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E-Learning Benefits and Applications

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According to Forbes e-learning is a €100 billion industry today and the number is growing regularly. It is already proving very popular in universities and it is estimated that by 2019 roughly half of the universities classes will be offered online. Major multinational companies are also using some form of technology in training their staff. But still the question remains how effective it is to move educational materials online in order to engage students more and get good results as compared to face-to-face learning/training.

The aim of this thesis is to study the background and benefits of e-learning and to create an online course using one of the platforms available in Helsinki Metropolia University of Applied Sciences. The benefits of e-learning can be in form or cost of productivity.

The thesis is divided into different sections: overview of e-learning, cost benefits, a case study of one company in India and preparing an online course in the open platform edX together with dental hygiene students.

The outcome of this project is a report including a detailed description of how to create an online course in Metropolia edX platform. The created online course is intended to aid new dental hygiene students. Soile Vedenpää and Nelli Sarantila prepared the course materials. The case study was prepared with the help of Shila Ghimire who is the deputy finance manager at M'Cons Media Marketing Private Limited, India. This study can be furthered by learning about online study environments implemented in other universities and collecting feedback and analysing the effectiveness of the online course prepared during this project.

Keywords	E-learning, Metropolia edX, Tuubi, Moodle

Contents

1 Introduction

The goal of this thesis is to study the background and popularity of e-learning, cost factors associated with it and why it is beneficial to universities and companies. Because the main idea is to study the effective way of delivering the required materials to the intended students and to the trainees, I have studied some of the e-learning environments implemented in Helsinki Metropolia University of Applied Sciences and followed them while publishing learning materials in the edX platform.

The popularity of the Internet and Internet-based applications have grown fast in recent times. It has affected the ways in which we conduct our day-to-day activities. People rely more and more on the Internet to find the information they are looking for or even to learn new subjects. When we talk about the Internet and learning there is a word "e-learning" that comes to our mind. E-learning is a very board term which generally covers a wide range of teaching and learning activity via electronic media such as computers or web based platforms. E-learning is not necessarily distance learning and may also occur in the face-to-face classes.

The online course prepared during this thesis project is intended to help new dental hygiene students but it can also help the students who have already graduated to keep their knowledge updated. After any training students always seek the possibility of accessing the system whenever they need any help and this course is designed to provide that assistance to students. The materials in this online course may also be used in regular classes and we have used the edX platform to publish our materials. There are many platforms we could have used but universities around the globe continuously govern the edX platform and edX is also doing research on the current trends in online education to improve the quality of the contents they are providing.

When we talk about change the first thought that comes to any business-minded person's mind is, "what will it cost me?". The cost of setting up a new e-learning system will not always be the same as it depends on the complexity of the system and the goals of the companies.

2   Overview

The use of computers and the Internet as teaching applications has grown rapidly in recent times. This is just an example of the growing influence of the Internet in our life. While not that long ago sitting in a classroom and listening to the teacher's lecture and making notes on paper used to be the common practice in learning. Then slowly with the evolution of computers the methods shifted towards more technological ways like the use of PowerPoint slides in the classroom or using pdf files to share notes with the students. [1,725.]

The term e-learning usually refers to the use of different kind of information and communication technologies (ICT) and electronic devices in education. It is a broad term for teaching and learning activity that uses any electronic devices or network completely or only partially. E-learning is a change from the traditional education or training system to a more ICT-based personalized and flexible education systems. E-learning may also be referred to as distance learning, virtual education, digital education, web-based training (WBT), Internet based training (IBT), computer-based training (CBT) or technologically enhanced learning depending on the emphasis of the delivery method or the components. The delivered learning materials may be in the form of text, images, animations video tutorials or even a computer programme. For example, in computer-based training a student learns by executing a special training programme on a computer. Such training materials are usually embedded with the computer applications so the students can practice using the application as they learn. [3.] [4.]

2.1   The evolution of e-learning

The growth of e-learning is more of a dynamic process as it is affected by many factors such as the subject matters, the knowledge level of the audience and the environment around the audience. The users also play an important role in how they want to learn as all users do not have same approach to learn. A major factor that affects the e-learning process is the amount of information that the user wants to receive. The users must decide for themselves which information is important for them at a moment of time and how much they can process. These all factors have vastly affected the way e-learning has developed from the early times to the present. [1,725-726.]

During the early 1980's when computers were scarcely available instructors-led training (ILT) was the only way of learning things from or about computers. Computers were only available for official use, and if staffs wanted to learn from computers they had to use the office hours. Using the office hours to train led to major slowdown in the official work and was rather counterproductive for the offices. [1,727.]

Then arrived the era of multimedia advancements from around 1985 to 1995 Windows3.1, Macintosh, CD ROMs and PowerPoint started making their marks. Then to make training portable and visually engaging, instructors started using CD ROMs to deliver instructions. As the instruction could be easily transported using a CD and could be delivered repeatedly even without the presence of any instructor, this era represented a major upgrade from instructor led training. This also resulted in major cost savings and was more productive compared to an instructor led training method. The major downside of this training method was the lack of the instructor's interactions and dynamic presentations, which left the audience wanting more. [1.]

During the mid 1990's when the World Wide Web (www) started evolving, instructors started exploring the possibilities of using the new technology to deliver instruction in more efficient and cost effective ways. This period saw the growth of email, web browsers, HTML, media players, low definition audio/video files and basic Java applications. With the growth of these technologies the way in which instruction was delivered was also evolved. Instructors and students started communicating via emails and the use of audio/video files in delivering instruction starting to emerge. The major downfall was the size of the instruction files. The larger files could not be delivered via the web and it was also highly costly to use the web during this period of time. To deliver via storage devices was also not possible because the floppy discs were the storage commonly used storage devices used then and had a really low storage capacity (720KB). [1.]

Then in the early 20th century the world started seeing a major growth in the field of computers and webs. People started moving from the age of CD ROMs to USB and low bandwidth web to the high bandwidth web. Faster and portable computers were replacing slower and bigger computers. The Java/IP network applications, high definition audio/video files started surfacing [1]. All these changes started to change the way people learn. The instructors started to have real-time conversation with students on the web and bigger files were easily transferred via USB or were easily accessible via

the web. When slowly smartphones and hand-held devices with the Internet started gaining popularity, it completely changed the way people looked for information. The term e-learning also started to gain attention. [5, 311-313]

With the growing popularity of hand-held devices the effectiveness e-learning has grown even further. With use of the Internet in hand held-devices people like to access instructions or information with just a single click. Today the e-learning process has come a long way from the instructor-led training era to a hand-held era.

The time chart below represents the technological growth in the field of the e-learning.
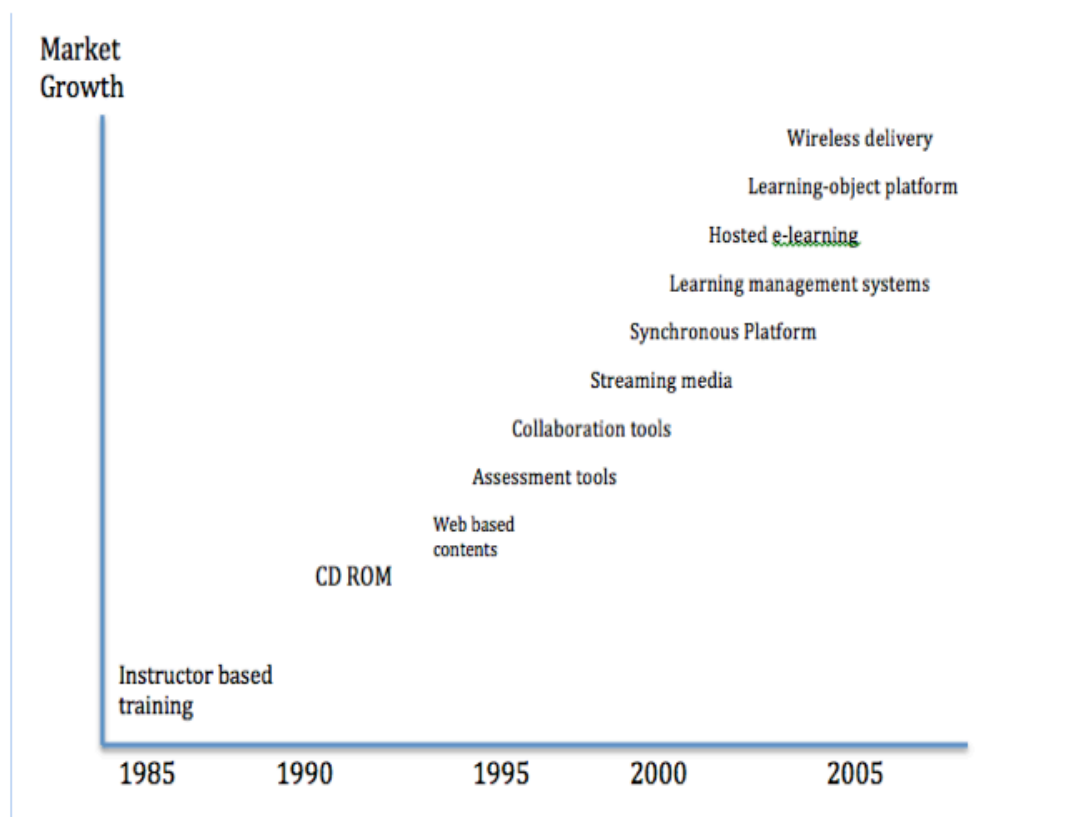
Figure 1: Technology evolution in e-learning [24]

Figure 1 above illustrates the growth of technological aspects in the field of e-learning from the age of instruction-based training to a modern era of web technologies. The figure 1 shows the growth only till 2005 but after 2005 the popularity of hand-held devices such as mobile phones and tablets has grown and the market has started shifting towards accommodating them.

2.2 Types of e-learning

The learning process achieved by using digitally delivered content or interaction is e-learning. Mainly e-learning focuses on the use of computers whether in distance or in a classroom to deliver content to students. With the advancement in technology and the use of the World Wide Web the learning process is not only limited between a teacher and student. Learning can be achieved through reading blogs, participating in online forums, threaded email discussions, social media or through online training platforms such as the code academy.

It is very common for people to use a search engine such as Google to look for information ranging from what to eat to what to wear in a particular day. People consult different blogs or online tutorials to learn about products or particular ways of doing tasks. These all are e-learning processes. Depending on the use of the source or the delivery medium, e-learning can be of different kinds:

- Purely online: no face-to-face meetings
- Blended learning: distance learning or a combination of online and face-to-face
- Synchronous: instructor led online courses
- Asynchronous: self-placed learning methods placed on the internet, network or storage devices
- Instructor-led group: distance learning where students may be from different geographical locations and learn from a single teacher
- Self-study: learning by visiting blogs, tutorials or informative websites
- Self-study with subject matter expert: learning by regularly visiting some experts blogs or up-to-date sites
- Web based: learning purely by looking up on the Internet with the use of search engines or social media groups such as Facebook
- Computer based: learning by accessing study materials from different storage devices like CD ROM or USB in the computer
- Video/audio tape: learning by accessing multimedia files through YouTube or any other video/audio sharing websites [6.]

Depending on the use of technological advancement and interactive capabilities of the learning system, e-learning can be divided into three different types as shown in table 1.

Table 1: Types of e-learning based on their interactive capabilities [6].

Type 1	Type 2	Type 3
E-learning systems with low interactive capabilities, which mainly consist of texts or multimedia materials.	E-learning systems with moderate interactive capabilities.	E-learning systems with high interactive capabilities either with student to student or student to teacher or even both.
The examples of this type of systems mainly consist of power point presentations, learning from an e-book or learning from watching videos or audio podcasts.	The examples of this type of systems mainly consist of quizzes with feedback, interactive resources, reflective learning, and learning by using simulators or demonstrations.	The examples of this type of system mainly consists or modern blended e-learning systems such as virtual classrooms, video conferencing, streaming medias, different online group games, online blogs, Wikipedia or social media groups.

Table 1 above groups different kinds of e-learning types depending on their interactive capabilities. Although type three systems are more advanced, systems type one or two can become equally important for users depending on their needs.

2.3   Advantages and disadvantages of e-learning

As the world is moving towards the digital age and more and more universities are trying to maximize the use of technology in education, one must consider both the advantages and disadvantages of doing so. Although the use of technology in the field of education has revolutionised the way we learn there are still some downsides of relying completely on technology to learn. E-learning systems are the storehouses of information, trainings and knowledge but at the same time they could be the storehouses of misinformation, poorly guided training or bad knowledge.

E-learning has many advantages. With the combination of a well-organised e-learning system and a highly motivated student, one can achieve great success in a short period of time. Some of the major advantages of e-learning are listed below:

a) Convenient for students

E-learning materials are self-placed and can be accessed any time the learner wants. They do not require the learner to be physically present in a classroom. Students can also download and save the learning materials for future purposes from the system.

b) Lower cost

E-learning is usually a cost-efficient way of learning for most students as they can choose from a large range of courses and make the selection depending on their needs. It can also be cost-efficient for many universities because once the learning platforms are set up, they can be reused for many sessions.

c) Up-to-date learning materials

The study materials in e-learning systems can be updated more frequently than in the classroom-based education systems. Once the study materials are placed in the system, they can be updated without changing the whole materials and the materials can be available and reused for longer times.

d) Flexible way of learning

E-learning is a flexible way of learning for many students. Most of the study materials are stored for the students to access whenever they want. Students can also choose between an instructor-led and a self-learning system. In e-learning systems it is also possible for students to skip over the study materials they already know and choose the ones they want to learn.

e) World-wide learning society

E-learning systems help in creating a worldwide learning society as anyone can access the study materials regardless of the geographical location. In the systems available now learners can also contribute to the study materials, which helps to keep the materials updated.

f) Scalable e-learning systems

The number of students in virtual classes or e-learning systems can be very few or really high without causing any significant difference in the total cost.

g) Higher degree of freedom for students

One may find it difficult at times to learn new ideas. E-learning systems provide the possibility for students to learn the same material repeatedly until they are satisfied.

h) Better retention

The video and audio materials used in e-learning make the whole learning process more fun. This will help students to remember the things they learn for a long period of time. E-learning materials can also be accessed whenever wanted, thus the repetition makes the retention easier. [9.]

As any other systems e-learning also have some drawbacks. Being flexible is not always good as it may cause laziness and thus reduce efficiency. Some of the major disadvantages of e-learning include:

a) Low motivation

Students with low motivation may not achieve the set goals most of the time, as there is noone to look over. Students are themselves responsible for the routine and organisation of the course, thus leading to laziness and low motivation at times. Lack of a fixed schedule and deadlines may lead to students dropping out of the course prematurely.

b) Technology-dependency

The study materials in e-learning are delivered using computer applications. For some people just to learn how to use those applications might take a long period of time. There are also other factors such as a poor Internet connection and machine malfunction, which may make the learning process tedious and time consuming.

c) Compatibility issues

As there are many learning systems available, sometimes the study materials prepared by using one system may not be compatible with another. For example mobile devices such as iPads block the flash videos from being played in their browsers. Access to websites may not be free in all places as some countries impose restrictions on the number of websites that can be accessed.

d) Reliability of the content

The content available on the Internet might not always be reliable. There are people who mislead the readers and feed wrong information. So the readers must be careful while searching for the information and check the reliability of the content before learning it.

e) Social isolation

Lack of a real classroom or classmates might not be good for all students. Students might feel socially isolated at times due to lack of real people around while learning.

f) Expenses management

In the long run e-learning is usually a cheaper option but still for the first time it might prove too expensive for some institutions. Buying new equipment like computers, projectors or new software all at once might not always be easy for new or small institutions. Also the cost of developing training materials is high compared to the traditional methods.

g) Disadvantages for disabled students

While developing new study materials or study environments companies usually target at large user groups. They might not always think about disabled students such as visually impaired students as they might not gain from it as the development costs may be high.

h) Not effective in all cases

In some cases face-to-face study materials might be more effective than learning online as e-learning lacks two-way communication. [10,11.]

Table 2 below summarises some of the major advantages and disadvantages of e-learning.

Table 2: The advantages and disadvantages of e-learning systems [8].

Advantages	Disadvantages
It reduces the need to travel longer distances or away from home to get the desired education.	It lacks face-to-face interactions that students in the normal classroom would get.
It is a convenient way of learning things as it can be accessed any time anywhere and on self-demand.	Lack of strict guidelines may demotivate students and lead to dropouts form the learning process prematurely.
It is a self-placed private learning system and is mostly flexible for learners.	It is sometimes difficult to measure the reliability of the placed learning systems.
It uses the media resources, thus making it easy for learners to understand.	Slow internet connections or server problems may make the learning process frustrating.
It is repeatable as the content is stored in storing devices and each time the learner accesses it, the same content can be repeated.	It may take some learning time just to understand the learning systems.
It is easier to track the progress of learners in the e-learning system.	Students may feel isolated due to lack of social interaction.
The content of learning materials is consistent for all users regardless of the location or time of accessing.	Real-time interactions may not be available at the time of need for students, which can be frustrating.

As we can see from table 2 above there are various disadvantages of relying on e-learning systems although having several obvious advantages. But one can develop a good learning system by trying to minimize the disadvantages. Sometimes it also depends on the learners on how they use online learning tools to their optimum benefits.

3   Cost benefits analysis of e-learning

We discussed the major advantages and disadvantages of e-learning in chapter 2, but the major question for any institution and company before implementing e-learning will always be if it will be cost-effective. For many multinational companies e-learning is a very effective method to impart knowledge and information to staff who are on different geographical locations. It can be a very beneficial means to improve employee performance. E-learning tools can be used to share knowledge and experience among the employees, which improves the performance of the workers and eventually improves performance of the whole organization. The bottom line is that if the company does not see long-term profits on their investment, they will not invest in implementing e-learning systems.

Before making any significant investment it is crucial for companies to calculate the cost-benefit for e-learning before implementing it in their organisation. The benefits of creating and administering the e-learning systems should outweigh the development cost associated with it in the long run. This chapter explains the cost formula associated with creating and implementing a new system in companies.

3.1   Cost analysis

Whether it is face-to-face learning or e-learning there are various kind of costs associated to it. So while choosing between the two, one should carefully understand the costs associated to it. For example, in face-to-face training the costs of an instructor travelling to train the learners depending on where the class is, in addition to the costs incurred in developing courses should be considered in the cost analysis. Instead in e-learning cost analysis, the cost associated with development of study materials has to be considered in case if the course is specially developed for one's own organisation. If the company brought pre-prepared materials from somewhere, user licence costs should be used. For each different costs factors there is a certain degree of variability associated with it. It can be dependent or independent of the number of students being trained. Basically there are three factors that affect the cost factors most.
- The number of students being trained
- The distance that has to be travelled
- The time period of the training [13.]

While doing the cost analysis in both cases we should consider all the fixed costs, variable costs and the cost associated with the total number of participants. Fixed costs are the development fees that remain always same regardless of the number of materials produced or the number of students trained. For example, the cost of buying PowerPoint from Microsoft and using it to create slides is a fixed cost as it can be used to produce as many slides we want. A variable cost will change depending on the number of materials produced. For example, if we distribute the materials in paper form the cost of printing papers will depend on the number of papers we print. The number of participants will also contribute to changing the total costs. For example, in face-to-face training a bigger space should be reserved to train a large number of trainees, which will cost more than training fewer trainees.

While adopting e-learning the costs due to technological factors are the main cost factor to be considered. The cost of preparing the content digitally, maintaining the content and hosting the content for the first time might cost a big amount of money but companies must make long term plans for re-using those materials and limit the expenditure in the future. Some of the major costs due to technology include:

a) Creating digital content

    The content can be created by using the manpower within the company or bought from outside. While buying the content externally the companies must use an expert in the multimedia field in order to avoid any surprise during the training periods. This will also cost extra to the companies and generally is not required in face-to-face trainings. The companies can divide the cost of purchasing the content into annual instalments depending on how often the training may be repeated. The number of students trained in any the training period does not affect this cost in any way.

b) Maintaining the digital content

    Once the content are created they can be used repeatedly but due to the changing nature of the technology some minor maintaining may be necessary from time to time. So any cost estimate should include the possible cost for updating the materials in the future.

c) Hosting the content

The content can be stored and used whenever necessary or can be made available continuously by hosting in the server archives. The server can be the company's own or can be from an external web space supplier. It the content is hosted in the server then the annual cost of hosting it should be considered annually. The cost of hosting the content is not dependent on the number of students but may depend on other various factors like the size used to store the content. If the size of the content is large, a larger space is needed to store it and it will cost more.

d) Learning Management System costs (LMS)

A learning management system (LMS) is a software application used to create, implement, document, track, report and deliver the digital learning materials or the e-learning materials [12]. Buying an LMS is the most expensive cost factor while setting up a new e-learning system, thus it should be a long-term investment. If the company or university administration is planning to use the e-learning training for just once then it will make no sense to invest a lot of money in LMS. Since LMS is going be used over a period of time, this cost can also be divided into annual instalments. The cost associated with LMS is not dependent on the number of students, their distances or the number of courses, either. [12].

e) Hardware and software costs

If the hardware and software are not yet available in the company, the cost of buying them should be included in the cost estimate. But if they are already available, then we should not include them. [13, 334-336.]

The cost factors from the technological point of view can be summarised as in table 3.

Table 3: Cost factors-technology point of view [13,225]

Cost	Number of students	Distance	Course duration	Value compared to traditional training
Content development	Fixed	Fixed	Fixed	Exclusive (High)
Hosting content	Fixed	Fixed	Variable	Exclusive (Low)
Maintenance content	Fixed	Fixed	Variable	Exclusive (High)
Distribution content	Variable	Fixed	Fixed	Exclusive (Low)
LMS • Licence • Installation • Maintenance • Hosting	 Fixed Fixed Fixed/variable Fixed	 Fixed Fixed Fixed Fixed	 Fixed/variable Fixed Fixed/variable Variable	 Exclusive (High)
Technological Infrastructure	Fixed/variable	Variable	Fixed	Exclusive (High)

Table 3 shows the cost factors while creating a new e-learning system from technology point of view and describes the costs if they are fixed or variable in relation to the number of students. As we can see most of the costs are high compared to face-to-face training but most of the cost factors can be used for a long term, thus being beneficial.

Apart from the technology costs there are also other costs involved in creating an e-learning system such as administrative and staff costs. Some of such costs are listed below.

a) Tutor's costs

While preparing some course materials, continuous supervision by professionals is necessary. Some of the materials require the presence of the training staff during the implementation. The cost for this factor depends on the number of students to be assisted during the training.

b) Multimedia technology personnel and training costs

The role of the teacher is evolving day by day due to availability of the number of information sources. The day when the only means to acquire knowledge

was to sit in a class listening to a teacher's lecture are behind us. So it is necessary for teachers who use blended e-learning to have some level of multimedia technology training or have a staff who can improve the learning process. This factor is not always necessary if the teacher or trainers are already familiar with the e-learning system.

c) Administration, management and consultancy costs

Like the face-to-face learning, e-learning also needs administration and management during the development and implementation phase. Also during the training it needs some sort of supervision. But since it is a new area for many organisations it may be necessary for the management to consult with professionals. [13,336]

The cost of technology is considered the major cost factor while setting up a new e-learning system. But due to rapid growth in the field of technology the cost of web-based or computer-based systems is decreasing causing the decrease in cost for setting up or using e-learning systems. We can buy many tutorials in our application stores these days. So we can expect better quality of the system at the same price or the same system at lower price if this trend continues. According to Forbes [25], which is a leading newspaper in the field of business the e-learning business is growing really fast and more new companies can enter the field. This trend will surely ignite competition between companies and we can expect the price of many online courses or cost factors to go down.

3.2   The cost formula

As explained above, costs can be either fixed or variable in relation to the number of participants. Fixed costs are usually development costs, which occur independently of the number of participants. So, fixed costs will always remain the same or will not increase no matter how many students are trained, where they are trained or when they are trained. It means the fixed cost per person will actually decrease if the number of participants increases. This phenomenon is called "economy scale". Whereas the variable costs, such as the travel expenses, refreshment expenses will occur for each participant individually. This means the total variable costs will increase with the increase in the number of the participants but the variable costs per person stay constant.

To calculate the total cost incurred in face-to-face or e-learning the following formula can be used.

Total Cost = (Fixed cost per participant + Variable Cost per participant) x Number of participants

As we can see from the formula, the main way of decreasing the total cost will be to decrease the fixed cost per participant and the variable cost per participant. In the e-learning process the total cost for the first year might be high due to the expenditure in setting up the system, but once the system is in place in the long run it is going to b very beneficial.

During the decision making process we need to consider both the long-term and short-term benefits of setting up the system. We need not include the irrelevant cost on the calculations during decision-making. Irrelevant costs are the costs that are same for the face-to-face training or e-learning for example the cost of the training offices if blended e-learning method is used. So, to include the irrelevant cost while comparing the cost of replacing face-to-face learning with e-learning will make no sense and will just create more work while giving the same results.

Also when deciding whether to blend or substitute the existing face-to-face training with e-learning, we should not include the costs that have already been paid for the face-to-face training (sunk cost). For example, if the materials for face-to-face training, which is already developed, can be used for e-learning system that fixed cost can be ignored and is referred to as sunk cost. In such case only variable cost should be considered (i.e. trainer's salary). But if the materials are created for the new e-learning system or are modified to fit the new system such costs must be included are not considered to be sunk cost.

Once all the costs associated with developing a new e-learning system are taken into account the companies have to calculate the benefits of e-learning in financial terms.

3.3 The financial benefits

One of the leading universities in the field of online education, The Open University (London, England) has stated that the cost of online courses are about 45% of that of face-to-face courses [13,338]. Calculating the financial benefits of e-learning can be very tricky and difficult to narrow down. If the infrastructures are not in place yet, the total cost can be very high in the first year. But one always has to regard it as a long term investment and make the decision accordingly. So while calculating the financial benefits it is very important to try to lessen all costs. To calculate the monetary value of the benefits, the companies must identify:

- The specific task targeted to be improved by introducing e-learning
- The average profit an organisation can make by improving performance of the targeted task [13,338-339.]

Once the companies have identified their specific target, to calculate the financial benefits the monetary value has to be multiplied by the number of persons and again by the time period. When both the total costs and benefits have been calculated, return on investment (ROI) can be calculated by using the formula:

$$ROI = \frac{Benefits - costs}{Costs}$$

The benefits minus costs represent the return in the project and the cost is the initial investment in the project. The higher the percentage of ROI is ,the higher is the benefit. [13,340.]

3.4 Case study on financial benefit of e-learning

Sometimes simply by replacing traditional face-to-face training with online training, companies can save a lot. It may not always be that straightforward but due to the presence of many open-source software (freeware) and communication tools, it is possible. Below I have included an example in which a company was looking for an alternative to save their revenue and to complete their projects at the same time. Due to a

strict regulation the company had to provide specific training for their core members, one hour each for 50 days during training. So, in order to save the productive time and continue the project while providing the training the company decided to explore the possibility of providing training online.

M'cons Media Marketing Private Limited is an organisation in India that undertakes government projects. Their main task is to give vocational training the poor people in the rural part of India. They bear all the travel, food and living costs of the participants during the period of training. Over the past few years due to poor planning the company is not being able to earn much profit from the projects they are undertaking. The staff and trainers who plan and propose the projects usually leave the company before the projects start, thus creating a need to train new staff over again, which increases the total cost of the project significantly more than in original plan. Shila Ghimire is the present deputy finance manager at the company, and she was appointed almost two years ago to plan the healthy financial situation of the company in the long run. Recently the company got projects with a revenue worth INR 1000000 with strict guidelines. They also got a warning that the projects had to be completed on time or they would lose the revenue. The company had to train five core members of the team from the main office on how to increase the productivity of the company. Shila was given the task of proposing the training module. The training was designed for 50 days one hour daily, thus the company was looking for alternatives to reduce loss in productive time without making it difficult for the employees either. So, they decided to see if using a virtual learning system was a viable option to train them.

While the system of communication was already in place in the company, it was just the case of upgrading and creating new online courses if they wanted to implement the virtual training system, so that the trainees could complete the training from their working desks. The proposed learning time was one hour per day. The proposed cost associated with designing, developing and delivering the module is shown in table 4.

Table 4: Cost components for developing e-learning system

Cost Centre	Amount in Indian currency (INR)
Hardware cost: The total costs of upgrading the hardware and machines necessary to develop and implement the module.	100000
Software development and design cost: The cost is INR 500 per hour and the total designing and development time estimated is 100 hours.	50000
Meeting and review time: Hourly rate for organisation meeting is INR 1500 and the time allocated for meetings and review of software with developers is estimated to be 5 hours.	7500
Loss in productive hours: Average hourly pay of the employees works out to be INR 500 per hour. Loss of productive hours will be INR 500x5x500 for total 50 days.	12500
Total	**307500**

After the training the core team will be confident enough to handle the project and accomplish it on time and they will not lose the revenue. As per Pareto analysis (80-20 rule) 20% is an important component in the organisation [21,100]. So by training the core 20% of their main team the company's plan was to follow the Pareto analysis to make the rest 80% of the team also function effectively.

Benefit or Return On Investment (ROI) can be calculated by using formula of ROI.

$$\text{ROI} = \frac{cost\ of\ introducing\ e-learning\ module}{Benefit\ of\ e-learning} \times 100$$

$$= \frac{1000000 - 307500}{1000000} \times 100$$

$$= 69.25\%$$

By implementing the training module through an e-learning system the company can get a return of 69.25% on investment.

The cost components for the organisation if they decided to provide the training through a face-to-face module are listed in table 5.

Table 5: Cost components for day-to-day training

Cost	Amount In Indian Currency (INR)
Production of training materials- INR 5000 per trainee	25000
Travel cost- Travel cost of trainees works out to be INR 100 per trainee per day. Total travel cost will be	25000
Refreshment cost per trainee works out to be INR 300 per trainee-day. The total refreshment cost will be	75000
Costs for the space and trainer INR 20000 per day. Total cost for 50 days will be	100000
Loss in production hours- Average hourly pay of employees is worked out to be INR 500 per hour. Due to travel causes the loss in productive hours is 3 hours per day and it will cost INR 500x5x50x3 for 50 days	375000
Total	**600000**

Benefit or return on investment (ROI) can be calculated by using ROI formula.

$$ROI = \frac{cost}{Benefit} \times 100$$

$$= \frac{1000000 - 600000}{1000000} \times 100 = 40.00\%$$

Descision:

By implementing the face-to-face training the company will have the ROI of 40.00%.

3.4.1   Decision making on e-learning vs. face-to-face learning module

For the decision making it is necessary to compare the cost components of both the modules and in table 6 the comparison is shown.

Table 6: Cost comparison between e-learning and face-to-face learning module

Cost centre			
E-learning module	Amount (INR)	Face-to-face learning module	Amount (INR)
Hardware cost: The total costs of upgrading the hardware and machines necessary to develop and implement the module.	100000	Production of training materials: INR 5000 per trainee	25000
Software development and de-sign cost: Designing and devel-oping software cost is INR 500 per hour and total designing and development time estimat-ed is 100 hours.	50000	Travel cost: Travel cost of trai-ees works out to be INR 100 per trainee per day. Total travel cost will be	25000
Meeting and review time: Hourly rate for organisation meeting is INR 1500 and time allocated for meeting and review of software with develop is estimated to be 5 hours.	7500	Refreshment cost per trainee works out to be INR 300 per trainee-day. The total refresh-ment cost will be	75000
		Costs for the space and trainer INR 20000 per day. Total cost for 50 days will be	100000
Loss in productive hours: Aver-age hourly pay of the employ-ees is INR 500 per hour. Loss of productive hours will be INR 500x5x500 for total 50 days.	12500	Loss in production hours: Aver-age hourly pay of employees is INR 500 per hour. Travel time 3 hours per day will cost INR 500x5x50x3 for 50 days	375000
Total	**307500**	**Total**	**600000**

As we can see from the table 6, the total cost for production of the materials may be lower in the face-to-face module but the travel, refreshments, trainer and loss in productivity makes the total cost the for face-to-face module much higher. The company gets about 30.00% more return in investment if they opt to go for an e-learning training module.

We should also remember the investments in hardware upgrades are investments that will help the company in future training programmes. The company can re-use these upgrades to train future employees with much more less cost. The training materials are also safely stored in the system for future use. The decision in this case was very easy for the company as they had the immediate saving as well in addition to the long-term benefits. This was due to the fact that most of the hardware and communication systems were already in place. But for some companies that might not be the case, so they should look for the long-term benefits.

4   E-Learning systems

4.1   Architecture of e-learning systems

The main requirement of the developers while developing any e-learning system is that it should be easy to use and safe. Students should be able to choose their course, find the resources easily, track their progress and reach their final goal on time. In the learning system students should be able to communicate and help each other, in other words it should be social and engaging. While developing the learning system the designer should focus on creating a perfect mix of traditional and virtual learning methods to help the students engage more and reach their goals. [15.]
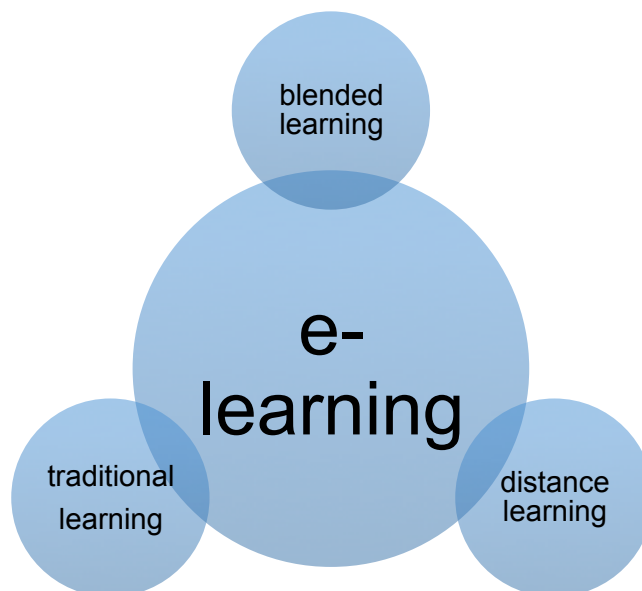
Figure 2: Learning Models

A perfect e-learning system is a mix of all the learning systems shown in figure 2. In theory the perfect e-learning system will allow students to learn from their home while having some real-time support and interaction with other students who are taking the same courses howeve,r it might be difficult to achieve in real cases.

The architecture of an e-learning system might be difficult to understand in technical term but it usually consists of three parts:

- User Interface
- Platform

- Database.

A database is the place where the digital learning materials are stored and a learning platform is the media from which the students access the learning materials. A user interface is what the student sees while accessing the platforms. The communication process between these three parts is very important for the whole system to work perfectly. For example, we can use MySQL to store the digital materials, use edX platform to access the materials and students can visit the edX platform using their web browser.

The connection between the three parts of the e-learning system is shown in figure 3.

Figure 3: Connection between parts of learning system

As we can see from the figure 3, the user interface is what the student sees while accessing the platform, which will have the access to the database.

The user interface is the means by which the student interacts with the system, including the input devices and the software. It allows user to input their command through input devices such as a mouse or touch screen and shows the effects of the user input. Applications and web browsers are some examples of the user interfaces.

A database is a structured set of information or data organised so that it can be accessed, managed and updated whenever necessary. In order to store, modify, extract

and administer the database a management system, database management system (DBMS) is required. There are many database management systems available in the market like Oracle, Microsoft SQL Server, and MySQL. [14]

The e-learning platform is the system that provides the access to the databases of e-learning materials or the online courses. The platforms are generally web-based. It enables the user to access the study materials, take tests, and track their progress whenever or wherever they want. There are many such platforms available in the market. Companies can either use such platforms or develop their own. Developing such platforms may be expensive, so companies generally use already available platforms. The platforms can be free (open source) or commercial. The commercial platforms will let the companies to modify them to fit the needs of the users. While choosing the platform it is necessary for the companies to understand what they want. It depends on a number of factors such as needs of students and technical skills of instructors. [22.]

Some of the popular or best open-source e-learning platforms with their web addresses are listed in the table 7.

Table 7: Open source e-learning platforms with their web addresses

Platforms	Web address
Efront learning	www.efrontlearning.net
Moodle	www.moodle.org
Ilias	www.ilias.uni-freiburg.de/en
Dokeos	www.dokeos.com
Sakai	www.sakaiproject.org
Claroline	www.claroline.net
Atutor	www.atutor.ca
OLAT	www.olat.org
Colloquia	www.colloquia.net
edX	www.edX.org

As we can see from table 7, there are many e-learning platforms available in the market that can be used to learn courses online for free.

There are also some platforms that are built for commercial purposes. Some of the commercial e-learning platforms with their web addresses are listed in table 8.

Table 8: Commercial e-learning systems with their web addresses

Commercial e-learning platform	Web address
Blackboard	www.blackboard.com
Angel	www.angellearning.com
WebCT	www.webct.com
Desire2Learn	www.ocdsb.desire2learn.com/index.asp
KnowkedgePlanet	www.knowledgeplanet.com
SumTotalSystem	www.sumotalsystem.com

Some companies who cannot trust the open source platforms usually use the commercial platforms. And as we can see from the table above there are plenty of options for such companies to choose from.

4.2   Communication process

In the whole e-learning system the communication process plays a very important role. Whether it is during the preparing phase i.e. between the people involved during the creation phase or during the training phase as we saw in the architecture above, the communication process is necessary. The lack of proper communication in any phase of the system may not produce a desired result or even cause the whole system to crash. But the process of communication during the development and the training phase may differ.

People involved during the designer phase are the ones who prepare the materials and the ones who make those digital copies available to the users. But between that there a host of other people involved such as illustrators, drawers, recorders, camerapersons and photographers who have to work together to produce the necessary learning materials.

After the study material has been prepared it will be stored as a digital copy in the database. Users access the materials form the database using different different platforms. The communication process generally used here is the network.

In the whole communication process the technology used is the hardware, software and the network communication. But creators, host and learners use these components in different levels. In general the communication process can be summarised as in table 9. [23, 16.]

Table 9: Communication components in e-learning [23]

Communication component	Creators	Host	Learners
Hardware	Multimedia devices to create the materials, example: cameras	Network equipment	Computers or hand held devices with network connections.
Software	Applications necessary to create the material, example: Microsoft Office	Servers	Web browsers, flash and media players
Network Connection speed required	Moderate speed	High speed	Moderate speed

Table 9 illustrates the different components required in the communication process during the different phases of the e-learning system.

5   E-learning platforms at Metropolia UAS

The Helsinki Metropolia University of Applied Sciences is one of the leading universi-
ties of applied sciences in Finland. Metropolia offers courses in the field of technology,
business, culture, health care and social services. Metropolia aims at training students
for the future and integrating technology in the study process is one of the core parts of
the strategy. Metropolia offers students various e-learning environments to ease the
student's learning process as well as helping the teachers to offer better materials and
make the whole learning process effective. So to publish the learning materials pro-
duced by two dental hygiene students, we had a few options. Some of the options are
discussed in this chapter.

5.1   Tuubi

Tuubi is a portal in Metropolia dedicated to connect students with the administration
and teachers. It is a multifunctional platform. Students can get information about what
is going at the university and at the same time manage their courses. Every student in
Metropolia gets a username and password while starting their studies. While multi-
functionality is an asset of Tuubi, it makes its user interface complicated and students
will need some time to get used to using it.

Picture 1: Screenshot of front page of tuubi

Picture 1 is a screen-shot of tuubi while logged in by my user name. As we can see from the picture above the home page contains links to:

- Various administrative information for the students
- Links to various students tools
- Recent announcements
- Events
- Workspaces of the courses I have enrolled in
- General workspaces I have subscribed to
- Vacancy announcements

Having all these links in the same place makes the user interface of the Tuubi complicated but once students get used to it they can find it very useful. So while creating a course to be available in Tuubi students should enrol them using the enrolment service in winhawille or subscribe to the workspace using the tuubi. Once they subscribe the link to the workspace of the course appears on the left side of the homepage. An example of how a workspace will appear in tuubi is shown in the picture 2.
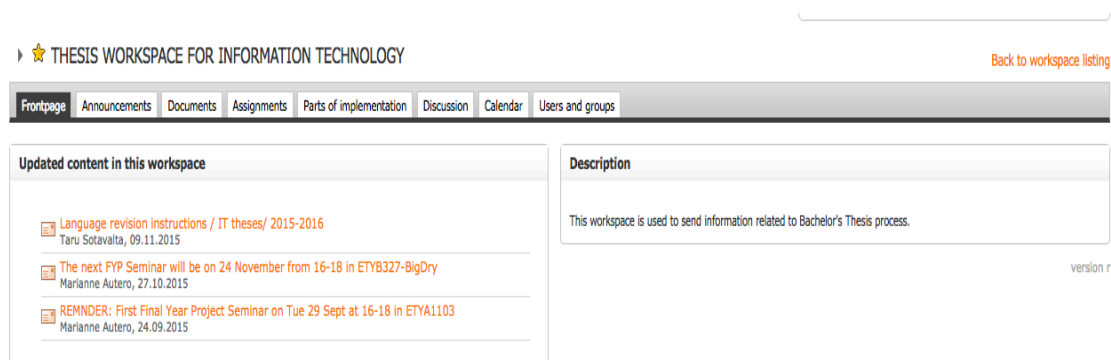
Picture 2: Example of how workspace appears in tuubi

As we can see in picture 2, there are several functionalities in the workspace in tuubi.

- The front page has a summary of the latest activities by the instructor and the description of the workspace.
- The announcements page contains all the announcements related to the course posted by the instructor.
- The documents page has the course materials uploaded by the instructors. The documents are usually pdf or word documents. If the instructor wants to post

any video documents he can just post the link to the videos. Embedding video files in not possible here.

- The assignments page has the details about the assignments created by the instructor as well as the space to return it with the deadline. The instructor can check the assignments and provide the feedback to the student using the assignment page.

- If the course is structured into parts it can be seen in seen in the parts of implementation.

- Students can involve in discussion related to the course using the discussion page. They can start a new thread or contribute to the existing thread to solve various questions related to the course.

- The calendar page has the important dates related to the course such as the schedule of the course, assignments deadline and exam dates.

- Users are divided into students and instructors and displayed accordingly on the users and groups page. It helps students if they want to contact the instructor or any students in the course directly. They can obtain their e-mail id from here.

So as we can see there are various functionalities of using tuubi to publish the materials but there are some major drawbacks as well. In tuubi we cannot publish any videos directly. Instead we have to post the link only and the pictures also have to be published in pdf format. There is no general structure for the course. Instead the lecture materials can just be published with their names and students have to download them to view. Once the students graduate from the university they have no possibility to view the workspace again. They can view the materials only if they have downloaded them during the study period.

5.2   Moodle

"Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments"[16]. Moodle is an open source platform that is very popular globally. The full form of Moodle is Modular Object-Oriented Dynamic Learning Environment and it is developed using the PHP programming language. Moodle is used in many countries around the world as it is available in various languages.

Moodle is a web application and can be downloaded from https://download.moodle.org/ for free by anyone. After downloading Moodle it can be installed on a web server and can be accessed using a web browser. It can be edited to fit ones need. The latest version of Moodle is 3.0.1 but Metropolia is using Moodle 2.8.

Picture 3: Moodle for Metropolia University Of Applied Sciences

Picture 3 shows Moodle installed in Metropolia server and it can be accessed through https://moodle.metropolia.fi/. To login we need Metropolia credentials. The user interface of Metropolia Moodle is relatively easy and has only necessary information. It has a link to a book with instructions on how to use Moodle and links to the latest news on Moodle. To create a new course in Metropolia Moodle one has to request for a course space from IT helpdesk in Metropolia.

In the main Moodle website (https://moodle.org/) there is a demo section where we can understand about using Moodle more. There are separate examples for instructors and students to see how Moodle works. From the example we can see that there are several advantages of using Moodle.

Picture 4: A course created in Metropolia Moodle

As we can see in picture 4, the user interface of a course space for students looks more or less similar to that in tuubi. But the major advantage of using Moodle is that the course is more structured here. The instructor can create a quiz, create assignments and upload materials here. The materials can be in form of audio or video files in addition to texts. Students can also track their progress from each chapter while using Moodle.

There are several advantages of using Moodle and it was one of the platforms we considered to publish our materials. There are several courses taught by using Moodle in Metropolia already. Compared to that edX is a new platform in Metropolia and equally competent if not more. So, we decided to use the edX platform instead.

5.3   Metropolia edX

EdX is an organisation founded by the Harvard University and the Massachusetts University of Technology to promote online education. The universities aim to promote campus-based learning and create a global online community through edX. [17] Using edX these universities plan to study the current trends in online education as they

acknowledge that online education is the future of the learning process. "The mission of edX organisation is:

- Increase access to high quality education for everyone, everywhere
- Enhance teaching and learning on campus and online
- Advance teaching and learning through research" [18].

The major difference of edX from other online learning management systems is that it is founded by two of the well-known universities in the field of technology and will be continuously monitored by them. This will ensure the quality of the content published in this platform and encourages more and more students to join this global community.

Open edX is the open-source platform that hosts the edX courses for free and with this platform educators and technologists can build learning tools and contribute new features to the edX platform while creating innovative solutions that benefits students everywhere [19].

In Metropolia UAS open edX is relatively new platform hosted by Metropolia UAS and KNORK project. KNORK is a project supported by European Commission that aims in promoting knowledge and work practices in education through digital competencies. In this project the members develop and test pedagogical methods, different digital tools and teacher training models to improve the competencies and practices in the higher education. The experiments will be carried out in Bulgaria, Finland, Italy and Sweden. And Metropolia UAS is one of the members that will take part in this project along with University of Helsinki and Helsingin Medialukio from Finland. [20].

To access our course in edX user could easily register their account through the homepage (http://edX.mw.metropolia.fi/) and find the course. In order to create a new course in Metropolia edX the user should sign up in edX studio following the link: http://studio.edX.mw.metropolia.fi/.
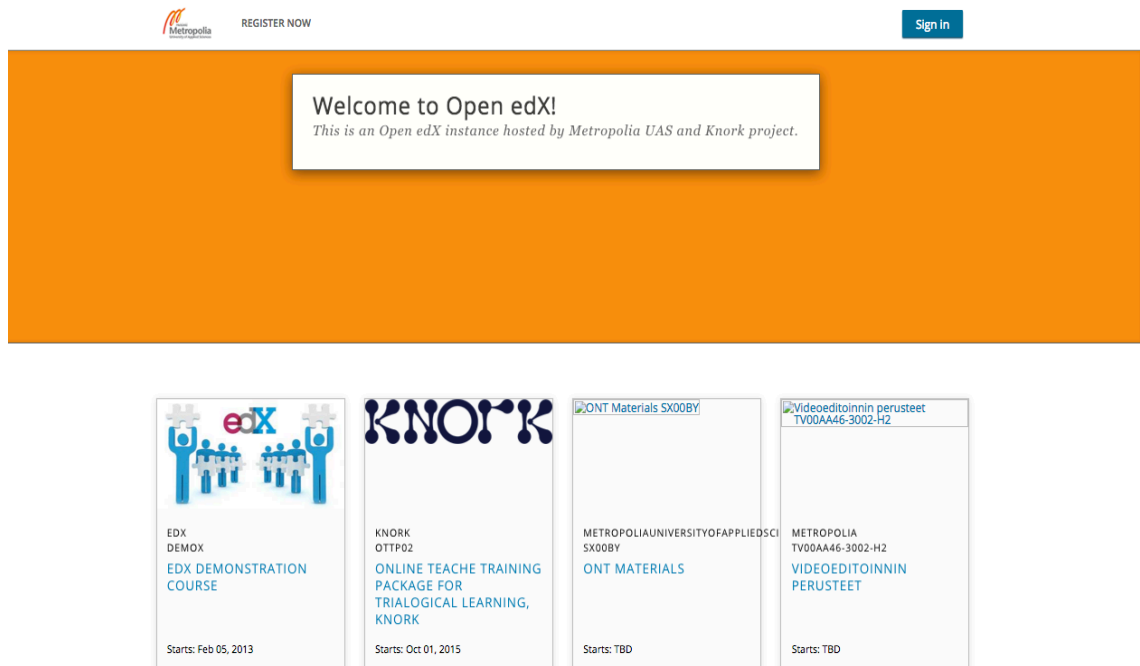
Picture 5: Homepage of Metropolia edX for students

Picture 5 shows the homepage of open edX used in Metropolia. It has the link to create a new account or to sign in in the top and lists of course available now towards the bottom. The course called "ONT MATERIALS" seen above the course that is prepared in this project.
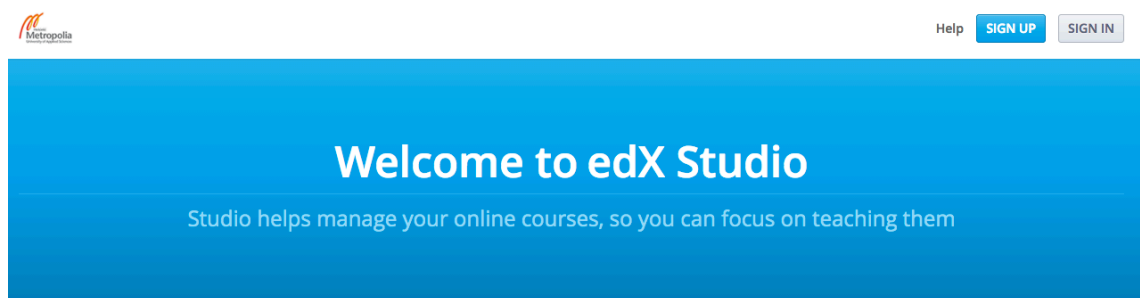
Picture 6: Screenshot from Metropolia edX studio

As we can see from pictures 5 and 6, the pages to create a course and view an available course are different and the user should register in the page accordingly. So in order to create the course I registered in edX studio and the details of preparing the course are described below.

5.3.1   Creating an account

After clicking the sign up button in the home page (upper-right corner as seen in picture 6) the user is directed to the registration page.

Picture 7: Registration page of Metropolia edX studio

As we can see in picture 7, on the registration page the user has to fill in the required details. The details required for the registration are:

- E-mail- it is recommended to use the institutional e-mail address.
- Full Name- this name will appear in the profile and it will not be displayed publicly. This name will be needed to issue any certificates the user may earn.
- Public username- this will be displayed in any discussions or forums the user will take part in and it cannot be changed once the account is created.
- Password- it is recommended to use unique and strong password.
- Location- this is not a required field and user can skip filling this part.
- Preferred Language- this is also not required field and user can leave it blank.

After filling up the form in registration page there is link to terms of service at the bottom to which the user should agree to and after checking the box the user will be able to create their account at Metropolia edX and start authoring course.

5.3.2   Login and create a new course

After creating the account the user will receive an email with a link to activate the account. After clicking the link user will be directed to studio home page for the user.
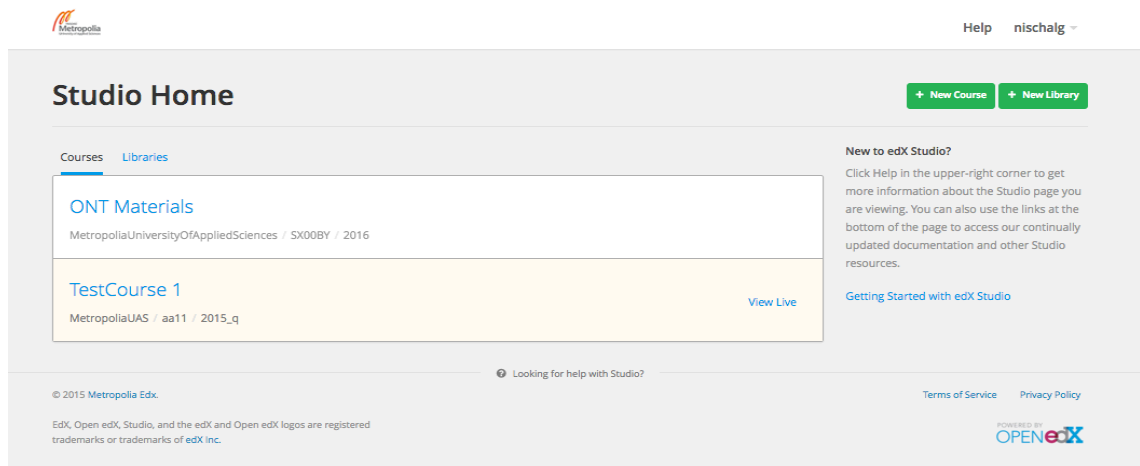
Picture 8: Metropolia edX studio home page after logging in

As we can see from picture 8, after logging in the user will be able to see the lists of course the user is authoring. On the top right corner there is button with link to create a new course. If the user wants to edit already existing course they have to click on the course in the list and follow.

5.3.3   Creating a new course

After clicking the new course button the user is directed to a new page with details to be filled about the course.

Picture 9: Details about new course

Picture 9 shows the details to be filled in order to create the new course. All the fields are mandatory fields. The details to be filled are:

- Course Name- it is the title of the course and capitalization is recommended.
- Organisation- here we can fill the name of the university. The use of white space or any special characters is prohibited, as it is a part of the course URL.
- Course Number- the study code of the subject in the university.
- Course Run- the year and term in which the course will run. Here also the use of whitespace and any special characters is prohibited for the same reason as above. But underscore (_) can be used.

After filling all the required details we can create the course by clicking the create button at the bottom left corner of the form. After the course has been created the new course will open in a the course outline page.

5.3.4   Course outline and registration

After the course appears on the course outline page the next step is to register on one's own course by clicking on the view live button that appears in the upper-right corner of the screen.
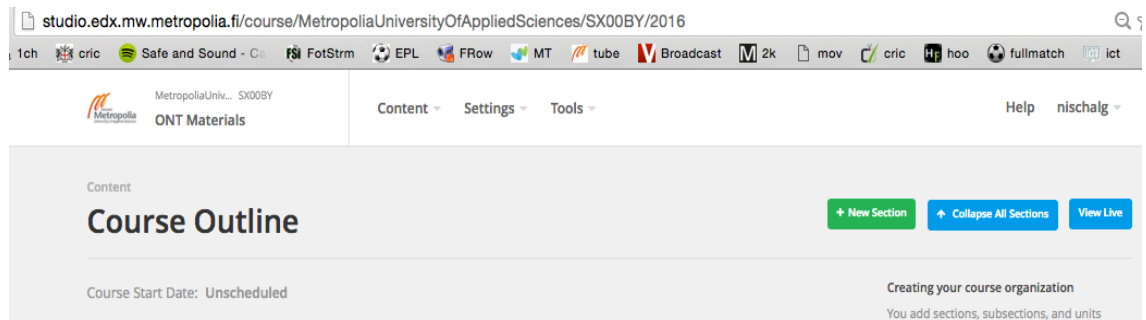

Picture 10: Course outline of the course created

As we can see in picture 10 the course URL includes the course, organization, course number and course name. In this course, the organisation is Helsinki Metropolia University of Applied Sciences, the course number is SXOOBY and the year run is 2016. Thus the URL of the course will be:

http://studio.edX.mw.metropolia.fi/course/MetropoliaUniversityOfAppliedSciences/SX00BY/2016

5.3.5   Creating section, subsection

In order to build a course in edX we have to create a section, subsection and unit. The unit consists of various components of the course. We can build a new section from the course outline. As we can see in picture 10, there is a button to create a new section in the top right-hand corner. Once the section is created we can create a subsection and add the units from there.
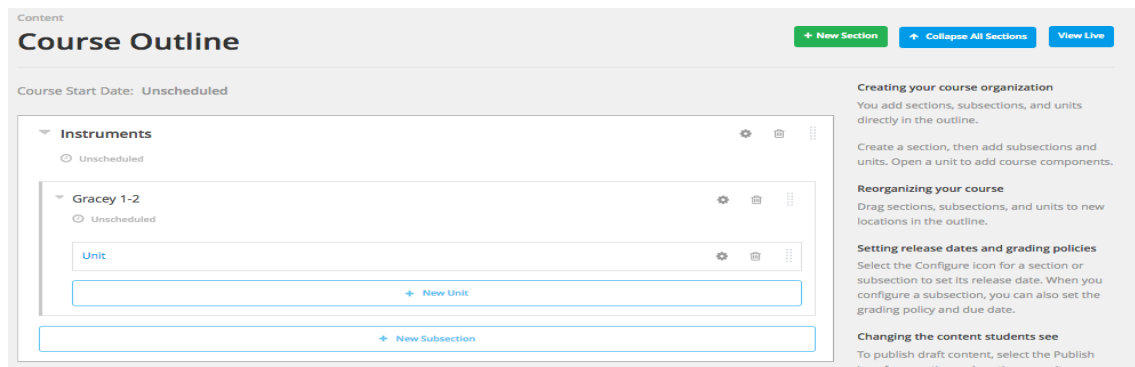
Picture 11: Creating subsection and unit

As we can see in picture 11, once the section is created we can create multiple sub-sections under that section. We can provide them with the required headings. We have tools to copy and delete the section and subsections and as well as to schedule them. The sections and subsections will not appear in students view before the scheduled time.

5.3.6   Creating unit

Units can be created under subsection by simply clicking create new unit button. Inside one subsections multiple units can be created. The units are the building block of the course. The units have four major components as seen in the picture below.
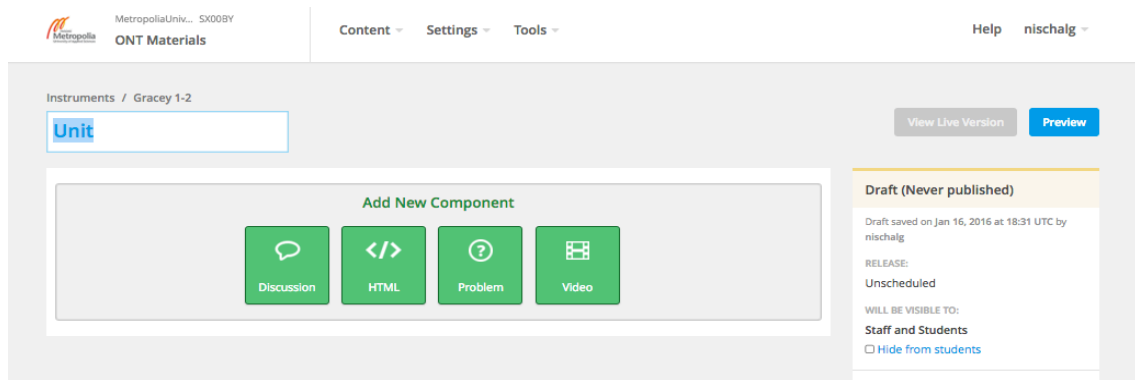
Picture 12: Components of a unit

As we can see in picture 12, we can add four different components inside a unit. Among them the HTML component is the basic building block of a unit. When we click on HTML a list will be displayed. By selecting from the list we can add resources to the course.
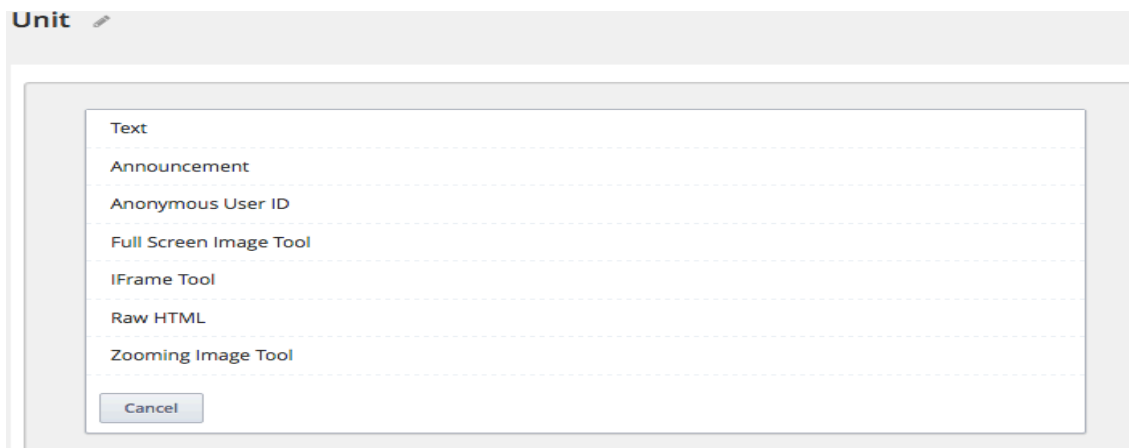
Picture 13: Lists inside HTML Component

In order to add the texts to our course we should select a text from the menu, which appears first in the menu as seen in picture 13. After we select text, a blank component appears.
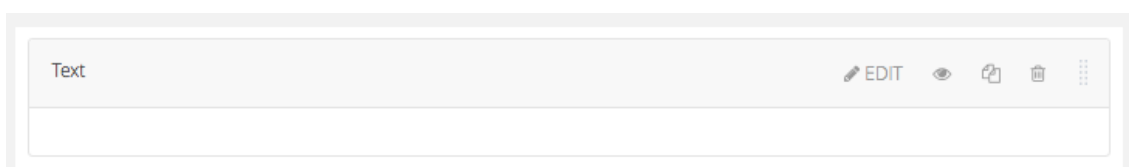
Picture14: View of text inside HTML component

The component has a menu bar with options to edit, preview, copy or delete the component as shown in picture 14. When we click on edit, the HTML component editor will open.


Picture 15: Editing menus inside text

As we can see from picture 15, inside the text edit menu there are various options using which we can add and edit our resources. We can use the paragraph menu to structure our course text to headings and body. Similarly, we can choose font, bold the text, change texts to Italics or add underline and also chose colour. There is a separate option to include the code block in our unit if needed. Apart from texts we can also add URL links in our unit using this edit option. Using the "insert picture" option in the edit

menu we can add pictures to our unit. A view of how texts and pictures from our course will appear in the unit is included in the appendix of this thesis. After adding the resources we should save the change by clicking the save button.

Another important component of the unit is video. We can add videos to our course using this component. In order to add videos in our course first we have to post the video online in YouTube and create a link of the video in the unit using the video component. The video will play by the edX video player once the link is created. The video formats supported by the edX video player are .mp4, .ogg and .mpeg format.

Once the video is posted in YouTube we can obtain the YouTube ID for the video from the URL of the video and then we can create a video component. An example of the URL of a video from YouTube is shown in the picture below.
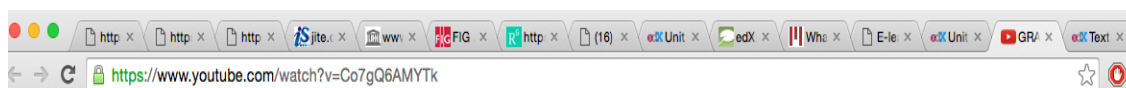

Picture 16: URL of a YouTube video

As seen in picture 16, the YouTube ID of the video is Co7gQ6AMYTk. We have to use this part to link that video in our unit. In order to add the video we can click on the video component that appears when we add a new unit. Once we click on video a default video component appears. Once we click edit, the video component editor will open with component display name and video URL for the default video. Once we provide a suitable name and change the default URL to the URL of the video we want, we can click on save to add our video component.

We can create a new discussion field in our unit using the discussion component. We can provide category, display name and subcategory to our discussion component. In order to view the live discussions we can either click on preview or view live in unit settings.

Similarly we can add problems to our resources using the problem component. We can create simple problem, multiple choice, checkboxes, dropdown and numerical input using this component. To create a new problem we can simply click on the problem button in our new unit page. We can select the problem component type in the screen.
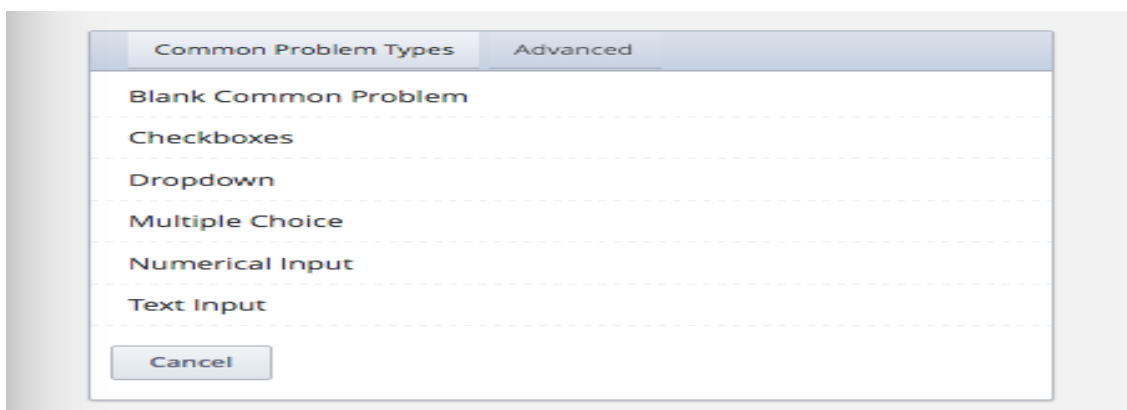
*Picture 17: Common problem types*

As we can see from picture 17, we can create various kinds of problems using the problem component. Once we select the desired option the editor will appear with default problems. We can just click edit and replace the default problems with the problems we want. We can add as many components we want to the unit just by following the same method. We can also change the setting of the problems from the settings menu. From the settings menu we can change the display name, maximum attempts and weight of the problem. This will help in tracking the progress of the students.

Once we have added all the components we need in our unit we can check the preview of the layout of the course. We can drag and reposition the order of components if we want to before publishing the course.

5.3.7   Visibility and welcome note

Once the course is prepared the author can control the visibility of the course. We can set the release date in each of the sections and subsections separately. Students will not be able to view the course before the release date. Similarly we can also set the visibility of the individual units to private or public. Only the public units are displayed to students and staff. The private units are visible only to the authors in the preview mode. In preview mode instructors are able to access the course regardless of the release dates or visibility settings. But in the staff view and student view these settings will have an effect. Usually in the edX studio the visibility of every unit is set to private by default. So, we should remember to change the setting before publishing the course.

Once the teaching materials are ready we can also add announcements, updates or welcome notes. Students will be able to view these announcements on the course info page. To add these updates we can click on the updates that appear in the course contents menu.
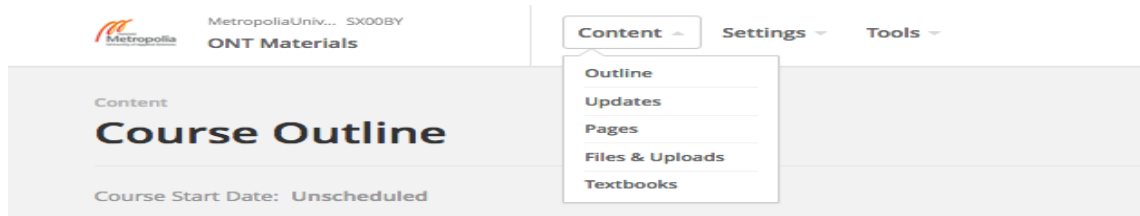
Picture 18: Editing bar of the course

After we click on the updates that appear in the content menu as shown in picture 18, we can add new updates about our course.

6   Discussion and conclusion

One of the aims of this project was to study the benefits of e-learning. The theory part of this thesis briefly explained the what e-learning is, why e-learning is the future of learning process and why many companies are also gradually shifting towards online training from face-to-face training. The business of e-learning is fast growing and at the same time many universities are creating free online platforms to assist students everywhere. But due to changes of technology and gadgets used to access these platforms the development is sometimes pointed in the wrong direction. Although e-learning has existed for a while now there has always remained a question about its effectiveness. In terms of the quality of the whole learning process, the use of technology to assist the process might be better than totally depending on it. Thus, the blended e-learning type such as the use of Tuubi in Metropolia UAS is very popular in universities around the globe.

Another aim of this project was to create an online course using the materials produced by two dental hygiene students. After studying the options available in our university I decided to use the Metropolia edX studio to publish the online materials. During this project I gained valuable knowledge about creating online courses and about the edX platform itself. I did not get all the materials from other students on time, so the online course was not published. But after the materials are available, I will add the materials and complete the course and publish it.

As a whole the project can be regarded successful even though the course was not completed. The skeleton of the course is ready, so as soon as the materials are available, the course can be completed.

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Appendix 1:

Course Structure In Metropolia edX

Screenshot 1: Structure of the Course

Screenshot 2: How a picture will appear in Unit
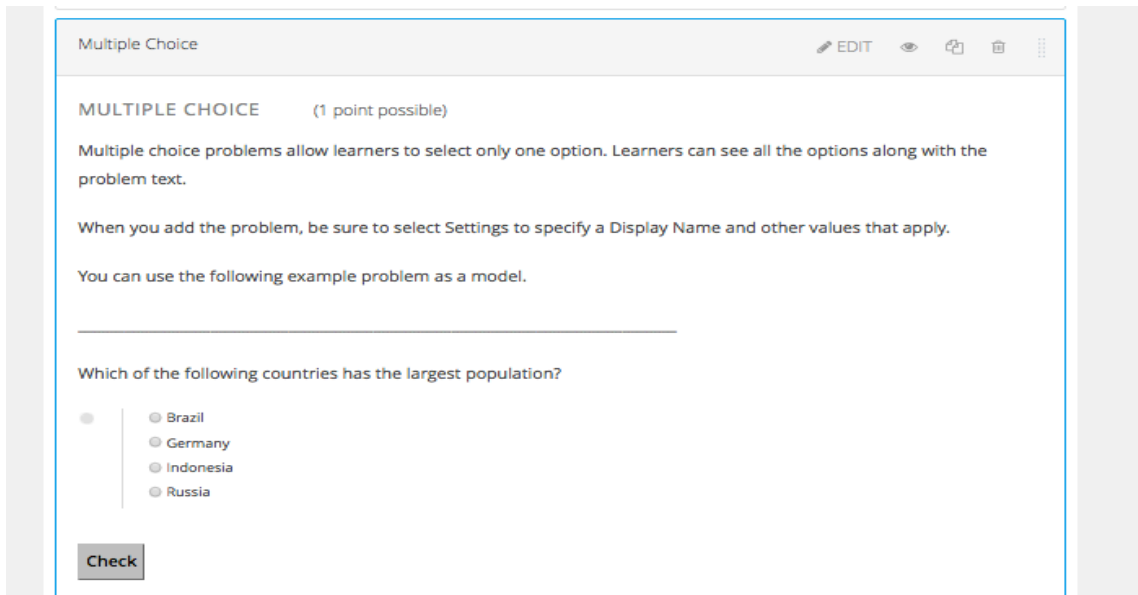

Screenshot 3: Copied Unit

Multiple Choice   ✏ EDIT   👁   ⌥   🗑   ⁝

MULTIPLE CHOICE   (1 point possible)

Multiple choice problems allow learners to select only one option. Learners can see all the options along with the problem text.

When you add the problem, be sure to select Settings to specify a Display Name and other values that apply.

You can use the following example problem as a model.

_____

Which of the following countries has the largest population?

⊙ | ⊙ Brazil
   | ⊙ Germany
   | ⊙ Indonesia
   | ⊙ Russia

Check

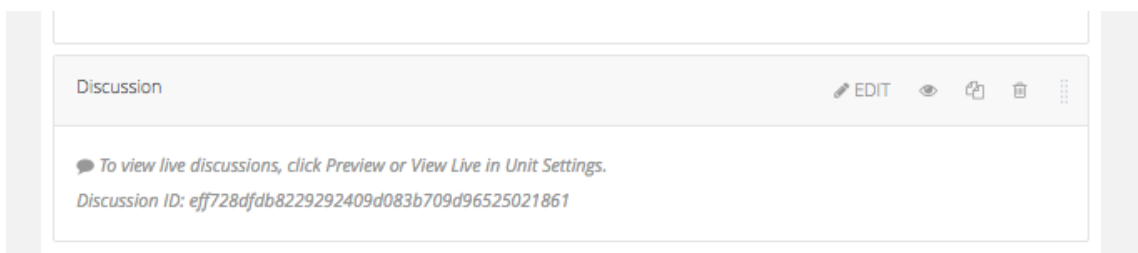Screenshot 4: How a multiple-choice question appears in Unit

VIDEO

close the angle and
insert the working
end to the base of
the pocket

You Tube

▶   0:00 / 2:04   ▸ SPEED 1.0x   ◀)) ⧉

Screenshot5: How a video appears in the unit

Discussion   ✏ EDIT   👁   ⌥   🗑   ⁝

💬 To view live discussions, click Preview or View Live in Unit Settings.
Discussion ID: eff728dfdb8229292409d083b709d96525021861

Screenshot 6: Discussion page created in the Unit