QUIS - Quality, Interoperability and Standards in e-learning

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Cost Effectiveness and Cost Efficiency in E-learning

Authored by the QUIS team.
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e Learning
Designing Tomorrow's Education

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Content

Background

The QUIS-project (QUality, Interoperability and Standards in e-learning) is a Transversal project in EU eLearning Programme. The activities for the QUIS project are all directed towards Quality in e-learning, Interoperability and re-usability of e-learning material and development of standards. The project is also looking at cost effectiveness and cost efficiency in e-learning. The project is building on, and further developing results from earlier EU projects. The most important of these are the MENU project (2002-0510 / 001 - 001 EDU-ELEARN, http://www.hsh.no/menu), the MECA-ODL: Methodological Guide for Analyses of Quality in ODL delivered via Internet, (87901-CP-1-2000-1-ES-MINERVA-ODL), the GreTel Leonardo project (D/00/B/F/PP-112216) and the on-going Leonardo project, Neworkers (E/03/B/F/PP-149.035) and the ongoing Socrates Minerva project E-LEN (101421-CP-1-2002-CY-MINERVA-M)

Cost effectiveness and/or cost efficiency in e-learning and distance education is an important subject area. During the last decade there has been written quite a few articles and reports focusing on the cost of distance education related to effectiveness and efficiency. The focus is not always on e-learning, but distance education and computer based training (CBT) in general. The authors usually have a “narrow” perspective focusing either on, the user, the provider or the society when looking at effectiveness in e-learning. This is a potential problem for those who are going to implement these results when planning their future e-learning offer. When just focusing on one of the parts involved in the distance education and which impact cost effectiveness and cost efficiency will have on them, this most likely will lead to a solution which is not favourable for any of the other parts involved, in the long run.

Another reason for focusing on cost-effectiveness in e-learning is the fact that this kind of education is getting more and more popular. Nearly everyone will be affected by this new way of learning. In most articles researchers and educators either focus on the technology or the pedagogy, forgetting the cost involved and the fact that somebody have to pay for it all.

In the first QUIS project report focusing on cost effectiveness and efficiency in e-learning, we have tried to look at relevant case studies, articles and reports in this subject area. Further we have tried to describe the most relevant variables and factors affecting cost effectiveness and cost efficiency in e-learning, this in the perspective of the user, the provider and the society. We hope that this article will be an “easy” way to get a first overview of this rather complex subject area.

This QUIS project report will be followed by another report where we will present our own model(s) for cost effectiveness in e-learning based on both a theoretical and a best practice approach. We do not want to look at distance education in general but at e-learning. In the area of e-learning the QUIS project partners have a lot of experience from EU projects, research and from delivering education the last 20 years. We would like to look at our own success-model delivering e-learning and describe it focusing on cost-effectiveness and cost-efficiency for the user, the provider and the society. This work will be conducted in the next stage of the QUIS-project.

Distance education in a historic perspective

Distance education has its roots in the early correspondence education in Lund in Sweden in 1833 and by Sir Isaac Pitman in England in 1840 (*Rumble*). Distance education has been seen as a good way to reach a large number of people who otherwise not would get any education. Thru early media like radio and television it was possible to reach large number of people at low cost per person due to economies of scale. A typical example could be radio education in India.

Another reason for the development of distance education is the fact that this kind of education makes it possible to get an education even if one can't show up in a classroom. An example of this could be the popular correspondence courses in the 1980s bought by people who lived in low populated areas of Norway.

Another reason for the development of distance education is the fact that most countries and governments have realized that well educated citizens are very important to become a civilized and developed country. Distance education has turned out to be a good solution to give education and knowledge to many people. Earlier it was an offer especially attractive to people living in the countryside, but with the introduction of new technology, distance education and now e-learning have become a realistic education alternative to almost every person.

I general there has been a development in the distance education from the earlier letter and text-based correspondence, thru radio- and TV-education, until the computer-based solutions introduced in the first part of the 90's. The continuing introduction of new technologies has strongly affected the way distance education has developed in the last 50 years.

A changing society

Another important fact increasing the need for and the development of distance education and e-learning is the fast evolution of the technology and the society in general. These changes affect nearly all people living in developed countries. It does not matter if you are a travelling salesperson, a bank assistant or a rocket scientist, everyone need some kind of post school training or post graduate studies. The need to combine further education with job and family has been an important factor pushing forward the development of open and flexible distance education. Lifelong learning is a keyword.

"Peter Drucker, in book after book, beginning with Landmarks for Tomorrow (1959) and continuing through The New Realities (1989), kept reminding us that the centre of gravity in the employed workforce was shifting from those who worked with their muscles to those who worked with their minds" (*Fred Nickols 2000*)

Living in a knowledge- and information society can be quite demanding, both for the individuals, the organizations and the society in general. We live in the "computer age" and the letter "e" in electronic have become a natural part of our vocabulary. E-mail, e-

dating, e-business and e-learning are the future and there is no way we can ignore this if we want to take part in the modern society.

"Business as usual" is rapidly becoming a thing of the past – constant change and the pressure of competition are now the order of the day and providing learning solutions that work has moved up the agenda," (*Dennis R Quilter, 2000*)

New technology

With the introduction of e-learning many new challenges appeared, but also great opportunities. Dealing with the challenges and at the same time utilizing the opportunities should be a goal for all of us. Introducing new technology just because it exists doesn't necessarily make any sense. It is important to do the changes for the right reasons and be aware of the impact the changes have on the society.

Thru the use of new technology it is possible for students, educators and learning providers to communicate and interact with each other in a much more flexible way than earlier. The focus on flexibility and new technology should never be at the sacrifice of the pedagogy and the quality of the learning. It is also important to focus on the cost of implementing and integrating the new technology in education. Introducing new technology in education or e-learning can be very expensive if we don't focus on the cost, the cost-effectiveness and the cost-efficiency. Another problem is that what might be cost-effective it the eyes of one interest group, turn out cost un-effective for another group. Here is an example.

"A Norwegian university college (UC) decides to stop the classroom education in entrepreneurship and only offer web-based e-learning because it in the long run will be more cost-effective in the eyes of the UC. By introducing e-learning the UC can reduce the education staff in the area of entrepreneurship from four to only two teachers. The education provider is satisfied because they will save money. This looks like good business in a narrow perspective without considering the cost and the total satisfaction for the user and the society in general.
If introducing e-learning means that each of the students have to buy their own computer and get their own high-speed Internet access-point, the students might be less satisfied with the shifting to the e-learning course, even if they learn the same and it might be more flexible than classroom education. If introducing e-learning also results in the fact that less students in Norway choose to follow courses in entrepreneurship, this could be negative for the society in general. Entrepreneurship is important for the future development of the country.
In other words, this example solution with the introduction of e-learning was potentially cost effective for the provider, but cost "un-effective" for the user and the society. This on the other hand does not mean that introducing new technology can not be cost effective for all the parties involved."

"Historically, changes in educational structures have opened access for some groups while restricting access for others" (*Ehrmann 1999*).

Definitions of distance education and e-learning

Since we in this paper will look at earlier articles and reports focusing on the cost of distance education and e-learning we will start by giving you some definitions of distance education and e-learning.

Rumble and many other authors talk about distance learning in general. In this report we want to look at what we call e-learning. The concept of e-learning has become familiar during the last decade. E-learning is one way to implement distance learning, but distance learning does not have to involve e-learning.

E-learning/ web-based education

There are many different definitions of e-learning and web-based education. We can start by presenting a wide description of E-learning according to Wikipedia, the free encyclopedia.

"As opposed to the Computer Based Training of the 1980s, the term e-learning is most frequently used to refer to computer based training which incorporates technologies that support interactivity beyond what would be provided by a single computer.

E-learning, therefore, is an approach to facilitate and enhance learning through the use of devices based on both computer and communications technology. Such devices can include personal computers, CDROMs, Digital Television, P.D.A.s and Mobile Phones. Communications technology enables the use of the Internet, email, discussion forums, and collaborative software.

E-learning may also be used to support distance learning through the use of WANs (Wide area networks), and may also be considered to be a form of flexible learning where just-in-time learning is possible. Courses can be tailored to specific needs and asynchronous learning is possible. Where learning occurs exclusively online, this is called online education. When learning is distributed to mobile devices such as cell phones or PDAs, it is called M-learning."

The Norwegian Research and Educational Network have the following definition of e-learning and web-based education:

"Learning who communicates thru different instruments (video, sound, text), who contains a certain degree of interactivity and are available thru the Internet."

Another definition from the Elearning Europe initiative:

“e-learning: The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration”

The concept of e-learning is quite new, and there are many definitions. The concept was probably born after the introduction of e-business or e-commerce, trading over the Internet. What most of the definitions have in common is the fact that they define e-learning to be interactive learning who communicates thru different instruments using the Internet.

Distance learning

Distance education is a much older concept than e-learning. Many of the articles we have studied in the QUIS-project talk about distance education in general, not specially focusing on interactive learning over the Internet. We can look at some of the definition of distance education.

From Wikipedia, the free encyclopedia.
“Distance education is a method of teaching in which the students are not required to be physically present at a specific location during the term. (This is debatable as Coldeway's quadrants do allow for four different models of delivering distance education.) Most often, regular mail is used to send written material, videos, audiotapes, and CD-ROMs to the student and to turn in the exercises; nowadays e-mail, the Web, and video conferencing over broadband network connections are used as well. Often students are required to come to meetings at regional offices on specific weekends, for example to take exams. Distance education is offered at all levels, but is most frequently an option for university-level studies. Full time or part-time study is possible, but most students choose part-time study. Research study is possible as well.

Distance education is a newer term for correspondence courses, which arose from the need to provide schooling to students in remote, sparsely populated areas that could not support a school. Such courses are generally offered at the primary or secondary level, often with the students' parents supervising their education. While there are many "correspondence schools" that still offer a dull and lifeless form of DE, many colleges are now able to integrate dynamic learning that is interactive and engaging for the student.”

Another definition taken from an article written by Brian Morgan (*2000*)
“Distance learning is a type of education where students work on their own at home or at the office and communicate with faculty and other students via electronic mail, the WWW, electronic forums, videoconferencing and other forms of computer-based communication”
This definition is very close to the e-learning definitions we have looked at. This shows that e-learning can be distanced education, but the concept of distance education can be much broader.

Cost Efficiency and Cost effectiveness

Before we start looking at cost efficiency and effectiveness from different angels we should start by explaining the concept. In 1997 Greville Rumble published his book "The Cost and Economics of Open and Distance Learning". This book looks at many of the factors controlling the cost in planning, developing and delivering Open and Distance education. The book is based on historical data, but still it is very relevant when looking at cost-efficiency and cost effectiveness in e-learning today.

Cost efficiency

This is what Rumble (*1997*) say about cost efficiency:
"Efficiency is the ratio of output to input. A system is cost efficient if, relative to another system, its outputs cost less per unit of input. A system increases its cost efficiency when it maintains output with less than proportionate increase in inputs. Efficiency can conveniently be divided into two components: allocative efficiency is concerned with the allocation of given resources between alternative uses in ways that maximize social welfare; x-efficiency is concerned with producing more output without any change in the allocation of inputs. It therefore focuses on inefficiencies such as overstaffing and managerial waste"

Cost effectiveness

We also want to look at the concept of cost effectiveness before we go into the perspective of the user the provider and the society. "Cost effectiveness" is a concept borrowed from the lexicon of economics, which is concerned with comparing different ways of achieving the same objective such that the most cost-effective choice will be the least costly of the alternatives being compared (*Thomas and Martin, 1996*).

Greville Rumble (*1997*) explains effectiveness in general this way:
"Effectiveness is concerned with outputs. An organization is effective to the extent that it produces outputs that are relevant to the needs and demands of its clients. This implies the existence of criteria by which the organizations success in this respect can be measured.
Schools can be effective but not necessarily efficient. For example, students can be taught programming very effectively, but if the cost of doing this is ten times the cost of any comparable programme, then it has not been very efficient.
Organizations need to be both efficient and effective. An organization is cost effective if its outputs are relevant to the needs and demands of clients and cost less than the outputs of other institutions that meet these criteria. Organizations that pursue efficiencies to the extent that the quality of the output is jeopardized or poor may cease to be effective."

Jones (1989) suggests that any education system which seeks to make a meaningful measurement of cost-effectiveness must:
- describe the nature of the business in an objective way and establish a clear definition of the product
- determine the extent to which one is able to achieve the product aim, i.e. quantify the

output of the production process, and
- establish the cost of the operation so that one can make some sort of measurement of the cost-effectiveness of the process by relating the extent of product success to the cost of achieving it.

(NG, 2000) states that it is important not to mix the concepts of efficiency and cost-effectiveness. It is possible for a programme to be efficient but not cost-effective if the outputs which are actually produced do not contribute to the programme objectives; that is, it may be efficient at doing the wrong things

We can describe a strategy as cost effective if it is:

- less costly and at least as effective
- more costly and more effective with an added efficacy that is worth paying the additional price for
- less effective and less costly, where the additional cost of the alternative is too high for the additional benefits provided

It does not just mean the cheapest strategy.

In an article Lesh refers to findings done by (*Moore et al 1990*) looking at cost effectiveness and distance education.
"The weight of evidence that can be gathered from the literature points overwhelmingly to the conclusion that teaching and studying at a distance, especially that which uses interactive electronic telecommunications media, is effective, when effectiveness is measured by the achievement of learning, by the attitudes of students and teachers, and by cost effectiveness."

There are different kinds of effectiveness, and cost effectiveness is only one of them. An area where there have been conducted much research is learning effectiveness. Learning effectiveness will in many cases be closely related to cost effectiveness. If a learning program is learning effective it has the potential of being cost effective. This depends on the cost and the learning efficiency. It is important to have this in mind looking at benefits from introducing e-learning for instance in higher education.

Earlier studies

In order to examine earlier studies in the area, we made a thorough search in all academic resources for material containing the words “effectiveness” or “efficiency” together with “distance”. The search result was immense. After a quick browse we realized that reports written earlier than 1999 had little value since the focus on the form of distributing the course has shifted towards e-learning and web based material. The developing of video or CD-ROM based courses is not very relevant for this project. We therefore decide to use only material newer than 1999, with exceptions for some standard work. That left us with about 100 references. We indexed some of them after relevance and the list is found in Appendix A.

We found reports from Europe, America and Asia, and it is interesting to notice a slight different focus in the different parts of the world reflecting different ways of organizing education and different target (number of students and educational level)

The focus of the research results are quite different depending on what expectations and goals they had by introducing e-learning. Looking at e-learning as a way to educate as many persons as possible, to the lowest unit price per student, is very different from looking at e-learning as a way to improve education and educational quality in general. These differences are important when we are looking at earlier results trying to find different facts and aspects affecting cost effectiveness and efficiency in e-learning.

From the society perspective

Reasons for subsidizing development of e-learning

- **More education** - In general we can say that e-learning makes lifelong learning easier. As stated earlier, we live in a knowledge and information society. The whole economy is based upon rapid changes in the technology. If a company or a country is going to be able to compete in the global market, employees with up to date knowledge and education is a must. E-learning can be an effective way to educate people. With the latest e-learning solutions it is possible to acquire new knowledge and take part in “lifelong” learning while already being employed. E-learning can hopefully stop the negative tendency where some people are ejected from their jobs because they lack relevant and updated knowledge. This is typical a problem in the “elder” working generations in high technology areas. In general we can say that by introducing e-learning more people get access to education, and this means a more educated society. Living in a knowledge and information society, this is crucial.

- **Geographically obstacles** - E-learning can remove geographical barriers. With e-learning a student in Hong Kong can get a bachelor degree in Norway by following e-learning studies over the Internet. This is also the case within a country. For example, Norway is a geographically very long country with relatively few people per square meter. E-learning makes it possible for people

living in remote areas to follow courses given by one of the Universities or University Colleges (UCs) in the bigger cities without physically moving there to study. This is important to give equal opportunities to the whole population of the country. In Norway, keeping the countryside populated is one of the official goals of the government. This is one of the reasons why the government also invest in the development of a broadband infrastructure in less populated areas.

- **Avoid costly duplication** - Every year billions and billions of Euros are spent on education. Most countries in the world see education just as important to the society as water is to us humans. When educators are spread around the country each of them serving their own geographical area, there will be an enormous duplication of studies throughout each country. This degree of duplication can be reduced by introducing e-learning. We can take an example from Norway.
  In Norway we have 26 public UCs spread throughout the country. A large number of these are offering their students a bachelor in Informatics. Each College University are subsidized from the Norwegian government to deliver these studies. Each UC develop their own material and have their own administration taking care of their Informatics students. An enormous amount of money is spent on duplicating material. By the use of e-learning and electronic material it should be possible to save money by sharing material.
  Another fact in Norway is that there are too many empty student "seats" in many educational areas compared with the numbers of students applying. By offering more studies using e-learning one didn't have to offer the same studies locally at all the UCs. If we are able not to duplicate too many study programs, the different UCs could potentially save the society and them selves a lot of money. Maybe the UCs who deliver the most cost-effective and efficient e-learning program in every subject area should get the government founding. Research on implementation and use of Learning Objects (LO) following the same technical standards are important when we are looking for new ways to enhance the reuse of learning material, and avoid costly material duplication. By using mutual standards LOs could even be placed in large repositories for common use.

- **Teacher time saving** – Some research have shown that introducing e-learning in higher education can be more time efficient. The professors and teachers then potentially get more available work-time for research. This is very important if we want to develop our societies and have the ability to compete. By subsidising e-learning and the development of e-learning the society builds the foundation for harvesting time- and cost-effective benefits in the future. Making e-learning more time- and cost efficient than traditional classroom education is an ongoing job. The society providing money to support research on e-learning is helpful to speed up the process in finding the best e-learning solutions.

- **Student time saving** - The ability of reducing time spent on learning is not only favourable for the teachers and professors. Research has shown that e-learning can be time efficient also for the learner. There are several reasons why this is the case. One fact is that e-learning often is designed to let the learners decide what

they need to learn and how much time they have to spend absorbing the relevant learning material. In traditional classroom courses the learners have to be present throughout the entire course even if they already have parts of the knowledge being presented in the course. E-learning can be more efficient for the learner, letting him choose where to put his time and effort going thru the course material. Many students will also be able to spend less time on travelling, when they can study using the Internet. By saving time in the learning process, the entire society will "productive" time available. This means that we can produce more, and hopefully earn more money.

- **Potentially student adjusted** - E-learning can be useful in helping physically disabled people getting a better education offer. People who are sitting in a wheel chair or for other reasons have problem with travelling around, can get access to study programs through the Internet.
  By integrating the latest computer based tool when offering e-learning, one can customise education to fit people who are weak-sighted or have reduced hearing capabilities. Being able to offer an educational study program to as many people as possible should be in the society's best interest.

- **Higher recognition** - In most countries e-learning and net based education have become more and more popular. Still it's a fact that education taken over Internet and at distance doesn't have the same status and acknowledgement as traditional campus education. There might be logical reasons for this looking at distance education in a historical perspective, but that should not be the case today. Therefore it is important that society subsidize the research and development of e-learning. High quality e-learning will ensure that the society will not be worse off even if e-learning will be the way to go in the future. It is possible to impose Quality standards for e-learning courses in the same manner as for traditional campus courses.

- **Global competitiveness** - Economists have the last five years talked about the "new economy". What makes the economy new is the fact that "the world is getting smaller". Thru Internet and other types of electronic communication, most companies can get access to the global market. If we are to buy a book we can physically take the bus into the city and go to the bookstore, or we can access the Internet and order the book from Amazon.com.
  Former geographical barriers disappear and we move from local to global competition. This has become reality in the commodity business and this could also be the case in the education industry. With the proper business models and the right e-learning solutions a national educational provider could offer education in an international market. Selling e-learning in an international market will become more and more common, and each society which wants to be an educational supplier should subsidise and invest in the development of high quality e-learning. Through this effort e-learning can also be helpful for countries getting a more international focus. However there is one important challenge, language. Some languages like Spanish and English are spoken by many people

throughout the world and are therefore well suited for if we want to share learning material between countries. Content developers living in smaller countries with their own native language will only be able to share LOs if they write them in one of the big “international” languages. Today translation of digital content can not be done at low price by the use of existing technology.

- **Technology updated** - In general we can say that subsidising e-learning is a good investment to make the society become more technology updated. The children of today are born with computers being a natural facility in the modern home. At young age children use the computer to play games and communicate with each other. For these children there will be no barriers relating to a computer as a helpful aid in receiving their education. In a computer society the society should support the evolution, and e-learning is a part of that evolution. Greater use of computers and technology in education is one the official intensions launched by most European governments.

Cost effectiveness and cost efficiency in the society perspective

In the society perspective it is important that the e-learning is worth the money. We can ask ourselves if e-learning and net based education is learning and cost effective. The answer to this question is not easy, but from the reasons already listed we can see that there are many reasons to support the development of e-learning in the society perspective, and that most of them can be led back to cost savings and/or increased effectiveness. When we are able to combine cost savings and better effectiveness in the eyes of both, the students, the institutions and the society in general, then we have a potentially good cost effective e-learning model. Just by going thru the e-learning "cost effectiveness literature" we see the potential of e-learning being cost effective in a society perspective. In the nest QUIS project report (end of 2006) we will present our own e-learning model.

Differences in the participating country's

The educational systems differ greatly between countries, mainly for historical reasons. Despite several mutual EU projects the organization of education still differs within the EU (and outside EU).

There are differences when it comes to types of exam, credit points, intake at schools and financing. There are great differences in governmental subsidizing for the students and the educating institutions.
It is not without problems for a student from one country to continue his/her studies in another country without often having to take part in supplementary examination and/or going thru a lot of bureaucracy. This extra effort leads to additional costs for the students, the educating institutions and the society.

The "economic" part of the QUIS project has a goal to create a model for cost effective and cost efficient e-learning (second report Dec. 2006). In doing this studying economical factors are important. The differences between the countries are a big challenge for us trying to make a general model for cost effective e-learning.

We can look at an example from Sweden where the universities are getting paid for every enrolled student.

- In Sweden all studies are free of charge for the students. This sometimes results in students signing up for to many courses without ever finishing them.
- The student is entitled to apply for full study support for distance courses, even if many of the students chose not to do this.
- The institution (the university a little bit more) is fully paid for each enrolled full year student (year 2005): 34 024 SEK (3 754 EURO). After the student completed the courses the institution in addition gets: 35 520 SEK (3 919 EURO). This means that it is good business to have lot of students enrolled even if they don't finish the course.

- In addition the university (year 2005) receives extra founding for creating new distance courses with 4000 SEK (440 EURO) per enrolled student in distance education courses listed at the Swedish Net University.

All policies above can rapidly change for political reasons, and therefore it's difficult to make long term plans. If we want to compare cost effectiveness and efficiency between different types of learning in the society perspective there are many general and country specific factors that need to be considered.

QUIS Partners

From the institution/ learning provider perspective

Reasons for developing and offering e-learning

There are many reasons why educational institutions should develop and offer distance education and e-learning. Some reasons are administrative, some reasons are pedagogical and some are economical. An interesting thing is that nearly all the reasons will affect and influence on the quality of the education being provided to the end user. High quality education is often similar with learning-effective education and that's very positive for the student, the educating institution and the society in general. An education study program which are learning effective and learning efficient are also likely to be cost efficient and cost effective. Many of these factors that we are looking at can be closely linked together in a positive way. This is why it is very important to consider the different reasons for developing e-learning in more that one perspective. Now let us look at the institutions perspective. We have chosen to divide the reasons for developing and offering e-learning into three; pedagogy, administration and economy, even though they are closely related.

Pedagogic factors

- **Interactivity** - E-learning can make the teaching more learning centred. Lectures are replaced with a variety of learning resources that move students from a passive, note-taking role to an active, learning orientation. Interactive programs and on-demand help functions have proven to be positive in engaging students in their learning process. This does not mean that just by defining a course to be e-learning, the students will be more engaged. As we all know there are great differences when it comes to good and not so good lectures, this is also the case with e-learning. To develop an effective e-learning course it takes quite a lot of effort. There are many technological and pedagogical factors involved.

- **Communication** - One of the most important factors involved in e-learning is communication. Thru the use of technology it is possible to enhance student-student and student-teacher communication. E-learning technology enables both synchronous and asynchronous communication.

- **1 to 1 student time** - With online learning the instructor gets more time to spend on each individual student. Letting the students follow a more or less pre defined and pre developed e-learning course on the Internet, the learning instructor can use more of his time to directly guide and communicate with each student individually. (*Morgan, 2000*)

- **"Natural progress"** - If the e-learning course is pre-defined and module-based, it will possible for each student to have their own "natural" progress. This is positive both when it comes to student learning and flexibility in the students

progress. Each student can optimize his learning, and the learning institution will hopefully achieve a better overall student result. (*Morgan, 2000*)

Administrative

- **Greater Flexibility** - It is not just the students who can have a lager degree of freedom following an e-learning course, the teacher, the teacher supervisor and the administrative staff will also get greater flexibility when they are to support and administer the students. The administrational staff can monitor students and implement automatic student handling systems.

- **Better administration** - The use of Learning Management Systems (LMS) in e-learning have proven to be a positive tool when it comes to student administration and student monitoring. Thru e-learning and the use of LMS the learning institution can follow the activity of their students and better guide them to a better result. By integrating different student administrative and learning systems the administrative staff at the learning institution is better able to do their job more effectively. A positive thing about e-learning is the fact that we can log and trace activities going on in the e-learning environment. These data can help us calculate and compare e-learning with other types of educational methods.

- **Removing geographical barriers** - The introduction of e-learning has to a larger extent made it possible for the learning institutions to offer their courses at a low cost outside the institutions nearby area. For the administrative staff there will be no significant difference in serving students located on or off the campus area. They will all be integrated in the same systems, and the monitoring and communication will take place over the Internet (ex. The LMS).

Economic

As we can see there are many reasons why learning institutions should deliver their courses thru e-learning. In education in general there is never “enough” money. This meaning that there always has to be compromises when a teacher or a professor are developing and lecturing a course. E-learning can be positive when it comes to save money or reduce the overall cost. We can look at some reasons why this is the case.

- **Less student/teacher time** - Looking at e-learning in the society perspective we said that e-learning could give the teachers more time to spend on research and other activities. If the institution choose to use this time to educate even more students, this could mean that the institution could reduce their staff or enrol more student. This means that the institution will either save or earn money. It is important to note that if the students learn less due to the shifting from classroom to e-learning, this solution may not be cost efficient.

- **Replace expensive labour hours** - Another potential positive and money saving effect by introducing e-learning is the possibility to replace expensive labour

hours. Traditional classroom courses were often fully development and administrated by the teachers and professors. When developing, running and administrating e-learning courses one can involve different kinds of staff and even students can contribute. This could lead to the saving of money.
Another positive thing about this is the fact that the different groups of employees get to do what they are best at. The teacher can focus on presenting the facts, the computer guru can work on the interface and the administrative people can take care of registration and enrolments. Doing what we are best at saves time, we don't have to waste resources in duplicating the different specialists knowledge and skills.

- **Economy of scale** - When looking at e-learning and cost we always have to consider the "economy of scale". Bassi (*Weller, 2000*) claims *"the economies of e-learning are highly dependent on the number of learners involved. The greater the number of learners, the greater the probability that economies of scale will make e-learning an attractive proposition from a cost perspective"*. The reasoning behind that statement is the fact that e-learning can be of high quality and still require low levels of student support. (*Weller, 2000*) states that: *"The traditional distance education technologies have high fixed costs, but relatively low variable costs"*. To get down the overall cost per student, a large student number would be preferable. In an article by (*Morgan, 2000*) he comments that: *Inglis (1999) notes that by increasing student intake, one could achieve a greater economy of scale and reduce the overall costs per student.*
Knowing this, it is a good thing that e-learning could be offered to almost anyone independent of where they live. Educational institutions can address a large market or target group after having invested high "fixed" costs in developing an e-learning course. Thru the use of e-learning, the learning institutions can attract students from outside the area they are geographically located. This increases the possibility to get "enough" students and achieve higher income and economy of scale.

- **Re-use and modularization** - Learning objects (LO) and reuse of learning material can be an important benefit from the institutions developing of e-learning. LO will help us reduce the fixed cost by four means: reuse, rapid production, ease of updating and cost effective pedagogy. The SCORM standard defines LO this way: "*a portion of a course packaged with sufficient information to be reusable, accessible, interoperable and durable*" and the definition by (*Wiley 2000*) : "*any digital resource that can be reused to support learning*". We can see that both definitions focus on the LOs ability to be reused in learning. The reuse makes us save money since we do not have to build everything from scratch every time we want to offer a new e-learning course. Using LOs who are modules of facts we can reuse material and this helps us divide the expenses over several different courses. Another important fact is that most e-learning courses can be offered to students over several semesters without major changes. We can refer to what Tomas and Martin said in 1996 (*NG*): "*the concept of cost-effectiveness is concerned with comparing different ways of achieving the same objective such*

that the most cost-effective choice will be the least costly of the alternatives being compared." With high quality module based e-learning material and economy of scale, e-learning appear to be cost saving and hopefully cost effective.
We have to say **appears** to be cost effective, because measuring effectiveness is not an easy task, something (*NG*) also points out:
"Deciding which outcomes should be assessed for effectiveness involves value judgement and often exposes conflicts of values. Moreover, in education, the outcome of the learning process is not quantifiably measurable in most cases, while there is no single objective criterion to use in measuring or comparing performance"

- **Classrooms and computers -** In many ways we can say that it is the capabilities provided by the information technology that helps us achieve many of the benefits from e-learning. For example, students following e-learning courses save the institution considerable costs when the institution do not have to get hold of classrooms for lecturing and access to student laboratory computers.

Demands on the institution concerning staff, technology and support

There exists plenty of research looking at which factors we have to consider when developing and offering e-learning (distance education). There are many potential obstacles and pitfalls we should try to avoid. Here are some important ones.

On faculty level there have turned out to be some problems adapting to the new situation with an increasing percentage e-learning courses. The traditional way of allocating resources and evaluate results cease to function when there are no traditional face to face lecture hours, laboratory groups or computer laboratories. It is easy to think of e-learning and distance education, without any of these resources, as a cheap way to offer education. This is a dangerous thought since recent research shows that there is an obvious risk that the work done by teachers and instructors are becoming underrated. The demands on teaching personnel time and the need to communicate with the students are still present even if courses are offered by e-learning and distance education. There can be high fixed development costs.

In HEIs much of the focus often lays in research and the "production" of postgraduate students. This process depends on a close relation between researchers and students which is considered difficult to achieve in distance education and e-learning. Since many of the distance courses are used for further education/life long learning they are not as highly respected and popular in the eyes of faculty staff, unless they can be used for saving money.

It's important to make the right decisions regarding suitable form of education for different situations to attain high effectiveness and high efficiency. It is vital to understand and be able to evaluate the pro and cons of e-learning and to understand the difference and similarities between traditional education and e-learning.

Little pedagogic knowledge on e-learning courses
To often the teachers in higher education are not recruited for pedagogic skill, but rather their present or future contribution to research. The teachers have little knowledge about how students learn and therefore no sound strategy for how to create good courses. Susceptible teachers use trial and error and hope they will get it right sooner or later. The same non-pedagogy is used when they are supposed to transform their classroom courses into e-learning courses. This is often an even bigger challenge if they have little experience with new e-learning environments themselves.

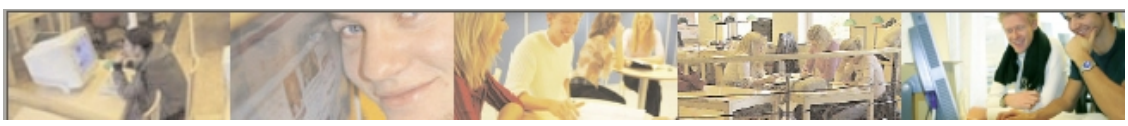
The demand for the teacher to get more pedagogic knowledge will increase as there is a new “demanding” kind of students taking e-learning courses. The students are older, more targeted and often with former higher education. These students will not accept badly prepared courses or teachers that are hard to reach.

Support for new technologies
Teacher as well as students in e-learning becomes more dependent on serviceable computer and network systems. Instead of a lot of computers at campus witch are consuming resources for purchase, management and administrating, they need servers, programs and network. E-learning can’t be offered without Internet access points and an Internet infrastructure. The future technical platforms must be directed towards mobile students using distributed resources.

Traditionally the technical support department exists to support on campus activities, but with an increasing amount of e-learning, the demand will shift to more remote and distributed IT-system support.

Costs for developing, administrating and running distance education
The actual costs for developing a distance course are often underestimated; or rather the possibility to save money is overestimated. The educating institutions hope that the transferring from an on-campus course to e-learning will yield good money at day one. The problem is that this can manifests itself in little resources allocated for the actual transferring and the developing of the course to e-learning and reduced resources for running the new course.

Sometimes e-learning courses can save money but don’t have to be the case. Instead you risk ending up with e-learning courses with low quality and throughput and worn-out teachers. It is important that the educating institutions realize that producing and delivering high quality e-learning really takes an effort. There are potential savings and e-learning can turn out to be more cost-effective, but achieving this is a challenge. Considering the reasons for developing and offering e-learning that we have presented here is a good start.



Courses vs. programs

Traditionally looking at e-learning the focus has been on courses with limited amounts of content and duration for no more than one semester. There has until the last five years not been offered many full time or part time study programs using e-learning. There could be many reasons why this is the case; The fact that developing a full study program using e-learning can be quite expensive, the mentality that everything that should be offered as e-learning must be fully developed up in front, the fact that earlier correspondence courses were not to comprehensive or just narrow mined thinking by us who are offering education. Some argue that students who are following a full study program rather would like to follow traditional campus education because this will give them the opportunity to take part in a more social study environment.

As e-learning are becoming more popular and more and more courses are offered by e-learning, there will probably also be offered more full or part time study programs, by e-learning. One “popular” topic in Europe these days are Joint Study Programs (JSPs). The thought of two or more Universities offering a JSP is much more realistic when some or all the courses could by offered as e-learning by the Internet. There are many “problems” concerned with JSPs but we will not go into detail here. You can find more information about JSPs and our thoughts about courses vs. programs in our second QUIS report presented December 2006.

From the student perspective

There is a lot of research about distance education regarding pedagogic, didactic and economic questions but only a few from the student's perspective and none directly concerned with cost effectiveness and efficiency from perspective of the student.

Reasons to participate in e-learning

At Mid Sweden University, department of Information Technology and Media they have done continuous (year 2000 – 2005) research on their e-learning students. The research involves questionnaires to the students focusing on their study situation and how they experience the different courses, combined with the faculties own statistics on their results. What they tried to figure out was why the students didn't finish their courses even though they said they like the content and the web based environment (the report is being published early 2006).

Preliminary results show the difference between on-campus and e-learning distance students. It turned out that the distance students in general are older, are more socially rooted, have work and family, and are resident. In the study 50 % said they where working or searching for work, and 75 % said that they wouldn't have been ably to study if they have had to travel to the university. They also said that one of the main reasons for studying by e-learning was the fact that they more or less could study at their own pace.

About 50 % of the e-learning students said that the e-learning courses were part of further education and that they choose courses that match their present or future profession. Some of the students followed one or more courses to get a certificate matching their present knowledge making them more competitive in search of work. A small portion said that they choose e-learning courses because this would help them get a degree in reduced time compared with traditional education.

Most of the results from this survey match well with the impression we have gotten from people we have been in contact with in other European countries. The special thing about the e-learning offered by the Swedish net university is the fact that the students don't have to pay anything to attend their courses. This could be the reason why a large part of the students are dropping out of the courses before the final exam.

Effectiveness for the student

There are a few reports on students study results comparing the students following education on campus or by e-learning. The results from the reports are not unanimous. In some of the report they can't find any differences, in others they can. In one report written by *Debbie Johnson et al* they divided a class into two groups and gave one of them, in addition to traditional lectures, web based instructions and support. The results in the group with web support where better, but the people behind the article would not conclude that the web based solution in itself caused the better scores. (*Debbie Johnson et al, 2002)*

The results of the study indicate that the online students scored significantly higher than those students in the traditional classroom setting on the post-test, even after controlling for significant pre-test differences. One reason might be that the students in the online course reported that they spent 6-10 hours per week working on the course while the traditional classroom students reported working only 5 hours per week or less.

…online method of instruction places more of the responsibility for learning on the student.

It is difficult to compare different e-learning courses regarding effectiveness since they are so varying concerning student support, web material, level of difficulty, target group and so on. This is also the case when trying to compare traditional on campus classroom education with e-learning.

Earlier in this report we quoted the following (Rumble):
"Effectiveness is concerned with outputs. An organization is effective to the extent that it produces outputs that are relevant to the needs and demands of its clients. This implies the existence of criteria by which the organizations success in this respect can be measured.
Schools can be effective but not necessarily efficient. For example, students can be taught programming very effectively, but if the cost of doing this is ten times the cost of any comparable programme, then it has not been very efficient.
Organizations need to be both efficient and effective. An organization is cost effective if its outputs are relevant to the needs and demands of clients and cost less than the outputs of other institutions that meet these criteria. Organizations that pursue efficiencies to the extent that the quality of the output is jeopardized or poor may cease to be effective."

When HEIs are measuring their study programs the often just look at the number of students starting the course compared with the number of students finishing the course, if they want to see if the course is efficient and effective. This is a simplified way of looking at efficiency and effectiveness. In the eyes of the HEIs this number is very important since financing and funding often are related to the number of students following and finishing a course. In the eyes of the students there can be, and are, other factors that are more important when they are to say if a course are effective and efficient in their eyes. The students focus on several different criteria, and the criteria among the students are also different.

Getting good grades and finishing the final exam is not always important to students. Research shows that many older students following e-learning courses (Mid Sweden University, Dep of Information Technology and Media, 2005, manuscript) are not always attending the courses to get a good grade, but to get new and updated knowledge they can use in their present job. This is an interesting fact, and it is supported by our own course evaluations where we have found that students who haven't finished their course still said that the effect of the course was very good. The course "produced" the results the students were looking for in other word it was effective.

This fact is also backed up by research done by (*Morstain and Smarts, 1974*) who have found that adult learners to some extent have different goals and motives when following education than their younger fellow students. Adult students said that the following factors were important:

- Social contacts, to meet other students
- Expectations from the surrounding world, one shall study to contribute to the general development of the society
- Professional development, demands from the workplace
- Learn something new, get out of the everyday pattern
- The joy of learning in it self

Looking at these factors we can see that completion rates and the results on the exams are not what most e-learning students are focusing on, at least not the adult ones. This is a challenge for the education providers if they want to make the e-learning effective in the eyes of the students. In worst case this can develop into a conflict of interest between the education provider and the students (or the peoples/companies who are paying the students course fee).

If we want to make e-learning efficient and cost effective e-learning in the eyes of the students, we have to look more closely at student satisfaction. If the students are satisfied with their education the will also likely perceive it to be effective, or at least they will consider following more e-learning courses. They will hopefully also recommend it to other potential students, and in that way recruit new students. Student satisfaction is also important to make e-learning more recognized.

If we look closer at how students learn we will se that it is many of the same pedagogical principles that count in traditional classroom education and in e-learning: first the information must be made available to the students, and then it must be worked with and adapted into knowledge. The students and the teachers are working against a mutual goal, and the learning occurs in the process where the students and the teachers interact with each other.

In recent research concerning distance education we can identify three different types of interaction supporting learning:

- Support for the cognitive development through; lessons, guidance and feedback
- Emotional support through; treatment, encouragement and acknowledgement
- ”Institutional support” by; student administration, IT support, student demands and rights and other practical issues

The students can also interact in different ways:

- The teacher or teacher supervisor interact with the students thru guidance and feedback on student activities and discussions.
- Students interact with each other thru mutual assignments and projects.

The interaction the students have with the learning material is also important. Depending on different learning style the student, if possible, choose to use only parts of the available e-learning material; text, video, animation, etc

All factors mentioned above are important part of the pedagogical approach when planning a course and is crucial for students learning and thereby for efficiency and effectiveness (both learning and cost). One more time we can note that the student, the institution and the society have different views on what efficiency and effectiveness is.

Effectiveness for the company paying for the student

We felt that we had to say something about cost effectiveness in the eyes of the third part, not the student or the provider, but for example the company who are paying their employees further education. E-learning is being used more and more in upgrading courses and in further education. In our information society new and refreshed knowledge are crucial to companies if they want to sustain competitive. Keeping all the employees updated can be very expensive. The companies want the education they offer their employees to be cost effective and efficient.

Upgrading courses have typically been intensive courses with a few days duration where the course participants have to be present. These courses were often tailor made for the companies who ordered them. This type of courses is very expensive to the companies because of the course development costs, the working time occupied, travelling expenses and often the lack of competition between the educational providers. Another problem is that these intensive courses don't give the student the necessary time to absorb the information, and it will therefore newer turn into usable knowledge.
Some see the course as a social happening, which could be positive, but not if the don't learn what they are supposed to because of to much "social happiness".

By introducing e-learning the companies can harvest many advantages:

- E-learning can potentially be tailor made at a relatively low cost by the use of Learning Objects
- The employees can follow the courses at their own speed, and the company don't have to shut down their business while people are upgrading their knowledge.
- The employees can be encouraged or "forced" to update them self after working hours.
- By using the latest Learning Management Systems on can develop a sustainable learning network in the company where fellow employees can interact with each other in learning and knowledge activities.
- E-learning and LMSs makes it possible to better monitor each employees learning effort. This will be helpful in measuring the learning effect and cost effectiveness.

Summary/Comments

We started our QUIS project work with high expectations in January 2005. With our own experience from working with distance education we already “know a lot” and we thought this would be an “easy” job. Today after reading all the material, attending conferences and talking to people we are not so sure anymore. E-learning is hot and there is a lot of research going on from different perspectives and it is not easy to get a good overview.

There are many factors affecting cost effectiveness and efficiency in e-learning. We found through our research that there are many reports and articles touching this subject area, but none who looks at cost effectiveness in the eyes of the society, the provider and the student at the same time. Looking at research in each of the subject areas we find that there are potential conflicts between each subject group, but also within each of the subject areas. It would have been easier to focus on one subject group at the time in order to give some quick answers, but this was not our goal. We wanted to look at the total complexity. This has turned out to be quite a challenge, but perhaps this is reflecting the way knowledge is built. First when you start to dig into a problem you realize how complex it is and you sometimes have to increase the confusion before you can draw any sound conclusions.

Now we are looking forward to begin the work with the second QUIS project report. Here we both have to broaden our view and at the same time focus to give some answers. In the second report we will present our own cost effective business model for e-learning. This model will be based on this report, further studies and our own experiences with cost effective e-learning.

Please send us comments or visit our project website to see what other interesting e-learning subjects we are looking at.

Web address: http://www2.tisip.no/QUIS/index.php
Contact and comments: toratle@tisip.no

QUIS

Quality, Interoperability and Standards in e-learning

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Appendix A
Relevant articles: e-learning and cost-effectiveness

Author	Name	Relevance	Year	Subject
Carol A. Twigg	**New models for online-learning**	***	2003	Summarize a project in universities about how to redesign instruction using technology to achieve quality enhancements as well as cost savings. Presentation of 5 different course design models, from classroom to stand alone e-learning.
Thomas Taylor, G.D. Parker, Elizabeth Tebeaux	**Confronting cost and pricing issues (in distance education)**	**	2001	Looking at how universities can stipulate costs in e-learning/distance education, and how to set the correct prices, both to students and other universities.
Martin Weller	**Learning objects and the e-learning cost dilemma**	****()	2004	How to reduce cost in e-learning using **learning objects (LO)**. LO will help us reduce the fixed cost by four means: reuse, rapid production, ease of updating and cost effective pedagogy. Looking at the fact that: most educators have quickly discovered that simply transferring their teaching approach from one medium to the other is not effective. LO and reuse. Argues that LO and activity-based pedagogy is a good combination.
Kwok-Chi Ng	**Cost and effectiveness of online courses (in distance education)**	*****	2000	This is a relevant and really good paper. It discusses cost-effectiveness, focusing particularly on online courses in open and distance learning. The concept of cost-effectiveness is discussed, focusing on using online technology. The author uses a project example from the Open University of Hong Kong as an illustrative example. The author uses many relevant references for the cost/distance learning literature. Very well written!
	Calculating the Cost of Online Courses.			http://www.marshall.edu/distance/
Jay Buzhardt and George Semb	**Computers in teaching**	***(*)	2005	Integrating online instruction in a college classroom to improve cost effectiveness. Comparing online study guides to pen and paper study guides in terms of academic performance, the amount of time instructors spent grading study guides, and student preferences. The article shows that integrating online study guides saved labour costs and increased student satisfaction while maintaining student performance. Some cost history. Says that there is money to save by going online.
Lesh and Rampp	**Effectiveness of computer based educational technology in distance learning: a**	****	2000	The article present an introduction to the arguments for and against the use of recent advances in computer-assisted distance instruction, and to provide a thorough review of the current literature related to the effectiveness of learning at a distance through a technologically enhanced medium. Focus (distance learning and Kirkpatrick). Looks at the factor (media) which have the

	review of the literature			greatest impact on student satisfaction and learning. Useful review of literature. **Good conclusion.**
Ernst Z. Rothkopf	**Cost of asynchronous distance ventures**	**	2001	A simple mathematical model is described which provides estimation procedures for comparing college-level, distance teaching costs with on-campus operations. (focuses on asynchronous content distribution).
WCET - the Western Cooperative for Educational Tele-communications **http://www.wcet.info/about/**	**The technology costing methodology project**	Project web site **** USA	1998-2002	TCM Handbook Jones 2001 Looks at the costs of expanded use of electronic IT as a means of delivering instruction. The TCM handbook provides a comprehensive set of assumptions, principles, and procedures for calculating the costs of courses that are delivered by various forms of electronic technology as well as by traditional classroom methods. Focusing on the costs of a **single course**. Builds on Bates and Rumble)
Ruth Clark	**Six Priciples of effective e-Learning: What works and why**	***	2002	How best to arrange e-learning to get the best learning results. Not looking at costs, but looking at learning outcome.
Fred Nickols	**Evaluating training: There is no cookbook approach**	***	2000	How and why evaluate training (education). Kirkpatrick level one and so on. Some training evaluation history. Good conclusion
Kevin Kruse	**Measuring the total cost of e-learning**	***	2002 eLearning guru.com	The article describes most of the direct and indirect costs that make up the true cost associated with training program. Cost comparison between instructor led and technology-based training. TBT is best for large groups. See example
Dennis R Quilter	**A panacea or a culture change**	Quote	2000	
Frank L Greenagel	**ED472220 The illusion of e-learning**		2002	Critics about the way many providers have become to use e-learning. Negative, but interesting.
Jefrey Berk	**The eLearning developers journal – It's not how much you train but how**	***+	2003	Looking at how we can focus training measurement on how well we train instead of how much. Activity measures vs. performance measures. List with performance measures. Focus on Kirkpatrics four levels of training evaluation. Level five from Dr Jack Philips ROI. Three models for measurement solutions, Learner, Manager and analyst based.

	well			
Stephen Ehrmann	**Evaluating benefits of educational uses of technology**	****+	2002	How to asses benefits from introducing technology.
John Opper and J.B. Mathews	**Funding and cost containment of educational technology**	***	2002	Looking at cost involved with the new kind of education. Technology based. List over funding and cost containment strategies p 8 and 9.
Dennis Jones	**The transformation of Instruction by information technology**	***	2002	How to better make use of the technology in education. Implications for public policy.
Boverie, sanchez Mulcahy andZondlo	**Evaluating the Effectiveness of training Programs**	**	Before 2000	General factors affecting adult education, + Kirkpatrick
Darin E. Hartly	**E-valuation: Pricing E-leraning**	***+	2001	How to price e-learning. Common approaches for pricing of e-learning, per seat, one time flat, pay as you go, per server, free, payment based on time
Lockee, Moore, Burton	**Mearsuring Success: Evaluation Strategies for DE**		2002	Looks at formative and summative evaluation.
Börje Holmberg	**Theory and practice of distance education**		1995	
	SOU 1998:83	In Swedish	1998	Governmental report on distance education and cost effectiveness

Author team of QUIS reports

Contributions to QUIS reports are produced by staff members at the partner institutions.
All of these persons have taken part in discussions and production leading to this and other reports.
Contact authors for this particular report are listed on the front page.

The activities in the QUIS project will be directed towards QUality in e-learning, Interoperability and reusability of e-learning material and development of Standards. The project will also look at cost beffectiveness in e-learning.

Quality in e-learning is important to be able to exchange both learning materials and learning practices across HEI's in Europe. To establish joint study programs it is essential that cooperating institutions accept each others Quality Assurance Systems (QAS).

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Other staff members may have been involved with activities related to the project, course development, dissemination, secretarial work etc, but are not directly involved with the content and authoring of these reports.

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