E-Learning and its Impact on Education: A Conceptual Study

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Abstract

Entire sectors of an economy are nearly inconceivable without ensuring extensive use of information and communication technology (ICT). This is why ICT is acknowledged as the foundation of a country in the twentyfirst century. Moreover, today's education system could not operate without ICT. Mainly computer and computer based devices or peripherals have grown vastly and affect almost every step of our lives and make our lives easy and fast. In fact, Internet, the global network of networks, is becoming increasingly a significant tool in our education system in twentyfirst century. Most of the young generation cannot imagine passing a day without Internet. Now, the students as well as the teachers are gradually deviating from the traditional practices of education to the digital phase where educators will show the students how to excel their knowledge utilizing the different devices of information and communication technology. The objective of this study is to determine the impact of e-learning to accelerate education system, the development of e-learning, and how it gears up the entire economic development of a nation.

Key Words: E-Learning, Online Teaching, Information and Communication Technology (ICT), Digital Education.

Introduction

Learning is a process of acquiring knowledge. Learning is any relatively permanent change in behaviour that occurs as a result of experience. Ironically, we can say that changes in behaviour indicate that learning has taken place. It is clearly visible that a revolution is taking place in the education sector with concern to the way people learn things and the way instruction is being given. If we consider the present theory of education, it is basically transferring knowledge (tact or explicit) from one source to another. Information and communication technologies potentially offer increased possibilities for codification of knowledge about teaching and for innovation in teaching activities through the delivery of learning and cognitive activities anywhere at any time. Learning at a distance mode can further be more learner-centred, self-paced, and problem solving-based than face-to-face teaching.

E-Learning is a promising tool for expanding and widening access to education. Because they relax space and time constraints, ICTs can now allow people to participate in education by increasing the flexibility of participation compared to the traditional face-to-face model. People living in rural areas, non-mobile students, and even foreign students could now more easily

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participate in education. Learners can indeed study where and/or when they have time to do so– rather than where and/or when classes are planned or scheduled. While traditional correspondence-based distance learning has long played this role, ICTs have enhanced traditional distance education enabled the rise of a continuum of practices between fully campus-based education and fully distance education.

More specifically, fully featured online learning can allow large numbers of students to access education. The constraints of the face-to-face learning experience, that is, the size of the rooms and buildings and the students/teacher ratio, represent another form of relaxation of space constraints. ICTs indeed allow a very cheap cost of reproduction and communication of a lesson, via different means like the digital recording and its (ulterior or simultaneous) diffusion on TV, radio or the Internet. The learning process or content can also be codified, and at least some parts be standardised in learning objects, for example a multimedia software, that can in principle be used by millions of learners, either in a synchronous or asynchronous way. Although both forms might induce some loss in terms of teachers-learners interactivity compared to face to face teaching, they can reach a scale of participation that would be unfeasible via face-to-face learning.

Objectives of the Study

The study has been aimed to

- enhance the standard of education utilizing every available devices, tools & techniques of information and communication technology (ICT).
- expand and widen the access of almost all classes of people to electronic education relaxing time, space, and cost constraints.
- ensure benefits to the economically disadvantaged students and children with disabilities.
- result economic progress from direct job creation in the technology industry as well as from developing a better educated workforce.
- discuss how we can develop pertinent education system or methodologies in order to meet the large scale need of digital learning.
- find out the impact of socio-cultural aspects in building significant methodologies for the purpose of e-learning.

Advancing Knowledge: The Impact of E-Learning

The emergence of ICTs represents high impact for the education sector. Digital Technologies could indeed play a role on three fundamental aspects of education policy: access, quality and cost. Digital technologies could possibly advance knowledge by expanding and widening access to education, by improving the quality of education and reducing its cost.

The International Society for Technology in Education (ISTE) has identified a range of skills that will help students to conduct independent research, think critically, and solve problems, use

technology to communicate and collaborate, and understand societal issues related to digital citizenship. These are summarized in the following table:

	Basic Learning (without ICT)	Basic Learning (with ICT)	Classroom E-Learning	Fully Featured E-Learning
Technology Access	Minimum	25:1 (Students & Teachers)	Computers-on-wheels or shared desktops, Teachers PC Programs	Laptops (1:1) with Teacher PC Programs
Connectivity	Dial-up	Wired lap only	Wireless in classroom	Board, fast coverage (WiFi, WiMAX)
Digital Content	-	Focus on learning PCs	Some digital curriculum integration	Complete digital curriculum integration
Improved Learning Methods	-	Group collaboration	Project-based learning	Student-centred learning
Professional Development	-	Lab instructor only	More people, deeper instruction	Most people, through instruction

E-learning can also be seen as a capable way for improving the quality of education and the effectiveness of learning. These promises can be derived from different characteristics of ICTs. Like

- It can give students the increased flexibility of learning experience.
- It ensures more students the enhanced access to information resources.
- It may focus on the potential drive of innovative and effective ways of learning and/or teaching, including learning tools, easier use of multimedia.

A variety of studies have evaluated the impact of e-learning and concluded that appropriate policies, infrastructure, professional development, and curriculum can produce promising effects i.e. technology-rich environment delivers greater impacts on society. There are around five major areas of benefits of e-learning: student learning, teaching and administration, family and home, social and community, and economic development.

Student Learning

Studies show that e-learning can help increase student engagement, motivation, and attendance – key requisites for learning. Effective e-learning can also improve performance on core subjects and foster the development of 21st century skills whether in mature or emerging countries.

Engagement, Motivation, and Attendance

The US Marine Academy conducted a survey in 2009 relating to e-learning environment over 42,000 middle school students and 5,000 teachers. More than 80 percent of teachers surveyed said that students were more engaged and more actively involved in their learning and produced higher quality work.

Principals and teachers reported "considerable anecdotal evidence" that e-learning increased student motivation and class participation, and improved behaviour. (Silvernail, USA).

In a e-learning program at 10 primary and secondary schools in Malaysia, 85 percent of teachers, many of whom were initially skeptical, reported that the program helped them create an innovative and collaborative e-learning environment within their classrooms (Malaysia Ministry of Education and Intel Malaysia, Malaysia).

At a large rural high school, attendance rose from 91 percent to 98 percent after the e-learning program began. (Mitchell Institute, USA).

Greater technology integration, greater benefits

In West Virginia, one of the poorest US states, students who experienced classroom e-learning had higher gains in overall scores in mathematics than those who had technology access only in computer labs. (Mann et al, USA).

Performance:
A meta-analysis of 42 peer-reviewed papers published between 1996 and 2003 found positive significant correlation of 0.448 with cognitive outcomes, indicating that average students who used technology would be at the 66th percentile while average students without technology would be at the 50th percentile. It is observed that "the overall effects of technology on student outcomes may be greater than previously thought." (Waxman et al, Global)

Teaching and Administrative Outcomes

Researchers have reported that issuing laptops to teachers can empower them to teach better, increase lesson planning and preparation productivity, gain more positive attitude about their work, and improve efficiency of management and administration tasks.

Student-Centred Teaching and Preparation

- Using technology, teachers can access tools that enable them to deliver customized assessments and gain immediate feedback on individual and class progress. (Kerr et al, USA).
- With this feedback, teachers can provide personalized learning opportunities , using remediation and enrichment to deliver more differentiated instruction that better meets each child's needs.
- In a Turkish study of primary school teachers and students, 87 percent of teachers surveyed said e-learning improved their ability to conduct project based learning. They also stated that e-learning supported the shift from teacher-centred to student-centred teaching, and enabled them to act as facilitators more than lectures. (Aydin, Turkey).

Attitudes and Productivity

- When 400 teachers were surveyed on how they used time saved on lesson planning and other tasks, 31 percent said they performed additional preparation, planning and other core tasks, while 47 percent performed new tasks or performed existing tasks to a higher standard. (PricewaterhouseCoopers 2006, UK)
- A review of 17 recent European studies reported that teachers' role can be more rewarding in an effective e-learning environment. Teachers who perceive a highly positive impact from ICT tend to use technology in project-oriented collaborative and experimental ways. Teachers function as advisors, dialogue partners and facilitators for specific subject domains. (Balankat et al, Europe)
- In evaluating the Notebook for teachers and principals program implemented by the Victoria Department of Education and Training, researchers found that teachers felt more valued as professionals as a result of having their own laptops. They also felt that parents viewed them more respectfully, and that they were recognized as important by the government. Some 70 percent of teachers said the program had increased their professional competence in areas such as teaching practices and assessing and reporting student learning. (Gough et al, Australia)

Dual Investment Strategy for Optimal e-learning

A survey of 11 international e-learning deployments found that teachers are more likely to integrate technology into their pedagogy when they have technology in the classroom. The average implementation rate for teachers who had lab access only was 71.7 percent increasing to 87.2 percent when teacher had one PC in their classrooms and reaching 94.8 percent when teachers had access to two to six classroom computers.(Martin, et al, Global)

A second global survey highlights the importance of effective teacher professional development and support. It found that teachers who are most likely to use technology effectively to improve education are those who have completed professional development programs, work in school with ample support, and have technology in classroom rather than in a PC lab. (Light and Martin, Global).

Family and Home Effect

E-learning does seem to produce some positive effects in the home:
Evidence suggests a relationship between frequency of home PC use and academic achievement. Reviewing data from the 1996 National Assessment of Education Progress in mathematics, one study reported that student using home computers more often had higher levels of achievement in mathematic. (Wenglinsky, USA). This seems to echo findings from previous studies, describing

incremental impacts when technology is more mobile, personalized, and integrated throughout the day and across the curriculum.

Another impact noted by researchers is increased family interaction. Many school systems establish an e-learning portal that parents can access to track home works assignments, and communicate with teachers and staff, providing opportunities for increased awareness and discussion of homework assignment, student progress, and so forth. In addition, when students bring their laptops home, they are free to study in the kitchen with family rather than in a more isolated room. This gives parents greater visibility of schoolwork and opens new avenues for discussion. (Mitchell Institute, USA)

Social and Community Effects

Texas Center for Educational Research shows that economic disadvantaged students reached proficiency levels matching the skills of advantaged control students. In studies of students with disabilities, researchers have observed improved student self-esteem, increased motivation and ability to work independently, and other academic achievements such as improved quality and quantity of student writing. (Harris, USA)

A number of studies suggest that, from a long-term perspective, a wide array of social and community benefits are associated with improved education. These benefits include reduced criminal activity, increased reliance on welfare and other social programs, increased charitable giving and volunteer activity – even attainment of desired family size and improved health for the individual and his or her family. (Riddell, Global)

Economic Development

So far, we've discussed research showing how e-learning improve educational achievement. Now we turn to studies that examine how improved achievement can affect a nation's economic prospect. For many countries, economic development is the driving reason behind e-learning investments.

Recent examples indicate that e-learning investments can improve economic development in two ways: by direct job creation as governments procure the PCs, networks, software, and services to support the e-learning deployment; and indirectly, by developing a better educated workforce.

Direct Economic Impact

In July 2008, Portuguese Prime Minister Jose Socrates announced Project Magellan, an investment by the Government of Portugal to provide locally-built classmate PCs to all Portuguese students aged 6-10. Classmate PCs would be supplied by local technology company JP Sa Couto, Linux software provider Caixa, and other local ICT companies. JP Sa Couto plans

to manufacture and export 4 million classmate PCs in addition to 500,000 units intended for use within Portugal.

With Project Magellan, the Government is making a two-fold investment in the nation's knowledge economy: Portugal's children will be equipped with the skills to compete for high paying jobs in the future, and Portuguese workers will gain access to high-quality, high-value-added jobs in the near term. According to analysis by Vital Wave Consulting, Project Magellan will generate a total of 1,470 jobs and produce a total economic impact of $ 3.131 billion in 2010.

Indirect Impact: Economic Benefits of a Better-Educated Workforce

Although no research clearly addresses the indirect impact of e-learning on the economy, it certainly seems reasonable to think that, by increasing educational achievement, e-learning may be able to ultimately enhance economic attainment.
International comparisons show that education plays a pivotal role in fostering labour productivity and economic growth. For example, Harvard economist William Barro's analysis of education and economic growth concluded that an increase of one standard deviation in test scores would raise the growth rate of real per capita GDP by 1 percent per year.

A World Bank study further underscores these findings: it reports that raising test scores on the OECD Programs for International Student Assessment (PISA) test by 47 points (the equivalent of one country-level standard deviation) will drive approximately a 1 percent increase in gross domestic product (GDP). The World Bank report also references US research suggesting that an increase of one standard deviation in math performance at the end of high school translates to 12 percent higher annual earnings.

Developing an E-learning System

Education system is a sensitive issue because people's lives depend on that. One of the main reasons why still e-learning have not made big impression as it promised is "Trust". So it is important to build a good, secured and well planned system. This is where the system developer comes in action. To bring out the best of the system developers it is very important to have a good system development team. A good system development team is a combination of team spirit, size of the team, nature of the team, education level of the team and the cultural background that the team comes from. It is not important to make the team with all top class programmer or system designer. The main thing is to make a balanced team with same focus and goal. The development team must have the same vision and clear idea about what they are trying to accomplish.

The systems development team can be considered as the most critical aspect of any systems development. The aspects of the team can have a big impact on the system that they develop. For example a typical educational systems development team may consist of people such as instructional designers, web specialist with knowledge of JAVA, XML, UML and other related technologies, Software programmers, multimedia artists with image processing, animation

capabilities, and educators themselves in order to find out whether the systems to be developed achieves the required learning outcomes. Furthermore successful project team should have the same vision, and all the members of the team should know what they are trying to accomplish by doing the project and how the ultimate product will look like.

When there is a proper development team present, they should try to understand the requirements of the educational software system and the end users (mainly students) of this system, in order to do this they should have a clear understanding about the requirements.

When developing systems for the educational sector especially online education, as systems developers it's a hard task to get a clear cut approach. In this type of environments we can develop systems by utilizing **Soft Systems Methodology** which was developed by **Professor Peter Checkland** (1980, 1989) of Lancaster University. When we drill down to his approach we can see that it has been divided into seven distinct stages.

1. **Finding out the problem situation:** - At this stage the systems analyst have to be present in an education institute and observe the lecture to find out the techniques that the lecturer utilizes to deliver the lecture. This method will have its own advantages as well as disadvantages. The biggest disadvantage in this method is taht the lecture might not show the actual picture when he or she is being watched.
2. **Express the problem situation through pictures (Rich pictures)** : In this phase the systems developer tries draft the problem situation in diagrammatical format, for example the picture might show the interaction between the student or the lecture with system, how the data is been stored, the method and the medium of communication, Today's systems developer use different software to illustrate these pictures, For example we can model this type of environment by using software packages like **Rational Rose** (UML).
3. **Viewing the situation via root definition**: Root definition tries to identify the individual's perspective for a specific problem.
4. **Conceptual modules:** Each root definition gets its own conceptual module. This is where the systems thinking comes into play, at this stage we analyse the students and the lectures view or the perception and the activities that should perform to come to that perspective and express them in diagrammatical format.
5. **Comparison**: At this stage the pictorial view of the conceptual module is compared with the real world activities in order to find out any mismatches.
6. **Indentifying deviation:** Changes are identified by the systems development team properly.
7. **Implementation**: Changes are put in to actions.

With due respect to Peter Checkland methodology of soft systems, we can understand that the end user plays a key role in the development of the system and this can be considered as a very important aspect in developing educational systems.

Several methodologies exist in developing educational systems. **Avison & Wood-Harper's Multi-view Methodology** can also be considered as an excellent method to develop systems for the educational sector. Avison and Wood-Harper develop this methodology in such a way that it integrates characteristics of other methodologies. Multi-view methodology basically has 5 stages:

1. **Analysis of human activities:** In this stage, we try to find out the way that the required information systems enrich the educational institutes need.
2. **Analysis of information:** In this stage we try to analyse the entities and the functions that the system has to perform in order to achieve the desired learning outcomes. At this stage the systems developer can adopt different methodologies to carry out this function.
3. **Analysis and design of socio-technical aspect:** According to Avison and Wood-Harper (1986) *"People will have to have a basic right to control their own destinies"* therefore at this stage the systems developer will try to involve the end users (Student or the teacher) participation to a maximum. By doing so the end users will have a less tendency to refuse the system to be developed. Furthermore the systems developer also tries to understand the socio cultural issues related to the end user. For example we can consider the PRC (People's Republic of China) has a strong culture for ranking. In this culture, for the student to learn, there has to be a teacher available in class room, therefore the systems developer should consider all these issues when designing systems for students that come from these cultural backgrounds.
4. **Design of the human computer interface:** At this stage the systems developer should think about the ways that he should reach the end users, usually the students or lectures requirement. At this stage it can be considered as a good idea to develop the systems as small prototypes and get the students feedback for those prototypes. Later the developer can make changes to the prototype so the end product will be what the user intends to have.
5. **Design of technical aspects:** At this stage the systems developer should consider about all the technical requirements to develop the intended educational system. Furthermore to that the systems developer should also understand the technical infrastructure of the countries or the parts of the world that the systems are going to be delivered.

By considering all the aspects of the five stages of Avison & Wood-Harper's Multi- view methodology we can see that this methodology is still a subject to research in developing educational systems.

When we talk about methodologies in developing education systems we should also consider the **SSADM Structured Systems Analysis and Design Methodology** that was developed in United Kingdom in 1980's. Unfortunately now day's systems developers do not stick to this methodology in developing educational systems, but for research purposes it's always a good idea to compare with other methodologies.

1. **Feasibility study**: Evaluating the selected educational project is technically feasible to develop or not.
2. **Environment Analysis**: The existing situation of the educational segment is being analysed carefully.
3. **Systems options**: The functionality of the systems is agreed and the project is being budgeted.
4. **Requirement analysis:** Requirement of the educational project is being analyzed to the intended users.
5. **Technical systems availability:** The systems developer will consider the environment that the educational system operates. The hardware and the software requirement and other infrastructural requirements will be analysed.
6. **Logical design:** A report of what the educational software systems that are being developed intend to do. At this stage there is a considerable amount of user interaction with the systems developer.
7. **Physical Design:** At this stage the logical and technical requirement to the systems are being matched and system will be developed.

There are few disadvantages in developing systems by utilizing the SSADM methodology.

1. There is a limited amount of user (Teacher or the student) involvement in the analysis and the development stages. Because of this reason the final system will not be what the user intend to have.
2. Learning outcomes for the students is not properly gathered because of inadequate requirement gathering.
3. No socio cultural trends of the educator or the learner is being analyzed before developing the educational system.

This is the fact that when analysing requirements to develop systems for the educational system does not have clear boundaries, if we develop systems by utilizing this methodology limiting user involvement in the development process. It is my personal opinion that the educational systems developed by using this methodology can have limited amount of success in providing quality education and have more tendency to fail.

In order to build up quality educational systems, lot of systems developers adopt iterative development methodology, this can also be called as the user driver development methodology. When we dig bit more towards this methodology it can be seen that educational systems developed by this methodology is being implemented in small increments (One stage at a time). And the functionality of each stage grows over time. Furthermore to that each increment or the iteration has its own user centred analysis, user centred design development and testing. At every stage, the systems developer tries to analyse the cultural background of the student and the teachers that utilized the system and try to find out what they want from the system and equal that to the learning outcome to be achieved. And finally before developing the increment the systems developer tries to do a comparative analysis of what the student wants from the system and the learning outcome to be achieved to check whether there is any mismatches in ideas, if there is no

mismatches the increment will be developed. After that the developed increment will be handed over to the intended students or the lecture as a prototype to evaluate whether the requirement is being matched. This development methodology provided the systems developer will be able to see the progress of the project in a broad sense, and ultimately the end user or the student will be much more comfortable with the system. Furthermore to that by practising the iterative development methodology, the systems development team will be able to stay forces to the requirement and will have a clear understanding of what needs to be achieved.

According to this we can see iterative development is a brilliant way to develop systems for the educational sector, but still some educational projects that utilize this development methodology has also failed to archive the required outcome. This is simply due to cultural and human influence that has been deployed in the development stage.

- Educators or the teachers show a resistance to change: Because iterative development methodology gets the user requirements as much as possible at each stage in the development process, misleading information from the user can cause a major fall back in the project. In the education sector some teachers or educators think by deploying computer base systems in order to educate people will result in losing their job, because of this issue the educator might give misleading information about learning outcomes or might refrain from giving information. This can cause a serious damage to the overall project and no matter how good the methodology used the project can still fail.
- The systems developer should also understand the students are coming from diversifying cultural backgrounds and things can have different meaning with respect to their culture.
- The culture of the systems development team can also lead to the project to fail. As an example if the members of the systems development team think that they are the professionals in developing educational systems by utilizing this methodology, they might not see the room for improvement.
- Culture of the educational organization – No matter how good the system is being developed or how good the developed systems achieve the expected learning outcomes. The teachers of the educational organization might have a concept in mind like “This system is not going to work here”. And sometimes because of this reason they will show some reluctance to adapt to the system.

Conclusion

Information Technology is one of the revolutionary words which have a major impact on human lives. Computer and computer based product have grown so vastly and affect almost every aspect of our lives. Today most of the young generation cannot think limiting the use of technologies, mainly the use of Internet. Internet based institutions have offered some sort of e-learning. Even though e-learning industries have a good prospect because of the ongoing demand of it but still to make it successful, every organization should have a clear focus and a good development

infrastructure to develop e-learning. They also have to consider the new form of e-learning environment and the effect of that on learning culture. Finally, some suggestions are made to enrich e-learning culture to excel our economic development:

1. Since e-learning may gear up the economic growth by introducing an effective system of education, government should take necessary step to avail this opportunities for all classes of people.
2. The motto of present government is developing a *Digital Bangladesh*, so effective e-learning can play a significant role in this regard.
3. Government should take immediate steps to develop infrastructure, especially power generation, information and communication technologies (ICTs), etc to get the benefits of e-learning.
4. In our country, near about 73 percent people live in rural area, so we should ensure this opportunity for village people along with urban people.
5. Government, NGOs, and other private organizations should arrange awareness program about e-learning and practice it gradually.
6. It is noticed that the older are less interested in information technology (IT) than younger, so we should induce them to welcome e-learning mechanism and new technology.
7. E-learning is new way of acquiring knowledge. People with insufficient IT knowledge need proper orientation so that they can enrich themselves for it.
8. We should ensure woman to be involved in e-learning environment.

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