Chapter 7: Learning with ICT

7.1 Revolution in Information Technology and Communication Skills
7.2 ICT and Research Competencies
7.3 The Network
7.4 Swifter Communication
7.5 ICT in Education Management
7.6 IT and Knowledge based Society
7.7 E – Learning
7.8 The need for a strategies Foundation
Chapter 7.0
Learning with ICT

After fifty years of independence, we are perhaps struggling to be independent in our thoughts and concepts. I find it amazing, if we shed off hypocrisy and face the bitter truth that in all discipline of human endeavour. Education could be seen at the last rung of the ladder as is evident from the provision of negligible amount in our budget.

Reason! countless excuses and sophisticated diplomatic explanations offered by the stalwarts of our though noble but neglected profession. I too have my candid opinion though not going by the prodigious magnitude of explanations which to my mind if we search our conscience, it wouldn't sound any thing different than what had been said and accepted long time ago, "merely jugglery of words."

Megalomaniac professionals, particularly at the helm of the affairs, have been deeply inundated with inane ideology and their obsession with it, is unimaginable. Vicissitudes of human life and cataclysmic events always posed great threat to quality educational management and on top of it the topsy-turvy policies which probably singled out the single largest cogent reason for our debacle at educational front.

7.1 Revolution in Information Technology and Communication Skills

After the second world war many European countries who suffered heavy damages refrained from constructing roads and parks, instead spend prodigious amount on primary education of children with a view that best education should be imparted to these children and once you have well educated population then they will produce the leaders of tomorrow and construct the needed physical facilities and take the nation to greater heights. Great Educationist and Philosopher Bourke said "Education is the chief defense of the country: What I am trying to emphasize is the tremendous value of education. Earlier people communicated shared knowledge and information through letters which was of snail pace but slowly and steadily the science of quick dissemination of knowledge got developed and now the exchange of information from one corner of the Globe to another is done in amazing few minutes and even in seconds.

Sansanwal defines Information Technology "as the use of hardware and software for efficient management of information i.e storage, retrieval, processing. Communication, diffusion and sharing of information for social, economical and cultural upliftment."

In nutshell it can be conveniently deduced that "IT covers technologies used in the collection, processing and transmission of information".

To my mind information technology is great boon as the speedy communication helps the educationists to update themselves and keep abreast with the latest through Internet. There is plethora of websites providing abundant amount of information
covering almost all fields of human endeavour and this all can be done by spending negligent amount and that too right in your drawing rooms.

The only requirement is the basic knowledge of Computer and Internet operation, at present unfortunately not many people from education and teaching community in particular are friendly with the technology, if the present data are any indications. This can be learnt with the help of CD's available and even short duration course are run by scores of institutions. NCTE has also prepared some basic CD's in different languages which can prove pretty handy in picking up basics of the Computer and Information Technology.

Teachers have been making tall claims in their resume pertaining to their experience. For instance one claims twenty years of experience and that should mean twenty years of continuous scholarly work, scientific research and substantial contribution but in many cases it turns out to be one year of experience with nineteen repetitions, which spells out distinctly that the concerned teacher didn't develop competency by incorporating skills and techniques that have been developing over the years. Variety of Teaching models are available on numerous sites and also remarkable video cassettes are made by many universities which can be used by the teaching community to develop teaching skills and make the students active learner then passive listeners.

7.2 Information & Communication Technology & Research competency

It would be exaggeration if I say that the teachers in Universities are engaged in active research, we are all aware of the fact that the number of active researchers is dismal and even what ever research is done, the standard is questionable. There could be many cogent reasons for this and this may not be appropriate forum to discuss the quality of research. The single reason that appears in present scenario is the lack of knowledge of sharing and dissemination of knowledge and obviously because they are either ignorant of the Information and Communication Technology or indifferent. A teacher can certainly enhance his/her capability about teaching and research etc by learning to use Internet and communicate through e-mail with other like minded scholars.

7.2.1 Optimum Utilization of Communication Technology

The presenter has connections with several scholars interested in research in US, Canada and Australia. This could be striking instance to demonstrate and understand the best use of information and communication technology, we are engaged in certain projects with the fellows from US and Canada and have already completed two papers and one paper is published in ICHPER, a renowned referred International Journal, we collected data on our professional students and sent it to US for analysis and the report was written jointly. All done through e-mail.

We wonder if you find it astonishing that we have a paper "Body composition and

In one of the biggest European Conference with over 1500 participants from about 50 countries 6th Annual Congress of European College of Sports Science” Cologne (Germany) 24-27, July 2001. We got two papers presented and also published in their abstract booklet courtesy Internet and science of Information and communication technology.

Owing to the contemporary Information and communication technology, We got another paper presented in International Conference through my former student, Ms Anita Gairola and former class mate Dr.Swapan Mookerjee, Associate Professor, Bloomsburg University, at Mid Atlantic Regional Chapter, 24th Annual Scientific Meeting Nov.23,2001 (American College of Sports Medicine). The data was collected in India and processed in Canada and presented in US.

Is it bragging about my presentations? Oh ! No ! not at all ! these are few instances that I wanted to humbly present to the galaxy of scholars just to demonstrate the power of Information and Communication Technology and I must repeat and stress that this is easy to use and only require positive attitude and little time.

The Conferences are also conducted and people participate by remaining in their respective places and we call that Video Conferencing but this system is technically complex and financially expensive and beyond affordable limits of most of the Universities but the present Information and Communication Technology is available with very low cost and with in affordable limits for even individuals. We have this facility in our University but have not used much.

7.2.2 Advance Use of the Technology

In developing countries the teaching community has been making full use of this boon, the professors in many good Universities in US and Europe have their home pages with full scientific information about the subject they are dealing and after lectures in class room the students are advised to visit their home page for more details. The concepts of VIRTUAL UNIVERSITY is gaining momentum and this could solve many problems that are faced by the traditional Universities such as: growing population, infrastructure, number of courses, rigid schedules etc. This University on Internet reaches every nation and benefits huge number of people and the only requirement is the availability of Internet facility.

7.2.3 Interactive Television for Instructions

Another novel method of reaching huge number of people, courtesy "Information and
communication technology" is Distance Education by using "Interactive Television for Instruction" with following objectives:

- Imparting quality education/training to college/school students in class rooms spread all over the state.
- Providing access to expertise of the best resource persons for all the students at a time.
- Bringing in uniformity in the level of education training for all the students.
- Conducting programs for teacher education, continuing education and degree diploma award in the distance education mode.
- Serving as major data and information channel for the University linking all major educational institutions in the State.

This is to supplement class room instruction in colleges and schools through expert lectures by Information and Communication Technology in Education and Educational Management using state-of-the-art interactive television based on INSAT satellite and telephone talk back for instructions. It aims at transforming the whole state into a virtual multimedia enabled class room.

7.3 The Network

1. (Teaching end, at the University Campus)
   - TV studio/class room and conference hall for video, audio Broadcasting.
   - MPEG-2 encoding and satellite up-linking earth station.
   - Telephone /fax/ e-mail reception for return path

2. Receiving end, at class rooms in colleges! schools
   - Dish antenna based direct reception system (DRS)
   - TV set or projection TV Telephone/fax/e-mail, required in each class room for talk back.

3. Medium
   - INS AT series satellite
   - Digital up / down linking in the extended C band

Goa University is perhaps the first University in India to have launched this system and covering about 25 colleges to begin with. The teacher expert delivers his/her lecture in a studio specially constructed for this purpose and it is live telecast to all the colleges connected with the system.

Anyone from any college can either call the teacher on phone and question or seek clarifications or the querrees can also come through e-mail, even a fax facility is also available.

The students can also send their questions or queries in advance and the expert can come prepared and clarify the doubts. This is truly interactive. Years ago the presenter studied management in Germany and there they had video system installed in all class
rooms and all the class rooms were connected to a central controlling unit which supplied films and video clippings as desired by the teacher. So IT was in some other form used as teaching aid years ago also.

7.4 Swifter Communication

Developing communications skills and facilities perhaps needs colossal amount and with present financial situation in the country where perhaps each University and college has serious financial constraints. So how do we develop infrastructure to enable us to reap the fruits of the IT.

Taking pragmatic view it appears that financial crunches is the strong impediment but should it also mean that we have to wait till the God almighty descends from heavens with all his celestial grace and shower his blessings of riches on us. No! What is needed is that we search our lurking potentials and explore "Creativity and Innovative ideas" Einstein said that Imagination is more important than knowledge.

Here is imaginative idea. In Hansraj Model school, Punchkula, Haryana. The principal got indigenously developed communication system by installing control panel in his office connected to all the class rooms, Labs, Library etc. Any moment the principal could send message to all or to selected with out spending energy and money on office staff and stationary. Isn't the communication quicker and swifter?

The same school has another system installed (Intercom with cordless sets) with mobile phone provided to all teaching and administrative staff and this way the principal is in constant touch with his staff. We too have Intercom facility at our University which saves lot of time and everyone in touch with fellow colleagues.

I am sure it is nothing new and sensational that I have talked about, I just only wanted to draw your attention to the innovative ideas. How many Universities in India have this or ever thought of developing such communication system and mind you this is not expensive as generally thought by many. The cost is with in affordable limits.

7.5 ICT in Educational Management

In efficient management creativity and innovative thinking occupies vital place. Normally in Indian scenario the management of educational affairs is very casual as each manager prefers to find lame excuses and scapegoats for his/her failures. Here is interesting story of management specialist which speaks in volumes, though presented in lighter spirit but one can always read between the lines.

7.5.1 Management Specialist & Engineer

A man is flying a hot air balloon and realizes he is lost. He reduces height and spots a man down below. He lowers the balloon further and shouts,

"Excuse me. Can you help me? I promised my friend I would meet him half an hour ago, but I don't know where I am. .. The man below says, "Yes, You are in a
hot air balloon, hovering approximately 30 feet above this field. You are between 40 and 42 degrees N. Latitude, and between 58 and 60 degrees W longitude." "You must be an engineer," says the balloonist.

"I am," replies the man. "How did you know?" "Well," says the balloonist, "everything you have told me is technically correct, but I have no idea what to make of your information, and the fact is I am still lost.

The man below says, "You must be a from management." "I am," replies the balloonist, "but how did you know?" "Well," says the man below, "you don't know where you are, or where you are going. You have made a promise, which you have no idea how to keep, and you expect me to solve your problem. The fact is you are in exactly the same position you were in before we met, but now it is somehow my fault."

Messages are as important as media. What flows through wires and ether is equally important. How to ascertain the needs of the users and produce compatible quality substance is a big challenge. The place of formative research in software designing and distribution needs to be thoroughly explored. Simultaneously it is an age of media implosion. Different forms and levels of ICT are coexisting in the globe. ICT labs are originating and expanding very fast. The globe is turning from formal to informal, analog to digital, local and standalone to world-wide. There is a move from "no-computer to knowcomputer", from c++ to c#, from BASIC to Visual BASIC, from JAVA to Network Technologies. There is a shift from face to face communication to electronic communication, from circular communication to direct communication, from general channels to dedicated channels. At the same time we are turning from primary to secondary, real to virtual. The world has become an open system with many varied TV satellite channels available. We can be on the WWW any moment. We can rely life time on telephone services, cable network and internet. Sat yam, Wilnet, kenet, HCL Infinet, and BSNL etc. have made us more mobile. DD Gyan Darshan and DD Gyan Vani are round the clock dedicated educational channels. There are virtual teachers, virtual learners and virtual classrooms. There are many changes and many challenges. The present paper includes some of the changes and challenges in ICT in Education.

7.5.2 Emergence of India as a super software power

Right from infancy we Indians face and solve problems more than anyone else. So, we are in a position to generate most efficient and economic algorithms and programmes. Every third person in Silicon Valley is an Indian. A large number of Indian engineers - chemical, mechanical, civil, electronics have turned into InfornIT\ation and Communication Technologists. It is because of global need. How to strike a balance among individual's objectives, institutional objectives, national objectives and global objectives?
7.5.3 Wide Gaps between ICT and Education

Out of about 11562 colleges in India 10% have internet. Out of 250 universities in India 5% have internet. Rarely the universities and colleges are interconnected.

The schools and colleges of education do not have adequate ICT facilities. In the outer world there is a move from primitive and print media to modern electronic and multi-media. Our schools and colleges are still compromising with chalk and talk. Computers, computer labs, ICT labs, media are more for exhibition than for education. Why? It is because there is very little convergence of perspectives of school education, teacher education, state governments and central government. Rarely the ASCs have inputs of ICT for orienting and refreshing higher education teachers. Though computer science is offered as school subject and there is a need to have media aided instruction but rarely teacher education has made provision for training teachers. Though UGC has approved actual position of lecturers in computer education in the 9th five year plan but there is no concurrence from state governments. Whose concern is education? Should education be on Centre List, or State List or Concurrent List? Should education be public? Should education be private? Should education be public and private both? Which level and which type of education should be on which list?

7.5.4 Integrating ICT in Education: Some Issues

There are many emerging issues that necessitate integration of ICT in Education, such as, Technological, Process, Pedagogical, Ethical and Economical. The technological issues are in connection with the telephone network, power supply, machines, maintenance, technical support and networking etc. The process issues focus on the drafter of policy, driving force, programme formulation, time frame, resources and, models of dissemination. The pedagogical issues emerge out of special needs, gender, language, curriculum, literacy, role of learner, teacher, law maker, policy maker, local community, parents, intellectual property, public domain, propaganda, blasphemes, and pornography. There are economical issues emerging out of global domination and educational market.

7.5.5 ICT :Encouraging Scenario

The ICT has entered in our lives in a big way and we are responding to these trends. The UNESCO has established international institute of technologies in education at Moscow. It has started looking at the various aspects of ICT policies, education training and development. Related to Asia-Pacific regions the regional office of UNESCO, Bangkok is encouraging development of ICTs in education at different levels. The 10'h Five Year Plan envisages intranet and internet connectivity for college and university teachers under UGC - net, computers and internet literacy for teachers and administrators and special support activities for SC/ST minorities, women and disadvantaged groups .in
computers, communication and information and biotechnology studies. The government at the centre and the state governments of India have entered in the area of IT - ICT in education in a big way. The ministries, UGC, Open - education, NCTE, NCERT, NIEPA, School boards and other organizations are supporting ICT in different forms and levels.

7.6 Information Technology and Knowledge Based Society: Challenges before the Educational System

The end of 20th century and beginning of 21st century has witnessed very exciting changes, one of them being in the field of information and communication technology. World over governments are making attempts to formulate strategies to make use of information and communication technology to improve their competitiveness in business, industry and education and provide a better quality of life to their citizens.

Speed of technological developments and speed of change are phenomenal. India, too has witnessed these changes and is pacing ahead. Despite development lagging in some of the areas, India is addressing itself to the need of becoming a part of the global community. The advancements in information technology have been compelling enough to invest in information infrastructures and thus creating an information society.

Information technology is the technology of the present and the future. In general, information technology deals with information handling, data storage, access, retrieval, analysis and intelligent decision making for enhancing organizational effectiveness and eventual success. It can be defined as a medium and a means to produce or transfer information. The computer, the television and the telephone are the media of information. The convergence of these technologies has become a reality in the present times. The future will see more novel and exciting changes.

The 21st century is going to comprise of knowledge-based societies. For this information has to be converted into knowledge. This can happen only when information is available for application in diverse opportunities. And the opportunities are tremendous. There is an increasing interdependence among nations for sharing of information and knowledge, thereby creating knowledge-based societies.

A knowledge-based society is knowledge driven, where intellectual achievements are highly appreciated and ranked. A knowledge-based society is globally connected and creating, using and trading information and knowledge for global markets. Transforming information into knowledge, managing and utilizing it is the major challenge for the knowledge-based society.

It is indeed the need for all nations to build knowledge-based society and economy i.e. society's economy endowed with the ability and capacity to generate and capture knowledge and then access, absorb, share and use efficiently the information, knowledge, data, communication and best practices. As such information and knowledge are to be
viewed as global public property.

The objective of information technology is to bridge gaps, empower all development partners through participatory approaches and access to knowledge and information. Global knowledge partnership has to reinforce the view that access to and effective use of knowledge and information are increasingly important factors in sustaining economic and social development. However, if there are enormous disparities in societies in the information technology and knowledge endowments, infrastructure capacity to use information technology, affordable and equitable access to knowledge and information, then this will lead to "information poverty" in nations less fortunate.

In order to vitalize the Indian economy, the industry oriented society has to be converted to globalized knowledge based society, where there is sustainable security for international and environmental resources and public and private spaces which is enabling for all and which nurtures diversity.

While a large segment of the society's economists express doubts about the capability of information technology to offer solutions to country's basic problems like poverty and illiteracy, technocrats and professionals are of the view that if not solve these problems the information technology infrastructure could certainly address these problems in many ways. Having an information technology infrastructure could spread education through the satellite communication systems. Thus even though socioeconomic disparities in our country continue but knowledge and awareness of the masses would increase and thus create a strong ground for changes to come. Use of information technology tools such as the computers and the Internet should be used to solve, on a sustainable basis, the human problems of the people of the world including global environmental degradation.

But has information technology failed the traditional society? Why invest in information technology when 75% of population is out of the mainstream? Can information technology make a difference without access to technology or ignorance of English? Only small segment might stand the benefit in an information technology based environment. Why information technology has not developed software for education, agriculture or poverty and illiteracy alleviation? These are some of the issues that linger in the minds of many.

However, having realized that information technology is valuable for making progress in various fields of human activity, nations are addressing themselves to find out ways and means of reaching the benefit of the information technology revolution to the common man. Application of information technology to a whole range of activities which will improve the quality of life in society, and eradicate illiteracy and poverty should be
ensured.

Compared to traditional technical assistance, information and communication technology can reach more people simultaneously, allow deeper geographical penetration, and deliver services faster and with higher quality. Information technology can offer more diversified and adapted content related to medical and health, business and economy, geography and science and cultural and heritage.

7.6.1 Information Technology Tools

On one hand information and communication technology is seen as a vital tool for, a knowledge-based society and on the other hand it uses essential tools. Some of these information technology tools are

- Modern computer devices combined with telecommunication networks have generated greater connectivity through the Internet;
- Internet helps explore world wide pool of knowledge through the World Wide Web;
- Integrated television and multi channel television networks have helped people cross all barriers to learn about other cultures and civilizations. Television is a powerful broadcasting tool reaching the masses;
- CD ROMS run on multimedia personal computers and are ideal for reaching information to remote areas where networking may not be possible;
- Satellite based communication technologies such as the television, fax machines, e-mails, cyber space, Internet have all made information technology more powerful media.

7.6.2 Challenges before the Educational System

The rapid developments in the field of information technology in today's modern society have thrown open challenges before the educational system. The new information technologies have provided access to vast amounts of information. If this information has to be handled properly and competively, then information technology can assist in improving the quality of life in general. If full advantage of information technology has to be taken, then there have to be changes in the educational system with regard to teaching, research and educational administration.

A point to be noted here is that technology is not just machines and equipment. Technology is extension of human abilities, competencies and talents in using machines and equipment to get information by overcoming barriers of time, space, expenses and efforts.

In general some of the challenges which the educational system has to address itself to and are its immediate concerns are:
 Conservation and enhancement of nature and national resources.
 Achieving healthy society.
 Eradication of illiteracy, deprivation, poverty and hunger.
 Ensuring environmentally, socially, and economically sustainable food, and livelihood security,
 Promoting the ethics where profit helps to promote public good and not personal wealth leading to rich poor divide.
 Promoting love and understanding for diversity in human societies and thereby creating an enabling environment for lasting peace and security.
 Changes in the entire scenario of education due to information explosion and population explosion. Teachers have to respond to the different situations.
 Teachers' lack knowledge and skills in education technology, low level of awareness about instructional materials and methods. Teachers are in a helpless position.
 Growing explosion of population, knowledge and aspirations.
 Upgrading of poor schools.
 Removal of caste, class and regional imbalances.
 Universalization of education.
 Vocationalization of education.
 Accept the fact that children will learn at home using new information technologies
 Problem of funds.
 Lack of professionals with skills needed to identify user's needs, to organize and store information, add value to information, conduct research, evaluate information or have up-to-date subject knowledge.
 Lack of management professionals who can understand organizational culture, manage projects and finance, manage change, do strategic planning, manage human resource development, communicate effectively.

Can all this be achieved with the help of information technology? The educational system has to be responsive to all these issues related to life.

**7.6.3 What Can The Educational System Do?**

The world of today is referred to as a global village. The quality of human resources is a major factor of success for all the countries in the new century. The intellectual capital of a country is now becoming more important than other resources- natural or financial to compete in the global economy. The barriers of time, distance, language, limited local competence and resources are disappearing.

In order to survive in this highly competitive world the first important requirement is
of trained technical people along with managerial skills. Strength of all the countries lies in their ability to produce, absorb and disseminate knowledge. Innovations in information technology and tele-communications have changed the type of people required. Information technology has made a visible impact on the industry and its management. Automation of machinery and management functions had created the need for special type of work force-information system managers and thus opening new avenues for the specialist type of manpower.

Quality of education has to be global and the educational standards have to be raised at all levels and made comparable with the best in the world. But to meet this demand of the industry, numerous institutions have sprung up all over the country. The quality of education provided by these institutions is not regulated by any agency for which exorbitant fees are charged from young aspirants.

The responsibility then falls on the country's educational system and therefore, the system needs to prepare such manpower which can face the challenges of this changing world scenario where technology touches every aspect of ones life. Restructuring of the nation's educational system, through imaginative changes in the curricula at the school, college and the university level, keeping in view the overall framework of the national policy, is the need of the hour. An educational system that aims to prepare learners for life in such a society has to adapt its curriculum to include technology as an important field of knowledge. This will help the young students to adopt new technologies and utilize them rationally, efficiently and effectively. Educational institutions and commercial organizations must support these changes at the level of redesigning the system of education in general and higher education in particular.

The education system must move away and do away with its emphasis on the student's mastering large mass of material. In fact education should be reoriented towards developing the individual, creative and openminded thinking, self-esteem, problem solving capability and coping capacity. The educational process should also focus on character building, inculcation of moral values and patriotism and human beings' responsibility to themselves, and to the society. This change in approach must be adopted right from the time the child's schooling begins. Emphasis has to be on liberal acts including philosophy and History to foster intellectual curiosity and respect for variety and diversity and deep understanding by different cultures and civilizations thus building a society which creates new knowledge and wisdom.

The educational system has to also overcome several barriers, which exist in the adoption of information technology. Often it is the educational institutions which are least resistant to change but last to adapt technology innovations in their operations. However
it should be remembered that information technology helps to bring cultures closer and
connect individuals and communities around the globe. Many political leaders,
responsible for social and educational development do not see the need to build
information infrastructure which is technically and economically sound and which will
help meet the country's of educational, social and economic development goals. Some hold
strongly against anything foreign, even technology, which might help solve many
problems. Some leaders resist private enterprise for the fear of losing government control.
Cost involved in building information infrastructure is another major block. However
leaders fail to see greater losses in terms of slow economic and human resource
development in this information age, in terms of undereducated and illiterate people
whom the world will just ignore.

**7.6.4 Role and Responsibility of the Educational System**

The main aim of the educational system should be to include technology and its use
in the curriculum at all stages of education. This will make the students technology
literate. Information technology in the curriculum will help students learn skills needed
for systematically handling information. Today's students must understand and master
the use of tools of technology if they have to be global students.

Students should be given opportunities to use information technology tools and
information sources to analyze, process. and present information for their assignments. In
fact communication and information processing should be integrated with other subjects.
During electronic interface students should be given the liberty to choose the medium of
interaction. It is he who decides whether he wants to use the phone, the Internet or the
TV.

Every educational institution school, college or university should be connected to
information super highways thereby allowing these institutions to get connected with one
another and link them to other learning institutions such as libraries, colleges,
universities, museums, galleries. Students will get material for their project work and
standard of education, subject knowledge and spirit of inquiry will be enhanced.

In order to explore the potential of information technology it is necessary to enhance
the awareness among the intended users. For this awareness should be created among the
students and teachers courses should be designed and offered to them to enable them to
get trained and educated in different area of educational and information technology.

Urgent attention has to be given to reorientation of teachers at the school, college and
post graduate levels. Teacher development programmes in schools and colleges should be
seriously undertaken. Teachers have to be trained in the use of information technology
tools and develop confidence to use information technology in their teaching. This will
change the teachers' approaches/methods of teaching. No doubt teachers are bound by
formalities of completing the syllabus but well informed and techno-savvy teachers can go a little beyond the stipulations and help improve the teaching and learning scenario.

To promote utilization of educational and information technology, techno-managerial and financial support should be made available to educational institutions. Institutions should be encouraged to generate their own funds. The qualified youth going abroad should contribute for development of information technology. They can send finances to their institution from which they have studied. The information technology industry, main user of skills and expertise of highly qualified personnel should contribute funds and offer free connectivity to educational institutions. Some percentage of funds earmarked for infrastructure can be directed to building information technology infrastructure. Since business, trade and industry utilizes information technology facilities, they can contribute to build, maintain and update the infrastructure facilities.

Teaching, research and extension undertaken by institutions should be encouraged. Use of information technology tools will give the personnel involved a competitive edge in this era of globalization. Continuous need-based extension programmes, with the help of information technology will help improve quality of life in society and irradiate illiteracy and poverty.

A new course of action needs to be taken to enhance the exposure of student teachers in general and teacher educators in particular to the educational and industrial scenario of the country. A well-planned and supervised summer training programme and educational tours will bring about awareness of the current developments in the teacher educators and the student teachers. The quality of B.Ed. and M.Ed. projects and research need improvement with greater relationship to the actual needs of the education, industry and the economic system. All this is possible and can be achieved if the teacher education faculty has greater involvement with other educational institutions and invite participation from the industry personnel as guest faculty through lectures, panel discussions, seminars, workshops and conferences.

Education is the most powerful tool for change and hence it must train the minds of those being educated to cope with the change. Equally, the educational system throughout the length and breadth of India must actively promote that value system and outlook which is consistent with the kind of society we wish to establish. Finally, those who are thinking about education must realise that in the fast changing world of today no education system can be frozen into a mould. It would need periodic revision and change to enable the educated to grapple with social, economic and technological changes, (Devi, 1998).

The educational environment is changing as a result of the computer and will continue to change. The world of modern day is often called as "Age of Communication
and Information" (Rayuda, 1993).

Communication is the very core of the computer revolution. The exchange of data by computer gives fast, timely and accurate transmission capability for any subject area and by any organisation or individual. If more people understood how simple and useful communication by computer really is Hagen (1984) rightly believes the "Fear of Unknown" would diminish. The common language of the computer is enhancing the communication ability of man. Communication with telecommunication also offers the teacher, administrator, parents and the students the opportunity of informational exchange (Hagen, 1984).

The computer is one of the most powerful forces in society today. It's being put to use everywhere, it seems-in homes and in organisations of all sizes-and no one can doubt that this usage is having a strong impact on many people. There is no question that computer as an instructional device is going to have a profound effect on the students. The facility of access to information from anywhere at anytime and to have choice of output gives mobility to the mind. Any of the research educational or instructional data stored across the country can be brought to the classroom and the individual computer used by the students. (Hagen, 1984). Programs can be educational as well as entertaining. Educators agree that the computer can be a powerful motivating and learning tool. Thousands of educational programs are available in such categories as reading, languages, science etc. (Sanders, 1988). It depends on the individuals how he can make best use of such an important, dynamic and modern device to update one's knowledge and add to the education provided in the formal setup. The teachers can make best use of various programs to supplement their teaching. In fact such a device can prove to be an excellent teaching aid. It is observed that it has been used successfully in foreign countries.

7.7 E-Learning

Educators and educational technologists (e.g. Baynton 2001, Rosenberg 2001, Higgins 2002, Burns et al 2001, and Dobbs 2000) argue that learning practices are on the verge of a major change. Today, the knowledge and skills that we acquire are in danger of becoming increasingly obsolete, which in turn requires us to learn on an ongoing basis. Most traditional approaches (to learning) seem to be no longer adequate in responding to the new challenges with regards to the need for increased efficiency (and effectiveness) in developing, acquiring or disseminating knowledge. The solution (in most cases) seems to have been provided through the application of Information and Communications Technology (ICT).

Over the past few years rapid advancements in ICT have contributed towards a staggering growth in global computer networking and the emergence of a globally connected world. The Internet has evolved from being a network for researchers and academics into a
platform that has enabled new businesses to find alternative ways in which to offer their products and services. We have witnessed a paradigm shift in the ways in which the transfer and management of knowledge is handled. The Internet and Web-based technologies have both had a profound effect on the way(s) in which educational and training institutions now operate - in that it has made it possible for many innovative educators/trainers (within ICT enabled nations) to think of new ways in which to use the Internet in order to provide Web-based knowledge management and training opportunities.

There appears to be significant optimism amongst technologists and strategic planners for knowledge management. They view global networking and Web-based solutions as catalysts for addressing today's challenges of knowledge management and digital learning. This has become evident with an increasing number of tertiary educational institutions and industry based training organisations attempting to offer a wide variety of Web-based (online) learning solutions. These institutions have adopted a variety of strategies - some have considered Web-assisted solutions as a supplement to face-to-face communication between students and educators/trainers, whilst others have used Web-based learning through the Internet as the sole medium for delivery.

A review of e-Learning and KM cases (e.g. various cases in online learning in the Training Magazine, Asgarkhani 2003, Kiser 2001, Montandon 2002 and Rossett 2002) suggests that most tertiary educational institutions and professional training organizations (within ICT enabled and globally networked countries) acknowledge (to some extent) the strategic importance of using technology-based education and learning through Web-based applications. They seem to view e-Learning as being a fundamental and positive shift in the academic and professional knowledge management world. Yet there is also a danger. If we focus too much on the technology aspect of e-Learning and less on broader issues and/or strategies, we are unlikely to be able to deliver futuristic solutions of a high quality. On the whole, some electronically delivered programs/courses appear to have been developed and implemented in a somewhat reactive manner, and in isolation - more specifically, without much thought being given as to strategic implications; global developments; cultural issues; digital divide and the complexity of today's knowledge management systems. As a result, some of these solutions have proved incapable of meeting the expectations of their potential markets (students/trainees). Considering the significance of knowledge management and ongoing learning in today's environment, the development of knowledge management systems and electronic learning solutions needs to be based upon a strategic foundation.
### 7.7.1 e-Learning - The Concept

e-Learning has been defined in many different ways. The historical background of e-Learning can be observed over three decades of development in ICT based education (and training).

Various technologies (including ICT) that have been introduced throughout the past few decades (in order to facilitate learning) include:

- Film
- Advanced TV technologies and video tapes
- Mainframe computer based “teaching machines”
- Early microcomputers as a basis for Computer Based Training (CBT)
- Touch screens and interactive videodisks based on “InfoWindows” hardware technology
- Power PCs, CDs and VCDs
- Global networking advancements and web-based solutions

Overall, universities in the US and the army appear to have played a pioneering role in the application of technology and developments which has eventually led to digital delivery of learning solutions.

Today, the e-Learning industry is diverse. Numerous universities have developed profit orientated e-universities offering courses and degree programs.

It should be noted that the e-Learning industry also includes organizations that support the establishment of learning infrastructures and networks for higher education institutions and corporations – such as course management and delivery tools from Blackboard and WebCT that allow customers to create learning programs directly on the Web without investing in their own tools or infrastructure.

In this paper, digital learning (or e-Learning) refers to the use of Web-based technologies (and applications) in order to deliver a broad range of learning solutions - whereby learning materials can be accessed from the web or intranet via a computer and educators/trainers can communicate with each other using e-mail, chat or discussion forums. e-Learning can be used as the main method of delivery of education/training or as a combined approach with face-to-face classroom-based teaching.

Some of the key characteristics of e-Learning solutions (Rosenberg 2001) can include:

- Relying on computer networking technologies – so as to make it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information.
- Delivering to the learner via a computer that is connected to standard Internet technologies. However, there is much debate over the interpretation of the term “computer” and what it actually refers to.
- Focussing on the broadest view of learning. That is to say, it considers learning solutions that go beyond the traditional paradigms of training. E-Learning moves
beyond training to include the delivery of information and tools that improve performance and competitiveness within the job market.

7.7.2 Change of attitudes in the transfer and management of knowledge
Training Magazine’s 1999 statistics (Industry Report 1999) demonstrate that companies are shifting some of their training investments away from on-site classrooms. There appears to be growing evidence that in the future, changes to business, society, general attitudes towards learning and the application of technology will limit the effectiveness of traditional learning/training. Providing effective futuristic learning solutions requires a shift in attitudes and perceptions – including:

- Focussing on outcomes – Learning solutions need to make a positive impact on learners’ performance and work-readiness.
- Providing flexible access (anytime/anywhere) – Knowledge solutions must meet the diverse needs of learners concerning time frames and locations.
- Placing emphasis on online rather than paper-based delivery
- Shifting the focus from physical facilities to networked facilities – Networked solutions for knowledge delivery (Internet or Intranet) play a significant role in information sharing, communications, and flexible access to learning material from any location in real time.
- Facilitating real time rather than cyclic learning – Today, the pace of change is extraordinary and the cycle time concerning knowledge is short. There is a need for improved learning efficiency and pace.

It has to be emphasised once more, that there is an enduring and important role for traditional classroom instruction (Asgarkhani 2003). Those who believe technology will eventually replace highly skilled teachers within classrooms of highly motivated learners are as misguided as those who consider the Internet as a phenomenon that can be overlooked as its impact will diminish over time.

7.7.3 Potential benefits and drawbacks of e-Learning
There has been much debate over the potential benefits and drawbacks where web-assisted learning is concerned (Asgarkhani 2003, Rosenberg 2001, Kruse 2002b, Kruse 2002c, Sitze 2001 and Burns et al 2001).

The International Data Corporation (IDC) and Online Learning Magazine (OLM) recently examined the general attitudes towards e-Learning - as expressed by a group of OLM readers about training within organisations (Kiser 2001). According to this research, those people who have been responsible for the implementation of e-Learning solutions seem to be pleased with the results (80% of the respondents used some form of e-Learning and
there were indications that this percentage will increase - as more than 40 percent of the respondents whose employers had not yet adopted e-Learning were apparently planning to do so within the next two years). Research by the IDC has shown convenience as being one of the most important reasons for employees for using e-Learning.

Furthermore, recent studies of learners' attitudes towards e-Learning within tertiary educational institutions (e.g. Burns et al 2001, Asgarkhani 2003) indicated that there is an increasing demand for web-assisted courses. A recent pilot study of trends and attitudes within the CPIT in Christchurch, New Zealand (Asgarkhani 2003) suggested that in general, there is an increasing interest in the application of e-Learning (despite the fact that most of their learning still happens in the classroom). Even though the results of this study are not considered as being final, it appears that the demand for quality web-assisted courses with multifaceted person-to-person interaction will increase rapidly in the near future.

7.8 The need for a strategic foundation

7.8.1 Assessing the effectiveness/success

While the impact of e-Learning within the academic and the professional world can be widespread, it is essential to monitor and assess the success/effectiveness of e-Learning projects.

e-Learning success can be measured with reference to either financial indicators or academic achievements. Some of the parameters that can be taken into consideration when measuring the success and effectiveness of e-Learning include:

- financial indicators such as return on investment (ROI), increased revenue, cost savings and total cost of ownership
- learners' achievements including comparison with other learning tools.
- functionality and best practice
- scalability and support resources

7.8.2 Potential causes of problems

While there are many case studies and success stories (with regards to e-Learning and KM), there are equally examples and cases where e-Learning and KM solutions have proved inadequate (e.g. Rosenberg 2001).

Typical causes of failure (Rosenberg 2001, Sun 2003, Asgarkhani 2003a and Galloway et al 2002) can include:

- lack of familiarity with proper applications and requirements of digital learning
- underestimating the resources and expertise that are required
- overestimating what can be accomplished through digital learning
- lack of understanding of the functionality and the tools that are available
- overlooking the potential problems of self-learning
- overemphasizing technological aspects of digital learning
inappropriate content planning and design
- authenticity of the solutions (programs) that are being offered
- lack of standards for digital learning solutions
- different requirements by different learners – “one size does not fit all”
- lack of support
- learners’ resistance to adopt digital learning culture
- lack of creativity in order to motivate online self-learners

7.8.3 Digital divide

Today, access to information and communication technologies (ICTs) is critical for economic and social development. Developing effective digital learning and KM solutions depend on the state of the ICT industry and electronic readiness (e-readiness) where it concerns countries, organizations, societies and so on (e.g. Information Society Index 2001, OECD Workshop 2000, META Group 2000 and Asgarkhani 2002b).

Overall differences in diffusion and use of ICTs and electronic networks can lead to:

- Divides between countries
- Social divides within countries
- Divides within countries related to income, education, age, family type, and location
- Business divides related to sector, region, and firm size

There has been much debate over the implications of digital divide on e-Learning and KM. In November 2001, the global communications company Marconi (Marconi 2001) called on government and private stakeholders in South Africa to accelerate the introduction of e-Learning centres in remote, rural and disadvantaged areas - suggesting that economic and educational benefits would have an immediate and measurable impact on poverty in South Africa. Higgins (Higgins 2002) views e-learning as a tool that can play a significant role in bridging the digital divide in the APEC region. However, the digital divide can also be considered as a barrier to successful rollout of e-Learning and KM solutions.

Some of the causes of digital divide that can also limit successful implementation of e-Learning and KM solutions can include:

- Lack of telecommunications and network infrastructure
- Limited PC access
- Lack of financial resources for developing an infrastructure
- Lack of ICT literacy
- Limited Internet access
- Cultural resistance
- High access costs to global networks and the Internet
- High cost of business investment
Strategic business impediments – applicability; the need to reorganise; the need for skills, security and privacy considerations

7.8.4 The need for strategic thinking

As we can observe, even though technology is a major component of e-Learning and KM, improving technology and infrastructure is not sufficient to produce outcomes of a high quality – as the components and relationships within today’s information society are complex. The development and delivery of quality e-Learning and KM solutions needs to be viewed as a holistic process, whereby a strategic foundation is developed in order to optimize the application of technology by giving consideration to many aspects of the digital delivery of knowledge such as digital divide, culture, social trends and so on. The process for strategic development of digital learning and KM must also consider critical success factors that have been widely discussed over the past few years (Kruse 2002d, Gallagher et al 2002, Hsieh 2003, Rosenberg 2001, and Rossett 2002) – which can include:

- establishing a culture of support for ongoing learning
- ensuring support from management
- deploying a nurturing business model
- sustaining the change throughout the organisation
- Today, it is essential that we view learning needs in a much broader context – one that includes:
- learning as the growth of the intellectual capital of corporations and societies
- learning as enabling higher individual and organisational performance

A strategy that is developed for e-Learning and KM needs to be examined, pilot tested and put in practice at a rate that technology develops and the Internet grows.

Any strategic framework for introducing e-Learning and KM solutions needs to be concerned with the overall direction of digital learning and KM whilst providing a foundation for tactical and operational issues. A review of some of the most widely used frameworks for strategy development (Robson 1997, Asgarkhani 2002a, Boar 2001, Heath 2003, and Rossett 2002) suggests that it (the process) should consist of at least three specific components/phases: Analysis, Choice and Implementation.

The total strategic process for e-Learning/KM is anything but linear. Integrating all the components of the strategic process is cyclic – often circling back to itself. The key elements of this cycle (as outlined in Figure 2) are:

- **Strategic Analysis** – involves establishing an understanding of the current situation, including: aspects of the environment; current technology infrastructure; available resources; expectations; broad objectives; and power bases.
- **Strategic Choice** – involves the formulation of the strategy itself through understanding various options, evaluating options and making a decision on a suitable strategy.

- **Strategy Implementation** – involves tactical issues such as resource assessment and planning, identifying human resources and systems, contents, determining organizational structure and so forth.

The first two stages of the strategy cycle outlined in Figure 2 should ideally result in the formulation of a strategy plan. The strategy plan can often be formulated as a hierarchy that clearly outlines the various stages (components) of the strategy process for e-Learning.

The components of the strategy plan often include (but may not be limited to):

- **Mission** - What are we planning to do with e-Learning and KM solutions?
- **Goal(s)** – What are we trying to achieve?
- **Strategies** - What alternative pathways are available to us – in order to achieve agreed upon goals?
- **Policies** - How should we be guiding our moves within a selected pathway in order to achieve goals?
- **Decisions** - What alternative options for moves should be considered?
- **Action** - This is the way we will implement our decision for introducing e-Learning and/or KM solutions.

Alternatively, the strategy cycle can help in establishing a foundation for successful development and delivery of web-assisted learning and KM – as displayed in Figure 4. As you can observe, Figure 4 depicts the critical components for successful e-Learning, including:

- Reviewing/reinventing the position of e-Learning – e.g. determining if Web-assisted solutions are to be introduced as a supplement to face-to-face communication between students and educators/trainers, or whether Web-based learning through the Internet is to be the sole medium for delivery.
- Compiling a sound business case for delivering on-line learning and KM solutions – more specifically, linking e-Learning goals with business goals
- Fostering an environment that balances learner and business needs in order to guarantee management support
- Allowing for an effective change management approach
- Establishing an information vision and architecture that would form the basis of the infrastructure (technological capabilities) needed in order to deliver and manage e-Learning and supporting KM solutions. This would require involvement
from ICT technologists in order to develop an understanding of baseline technologies.

Taking into consideration alternative approaches to e-Learning (and KM) and the ways in which e-Learning can be co-ordinated with other learning methods – including the enduring and important role for traditional classroom instruction.

Information and Communication technology tools can be used very effectively in education. There has been progress from classroom aids like slide projectors, overhead projectors and LCD projection to tools like the audio video tapes, radio and television broadcasts, cable television, tele-education through satellite, video conferencing, CD ROMS for large capacity data storage. Educational material can be prepared and stored in computers. Graphics, animation, music, speech and video interactivity is also possible through computers. Information technology has provided help to teachers by undertaking repetitive tasks such as drill, practice and information sharing. If so much is the potential of the information technology in education then the education system has to overcome, the barriers or the challenges it faces in adopting the technologies.