CHAPTER 4

Theoretical Background

4.1 Computerization of educational administration
   a tool to improve service efficiency 58
   4.1.1 Background 59
   4.1.2 Concept of Computerization 69

4.2 A View at University level 61
   4.2.1 Information System in the University - Objectives & Obstacles 61
   4.2.2 Computerization & University Management 65
   4.2.3 Uses of Information Technology to Educational Administrators 69

4.3 View at college level 72
   4.3.1 Computers and activities in the college administration 72
   4.3.2 Functions to be carried out by computers 72
   4.3.3 Steps to be taken to computerize an educational institution 74

4.4 Impact of computerization on educational set up 77
   4.4.1 Concept 88
   4.4.2 Nature of impact 78
   4.4.3 Preparing college administration for computerization 79
   4.4.4 Virtual education 80
CHAPTER 4
THEORETICAL BACKGROUND

4.1 Computerization of educational administration – a tool to improve service efficiency

4.1.1 Background:
At the end of the last century, Computers and Computer networks including Internet brought a fascinating economic growth to world economy. Everyone on the earth started to feel like a single family and human civilization started to unite under one roof. Internet brought a free flow of information without any barriers all over the world. When the world was facing the future with great certainty, American presidential elections, September 11 terror attacks and financial scandals in large American companies all once again brought a huge wave of uncertainty to the world economy? Today the world is faced with several questions. When the will present economic recession be over? Whether all the dreams about technical perfection about the Internet is true? Whether all the multimillion dollar investment we have made on the internet and information superhighways is necessary. All the questions above can be summarized into one single question: What are the social challenges of computerization?
4.1.2 What is computerization?

Computerization studies how the usage of computers influences and changes individuals, groups, organizations, relationships between these social components and society as a whole. This field tries to examine and answer the following groups of questions:

- What is the impact of computers on industrial production?
- Does it improve productivity?
- Is it increasing the risk of unemployment?
- Do computers empower the workers especially women or does it actually weaken them against market forces?
- How do computers help to improve service sectors like health care, educational services, and government services?
- How do electronic mail and Internet influence individuals’ social groups and human relations?
- How do computers bring changes in morals and social values?
- How can computers help us to improve the information management system and bring a new culture in management practice?

Sources of Advice & Information about Computerization:

It has been proved from previous research that there are different sources of information and advice about computerization (18). This suggests that it may be hard to target advice to researchers, particularly as no single direct targetable source type (e.g. books,
articles and other "static" sources) was used by more than 30% of researchers.

The following table shows various sources of advice and information. Total adds up to well more than 100% because most of the researchers used more than one source.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>% OF USING THIS SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departmental colleagues</td>
<td>67%</td>
</tr>
<tr>
<td>University Computer Center</td>
<td>56%</td>
</tr>
<tr>
<td>Program / Computer Manuals</td>
<td>50%</td>
</tr>
<tr>
<td>Books</td>
<td>29%</td>
</tr>
<tr>
<td>Computer magazine articles</td>
<td>24%</td>
</tr>
<tr>
<td>Academic journal articles</td>
<td>17%</td>
</tr>
<tr>
<td>Departmental superiors</td>
<td>14%</td>
</tr>
<tr>
<td>Colleagues in other departments</td>
<td>7%</td>
</tr>
<tr>
<td>Local computer shop</td>
<td>7%</td>
</tr>
<tr>
<td>Colleagues in other institutions</td>
<td>5%</td>
</tr>
<tr>
<td>Computer manufacturer</td>
<td>3%</td>
</tr>
</tbody>
</table>

The percentage shown above is in general and may vary slightly according to the various situations viz. time, place etc.

The most popular source of advice normally is the departmental colleagues and that is why the research process of this topic will mainly include the close interaction with the staff members actually working in the college-offices and use the computers fully or partially in their routine. One thing should be noted that
previous records of research show that no one has relied solely on manuals.

4.2 A View at University level

4.2.1 Information System in the University: Objectives & Obstacles

The main usage goals of the Information system are specified. The processes, which are planned to computerize in the future (20), and organizational solutions employed in Information system creation process are indicated. The computerization level and the problems in computerization of the University processes are reviewed. The main University Information system future development directions are formed.

1. Introduction

Information system is very important part of the today’s University. The University achievements in the education and the science areas straightly depend on the University activities computerization and the level of that computerization.

2. Purposes of Use of Information System

*Increasing of Competitive Ability of University.*

The evaluation criterion of the University activity is its competitive capacity comparing with other universities. This is competitive capacity is moved by the University academic production, which is stipulated by graduates, teachers, scientists, academic results, publications, arrangements, quality, etc. It is the time to realize the
importance of Information Technology in improving the educational administration (31).

*Improvement in the University Management.*

Information system requires the systematization of computerized process, the establishment general parts of processes and the integration of separate processes. Information technology can play a major role in developing these systems (29). Such a system helps for the University administrators to make decisions and increases their reliability.

*Decreasing Administrative expenses:*

For example, after the introducing of new scholarships division and the payment order, the servant has only to form the division of scholarships documents and instructions, in order information system would start to calculate scholarships and send the calculated results to banks through communication lines, and the rest is performed by information system. It releases the bookkeeping and other subdivisions from the inputting of infinite documents into the databases, their controlling, etc., and in addition, it decreases the mistake probability.

*Effective and Precise Presentation of Information.*

Information system allows effectively and precisely to form the confirmed forms reports for various authorities.
Transparency of Financial and Economical Activities (Accountability).

Information system creates the ability for various competent authorities to observe the processes at University. It increases the transparency and accountability of these procedures. Spreading correct information about it strengthens the prestige and service ability of University. That's why the information system has to be more open for the society. It has to be accessed not only for users of the University community, but also for parts of the society outside the University. The system has to be accessible in Internet.

3. Technological and Organizational Solutions

The University information system is created as the integrated system, aiming to computerize all University processes. Processes use general University registers, general classifications. It allows for individual users to avoid the different interpretation of the same data. All data are stored in a centralized database. This way it allows the avoiding of data duplication. Information is gathered, put to the database and managed, where the first sources are placed, i.e. in the University subdivisions.

That's why the circulation time of documents decreases, less logic mistakes are made, and search and elimination of mistakes can be done effectively.

The information system is based on University computer network. The fiber optic lines connect the most University subdivisions. It
ensures quick and reliable information's transmission. Information system operates using suitable database management system. The client-server architecture is used for information system, it enhances data reliability and security, in connection with technologies of Internet.

4. Computerizing Processes
The University information system contains all basic processes at University. The all processes of information system are not computerized in the same scale. The level of computerization of processes was defined by these factors: the priority of information demand of that process, the potential ability of process to computerize by itself, the University’s financial ability to give funds for the computerization, quite often changing of computerized processes. Let's examine every separate process, and pointed its computerization level and supplying advantage (usefulness).

Human Resources
The computerization of human recourses allows the receiving of the complete information concerning University staff, to observe the staff occupancy, to execute the control of certification of the University workers. Exhaustive and operative information about University staff provides the University administration with the opportunity of effective using of human resources. In addition, precise information about taken posts, the work time, the salary of every servant is necessary for bookkeepers for the accounting of salaries.
Management and Administration of University

The information system is a model of the majority processes, executing at University. The fact that the University heads operatively can get reliable information helps to control them in real environment. The registration of the received and sent documents was created in information system, improving the University administration. At the same time, the executing control of assignments and responses according these writings is carried out. In addition, the signed contracts between the University and other organization are registered. Information system renders the information concerning these contracts and helps for conclusion.

4.2.2 Computerization & University Management

Information technology is one of the wonderful inventions in 20th century. The prime concern of this technology is better information management in minimum amount of time. Whenever information, knowledge and wisdom is concerned, University comes in to picture as a generator of betterment of individual and betterment of society.

This is the age of information and in this age of information, Universities or in more broader terms our educational system can not play effective role giving services to the stakeholders without adopting these new means of information management and communication i.e. the information technology. If we consider the nature of University system and its management (19) for computerization point of view it seems much complex and quite different from any other management.
The management of educational system includes the following:

- Students management
- Academic management
- University administration (personal administration, financial management and planning etc.

Each of these units has different type of functions and follows entirely different procedures to achieve predefined aims and objectives. The educational management differs from management of other government departments, industries not only in the aims and objectives but also in the nature of work and procedures followed. This complexity must be thoroughly understood, discussed and rectified before planning for computerization of University management.

The computerization i.e. application of information technology in universities has provided a chance to redefine and modify the procedures, policies, decision making process etc. to keep pace with time.

**Need for computerization of University management:**
The University being an information/knowledge producing institution needs computerization and networking to compete with academic community of the rest world. The application of new means of information management and communication is also essential. The Universities need the applications of these technologies:
1. To accelerate the decision making process for better planning and administration by eliminating the barriers of time and space in communication.

2. To avoid the duplicity and to improve the standards of education research and development by providing common forum of discussion to the members of University and academic community.

3. To provide the better exposure of information technology to the society.

4. To decentralize the University system by insuring the free flow of information to all at anytime anywhere.

5. To offer the education at doorstep and for reducing the crowd of students from University campus and in turn to balance the growth rate of the universities with growth rate of population.

6. To make University system more objective, accountable and result oriented.

7. To develop better coordination amongst University members and also to make University system more transparent.

8. To reduce cost and volume of documentation.

9. To ensure the best possible use of all available resources.

10. To help to improve the efficiency in rendering educational services to student community and society

Apart from above points of application of information technology in University will certainly bring all the benefits of free flow of information and together-ness. Let us accept it as a means of bringing together the decision-makers, academicians, educational
administrators and students who are scattered around the globe. It must generate better environment for integration and coordination and will improve the quality and reduce the duplicity in education, management, research and development works of the universities.

Steps in computerizing University System
The long term strategic planning based on critical analysis is required to transform traditional University management into computer based objective and result oriented management. The plan should be able to provide the complete vision and anticipation of computerized University management. It may be divided in to two steps as given below.

1. Analysis:
It is the most important and crucial part of planning of computerized University management. It requires the complete analysis of present University system. Before thinking for computerization we have to have clear-cut factual vision about the functions, processes, activities and objectives of the University to be computerized. It requires crystal clear concept about objectives and their fragmentation in various processes by which, it is anticipated to achieve the defined objectives. The computerized University management system should be able to utilize all available resources in effective way to produce best results so, fragmentation and analysis of present system is a must to formulate the guidelines for anticipated system. It will also provide a chance to redefine and reform the obsolete procedures and policies.
2. Feasibility Study:
To evaluate the benefits of the computerization it is necessary to compare the present and projected University management system and study the practical applicability of the projected system. To select the most suitable software for defined objectives, comparision between projected University management system and application of the software available in the market. Discussion with software developer is also necessary as it requires the detailed information about the available software. Each of its functions should be tallied with the guidelines of the requirement that are prepared on the basis of analysis.

4.2.3 Uses of Information Technology to Educational Administrators
1. To sensitize administrators about the recent developments in Information Technology

2. To train the administrators with the use of computers and application of Information Technology in improving the quality and efficiency of University management

3. Planning for future application of Information Technology in realizing the goals of the University

4. Assessment of training needs for various uses of computers and application of Information Technologies in administrative
and activities of universities (21) and software requirements thereof.

Technical Aspects:
The different aspects involved are:

i. General

ii. Information Technology

iii. Office Management Software

iv. Demonstration/ Hands-on -Training

v. Computer for Campus Administration

vi. Current Trends in E-Learning

vii. Libraries in the IT Age

viii. Empowerment of Universities through Website

The management in University administration has two important components, viz., Academic and Administrative and emphasized that the constant changing scenario in education demands an effective administrative set up tuned to faster planning and execution of programs. For this, modern tools like Information Technology are of great help in improving the University system. The first and most important thing is to improve the examination system methodology and research and teaching in universities and suggested that computerization may lead to improve the efficiency and
delivery in the University system by creating data bank and linking various departments and offices of the University.

**IT Strategy for UGC**

IT strategy for UGC involves - incremental computerization to improve efficiency of operations of the UGC offices and units and systemic design, development and deployment of comprehensive information system (Higher Education Information System Project – HISP) covering various activities to smoothen the interface with the internal and external stakeholders of the higher education systems.

Incremental computerization effort would involve effective utilization of existing hardware / software infrastructure including training of the staff. It also involves procurement/ upgradation of additional PCs / printers, other hardware / software, and appropriate maintenance of the infrastructure through Annual Maintenance Contracts. Both these efforts are proposed to be launched in parallel that need to converge eventually.

**E-Governance in the University Administration**

It is recommended for creating Websites for universities and departments; setting up Web-enabled services and facilities like results on the Web, applications of various courses via Web, putting information bulletin on the Web; automation of the entire procedure of various sections, e.g. Establishment, Finance, Examinations; and setting a LAN of PCs in different section of the University and providing necessary software to improve their functioning.
4.3 A view at college level

4.3.1 Computers and activities in the college administration
Microcomputers can vastly improve the efficiency of data management, data analysis, and communication in the college office. Implementation, however, should be carefully planned in advance, with attention to relative cost for benefits obtained, appropriateness of software and hardware to tasks required, and potential security risks.

4.3.2 Functions to be carried out by computers:
The administrative uses of microcomputers (22) fall into four broad categories:

- data management
- data analysis
- word-processing
- communication

A brief sample of the college-records that can be stored and manipulated by microcomputers includes student records, personnel records, inventory of equipment, financial records, and special management records (such as transportation, food service, energy management, and sports program management).

The electronic spreadsheet, for example, shows instantly the overall classification of any alteration in a college budget or other quantifiable data, such as enrollment projections, time schedules, or
test averages. Other available software permits the user to translate raw data into bar graphs, and tables, or to perform complex calculations in a fraction of the time otherwise required.

Word processing is easily the most far-reaching innovation in written communication since the typewriter or the printing press. Currently available word processing programs enable administrators to compose, address, revise, correct, combine, rearrange, or delete written copy before it ever reaches paper, and then to print multiple letter-perfect copies in a wide variety of formats preaddressed and personalized, if necessary. Versatile graphics programs offer the same flexibility with anything that can be drawn in black and white or in color.

Communication:
The linkage of microcomputers with one another or with a mainframe computer--include such applications as electronic mail (replacing the burden of interoffice correspondence). Through the use of a modem, administrators can thus transform their micros into terminals for sending or receiving information, via telephone lines, to and from another computer anywhere in the district--or indeed, in the world. An advanced form of communications is the local area network.
4.3.3 Steps to be taken to computerize an educational institution:

Because of the rapid progress in computer technology, a well-conceived plan in designing and implementing a computer system is essential. There are three basic steps:

1. decide what functions should be automated and in what order of priority,
2. identify software that best automates these functions, and
3. identify hardware that runs the selected software

In developing a priority list of tasks to be computerized, you should conduct a cost-benefit analysis for each function considered, making sure in each case that a computer-based solution is most cost-effective. Carefully outline user requirements for each task, with input from all potential users. Develop a timeline based on priorities, and assign specific responsibilities to staff members for implementation.

Word processing is a good place to start in computerizing college operations, because word processing programs are normally easy to use and therefore quickly dispel "computer phobia." From there, the next step is to explore electronic spreadsheets and other quantitative analysis programs, before making final decisions about a data management system.
PROCESS OF SELECTION OF SOFTWARE AND HARDWARE:

In reviewing software, the most important prerequisite is to be well informed of the range of options for each task. Software of general applicability is likely, at first, to be more cost-effective, flexible, and available than software designed specifically for functions of educational administration.

Consider such factors as availability of support from supplier (including user training and follow up advice, refundability, and a discount on multiple copies), a balance between flexibility and ease of use, and compatibility with other software. With regard to the latter, the IBM-compatible MS-DOS microcomputer operating system has emerged as the industry standard for administrative use in both the public and private sector.

The current trend in computerized administration is toward "integrated management" systems, which combine database management programs, spreadsheets, word processing, graphics, and communication in a single versatile program. One step in this direction is "database management systems" (DBMS), which combine record keeping and data analysis in one system.

Determination of hardware should then be based on the selected software. The minimum microcomputer configuration for administrative purposes should include a standard typewriter keyboard, an 80-character wide screen with a diagonal measure of 12
inches, a 132-column wide dot matrix or character-impact printer, a 64K memory, two floppy disk drives and CD ROM drive. In considering the cost of the overall system, include maintenance, software, and training along with initial purchase cost.

BASICS ABOUT LOCAL AREA NETWORKS:
A local area network (LAN) interconnects computers (23) and their peripherals by wires and cables so that information can be transmitted at high speeds over limited distances—between offices, classrooms, or buildings. Unlike the modem, which allows two computers to communicate via telephone lines, local area networks can tie together a large number of users simultaneously.

At present, the best recourse is to wait or to install a small low-cost prototype network in order to gain hands-on experience with the emerging LAN technology.

SECURITY OF NETWORK:
Computerization poses a range of new concerns for the security of college records, especially when a local area network gives many users access to the database. For this reason, a key criterion in evaluating data management software is how much and what kind of security it provides. Ideally, programs should provide for accessibility to different parts of the database by people with different levels of security authorization through a system of passwords, locking codes, and so forth.
Programs are written for local area networks that will allow access of college records to many different users (for example, teachers, counselors, and administrators) and at the same time restrict access by some users to certain fields within a database. Database security remains one of the major challenges of the computer age.

4.4 Impact of computerization on educational set up:

4.4.1 Concept

The information technologies not only stimulate the information education for civilian but also affect the current education system. While the reformation of education system is encountering various dead ends, information technologies may break the limitation of traditional teaching environment which always regards the teacher as the main role in teaching-learning group, by multimedia computer assist instruction (CAI), computer network and by distance learning with self-learning databases, through which students can learn by themselves according to their own interests and abilities and teachers can be counselors or assistants to help them study, thus the idea of permanent study and different education for different people can be fulfilled. In addition, the educational administrators can fully understand the learning situation of students and offer their helps to students accordingly from the educational administration databases, past students records and counselors network of all levels of colleges.
4.4.2 Nature of impact

As mentioned above, we realize that the current campus might have encountered the following impacts during the process of computerization (18).

1. The interrelationship between teachers and students might be changed.

The speedy circulation, handy accessibility and diversity of information have changed the ways of applying information in education and research, and hence have affected the interrelationship between teachers and students.

2. The current education, research and administrative procedures need to be reexamined and reengineered.

Under the positive pressure of computerization, for example, the opening of information will bring about a striking effect on pointing out defects, so the current education, research and administrative procedures need to be reexamined and amended. Computerization insists on reengineering of an existing manual systems in administration.

3. Multimedia applications will bring revolutionary influences on education and research activities. The computerized applications, especially multimedia applications, will bring revolutionary
influences on education and research activities, especially on creativity and cognitive learning environments.

4. Decision making procedure for campus democracy and campus problems will be established. By the new information and communication media (computers and networks), teachers and students communicate with each other very easily, it will be an important issue to establish and practice a reasonable decision making procedure for campus democracy and problem-solving.

We will introduce the way by which colleges can prepare themselves for the coming of the computerizing era in the following paragraph.

4.4.3 Preparing the college administration for computerization:
According to the impacts mentioned above, our strategy is to establish promoting organizations and enlarge the functions of computer center on campus. A Computer Committee can be established on campus to setup strategies of computerization for campus.

Under the Committee some task groups can be formed to promote computerization for campus administration or to construct campus network. A computer center can be the executive unit for the above committee or task groups. Its function should be defined as being able to plan, construct and manage the campus network, to promote computerization for campus administration, to support teachers and administrative staff in computerizing the routine activities and provide
application services, information education training for people in/out of campus, and necessary technical service to library.

Having built the above computing environment, we can help students, teachers and all civilian through E-mail and distance education on networks to access various permanent study databases, library information, test samples database and CAI software, additionally, to discuss with each other and accept instructions to make interactive learning, and establish a permanent study environment fitting various peoples' need.

4.4.4 Virtual Education

A concept of virtual education is rapidly coming up as it has proved to be an ideal use of new technology to improve the service efficiency in education.

As with the other segments in the IT industry that have been greatly impacted by the revolutionary changes taking place in the areas of technology, the training market too is getting affected by some of the new developments.

Advances in technology are altering training delivery. Developments in hardware, intranets and the Internet, multimedia software and videoconferencing have created a tremendous potential for multiple-site delivery and bringing training to people’s work sites.
With the Internet and intranets proliferating both at the level of the global and Indian domestic market, one is witnessing the rise of a new form of training delivery -- E-training or on-line education.

On-line education is the next generation tool that has already started developing its roots in India. It is expected to allow both corporates and the Government to deliver state-of-the-art training to company personnel, students and home workers, and enable them to create the kind of skilled computer workforce required for the next millennium.

This kind of virtual education is being catalyzed by the continuing decrease in costs related to technologies, particularly computer hardware. The demand from all types of learning for more equitable access and service is also fueling the trend.

**On-line Education in India**

On line education is the best way to improve the service efficiency in education as it focuses on the convenience of the learner i.e. the customer. The On-line education market (24) in India is showing marked potential and is expected to be a significant revenue earner for the industry in the years to come.

Already a number of key initiatives are being taken by the industry to incorporate Net-based training as part of their curricula. Steps are also being taken by various State Governments in India to incorporate Net based training into their IT agendas.
Some of the developments taking place in the on-line education market are as follows:

- **Growth in the education to home market:**
  The Government has shown interest in this segment of the computer education market. An example are the Andhra Pradesh and Madhya Pradesh Governments who have initiated pilot programs involving education dissemination through the television, with student responses coming back over the Internet.

- **Distance learning:**
  The concept of distance learning is being adopted by leading private and Government funded educational institutes as a means of reaching a wider and more remotely located audience. Leading private sector computer institutes have already launched Net based courses which students can follow easily. Internet based distant education is becoming popular now a days (32).

- **Foreign University-Indian training institute tie up:**
  Yet another trend has been of foreign Universities tying up with leading Indian education institutes for offering Net based education. At the end of these self paced programs, students give an exam over the Net and receive a certification from the foreign University. Courseware too is usually free over the Net.
Collaborations between Indian Universities and Indian training houses:
In the recent months a number of computer institutes have tied up with Indian universities to jointly offer Net based training. The tie up of IGNOU (Indira Gandhi National Open University) with Satyam Infotech is a case in point.

On line training: the enlarging impact
On line training is not just the monopoly of the computer sector. The impact of such training will extend to various segments across a variety of industries. Such a mode of education will be used to reach out to students (both at the level of schools, colleges and institutes of higher learning) and even corporates to enhance the base of skilled manpower within their set ups. In fact, in the latter case, already a number of leading organizations are using tools such as video conferencing and on-line, self paced learning modules for employees.

Similarly, a host of educational sources have come up to offer various levels of courses that are targeted at segments such as students, teachers and even professionals. India’s leading computer education houses such as NIIT and Aptech have also diversified into the on-line training space and boast sites that provide courses that can be administered on the Web.
Delivering Training

Today, a number of methods have been devised to deliver on-line training so as to improve the service efficiency while delivering the training. These include live training, class room based support learning environments, stand alone, self paced learning, CD-based, and Web based education that facilitates the use of technology and in the creation of a virtual education community.

Opportunity for India

It is important that India takes the jump into the on-line education waters. A number of opportunities have opened out with the arrival of the on-line training trend in India as a part of upgrading service quality. These are as follows:

- Skilled manpower generation:
  The demand-supply gap for skilled manpower is still fairly wide. Demand constantly outpaces supply and India is constantly looking at ways and means of bridging this gap. On-line education opens up a major new avenue for training manpower and for meeting the manpower targets. Using on-line training Indian educational institutes can address the manpower issues both at the level of the domestic market as well as the global markets.
• Technology and content for global markets:
  India has the opportunity to develop technology and content to capture a share of the global on-line training market as well.

• On-line learning support services:
  India can provide online learning support services to developed and developing countries on their educational sources.

Summary – online education
The online education market in India is poised to take-off. The advantages of training over the Internet far outpace the conventional means of disseminating computer education. Online education will enable both private and Government run institutes to reach a wider audience and rapidly expand their base of both student and professional users. Internet based distant learning is also the need of today’s age (32).

As telecom infrastructure improves in the country, online education is likely to receive an additional boost. It is an opportunity that needs to be exploited for complete benefit.
21st century learning skills. These skills include inventive thinking, digital literacy, effective communication, teamwork, and the ability to create high quality products. Acquisition of these skills is facilitated by technology.

Technology, particularly the Internet, is a tool well suited to learning. Our understanding of how people learn has advanced tremendously in the last 30 years. In How People Learn: Brain, Mind, Experience, and School (40), the educationist contend that the Internet provides an ideal learning environment that allows people to learn by doing, to receive feedback, to refine understanding and build new knowledge, and to visualize difficult concepts through modeling and visualization software. Therefore it can be concluded that Internet is viewed as the best tool to improve the quality of education when it is rendered as a “service” in today’s environment of competition.

Although our understanding of how we learn has advanced tremendously in the last 30 years, research on the impact of educational technology on learning is lagging. A review of the literature by several groups has concluded that technology has great potential to enhance student achievement and teacher learning, but only if it is used appropriately.

Specifically, technology can be used to:

- Bring exciting curricula based on real-world problems into the classroom;
• Provide platforms and tools to enhance learning;
• Give students and teachers more opportunities for feedback, reflection, and revision;

Build local and global communities that include teachers, administrators, students, parents, practicing scientists, and other interested people