelihood. The infrastructure at schools is connected to LAN and Internet to explore the World Wide Web (www) also. In the Phase II, the centers set up in Phase I are being maintained as well as the project has been launched for setting up 100 ICT Vocational Centers in different parts of the country. 50 ICT centers have already been identified in consultation with States/UTs and are under implementation through ERNET India.

The remaining 50 ICT Vocational Centers would also be set up by December 2010. Ministry of Social Justice & Empowerment would be requested to carry forward up the scheme.

SETTING UP OF ICT BASED DISTANT TRAINING FACILITY FOR SPECIAL EDUCATION

For providing distance training to the special educators, parents and teachers of children with special needs, a project has been initiated in E-Infrastructure Division with the following main objectives:-

- To provide infrastructure facility for imparting distance training for the Teachers and other rehabilitation professionals in the field of special education coming in the region of EDUSAT southern foot print.
- Design and implement innovative programmes for the parents of differently abled persons and introduce the use of ICT in the process of programming the children with Mental retardation and associate disabilities.
- The project envisages setting up of 20 Satellite Interactive Terminals (SITs) and 80 Receive Only Terminals (/ROT) at special/SSA schools and institutions selected in the State of Kerala, Tamil Nadu and Karnataka at a total budget outlay of Rs. 442.72 lakhs over a period of 3 years. After receiving the equipment for SITs & ROTs, installation, commissioning is to be carried out to start the training work.

CREATING KNOWLEDGE DATA CENTRE (KDC) AT ANNA UNIVERSITY, CHENNAI

The project envisages establishment of a Knowledge Data Centre to provide services like e-education, digital library & technology resource centre for students and community of Tamilnadu. The project is in early stage of implementation Anna University is collaborating with Sun Microsystems to execute the project on turnkey basis. Infrastructure and web content development for educational content access for 50,000 100,000 students in first phase and then provide resources to tie up collaborative e- content courses for students and community.

NATIONAL KNOWLEDGE NETWORK (NKN)

BACKGROUND

The Government's decision to set up National Knowledge Network was announced in the Budget Speech, 2008-09. An initial amount of Rs. 100 crore for FY 2008-09 was allocated to the Department for establishing the National Knowledge Network. A High Level Committee (HLC) was set up under the Chairmanship of Principal Scientific Adviser to the Government of India to coordinate and monitor the establishment of the National Knowledge Network.

Government has approved the project on Establishment of National Knowledge Network in March, 2010 with an outlay of Rs. 5990 Cr. over a period of 10 years. National Informatics Centre (NIC) is the implementing agency.

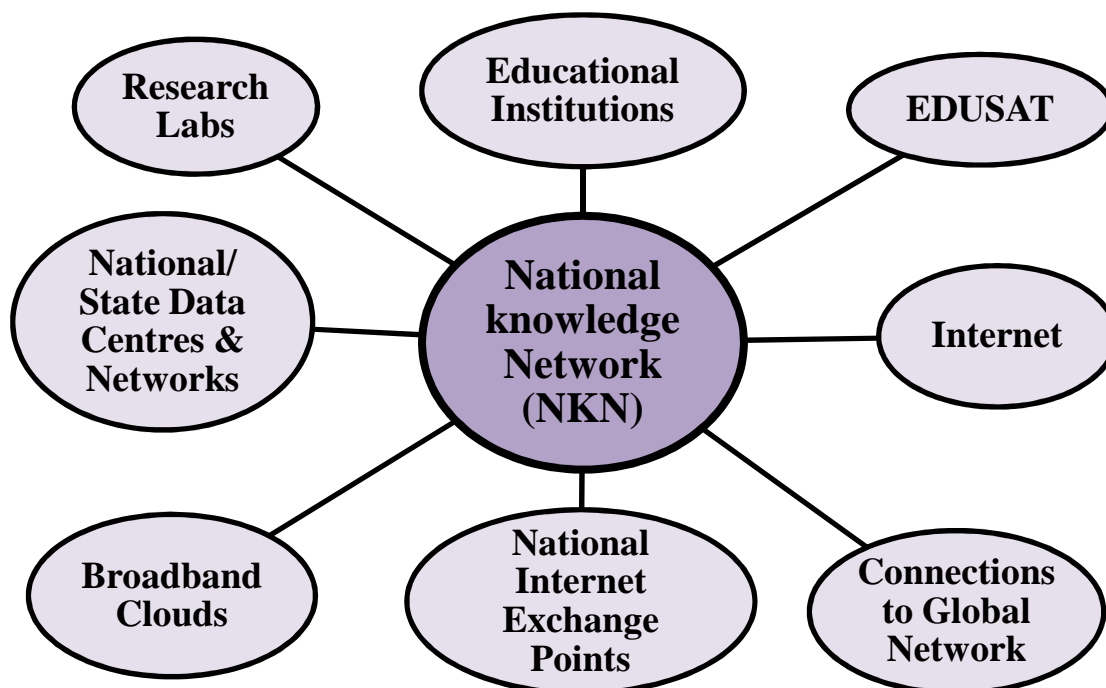
OBJECTIVE

The objective of the National Knowledge Network (NKN) is to interconnect all institutions of higher learning and research with a high speed data communication network to facilitate knowledge sharing and collaborative research. It will bridge the existing knowledge gap in the country. It will help the country evolve as a Knowledge Society and spur economic activities in the Knowledge domain. Under this Network, it is proposed that the core and associated links to around 1500 institutions shall be established in 2-3 years time.

CURRENT STATUS

As on 31st March, 2012, around 681 institutions (This includes 200 links to Institutions under NMEICT, MHRD which have been migrated to NKN) of higher learning and advanced research have been connected to the network and 52 virtual classrooms have been set up.

FIG NO. 1: NATIONAL KNOWLEDGE NETWORK



Easy access to internet and to E-resources is the key to enhance the quality of teaching and learning process. The Government of India's scheme to promote 1 GB connectivity to some select colleges and universities through NKN and NMB-ICT is a significant initiative. In the 12th FYP, this connectivity should be extended to all the colleges under Section 12B and to all the state and centrally funded institutions. The present condition of part payment by the universities/colleges and also payment for the cost of Router should be removed and in the 12th FYP, it should be fully supported by the Government of India.

AAKASH LOW COST ACCESS CUM COMPUTING DEVICE

Aakash is a project sponsored by the Indian Government, to design, manufacture, and distribute low cost Android-based tablet computers to Schools and Universities in India. The Ubiplate is produced by British company DataWind. It is manufactured by the India-based company Quad, at a new production centre in Hyderabad, under a trial run of 100,000 units. The tablet was officially launched as the Aakash in New Delhi on 5 October 2011.

The Aakash is a low-cost tablet computer with a 7-inch touch screen, ARM 11 processor and 256 MB RAM running under the Android 2.2 operating system. It has two universal serial bus (USB) ports and delivers high definition (HD) quality video. For applications, the Aakash will have access to Getjar, an independent market, rather than the Android Market. The device was developed as part of the country's aim to link 25,000 colleges and 400 universities in an e-learning

program. Originally projected as a "\$35 laptop", the device will be sold to the Government of India at US\$50 until further orders are received to obtain the \$35 committed price, and will be distributed to university students for free. A commercial version of Aakash is currently marketed as *UbiSlate 7+* at a price of \$60. The Indian HRD ministry projects introduction of an upgraded second-generation model called Aakash 2 in April 2012.

ICT INTEGRATION IN HIGHER EDUCATION

ICT INTEGRATION

Now, more than ever, moving vast amounts of information quickly and efficiently across great distances is one of the most pressing needs. With the advent of optical fibre, cellular telephony, Internet, voice over internet etc, distances have essentially disappeared in the global scenario. With the Internet, faster communication medium is available to reach large number of people at a very low cost. Through the application of information and communication technology, institutions will acquire the ability to diminish the impact of space, time and distance and spread across the country to any remote areas. Advanced technologies like computers and information technology can be used to educate large number of students at all levels of education who are useful to themselves and to the society globally. This requires the development of advanced information and communication infrastructure development envisaged and supported by EDUSAT.

INITIATIVES FOR ICT INTEGRATION INTO 11TH FIVE YEAR PLAN PERIOD (2007-12)

- 1) Digital Repository in Universities & Colleges
- 2) Internet Connectivity in Universities and Colleges
- 3) ICT for Universities
- 4) E-Content Development
- 5) Digitization of Doctoral Theses

TABLE NO. 1: OVERSIGHT COMMITTEE – SECTOR-WISE EXPENDITURE (Amount in Crores)

S.No.	Sector	No. of Institutions	Total Expenditure
1.	Agriculture	5	133
2.	Central Universities	17	3298
3.	Management	7	285
4.	Medical	11	1877
5.	Engineering	39	6746
	Total	79	12338
6.	Merit Scholarship Scheme	–	1680
7.	Research Fellowship	–	1500
8.	IT Infrastructure	–	1752
	Grand Total	79	17270

Source: Eleventh Five Year Plan, Planning Commission, Govt. of India

ICT achievements in the 11th plan period for promoting quality and excellence

1. **Launching the National Mission on Education through ICT (NMEICT)** – For digitization and networking of all educational institutions.
2. **National Knowledge Network (NKN)** and Connected Digital Campuses.
3. **Governance & Efficiency Improvement** - E-Governance of Higher Education & UGC
4. **Establishment or Up-grading of Computer Centres in Universities** - To keep pace with the developments in ICT, 32 universities have been benefited; of them, 20 Centres have been upgraded and 12 new Centres have been established.
5. **UGC-Infonet Digital Library Consortium and UGC-Infonet Internet Connectivity** - 374 Institutions have been provided with 12 Mbps connectivity to access approximately 7,500 e-journals in various disciplines of higher education.
6. **E-content Development** - 650 Universities/Colleges are availing the facility of E-content.
7. **Digital Repository in Universities and Colleges (e-Journals Scheme)** - 182 universities have been provided with 12 Mbps connectivity to access approximately 7,500 e-journals in various disciplines of higher education.

The New Schemes Proposed for the 12th Five Year Plan (2012-2017)

ICT Integration

- ❖ Digital Repository in University & College Libraries
- ❖ Internet Connectivity and NKN Portals to Universities and Colleges
- ❖ E-content Development
- ❖ Digitization of Doctoral Theses
- ❖ Strengthening the E-Initiatives
- ❖ Expand E-Resource Availability
- ❖ Automation of Administration and Examination to Achieve E-Governance
- ❖ Networking of Universities and Colleges through Setting up a National Educational Resource Portal
- ❖ ICT - Based Monitoring and Evaluation

The overall **budgetary provisions in 12th five-year plan** period in respect of initiatives to be launched for achieving the stated goals and objectives in respect of Access, Equity and Quality are outlined in Table No. 2.

TABLE NO. 2 AREA WISE BUDGETARY PROVISIONS

S.No.	Sector/Schemes	Proposed Allocation (in Crores)
1.	Enhancing Aggregate Access	1,44,350
2.	Equity	16,260
3.	Quality and Excellence	11,140
4.	Research Projects	5,350
5.	Relevance and Value Based Education	1,240
6.	ICT Integration	4,450
7.	Governance & efficiency improvement	1,950
	Total Projected Requirements	1,84,740

Source: Inclusive and Qualitative Expansion of Higher Education 12th Five-Year Plan 2012-17, UGC, New Delhi

ICT Initiatives in 12th Five Year Plan (2012-17) of Information Technology Sector

E- LEARNING

- 1) **Tools for information processing** in local languages are developed and made available for wider proliferation of ICT. This would benefit the people at large and thus pave the way towards 'Digital Unite and Knowledge for All' and bridging the Digital Divide.
- 2) **Creation of E-Infrastructure** for e-Learning is a very important aspect, essential to promote this mode of learning that can also supplement the traditional method of learning.

- 3) There is a need to **integrate formal and non-formal system of education** by introducing the concept of Virtual University or Central University with multiple campuses and blended learning mode.
- 4) **As a Part of Skill Development Initiatives**, the capacities of DOEACC and C-DAC would be enhanced to generate 10 million skilled manpower by the year 2022 starting from the diploma level right up to doctoral level and in line with the emerging industry/market/society needs. The Central Government scheme for providing financial assistance for setting up of ICT Academy in each State/UT under PPP mode by respective State Governments/UTs along with industry/industry associations.

E-INCLUSION

In order to achieve the vision of e-Inclusion in Twelfth Five year Plan an enabling and empowering strategy along with intervention and a focus on specified target groups and areas is proposed.

- ❖ The **target groups** identified for e-Inclusion are SC, ST, minorities, Gender, differently abled, senior citizens and BPL households.
- ❖ The **target areas** are North East Region; SC and ST concentration areas, the backward districts of India, etc.

It is proposed to initiate key programmes and projects in identified components of e-Inclusion as part of a major government programme modelled along the lines of NeGP. A study team will be constituted to examine and set the monitorable targets in consultation with all the stakeholders. It will also identify ICT indicators for e-Inclusion and propose policy and programme evaluation mechanism for the projects in the 12th Five Year Plan.

BARRIERS OF ICT

- 1) Lack of adequate infrastructure like PCs, Projectors, and other equipments
- 2) Lack of skilled and trained manpower
- 3) The lack of training and orientation program on computer literacy
- 4) The low rate of academic participation
- 5) Due to inadequate financial requirements
- 6) Due to improper working environment
- 7) The absence of student teacher interaction
- 8) Security problem due to viruses attacks on data and information
- 9) Interruption in electricity and server creates problems at the time of teaching, examinations and transmission of important materials
- 10) The faculty members generally reluctance to use computers in education
- 11) Lack of proper budget to equip the classrooms with ICT resources

CHALLENGES POSED BY ICT

Inadequate Infrastructure: Due to lack of adequate ICT infrastructure like Personal Computers (PCs), specialized softwares, multimedia Projectors, Interactive White Boards and mobile devices to effectively tap into the opportunities offered by the cyberspace.

Inadequate Skilled Manpower: Inadequate ICT technical personnel are a major problem in higher educational institutions. The reason behind this can be the lucrative job opportunities available to ICT professionals outside the academics.

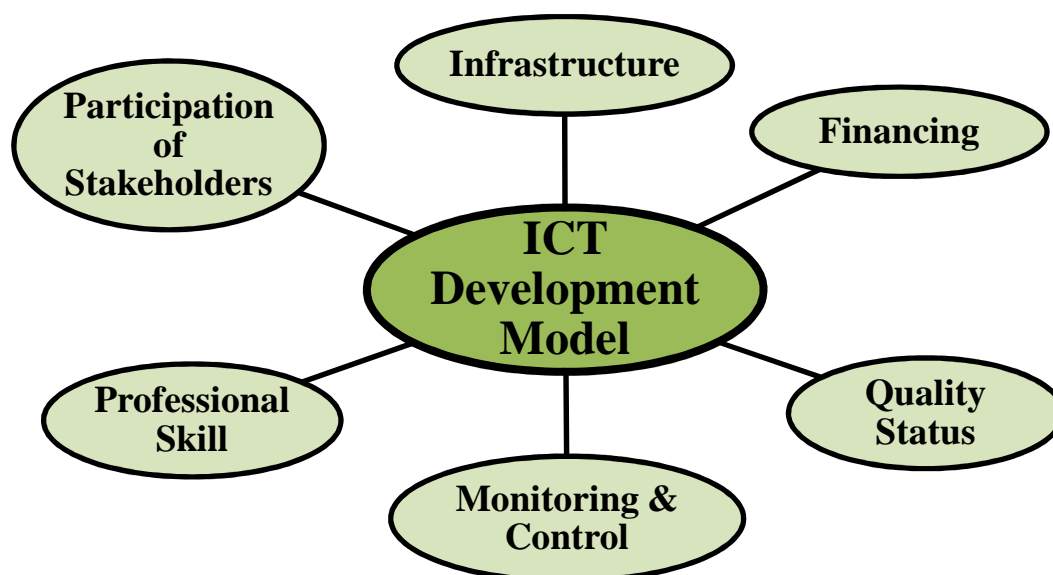
Resistance to Change: Faculty members not willing to adopt the ICT approach of teaching and learning rather they want to stick to the traditional approach as per (OECD report 2005).

Inadequate Funding: This challenge concerned with the acquisition and utilization of ICT in higher education sector. Lack of adequate funds leads to ineffective and inefficient utilization of ICT resources.

Strong Management Information System: The another challenge is to have a strong management information system and performance monitoring system to track progress, ensure quality of delivery, identify weak spots and gaps in the system.

Development Model for ICT in Universities and Colleges

FIG NO. 2: ICT DEVELOPMENT MODEL



This model provides a framework for the successful implementation of ICT in order to take advantage of technological advancements and for the development of education.

CONCLUDING REMARKS

Development of ICT in higher education in India depends upon the participation of all stakeholders. By integrating ICT in education requires new kinds of skills, capabilities and attitudes for this a proper ICT environment is the need of the hour. For this purpose, there needs to be an ICT plan, support and training to all the stakeholders involved in the integration. ICT integration in to higher education has changed the infrastructural requirements of higher education institutions in India. Teaching and learning by or through the use of ICT tools has a greater impact on students. ICT should be introduced in a systematic manner so that everyone can avail the advantage of this technique. Adequate infrastructural development is the major challenge behind ICT development in higher education institutions which leads to low penetration rate. There is so much growth potential in this sector. ICT enabled continued and sustainable growth of an economy. ICT is one of the fundamental ingredients of economic progress to utilize its full potential. Government has taken so many initiatives to enhance delivery and

quality of higher education despite of that sector faces so many challenges in its implementation. In nut shell, the vision of ICT is to create a competitive, sharp India which is resplendent with knowledge, research, creativity and innovation.

THE ROAD AHEAD

ICT can be used as a potent tool to achieve the following objectives such as:

- ❖ Higher education institutions must address the growing demand of ICT Literacy
- ❖ There should be a integration of ICT in education and develop a curriculum accordingly
- ❖ For a successful implementation of ICT there is a need to influence and empower teachers about ICT rather than acquiring computers and softwares.
- ❖ There should be proper control and licensing to ensure accountability, quality assurance, accreditation and consumer protection.
- ❖ We may have to take the advantages of ICT enabled learning in order to improve the quality and to reduce cost of higher education
- ❖ ICT expand the pool of teacher by or with technology-facilitated learning which extend the teaching pool beyond the specialist and set to include many more people.
- ❖ Expanding pool of students by ICT which ultimately creates a need to educate and aware them about the ICT tools and techniques which requires attention of concerned ministry to deal with this issue in a holistic way for the development of a knowledge economy
- ❖ ICT embedded in many of the government programs and enhanced its reach but there is still large scope to augment initiatives being run by the government and agencies. The government will require private sector participation to maximize the outcomes in programs.
- ❖ Policies should be designed in such a way that enables to increase penetration and the effective use of ICT in programs.

RECOMMENDATION

- ICT plays a very important role in overcoming infrastructural, quality and employment challenges, so it should be taken as a challenge to overcome these barriers.
- ICT has changed the way of learning imparted in educational institutions. The key stakeholders which include students, teachers, administrators, regulatory authorities, content development companies and in all parents also play a very significant role in ICT development so their roles and responsibilities should be clearly determined and fixed then their accountability can be fixed and ensured.
- Improving the management and administrative tasks which helps in realizing the overall objectives of education.
- To bridge the socio-economic divide prevalent in the country ICT act as an important tool.
- To increase penetration of ICT in higher educational institutions
- 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.
- High bandwidth should be the key priority because it allows computer power to be aggregated by linking computers. Enhance bandwidth/connectivity through the acquisition of suitable hardware, software, and the establishment of LANs, WANs, and Virtual Private Networks for effective coordination and efficient utilization of resources.
- Advancements in IT and Communication Technologies Boost to Exponential Growth in ICT Networks and Applications
- Establishment of new higher education institutions to boost the higher education sector to meet the growing demand of education.
- There is a need to educate and aware the masses about the ICT and its usefulness then the objective of quality and access to higher education can be achieved.

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