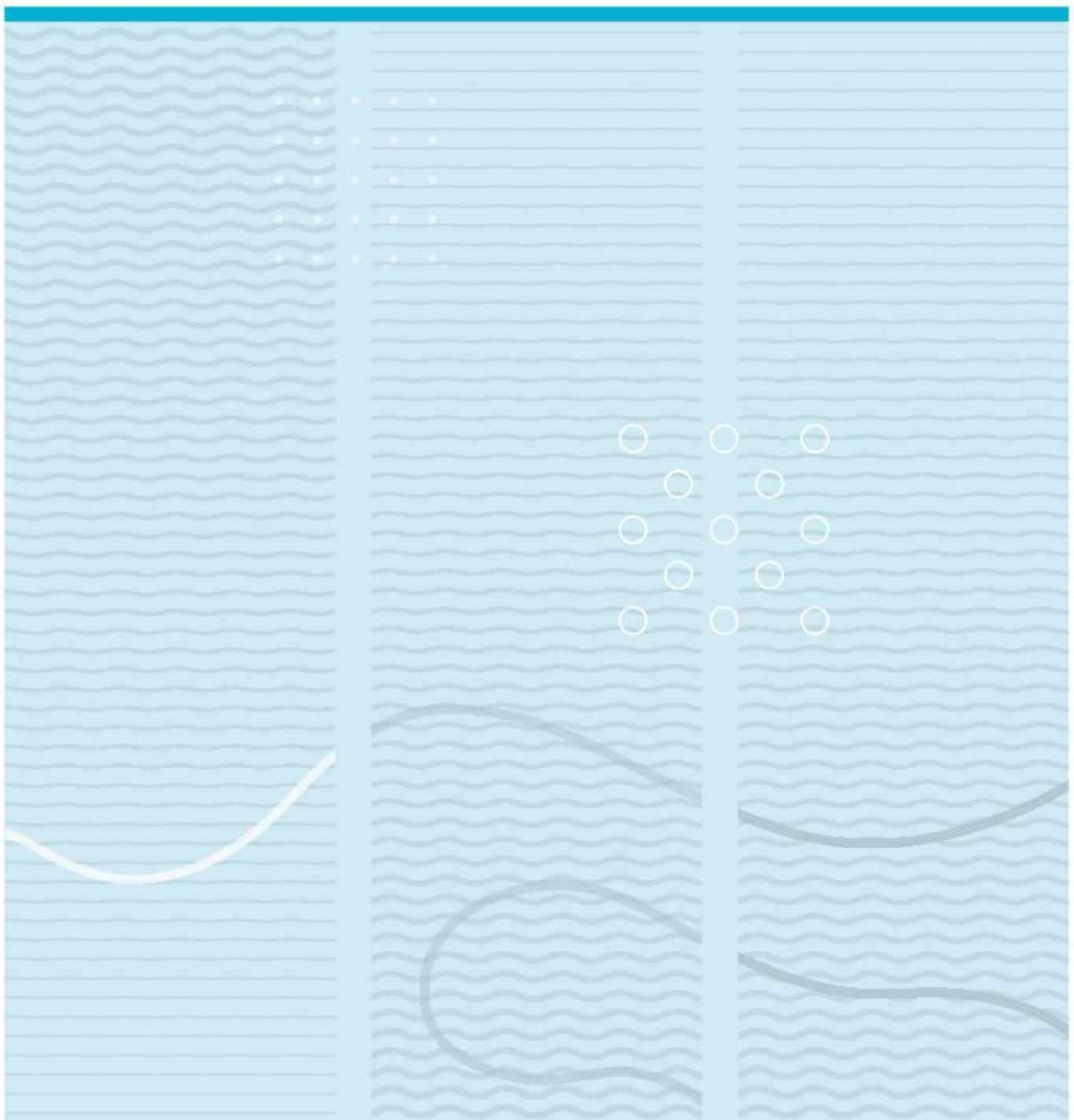


Christen J. Vagle

# Improvement areas for e-learning

What are the most efficient improvement areas for e-learning in the maritime and offshore industry?



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This thesis is worth 30 study points

## Summary

E-learning is a different way of transferring knowledge in where the traditional classroom has been replaced by a computer screen and the traditional instructor has been replaced by plain text, often supported by voice, some video or various types of animation. To achieve the full advantages of e-learning, the learning processes will often be moved to a Learning Management System (LMS) software. This limits administration and the learners may access the learning material individually, complete the learning at their own pace and achieve recognition of completion. E-learning is used globally and is accessible for all who have access and ability to use a computer device connected to a network or where e-learning has been pre-installed. The purpose of this thesis is to investigate the role of e-learning systems in facilitating knowledge transfer and explore contingencies that may influence e-learning systems' effectiveness. The data for the thesis consists of an online survey issued to 1437 e-mail addresses of current e-learning users connected to a large shipping company to which 154 responded (10,7%). The results of the study point to several areas where e-learning efficiency can be improved. In specific, more efforts should be placed on improving the assessment part. Courses should be in the native languages of the learners. Alternative login methods to e-learning LMS should be considered to remove the obstacle experienced by many in constantly forgetting their user name and password. This could also mitigate fraudulent actions by some. The results from this study can be used to improve both LMS functionality and e-learning processes. E-learning slogans suggesting that e-learning can reach *"anyone, anytime, from anywhere"* should consider limitations to e-learning in the maritime and offshore industry, such as access to internet and computers and various types of illiteracy, be it computer illiteracy, reading illiteracy and visual illiteracy. Considering this makes e-learning an effective tool for knowledge transfer, not for all, but for *"someone, sometimes, from somewhere."*

*Keywords:* E-learning, Maritime, Offshore, Oil & Gas, Survey

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## Foreword

I wish to acknowledge my advisor and the inspirational source for the focus on the thesis, Associate Professor **Salman Nazir** and Post-Doctoral Fellow **Steven C. Mallam**. Your support has been key to making me accomplish this study. A huge appreciation also to my mentor and co-study advisor, **Professor Anders Dysvik** for guiding me on the selected method of the thesis.

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Asker/14.11.2018

Christen J. Vagle

# 1 Introduction

The maritime industry is truly international with a worldwide fleet in 2007 of 74398 merchant ships over 100 Gross tonnage (Stopford, 2009). As parts of this industry became a knowledge-based industry, the need for lifelong learning became apparent (Bates 2001). With the introduction of computers, such learning could be offered electronically to anyone, anytime, anywhere through e-learning (Haythornthwaite & Andrews 2011). This is indeed practical for the maritime industry which employs a diverse workforce in terms of residency, educational and cultural background with China being the top supplier of officers and the Philippines being the number one supplier of ratings (BIMCO & ICS, 2015).

Due to the benefits of e-learning in a global perspective, the subject has been of interest to the author. Following an audit in 2009 of a large shipping company, a global oil company instituted required training of maritime and offshore workers to occur and be documented prior to embarking on a ship. Coincidentally the author was employed in the audited company at the time and was given the task of addressing this audit finding. How to best mitigate this audit finding when crew and offshore personnel came from all over the world, living in different time zones with varied background from young Able-Bodied seamen to highly experienced and qualified Captains? The answer was e-learning. Through e-learning, the company would be able to offer training anywhere, at any time, to anyone, prior to embarkation on any of their ships globally. Online documentation of completion could be recorded and shared instantly through an LMS without administration. Prior to this turn of events, such training had only been provided as classroom-based training using instructors with Power Point presentations. In this company, e-learning has since become a key element of the training offered to its personnel. The author has supported the implementation of an e-learning software, served as the e-learning administrator in the years to follow and attended several e-learning courses as a learner. In this process, the author has observed both the practical benefits of e-learning, as well as the disadvantages. Benefits in the sense of knowledge transfer being offered globally, at reduced cost, with the same content everywhere. Disadvantages in that some of the learners have later been found to be without basic language and computer skills. Yet they have reportedly completed their mandatory e-learning courses. While this is a limitation to e-learning, which will be discussed in later

chapters, it was also a spark to initiate practitioner research in the subject. This thesis seeks to increase our understanding of how e-learning can be implemented more effectively.

## 1.1 Research Purpose

The aim of this work is to improve the current e-learning offering in the maritime and offshore industry by understanding through literature review and research what the improvement areas for e-learning offerings are. Recommendations from previous studies on e-learning emphasize the need for continuous evaluation of the effectiveness of e-learning offered, suggesting the use of employee views as the method for future research (Clayton & Elliot, 2008). The research question discussed in this thesis is; **what are the most efficient improvement areas for e-learning offerings in the maritime and offshore industry?** Many of the maritime and offshore companies today use e-learning as a main component of knowledge transfer within their companies and they include e-learning as part of their training requirements for crew and offshore personnel (IBJ, 2016). The main providers of e-learning to the maritime and offshore industry, KVH Videotel and Seagull, have around 12500 and 7500 ships respectively where e-learning solutions have been installed (KVH Videotel, 2018; Seagull 2018). The cost savings of e-learning compared to traditional classroom or instructor led training are at up to 50% (Ruiz, Mintzer, Leipzig 2006). Most of the administration of the course content is outsourced by the ship owning – and offshore companies, to external providers This outsourcing leaves little incentive for these providers to continually improve the courses as the re-development cost for improvements are usually borne by them. The background for this thesis is therefore to find the most effective improvement areas for e-learning. This in turn could be used as an incentive for the industry or the external providers of e-learning to improve their current e-learning course offerings in these few areas, then in turn improving the learning outcome of the crew and offshore personnel.

## 1.2 Research hypothesis

To be able to test the research question, five research hypotheses; RH, relating to the research question were created:



RH01: Which are the most influential factors related to time when a learner engages in e-learning?

RH02: Which layout and design features within e-learning courses have most effect on the learner?

RH03 What pedagogical enhancements in e-learning can be efficient for the learner?

RH04 Is language a barrier to e-learning?

RH05 Will a change in the test and assessments after course completion improve the learning outcome for the learner?

### **1.3 Limitations**

This study was set up as an online survey where the participants would first complete a demographic section followed by 40 questions. The questions were related to the five main improvement areas identified. While the question section was setup consistently with a statement of the question followed by the response categories, the demographic section asked the participant to remove text or numbers that were not appropriate in their response. There were 154 participants from where demographic data could have been collected, but for 14 of them, non-appropriate demographic data were not removed by the participants. For this reason, statistical analysis of the demographic data was only completed for 90% of the participants of the study.

The questionnaire and the questions within were developed by the author. While they were part of the pilot study and underwent a couple of peer reviews, they had not been used in research before. This makes the questions unique. While unique questions are as reliable as previously used questions, they have not been validated through research before. It is therefore not possible to compare the results of this study with other studies. The design of this study however aims to repeat the study in where the same set of questions can be used in repeated studies. This then add to the validity of the questions used.

The fact that internet is slow and sometimes lacking on ships and offshore installations is known. Internet speed was therefore excluded as a factor in the survey. Lack of internet accessibility at the time of the study may therefore have excluded a few invited participants to attend to the study.

The design of this study place time as an element. Some demographic characteristics, such as age, educational level and years of experience are subject to change from year to year. This should be considered in repeated studies.

The study was performed online, while most of the participants invited for the study work in an offshore environment where internet speed is limited and access to computers are scarce. This may have reduced the ability of those working offshore to participate in the study. Participants selected for the study were from a mix of onshore and offshore workers. This was not captured as one of the demographics in the study. This limitation is also supported by an analysis of the demographic collection made in part 4 of this study.

The researcher of this study has years of experience and knowledge within the field of e-learning and within the company selected for the study. It could be argued that this has influenced the questions made for the survey and the data interpretation. However, through the extensive literature review made, the pilot study, the peer reviews and the annexes to this thesis it is argued that this is appropriate.

The maritime industry is truly international (Stopford, 2009), and employ close to 1,85 million people on ships and offshore with millions of workers supporting it from onshore (ICS, 2018; UN, 2016). It is understood that the limited sample collected in this research may not accurately reflect the improvement needs of the industry. Statistical analysis of the results will therefore be presented using descriptive statistics supported by graphical descriptive statistics, not inferential statistics. However, to include this research and making use of the proposed design will hopefully contribute to continued research on the area.

## **1.4 The structure of the thesis**

This thesis is structured around six chapters. The introduction chapter is meant to set the focus on what the thesis is about and to elaborate on why e-learning improvements are set as the main theme for the thesis. In the second chapter, the theoretical framework related to the topic is presented. An overview of the current use of e-learning in the industry is given followed by a discussion on the limitations of e-learning. This theory is relevant for the interpretation of the findings made in chapter four. The third chapter introduce the methods chosen for the study and how this method will affect this

study and follow on studies on the same subject. In the fourth chapter the results of the study are presented. The results are then compared against the theory in the discussion chapter five where it is pointed to some improvement areas. The final and sixth chapter of the thesis is a summary of the main findings followed by a practitioner summary, discussing the relevance of the results.

## **2 Theoretical framework**

Introducing theory related to e-learning is done to explain why the research problem under study exists. This theory will then be used as basis for the interpretation of the findings. The aim of the theory chapter is to create a theoretical framework related to definitions and concepts to understand e-learning, how the maritime and offshore industry effectively make use of e-learning as means of knowledge transfer, as well as discussing the limitations of e-learning.

The theory of this thesis is based on earlier e-learning research (Bates, 1995; Jenkins et. al. 2006; Haythornthwaite & Andrews, 2011). These theories are important to understand the concept of e-learning. In addition to this, theories related to Knowledge (Nonaka & Takeuchi, 1995), knowledge management (Sallis & Jones, 2002; Owens & Floyd, 2007), and knowledge transfer (Bates, 2001), are used. These theories include the discussion related to the differences between knowledge and skills which is important to understand the benefits and the limitations of e-learning.

### **2.1 The concept of e-learning**

The concept of electronic learning, e-learning, is expanding as information and communication technology develop. Today, e-learning is seen as a practical and strategic move in learning where the 'e' prefix also link to digitalization in other areas such as e-science, e-mail and e-research. E-learning now meet the everyday learning needs over a lifetime and can be used in support of many daily activities (Haythornthwaite & Andrews, 2011). Commonly seen, e-learning is simply the transfer of learning material on a computer, making this information available on another computer device with the intention of transferring knowledge. As more and more information is only made available online and through e-learning software, attention should be paid to the learner, the one sitting behind the computer to complete the e-learning, not only on the knowledge content. This would make the learners more effective as well (Jenkins et. al. 2006). To support teaching, technology has been used to supplement classroom training, from the use of blackboard and chalk, audio- cassettes, videos, films, television and even overhead projector. These technologies were additional means of learning before the electronic technologies to learning were introduced (Bates, 1995). E-learning is still relatively new and for most of today's workforce it was introduced during their lifetime

with the introduction of Computers which in turn led to the term Computer-Mediated Communication, CMC. Compared to face-to-face communication, the main features of CMC were that it was relatively anonymous, made available at any time, could be accessed from anywhere by anyone. It was quick, it was global, and it was text based. Initial research on CMC began as early as in the mid 1980's (Haythornthwaite & Andrews, 2011). The first web-based e-learning course used in Post-Secondary education appeared in the United States in 1995. It was a product of the American culture and economy at the time (Bates, 2001). Today, a lot of different industries use e-learning. The investment from companies in developing and maintaining their e-learning is massive and it is estimated that the global e-learning market will triple its revenue the next ten years and reach 325 billion USD by 2025 (Research and Markets, 2017).

E-learning is also a result of a more knowledge-based industry and economy. A knowledge-based industry requires a workforce that is both adaptable and flexible to change as the technologies and software programs change (Bates, 2001). With an average age in the core crew of Offshore Personnel at 42,2 years (UKCS Offshore Workforce Demographics Report 2015), most Offshore workers were educated before the introduction of e-learning. While these workers are technology skilled from the time of their education, they now need to constantly learn and stay up-to date and gain recent knowledge for them and their companies to compete effectively. Learning has become life-long and is also a requirement for various types of certification in the maritime and offshore industry. This has influenced the learning and teaching now in demand from employees and employers as well as from government institutions in knowledge-based economies. Small modules and short programs enabling them to grasp the knowledge required which can be done at home or around work and other activities are now required (Bates, 2001). Industries now must educate anyone, anytime and from anywhere (Govindasamy, 2002).

## **2.2 Learning theory**

Conventional learning theory is based on three main elements; transforming, framing and emergence (Table 2). The first, transforming, is the change of understanding that occurs during learning which transform cognition from an initial stage to a modified stage. This may be possible to observe if the learner change behavior, writing or even

other forms of work after learning. The second, framing, is how the learner will use own experiences and rules as frames to determine action from the learning. The maritime and offshore industry could potentially be such frames. Personal, political and social experiences are also such frames and the learning received by a learner in this industry would be framed within these boundaries. Lastly, in conventional learning theory is emergence where the learner through observation and on the job training within experience further learning, emerging to a new understanding of what was learnt (Haythornthwaite & Andrews, 2011).

1. Transforming learning	2. Framing learning	3. Emergence of learning
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*Table 1 The three main elements of conventional learning theory*

E-learning theory is not yet defined. It is argued by Haythornthwaite & Andrews (2011), that e-learning “changes the nature of learning in a number of significant ways” (p. 61). E-learning is different from conventional learning in that the classroom is replaced by a computer, hence no more face-to-face interaction is required with a teacher or instructor. E-learning removes the hierarchical level of a teacher / instructor being present and instead introduce a digital relationship between the learner and the knowledge. Lastly, it may be argued that transformation of the knowledge into new emerging knowledge is easier as the learning may now take place on the workplace itself, not in a remote school or university. Therefore, a new e-learning theory should be developed. E-learning theory is therefore yet to be fully developed but the e-learning practices are already shaped through the past decades of e-learning usage (Haythornthwaite & Andrews, 2011).

### **2.3 E-learning effectiveness and efficiency**

Increased possibilities within Information Technology, research, as well as organizational awareness of “what works” in learning has given rise to more effective e-learning offerings in the past years. Research on the effectiveness of e-learning has increased, showing that the most used way to measure effectiveness in e-learning is with pre- and post-tests (Noesgaard & Ørngren, 2015). Furthermore, introducing new

technologies, such as virtual environments have proven to make a difference in the training of industrial operators compared to a conventional learning environment, such as classroom slides presentation (Nazir, Kluge & Manca, 2014). Other research argues that the underlying pedagogy of e-learning is one of the most crucial prerequisites for effective and efficient implementation of e-learning (Govindasamy, 2002). Pedagogical principals are theories that govern good practice of teaching, such as developing content, storing and managing content, packaging content, student support and assessment (Govindasamy, 2002). Looking at assessment, assessment reinforce the learning approach that a student will adopt and students who are often tested are likely to adopt the deep holistic approach to e-learning (Twomey ,1996). For e-learning to be effective and efficient, the perceived e-learner satisfaction is of importance. Critical factors that affect an e-learners satisfaction has been thoroughly studied (Arbaugh, 2000 & 2002; Hong, 2002; Kanuka and Nocente, 2002; Piccoli et. al, 2001; Stokes, 2001; Thurmond et al, 2002). Govindasamy (2002), summarize e-learner satisfaction in six dimensions; learner dimension, instructor dimension, course dimension, technology dimension, design dimension and environmental dimension.

As relevant information required in everyday life is now found online, there is an acceptance amongst the public and in turn e-learning learners to acknowledge information in e-learning courses, which are non-peer reviewed, non-publisher approved as being relevant. In parallel to this is the introduction of the knowledge society and the need for lifelong learning amongst most workers in industrialized countries.

## **2.4 E-learning limitations**

E-learning is about transferring knowledge. Lai (2013), defines knowledge as a person's information base and divide between knowledge, skills, abilities and attitudes.

Skills on the other hand refers to the ability to apply your knowledge to specific situations (Filstad, 2016). Through practice and input / output, skills are developed. To achieve a set of skills, instruction through training and experience is required. Skill is normally acquired through five mental stages, from novice, competence, proficiency, expertise and mastery (Dreyfus & Dreyfus, 1980). The current e-learning offerings are

limited in that it does not transfer or improve work related practices or skills (Noesgaard & Ørngren, 2015).

### 2.4.1 Social aspects

E-learning removes the learner from the traditional classroom where they engage with the presence of a teacher or instructor and the social environment in where they engage with fellow students, often sharing the same values and discussion. While Haythornthwaite and Andrews (2011), argue that learning is the outcome of the network it has been applied in, researchers on conventional learning however argues that learning is social because it is an outcome of the environment that the learning takes place in (Rogoff, 1992). Network as in e-learning and environment as in traditional classroom training may then be contradictory in where the earlier researchers refer to environment as groups of students, workers and so forth, while researchers on e-learning theory argues that networks in which social learning occurs is also involving families, friends, colleagues and even electronic communities, not only the classroom or campus environment (Haythornthwaite & Andrews, 2011).

### 2.4.2 Practical aspects

In the maritime industry alone, the International Chamber of Shipping estimate an amount of 1,647,500 seafarers. 774 000 officers and 873,500 ratings (ICS, 2018), while the UN report that there are about 200 000 offshore workers worldwide (UN, 2016). Little or no education is required for the lower ranks working on ships or offshore installations, such as Stewards, Ordinary Seamen, Oilers and General-Purpose crew. To access and complete e-learning courses on the other hand requires technical competencies at a certain level. Use of e-learning through an e-learning software requires access to a computer. It then requires the learner to be computer literate and be able to remember the login details and password to first access the computer, then to locate the e-learning portal, finally to recollect the user name and password for the e-learning portal. Once inside the e-learning portal, navigation in the software must be done through several clicks within the software menus. Lack of knowledge to do this will indicate technical illiteracy and is in turn a significant barrier for e-learning completion (Clayton & Elliot, 2008). Sailing crew and offshore workers usually work in 1/1 rotational schedules where



they are at work for a period followed by a period at home (i.e. 6 weeks on / 6 weeks off). With the computer age came cyber security and the need to password protect access to computer systems and continuously update passwords at regular intervals. It has been a common understanding that spending longer periods away from work would make Sailing crew and offshore workers forget their passwords when returning to work. However, Pilar, Jaeger, Gomes and Stein (2008), reported that lack of ability to remember passwords was not due to age and a cognitive reduction related to age but rather the number of passwords in use.

### 2.4.3 Probity

While e-learning in the maritime and offshore industry does not give any academic recognition, flag states, class societies and industry standard setting bodies, such as OPITO, award their credentials to various e-learning platforms, recognizing the content as sufficient to meet national and international standards for knowledge. With the cost savings of e-learning compared to traditional classroom or instructor led training at up to 50%, (Ruiz, Mintzer, Leipzig 2006), e-learning usage is increasing, removing the instructor or teacher from the learner. Given this separation, the ability by the learner to engage in cheating to achieve a required pass score to document knowledge is now easier and increasing. Online cheating methods such as waiting for answers, claiming fraudulent error messages during assessment, purchasing answers or even to collude and work with others or providing login details to others. This academic dishonesty is a primary area of concern when it comes to assessment (Moten, Fitterer, Brazier, Leonard, Brown, 2013).

## **3 Methods**

As mentioned in the introduction, the research question of this thesis is; what are the most efficient improvement areas for current e-learning offerings in the maritime and offshore industry? This Method chapter will describe the research strategy chosen and the design of the study.






### **3.1 Method and design**

For this study, a quantitative data collection method was chosen using an online survey. In their research, Blume, Ford, Surface and Olenick (2017), proposed the use of time series to study the impact of frequently repeated measures of effectiveness over time. To be able to better understand the past and predict the future on the research subject, the element of time was therefore introduced to the design of this research. Time allows for the same study to be repeated at equally spaced intervals, collecting a series of responses to the same data. Linear computations from one set of data, such as mean and variance, describe global properties. Time Series Design is therefore chosen for this research, allowing it to be repeated by future researchers and thereby explore and quantify the collected time-series data. This will be further discussed in the Target Audience part of this chapter. For this design purpose, the collected and anonymized data from this study is to be kept for five years as approved by the Norwegian Data Protection Official for research. Research Project ID 60137 was assigned to this study.

### **3.2 Data collection**

The use of a questionnaire is a way to collect quantitative data to advance the knowledge of the topic studied. For this study, a questionnaire was developed, considering five main areas for e-learning, namely time, layout and design, pedagogical enhancements, language and learning outcomes after course completion (Table 2). These five areas were chosen based on the most interesting observations from the literature review. Pilar, Jaeger, Gomes, Stein (2008), suggested in their research on password usage and human memory limitation that the number of passwords used was the most influential factor on memory performance. Time related to login and use of the e-learning portal was therefore covered in part one of the questionnaire. Sabitha, Mehrotra, Bansal (2015), found that the course content and the LMS was important dimensions for

learners. This was then covered in part two of the questionnaire, layout and design. Govindasamy (2002), touched on the underlying pedagogy as one of the most important pre-requisites for successful e-learning implementation. This was in turn covered in part three of the questionnaire, pedagogical enhancements. Stopford (2009), referred to the maritime industry as a truly international one. Reported numbers of employees in the maritime industry from BIMCO & ICS (2015), supported this, referring to the nationalities working in the industry. Language and understanding of the course content in e-learning was then covered in part four of the questionnaire. Finally, Clayton & Elliot (2008), recommended to focus on the learning outcomes, using employee's views. This was supported by the research of Noesgaard & Ørngren (2015), who found that the most common way to measure effectiveness was through pre- and post- tests. This was then covered in the part five of the questionnaire, learning outcomes. The sequence of where the five areas appeared in the questionnaire was based on a learner's general experience in completing e-learning. Usually this is a five-step process that sequentially follows these five areas which begins with the learner accessing a computer device and the e-learning LMS or course. During this process the learner will usually reflect on the layout and design of the course undertaken, any pedagogical enhancements that can be made to the courses, the language used within the course and finally the learning outcome that has been achieved from taking the course. These five areas were also directly linked with the research questions, considering topics within each of them.

1 	2 	3 	4 	5 
<b>Time used to access a computer device and begin and e-learning course</b>	<b>Layout and Design of the e-learning course undertaken</b>	<b>Pedagogical enhancements that can be made to the e-learning courses</b>	<b>Language used in the e-learning course</b>	<b>Learning outcomes after the course completion</b>

*Table 2 The sequential order of the five main areas chosen for this study.*

Within each area, between 7-9 questions were developed with a total of 40 closed questions. Closed questions contain two parts, the statement of the question as well as the response categories and is recommended to be used when developing survey questions (Czaja & Blair, 2005) A commonly used five-point Likert scale was chosen for

the response with 1 and 5 reflecting the opposite ends of the scale. This would give a set of ordinal data required for the analysis and present a histogram for the response on each question. Using a Likert scale gives symmetry and balance in having equal numbers on the positive / negative positions and later allows for quantitative comparison. It was considered to use a seven or nine-point Likert scale. This would produce a slightly higher mean score. However, such scales were not supported by the software program chosen for the online survey while the five-point Likert scale was (Table 3).

<b>The five-point Likert scale used in the survey</b>
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

*Table 3 The five main improvement areas chosen for this study.*

A demographic section was also included to the questionnaire. The demographic part could help respond to the actual research questions by looking for significant differences between the respondents and the responses provided. Characteristics such as gender, age, education, years of experience in using e-learning, the current role held by the respondent, the level of e-learning usage and finally the number of companies in where e-learning had been used by the respondents were all included. This would allow for a set of nominal data. The ordinal and nominal data, also known as independent and dependent variables, could then later be compared in the Data Analysis part.

Following three rounds of thorough review by Supervisors, Co-supervisors and fellow students, the questionnaire was translated to an online survey and feedback software named Questback ([www.questback.com](http://www.questback.com))(Annex 1).

Online survey is only one of many data collection methods. Other methods considered were mail, skype or even face-to-face. There are however several disadvantages of online survey. Lack of internet access amongst the respondents, response bias due to low education or poor computer equipment as well as limitations in time and size due to survey fatigue, (Czaja & Blair, 2005). The lack of internet access for

possible respondents, as only 55,1 % of the world's population have access to Internet, (Statista, 2018) was not considered for this study as the target audience were current e-learning users, all with personal e-mail addresses. Survey fatigue though and the high awareness on cyber security with not opening or even addressing to e-mails from online survey tools were strong arguments for not using online surveys as the data collection method for this study.

Low cost and the speed and accuracy of which the data collection could be made was instead considered as key advantages when choosing online survey as the data collection method. Removing paper questionnaire is also an environmentally friendly gesture. This in turn allowed an increase in the sample size that could mitigate the general low response rate received in online surveys (Czaja & Blair, 2005).

Coinciding with this study was the implementation of the General Data Protection Regulation, GDPR, in May 2018. GDPR redefines the legal requirements to conduct online surveys. Valid consent must be obtained by the participants and the purpose of the data processing must be defined prior to each survey. The online survey was therefore prepared for GDPR compliance with an introductory text to the survey, clearly stating the requirement for valid consent from the participant as well as the possibility to withdraw from the study at any given point and time. (Annex 2).

### **3.3 Targeted participant sample**

The target audience for the online survey was current e-learning users in the maritime and offshore industry, with recent experience in using e-learning. Coincidentally the author is an administrator of an e-learning portal in an international company operating in both segments. It was therefore natural to ask this company for consent in reaching out to its employees, managers and external staff working onshore, offshore and onboard ships. The target audience were defined in these three groups to allow for further analysis of the responses should that be required. Employees being all employees of the company from 18 years upwards. Managers being Managers and above. External staff being consultants and service technicians engaged with the company through work in their onshore or offshore facilities. The pre-defined ratio within these three groups were 60,6 % employees, 34,7 % external staff and 4,7 % managers. With the research design in mind, this would also allow for the research to be repeated at equally spaced intervals

towards the same audience with the same characteristics. As consent was given from the Company, the target audience were selected extracting the e-mail address of the registered users of the e-learning portal for the past 100 days prior to the main study. The ethics around this extraction was thoroughly considered and in line with the consent received, the GDPR compliant online survey as well as the project approval given by the Norwegian Centre for data research.

### 3.3.1 Participant Demographics

When selecting the demographic characteristics of the participants, eight specific characteristics were analyzed: gender, age, current role, years of experience in using e-learning, number of companies worked for where e-learning had been used, educational level and number of years worked in the offshore industry. By learning more about the characteristics of participants it would be possible to see whether there were statistically significant differences between the respondents. This would help answer the research question. There were 154 participants in the survey in where 140 of them provided complete demographics data. This part will consider the differences between the participants in the study.

The gender distribution found many of the participants were male (79%) while there were 21 % female participants. This is well above the traditional female representation offshore which was 3,6 % in the United Kingdom in 2014 (UKCS Offshore Workforce Demographics Report, 2015).

In the Company studied, the female representation was at 10,9 % in 2018. This may indicate that most of the participants to the study were from the onshore workforce of the company studied.

The age distribution amongst the participants were found as normal compared to the industry with the average age ranging between 40-54 years of age. Again, compared to the referenced report from UK Offshore Work demographics, the average age offshore UK Continental shelf is at 40,8 years. (UKCS Offshore Workforce Demographics Report, 2015). Participants under the age of 18 were not included in the survey.

64,9 % of the participants were employees, 19 % of the participants held managerial positions in the company studied while 9,7 % were external staff, engaged through 3<sup>rd</sup> parties to work for the company, thus being setup for use of the e-learning software by

the Company studied. The pre-defined ratio within these three groups were 60,6 % employees, 4,7 % managers and 34,7 % external staff.

The level of e-learning usage amongst the participants had just over 6% listed as active and weekly users of e-learning. Monthly users were at 38 % of the participants while close to 48% used e-learning annually.

The educational level amongst the participants were distributed unevenly. 35 % of the respondents had high school diploma while 70 % had a degree at Bachelor or master's level.

The participants of the study had an uneven distribution of e-learning experience in where 38 % had used - for 1-5 years while 24 % had used e-learning for 6-10 years. On the other scale, 6% had used e-learning for more than 21 years while 24 % had 11-20 years' experience in using e-learning.

The final demographic section collected in the study related to years worked in the Offshore and Maritime industry amongst the participants. Around 15 % had from 1-5 years' experience while another 15 % had 6-10 years' experience. 25 % had 11-15 years' experience while 13 % had between 16-20 years' experience. 22 % had above 21 years of experience.

### **3.4 Pilot Study**

The purpose of conducting a pilot study is to test the feasibility of an approach that is intended to be used in a larger scale study. As the samples in a pilot study is relatively small, the pilot study does not provide meaningful output for planning of subsequent studies. Pilot study results can however identify modifications required for the main study and inform on the feasibility of the study. (Leon, Davis & Kramer, 2010). The other purpose of conducting a Pilot Study is to test the validity and reliability of the questionnaire, as the questions were developed by the author (Czaja & Blair, 2005).

Even though the questionnaire had been through several reviews by selected researchers, pretesting in an online study had not been done. From the authors perspective the pilot study was also aimed at clarifying whether the main study should be given in multiple languages as the target audience were from all over the world. The Pilot study for this research was shared by e-mail invitation to sixteen members of Academia, most of them from countries where English is not the native language. A brief

introduction to the study was provided in where they were directed to the online Questback survey. The Pilot study was kept open for ten days. There were eight (50 %) respondents to the survey in where two gave further comments on accessibility, order of questions and content of the questions. Based on the pilot study, the demographics section was kept unchanged while the questions part related to the five improvement areas were adjusted with more equal numbers of questions within each area, ranging from seven to nine. A more descriptive text prior to each improvement area to further enlighten and guide the respondents on the subject before they responded were included. As no need for multiple languages emerged, the study was undertaken in English only.

### 3.5 Main study

The main study was prepared as an online survey on Questback, ([www.questback.com/no](http://www.questback.com/no)). To select the respondents for the study, all e-learning users from the past 100 days of the main study in the company selected for the study were identified. In total, this added up to 1437 employees, managers and external staff of the Company. Each of them received an e-mail to their job or personal e-mail account, inviting them to take part in the study, (Annex 2). To mitigate the known disadvantages of online surveys related to cyber security, e-mail correspondence, skype calls and chat messages were used during the survey period to respond to queries related to this subject and confirm the true nature of the study. Participation was voluntary. The Main study was kept open for 14 days in August 2018. 154 responded to the survey which gave a response rate at 10,7 %.

### 3.6 Data analysis

Using online survey tools, reporting is an integrated part of the workflow. The online system automatically prepares reports from all questions and responses using charts and tables. Within minutes the data coding can be completed and transferred to a variety of software programs such as Power Point, Word or Excel. Raw data can equally be transferred to Excel, SPSS and as plain text, also referred to as comma separated values, CSV. From this survey, the raw data was extracted to Excel, allowing for coding of the



data. The results from each question was extracted to Power Point, allowing for a graphical presentation of the data in a histogram.

Through the data analysis of the raw material the challenge is to draw the relevant information for the research question. A mass of data needs to be compared by the calculation of appropriate statistic with the purpose to tell us what we want to know (Hinton, 2012). When the data are quantitative, we can look at the data collected graphically to see what the general trends are, and we can perform statistical models to the data (Field, 2009). The data transferred to the excel sheet was coded using 1,2,3,4 and 5 as numbers to each of the five Likert scale gradings. A dot was used to indicate the responses that had been indicated with “do not know”. The result of this analysis gave an average response rating to each of the 40 questions asked as well as a standard deviation to inform us on how much of the data that deviates from the average in the data set.

Even though collected data may require processing to produce the numbers needed for the analysis through coding, it sometimes is possible to look at the raw research data and see what it is telling us (Hinton, 2014). Power Point simple histogram was therefore used to see the frequencies of scores for each single variable within each main group of questions.

### **3.7 Ethical considerations**

The general guidelines for research ethics as published by the Norwegian National Research Ethics Committee in 2014 emphasize respect, good consequences, fairness and integrity as the main principles for good research. This study has been completed in accordance with the above guidelines. Respect in that each participant of the study has been given voluntary informed consent. This was the first main part of the Questback survey and one that had to be acknowledged by the participants before they could proceed to the online survey.

Good consequences in that all participants to the survey are entitled to have their personal information treated confidentially. This study was therefore reported to the Norwegian Centre for Research data and approved with project ID 61037. Upon completion of the study, all personal data will be deleted while the coded data will be kept for future research comparison in line with the research design.

Fairness in that the author has sought to adhere to good reference practices, peer review and cooperation in general. This has been possible through the continued guidance from the research institution to which the author is connected.

Finally, integrity in where the author stands behind the trustworthiness of the research presented, being fully aware that violations of good academic practice incommensurate with such trustworthiness. Recognized norms have been complied with as well as an open, honest and responsible behavior towards colleagues and the public.

## 4 Results

This part will present the results from each of the five main parts covered in the questionnaire. Each area will be covered with the use of tables listing the questions asked within each area. Figures will be used to visualize the response rate on each of the questions that were found to give a valuable result. After the results are presented a recommendation from the results will be presented.

### 4.1 Results related to time

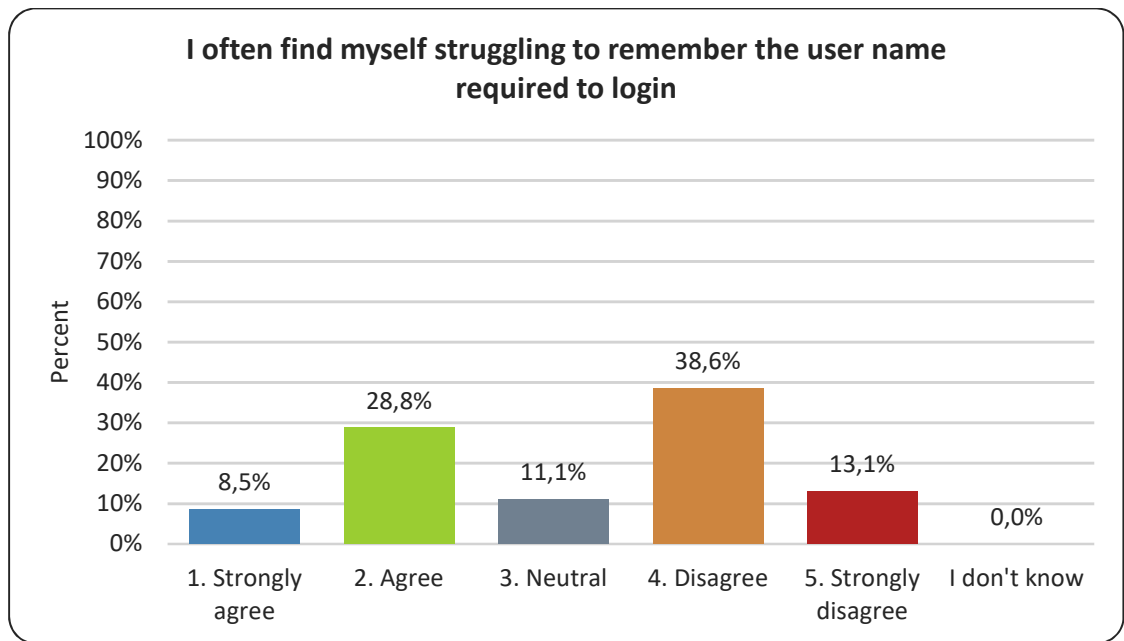
To respond to research hypothesis, RH<sub>01</sub>, on which time factor is the most influential when a learner engages in e-learning, the first section of the survey had seven questions related to this (Table 4).

Time
1. It takes too long time to login to use the e-learning portal
2. I often find myself struggling to remember the user name required to login
3. I often find myself struggling to remember the password required to login
4. It takes too long time to get support to login if login does not work
5. It takes too long time to navigate within the e-learning portal
6. My experience is that the course duration is appropriate for the content presented
7. The time limit for an e-learning course should preferably be:

*Table 4 Survey questions related to time.*

On the first question, 48,1 % of the respondents disagreed that it took too long time to login and use the e-learning portal while 25,3 % were neutral to this.

On the second question 38,6 % disagreed that they found themselves struggling to remember the user name and password required to login to the LMS but interestingly 28,8 % agreed to this and 8,5% strongly agreed (Figure 1).



*Figure 1 Histogram presentation of the responses given in question 2 of the survey.*

Most of the respondents, 34%, thought IT support if login did not work was adequate. 17 % however responded to this question that they did not know if support took too long.

Time spent to navigate within the e-learning portal was adequate by 47 % of the respondents who disagreed to this question.

Most respondents, 58,2%, reported that the course duration was appropriate for the content presented and 8,5 % strongly supported this.

39.6 % thought that the appropriate time limit for an e-learning course session should be between 15-30 minutes while 10,4 % strongly agreed to making the courses less than 15 minutes long. 22,1 % were neutral to this while 20,8 % of the respondents felt that the time limit for an e-learning course session should be 45-60 minutes long (Figure 2).

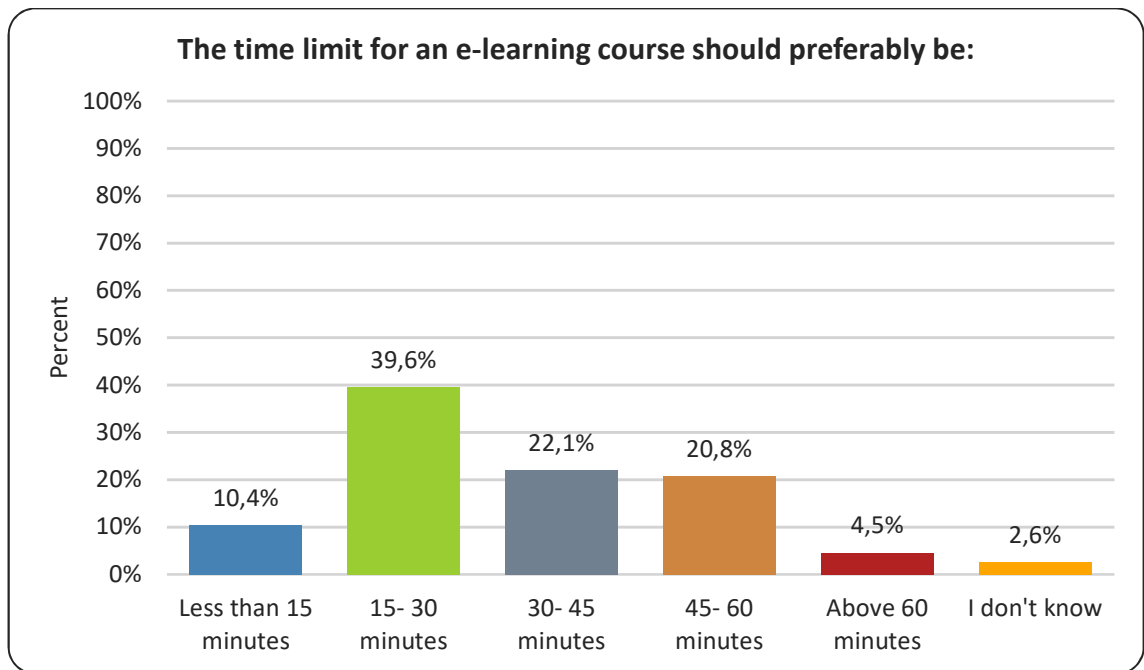


Figure 2 Histogram presentation of the responses given to question 7 of the survey.

## 4.2 Results related to layout and design of e-learning courses

To respond to research hypothesis RH<sub>02</sub>, on which layout and design features within e-learning courses that have most effect on the learner, the second section of the survey had eight questions related to this (Table 5).

<b>Layout and Design.</b>
8. Audio voice-over in the courses help to increase my learning
9. Sound used in the courses are clearly audible
10. More use of subtitles in the courses would increase my learning
11. Use of animations in the courses would increase my learning
12. Courses are easy to navigate
13. Courses are visually clear
14. There are too many divider slides in the courses with no relevant information
15. There are too many clicks to perform before the course begin

Table 5 Survey questions related to layout and design.

Almost half, 8,1 % agreed and 35,7 strongly agreed that audio voice-over in the courses helped increase the learning (Figure 3).

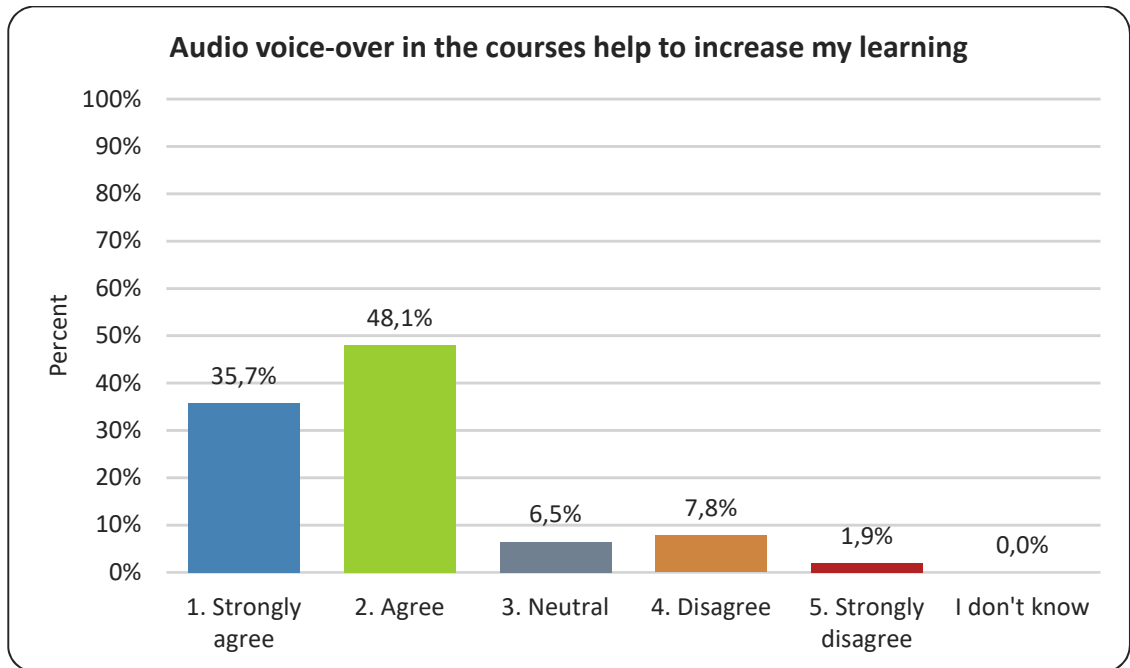


Figure 3 Histogram presentation of the responses given to question 9 of the survey.

The sound used in the courses was also reported to be clearly audible in question 10 with 63,6 % agreeing to this while 27,9 % strongly agreed to this (Figure 4).

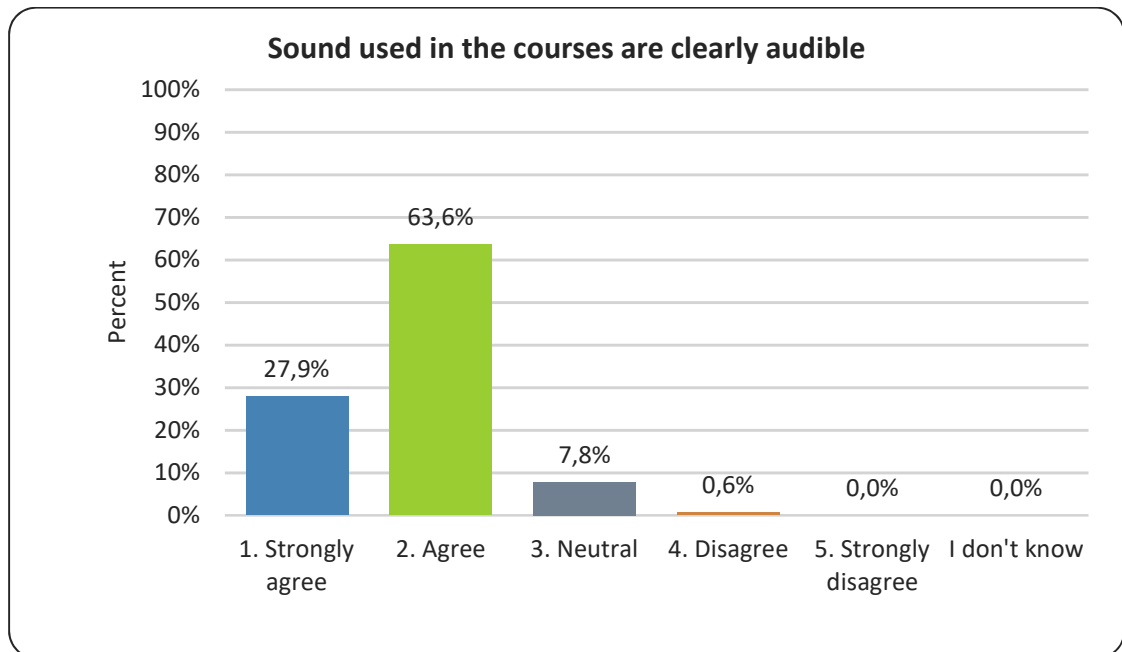


Figure 4 Histogram presentation of the responses given to question 10 of the survey.

42,2 % agreed that more use of subtitles would be supportive in increasing the learning and 19,5 % strongly agreed to this. Only 7,5 % disagreed to this (Figure 5).

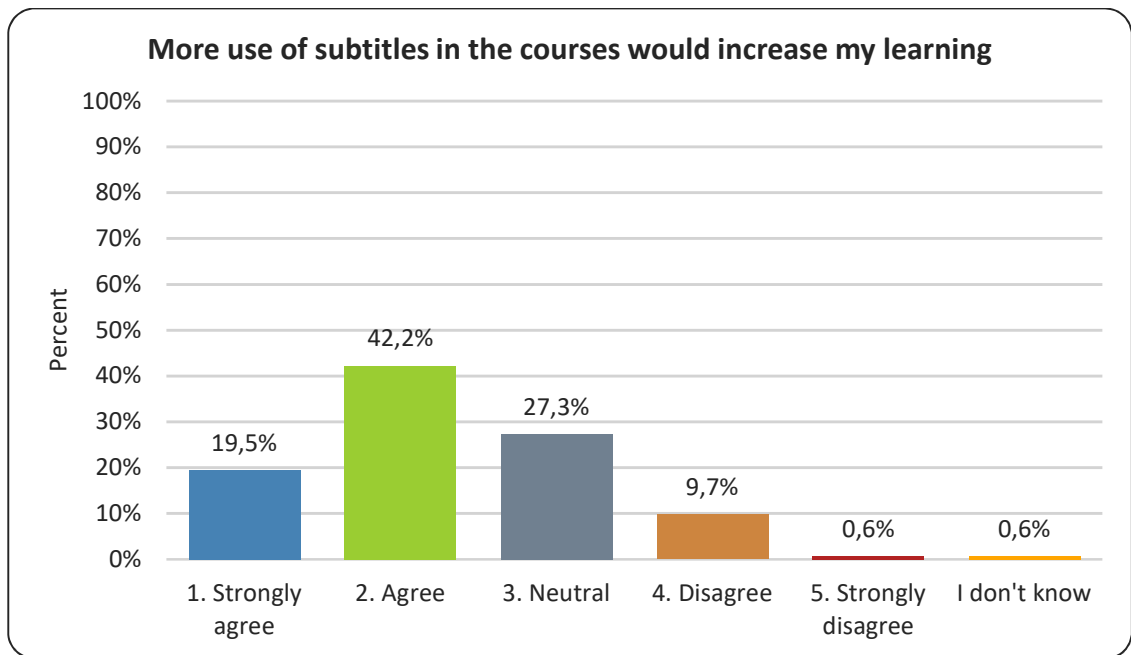


Figure 5 Histogram presentation of the responses given to question 11 of the survey.

Equal response rate was given to the use of animations and if this would increase the learning with 46,8 % agreeing to this while 27,3 % strongly agreed to this (Figure 6).

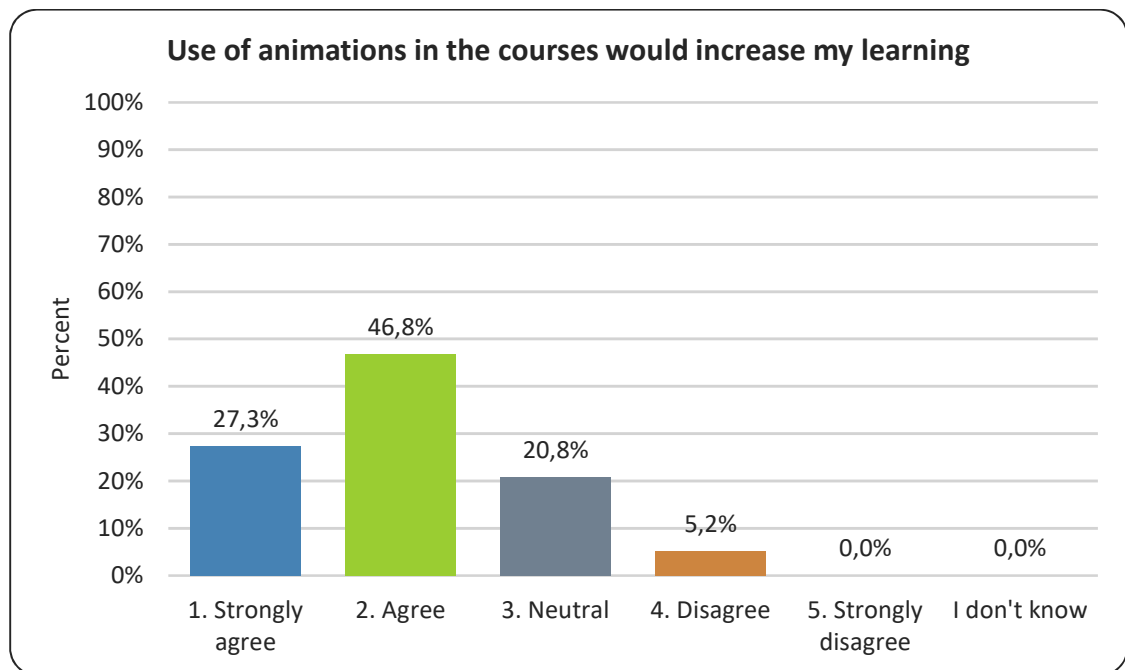


Figure 6 Histogram presentation of the responses given to question 12 of the survey.

Over half, 58,8 %, of the respondents agreed that the courses were easy to navigate with 15,7 % strongly agreeing to this.

A majority, 67,5 %, agreed that the courses were visually clear with 20,3 % agreeing to this (Figure 7).

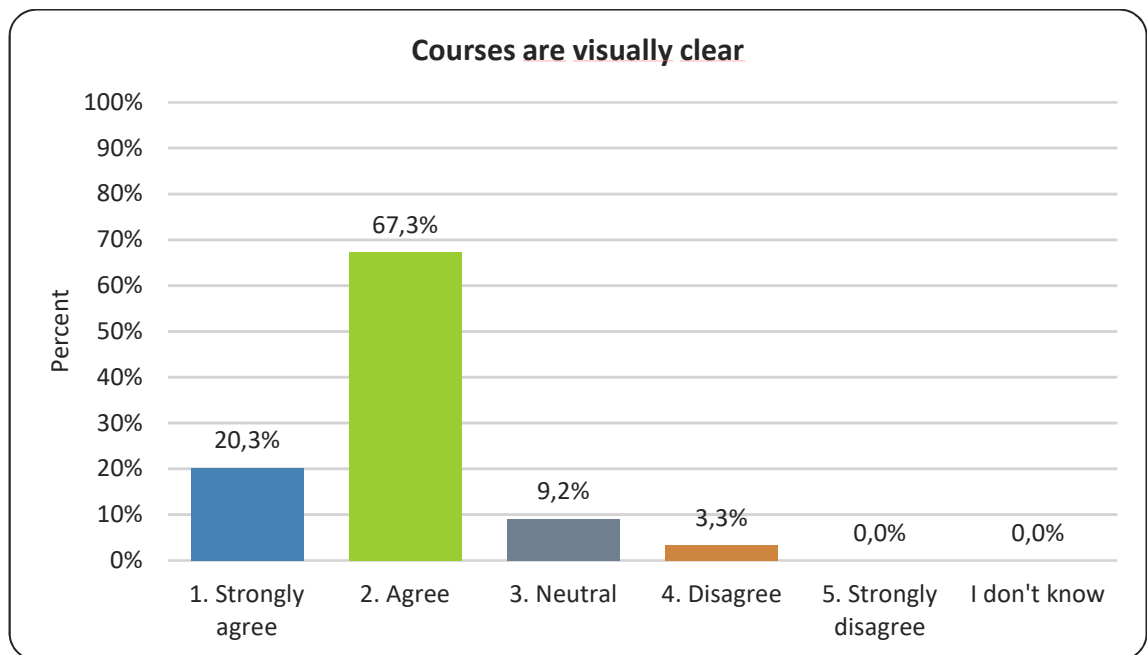


Figure 7 Histogram presentation of the responses given to question 13 of the survey.

The amount of divider slides used in the courses were equally distributed between those who agreed there were too many dividers slides (22,1 % and those who disagreed to this (34,4 %). 33,1 % were neutral to this question.

To begin an e-learning course within an e-learning portal, the learner will usually need to perform several activities to start the actual course by clicking through the menu setup, enroll to the course and start the course. Usually between 4-6 clicks. This was covered in the last question of the second area covered. 41,8 % disagreed to this with 2,6 % strongly disagreeing. 24,8 % were neutral.

### 4.3 Results related to pedagogical enhancements

To respond to research hypothesis RH<sub>03</sub>, on what pedagogical enhancements in e-learning could be efficient for the learner, the third section of the survey had eight questions related to this (Table 6).

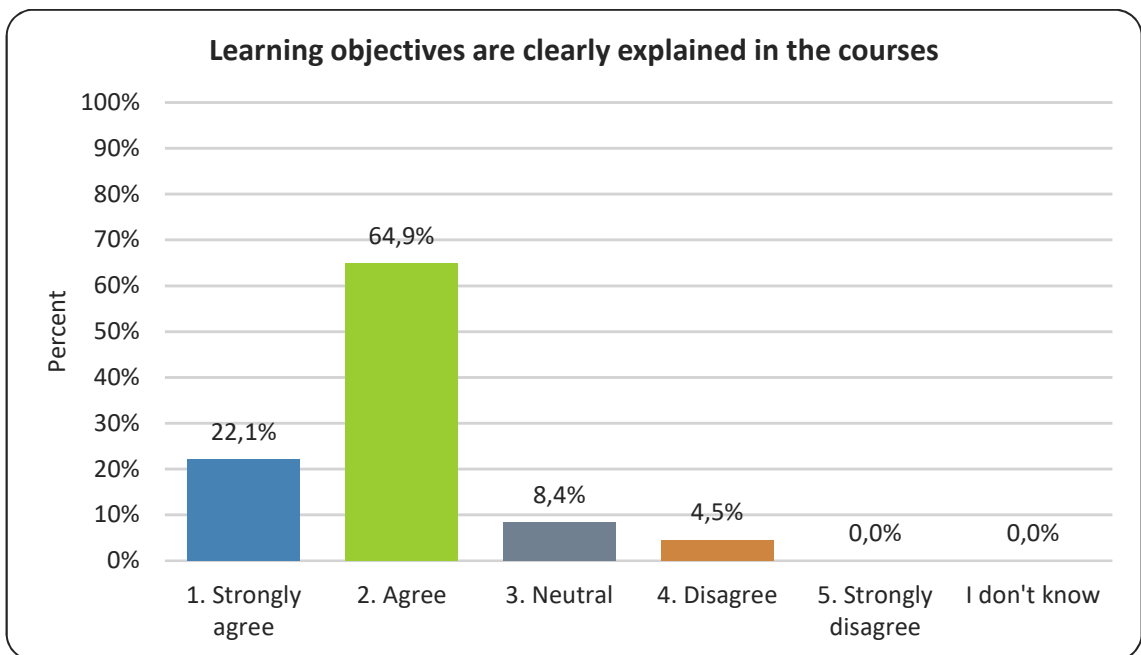
Pedagogical Enhancements
16. Learning objectives are clearly explained in the courses
17. The desired learning results of the course should be made more clear



18. Introducing the course author before the course start would increase my engagement on the course subject
19. Use of Virtual Reality, i.e. VR goggles, would improve the course experience
20. Further use of sketches in the courses would improve my learning outcome
21. Use of case studies in the courses would help me to gain a clearer understanding of the content
22. A one-page fact sheet summarizing the course content would be more helpful than going through an entire course
23. It should be possible to review the assessment after the course

*Table 6 Survey questions related to pedagogical enhancements.*

Almost all respondents, 64%, agreed that that learning objectives were clearly explained in e-learning courses and another 22,1 % strongly agreed to this (Figure 8).



*Figure 8 Histogram presentation of the responses given to question 16 of the survey.*

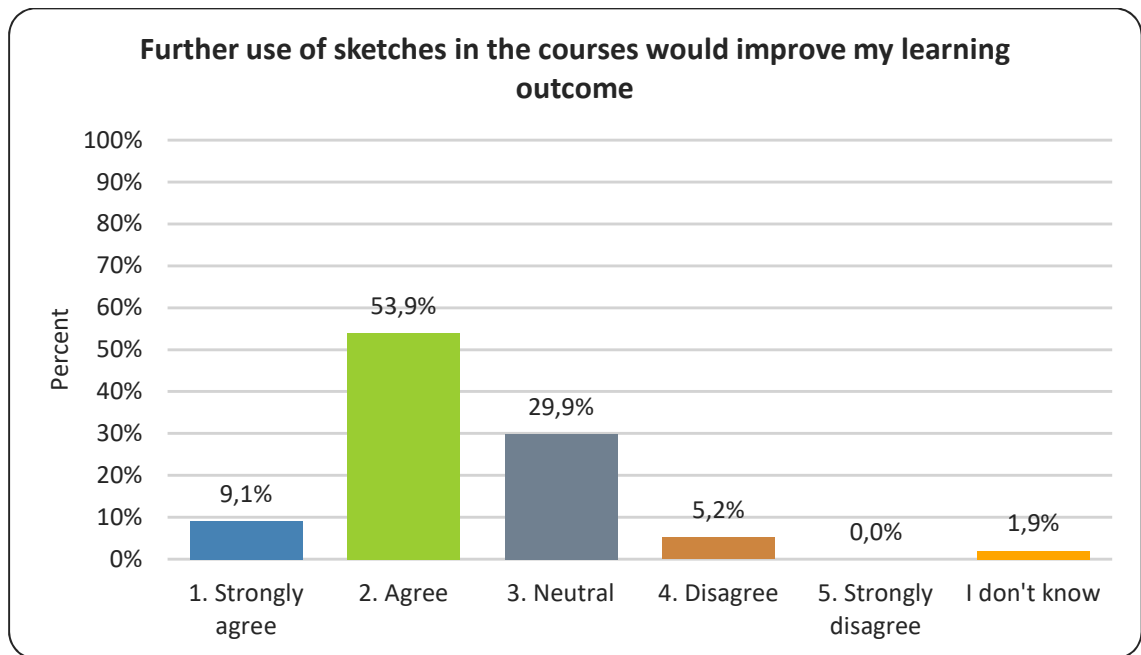
The response to whether the desired learning results of the course should be made clearer were equally distributed with 37% being neutral to this while 18,2 % disagreed.

34,4 % agreed that the learning results should be made clearer while 9,7 % strongly agreed to this. 36,4 % disagreed that introducing the course author before the course

started would increase their engagement on the course subject. 3,2 % strongly disagreed. 25,3 % on the other hand agreed to this while 5,2 % strongly agreed.

On question 19, 33,3 % believed that use of Virtual Reality, i. e. VR goggles, would improve the course experience. 17,6 % did however disagree to this while 29,4 % remained neutral.

Further use of sketches in the e-learning courses to improve the learning outcome were considered to improve the learning outcome were agreed to by 53,9 % with another 9,1 % who strongly agreed. Only 5,2 % disagreed to this (Figure 9).



*Figure 9 Histogram presentation of the responses given to question 20 of the survey.*

58,8 % agreed and 27,5 % strongly agreed that the use of case studies would help gain a clearer understanding of the content of the e-learning courses. Only 2% disagreed to this. (Figure 10).

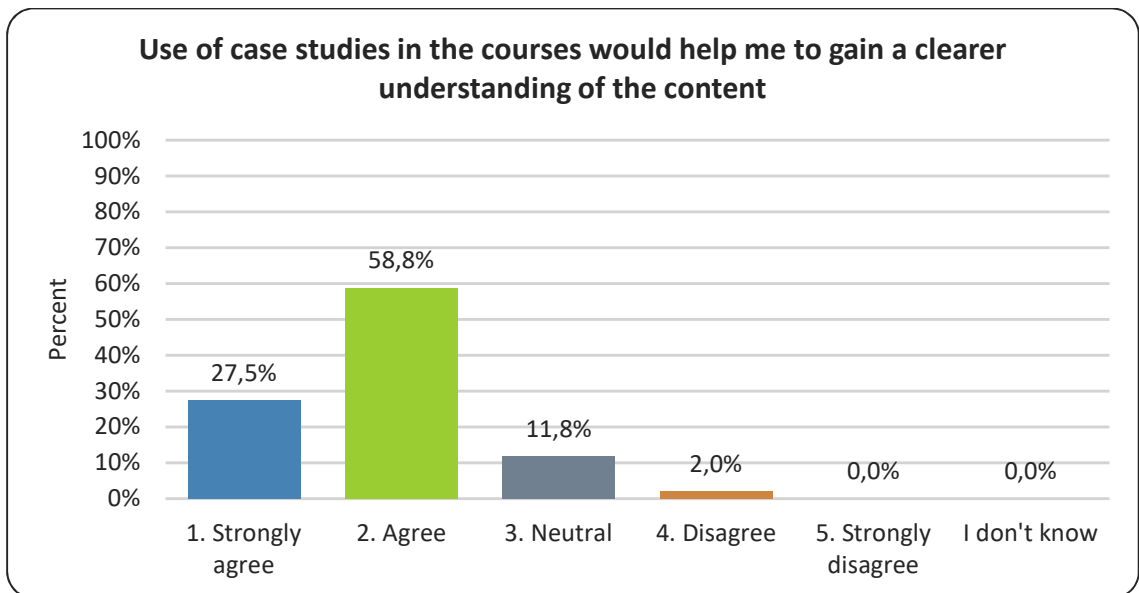


Figure 10 Histogram presentation of the responses given to question 20 of the survey.

On the question to whether a one-page fact sheet summarizing the course content would be more helpful than going through an entire course, the response to this was equally distributed with 32 % agreeing and 30,1 % disagreeing.

Almost all respondents, 58,4 %, agreed and 31,8 %, strongly agreed, that it should be possible to review the assessment after the course (Figure 11).

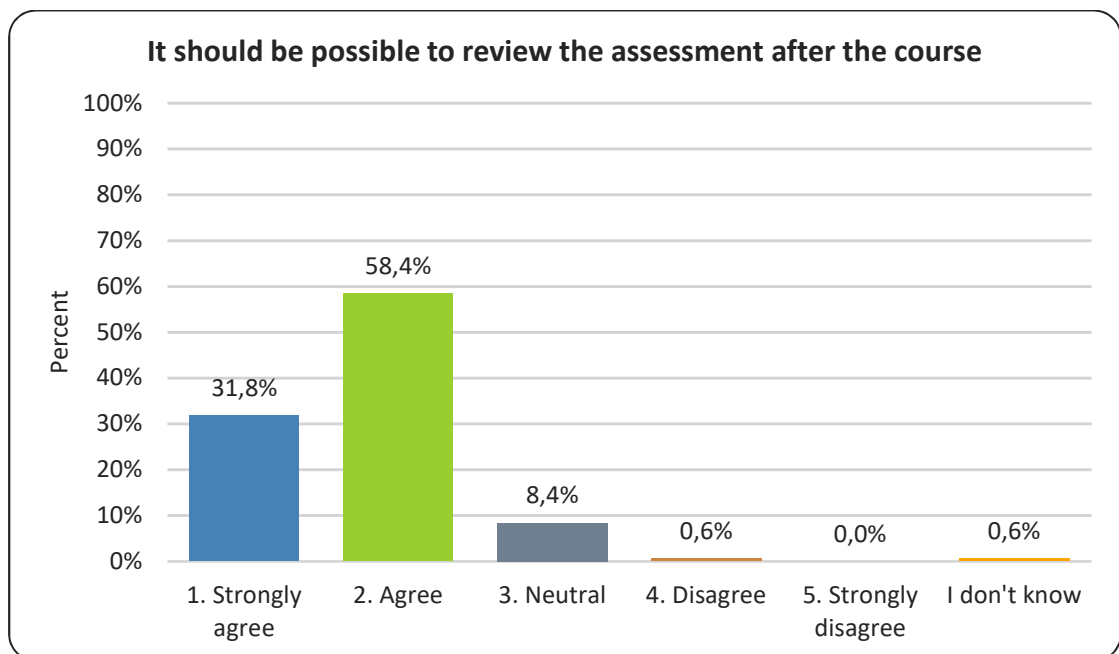


Figure 11 Histogram presentation of the responses given to question 23 of the survey.

## 4.4 Results related to language

To respond to research hypothesis RH<sub>04</sub>, on whether language is a barrier to e-learning, the fourth section of the survey had eight questions related to this (Table 7).

Language
24. Courses presented in non-native languages are hard to grasp
25. The learning outcome would improve if the courses were in my own language
26. Subtitles in my native language would be beneficial
27. Native languages should be used in all parts of the e-learning portal (Login, menu structure, etc.)
28. The English voice-over also help me learn more English
29. The English used in the courses is too complex
30. There are too many technical words used in the courses
31. The text in the courses contain a lot of spelling errors

Table 7 Survey questions related to language.

6,5% of the respondents strongly agreed, with another 20,1 % agreeing, that courses presented in non-native languages were hard to grasp. 31 % disagreed to this while 9,1 % did not know (Figure 12).

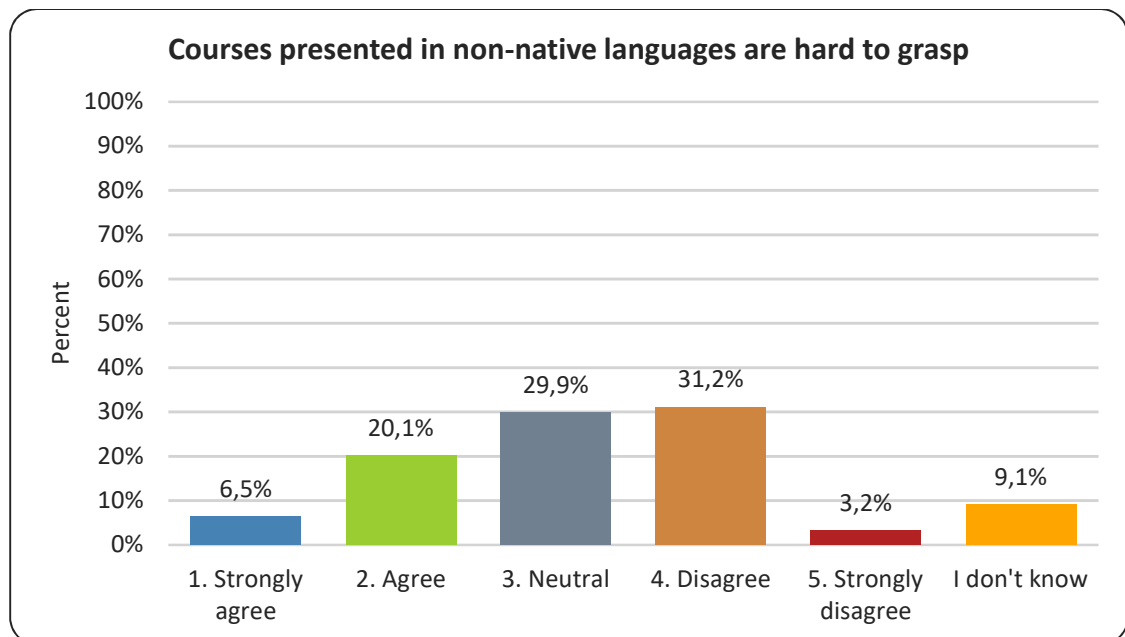


Figure 12 Histogram presentation of the responses given to question 24 of the survey.

However, when asked if the learning outcome would improve if the courses were in their own language, 23,5 % agreed to this and 15,7 % strongly agreed. Only 3,3 % did not know (Figure 13).

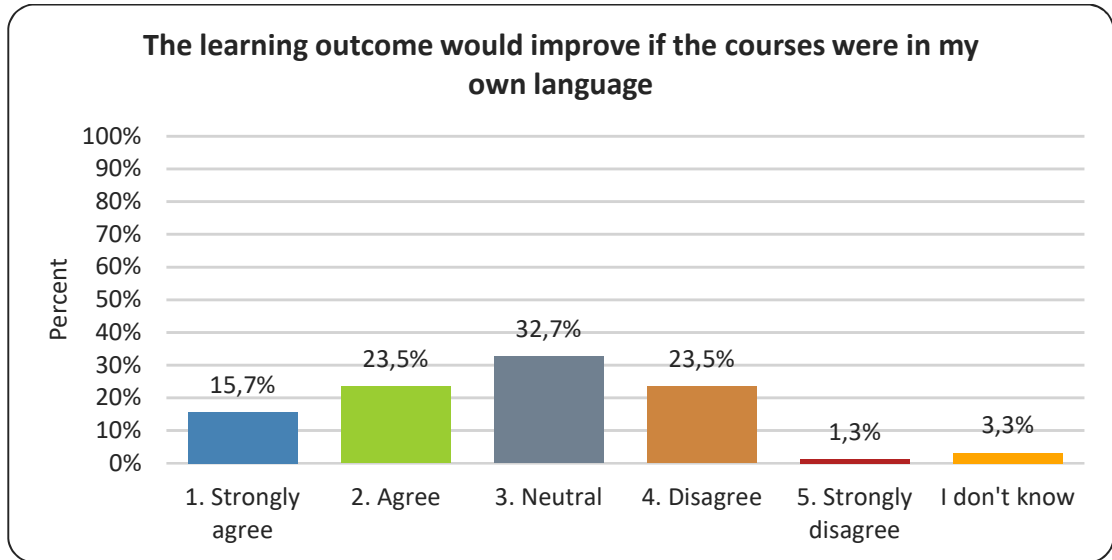


Figure 13 Histogram presentation of the responses given to question 25 of the survey.

Almost the same response was received on the matter of subtitles in native language and whether this would be beneficial in where 11,7 % strongly agreed to this. 28,6 % agreed while 21,4 % disagreed (Figure 14).

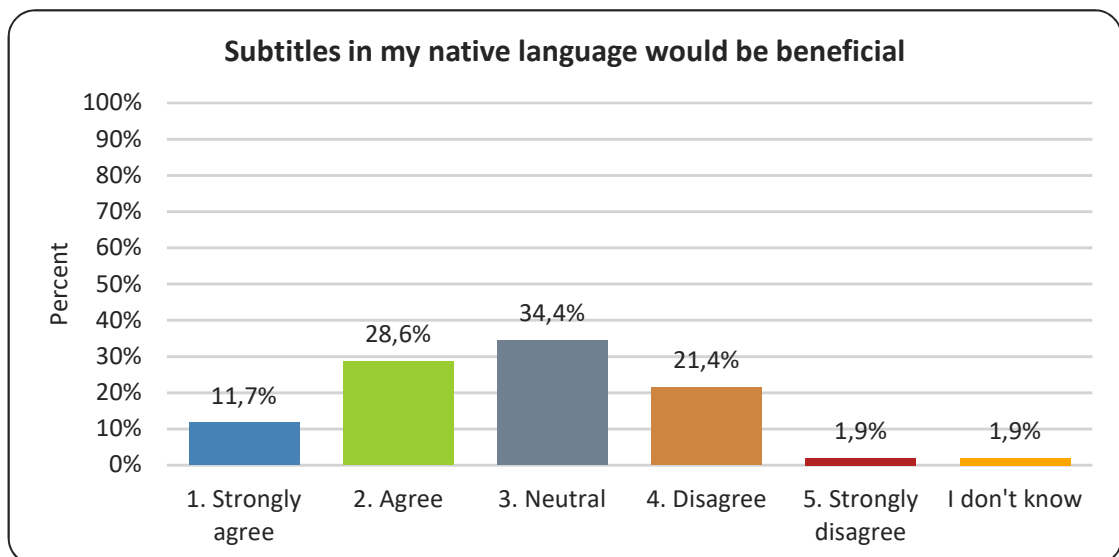


Figure 14 Histogram presentation of the responses given to question 26 of the survey.

When asked in question 27 of the survey on whether native languages should be used in all parts of the e-learning portal (login, menu structure etc.), there was a drop of those in favor of this with only 7,2 % strongly agreeing to this and 19,6 % agreeing.

English voice-over in the courses were considered helpful by 41,6 % who agreed that this voice over helped them to learn more English. 13,6 % strongly agreed that this was helpful.

The English used in the courses were not seen as being too complex by over half of the respondents with 59,5 % disagreeing to this and 11,8 % strongly disagreeing (Figure 15).

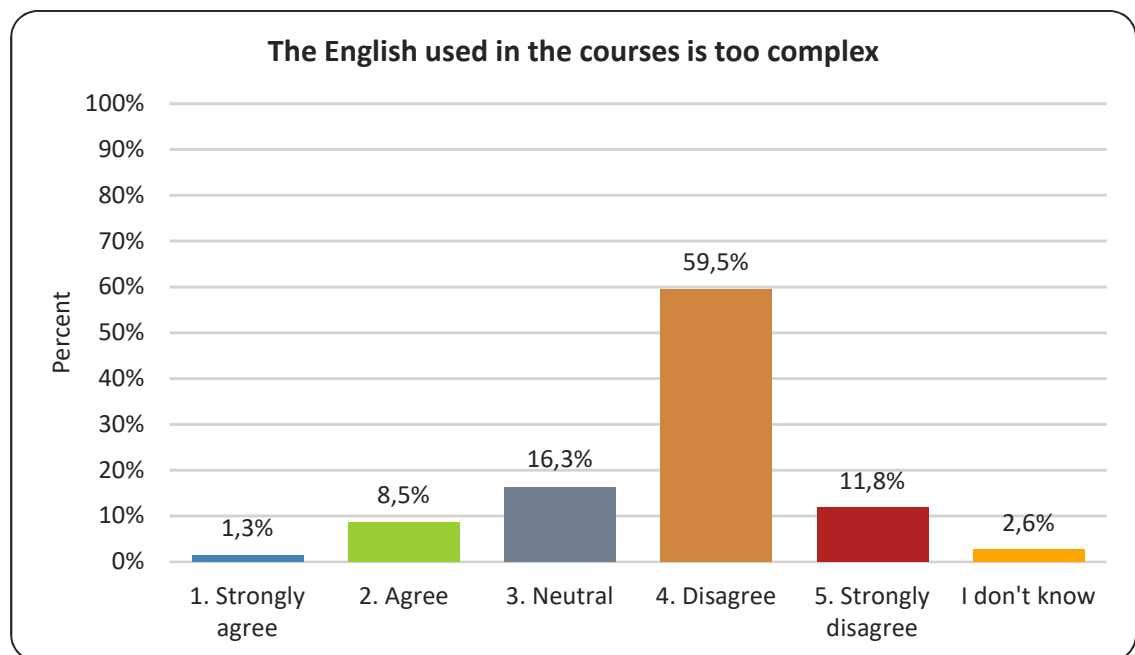


Figure 15 Histogram presentation of the responses given to question 29 of the survey.

Almost the same number of respondents, 58,2%, disagreed that there were too many technical words used in the courses with 9,8 % strongly disagreeing to this.

This number of respondents, 50,3% was also disagreeing that there were a lot of spelling errors in the text used in e-learning courses. 14,3 % strongly disagreed to this.

## 4.5 Results related to learning outcome after course completion

To respond to research hypothesis RH<sub>05</sub>, on whether a change in the test and assessments after course completion would improve the learning outcome for the learner, the fifth and final section of the survey had nine questions (Table 8).

<b>Learning outcomes after the course completion</b>
32. There should be more feedback on student performance of the various parts of the course
33. Feedback should be provided after the course test on which part of the test you did not respond accurately to
34. A more tailored follow up course based only on the areas where you failed in the test would be helpful
35. The course test is irrelevant as it only covers part of the course content presented
36. Tests should occur more frequently during the course, not just at the end of the course
37. The questions asked in the course test are relevant to the learning objectives set for the course
38. The course test should be more comprehensive
39. The 70 % pass score for the test is too high
40. Knowing there is a test to pass after the course increase my awareness to the course content

*Table 8 Survey questions related to learning outcomes after course completion.*

Half of the respondents, 50%, agreed that there should be more feedback on student performance of the various parts of the courses. 9,7 % strongly agreed while 9,1 % disagreed.

Almost all, 70,1 %, agreed that feedback should be provided after the course on which part of the course test they did not respond accurately to, while 16,9 % strongly agreed to this. Only 3,9 % disagreed (Figure 16).

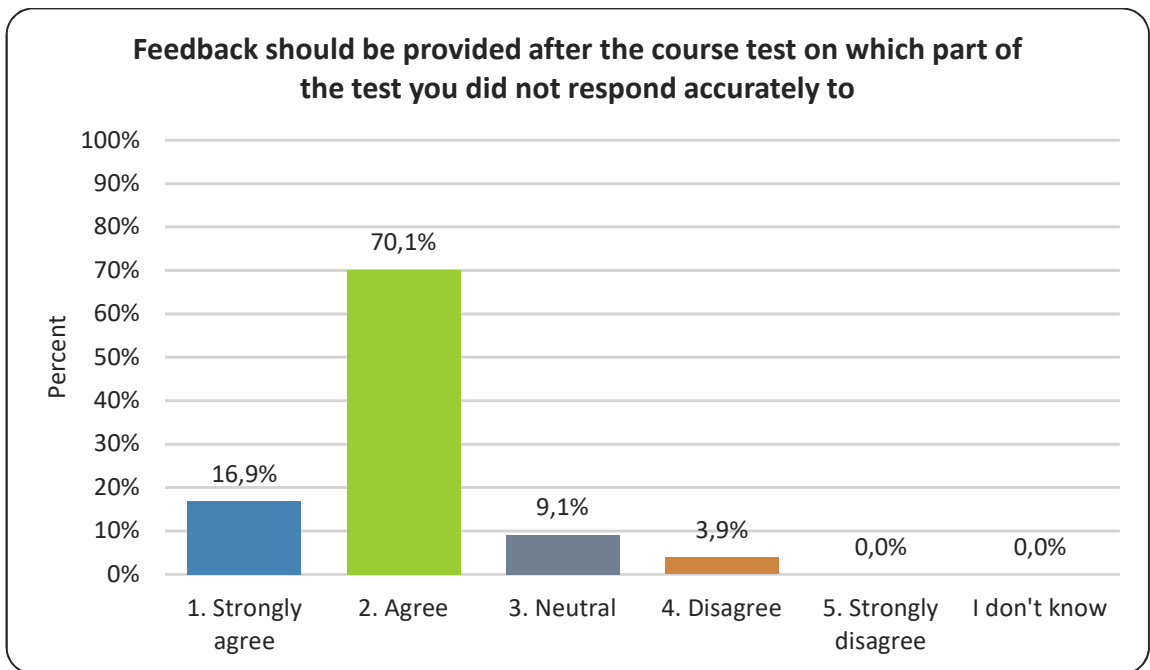


Figure 16 Histogram presentation of the responses given to question 33 of the survey.

A more tailored follow up course based on the areas where the learner had failed in the course test was considered helpful by 56,9 % who agreed to this. 13,1 % strongly agreed while no one strongly disagreed (Figure 17).

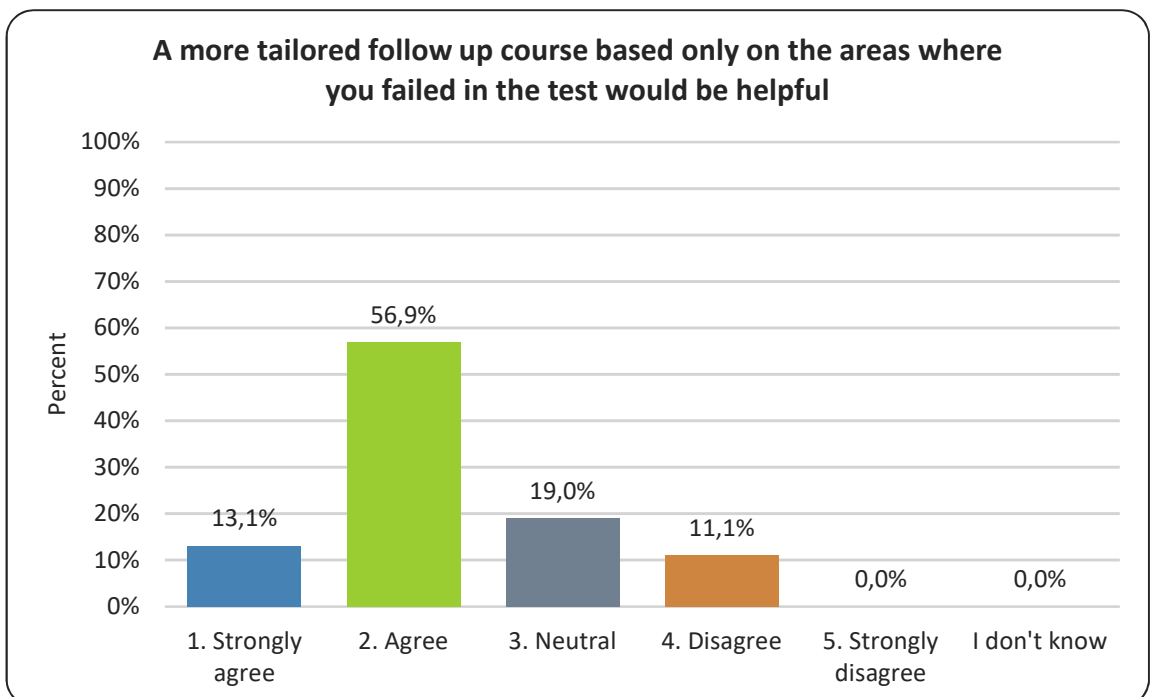


Figure 17 Histogram presentation of the responses given to question 34 of the survey.



54,9 % disagreed that the course test was irrelevant, even if it only covers part of the course content presented. Only 15 % agreed that the course test was irrelevant, and no one strongly agreed to this.

Close to half, 47 % of the respondents, believed that tests should occur more frequently during the course and not just at the end of the course. 19,9 % disagreed to this.

Almost all, 73,4 %, agreed that the questions asked in the course test were relevant to the learning objectives set for the course and another 11 % strongly agreed to this (Figure 18).

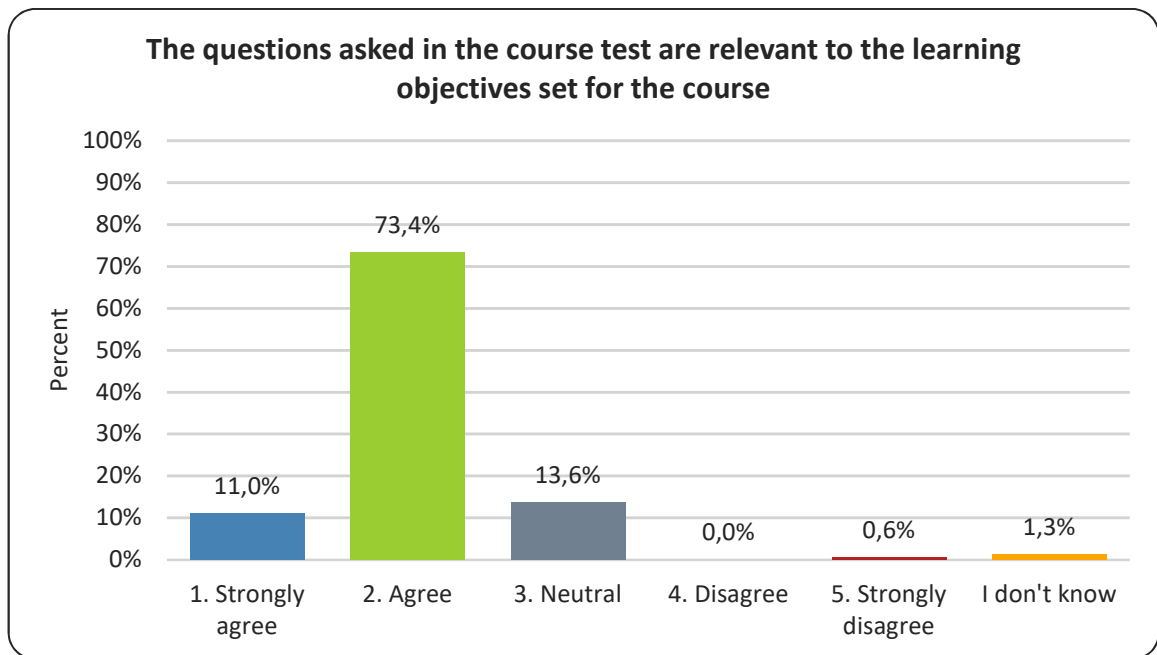


Figure 18 Histogram presentation of the responses given to question 37 of the survey.

On whether the tests should be more comprehensive, 22,9 % agreed to this and 24,8 % disagreed. 43,1 % of the respondents were neutral to this.

More than half, 61,7 % of the respondents, did not feel that a 70% pass score for a course test was too high. 13 % strongly disagreed to this (Figure 19).

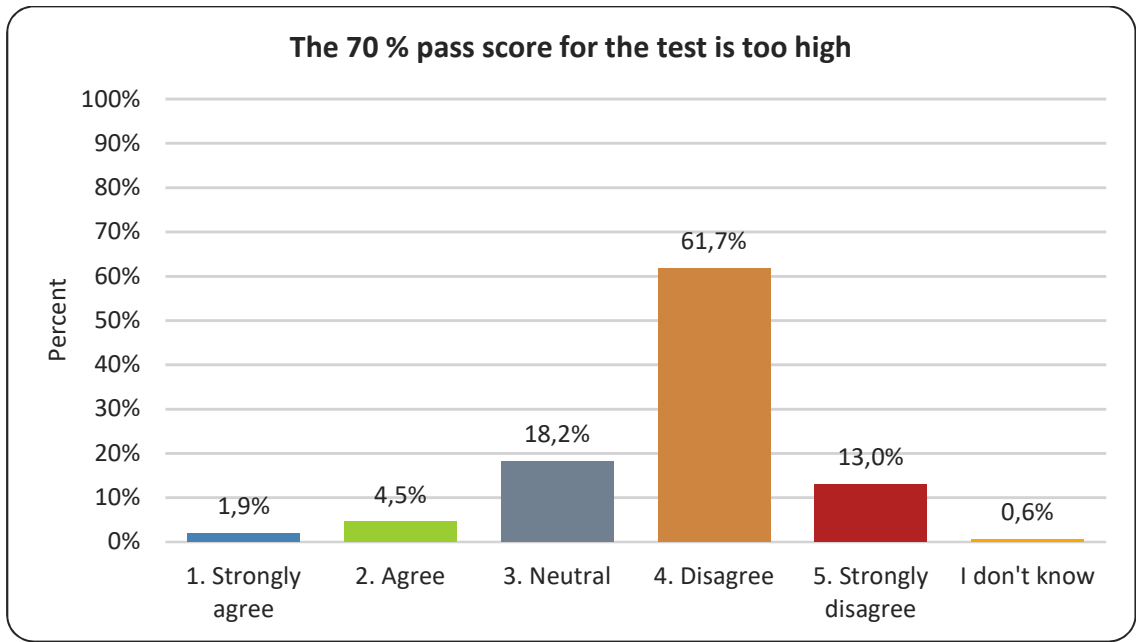


Figure 19 Histogram presentation of the responses given to question 39 of the survey.

On the final question of the survey, over half, 54,6 %, responded that they agreed that their awareness to the course content increased by knowing there was a test to pass post-course completion. Another 34,9 % strongly agreed to this (Figure 20).

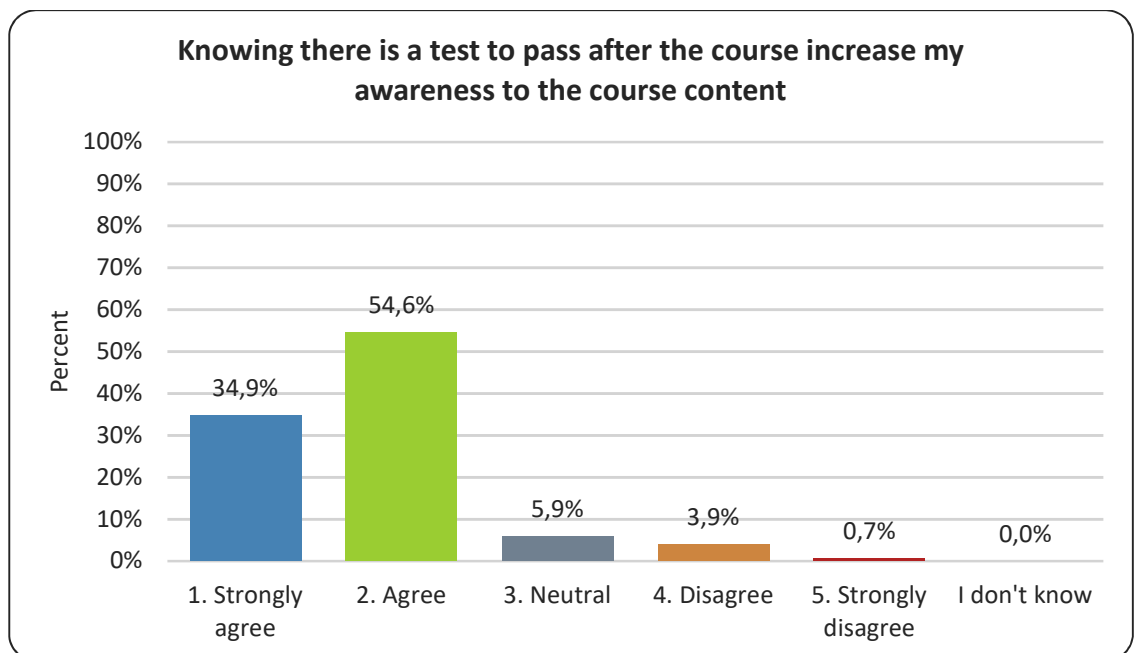


Figure 20 Histogram presentation of the responses given to question 40 of the survey.

## **4.6 Recommendations from the results**

### **Time**

Course duration should be considered by those preparing e-learning courses. Instead of covering too much in one course, learning objectives covered in one course can be reduced.

Many e-learning users struggle to remember their login credentials and passwords. Alternative login methods can be considered.

### **Layout and Design**

The technical tools used to improve the layout and design within the current e-learning courses, such as audio voice-over, subtitles, animations and sketches are positively received, and the current e-learning courses are presented with good sound and clear visibility. This should be continued in future e-learning course developments. This result underlines the importance of technically good computer equipment, to include a modern screen and loudspeaker / headset.

### **Pedagogical enhancements**

Introducing the course author prior to undertaking an e-learning course and providing a one-page fact sheet, summarizing the course content, is not dismissed. Therefore, consideration could be given to introducing this as optional features.

Further use of sketches and case studies are welcomed, as is a possibility to review the assessment post-course completion

### **Language**

E-learning course offerings in multiple languages will help broaden the audience of e-learning users. While English is sufficient for the majority, to reach anyone, e-learning courses should be translated to native languages or fitted with subtitles spoken and understood by the target audience. Not understanding the language of a course, be it text or audio, reduce the value of undertaking the course.

### **Learning outcome post- course completion**

Emphasis on the test and assessment methods post-course completion is considered important. While the current test regime is sufficient and relevant, further improvements could be done in this area to improve the learning outcome.

## 5 Discussion

Based on the results from the survey, the identified areas that could most effectively be improved in the current e-learning course offerings are the post-course assessments, the languages used and the login methods to e-learning, which could also mitigate fraudulent actions by some. The effective and prioritized improvement should be to make the e-learning courses available in languages understood by the learners. Secondly, alternative login methods to ease the use and identify the learner should be improved. Finally, the assessment methods should be considered to strengthen the learning outcome.

### 5.1 Translation to more languages

As more and more information is only made available online and through e-learning software, attention should be paid on the learner, not only on the knowledge content, in order for the learners to become more effective as well (Jenkins et. al. 2006). Maritime and offshore workers across the globe rarely have English as their mother tongue, yet most e-learning courses are offered only in English. The majority of the world's seafarers come from China, the Philippines and Indonesia (BIMCO, 2015; ICS, 2015). While the SOLAS convention, Safety of Life at Sea, requires all seafarers to communicate in English, learning may not be effective when the information shared by English text or language is not properly understood by the learner. Conventional learning theory is based on three main elements; transforming, framing and emergence. The first, transforming, is the change of understanding that occurs during learning which transform cognition from an initial stage to a modified stage (Haythornthwaite & Andrews,2011). If, however, the learner does not grasp the knowledge content, framing and emergence will not be possible. The learner has then not learnt anything from the e-learning.

A few key areas for improvement can be:

Analyze the types of languages spoken amongst the target audience, then either introduce subtitles or translate the course content accordingly.

Review e-learning software on the market that offer course development modules in multiple languages.

Make translators available or refer learners to Google Translate.

## 5.2 Time related to login to e-learning portal

Close to 1/3 of the respondents in this study were found to have challenges with remembering their login and password for the e-learning portal. This would in turn exclude them from accessing the learning material. Additional time is then spent on contacting support, re-setting password and communicate back the refreshed login details. Pilar, Jaeger, Gomes, Stein (2008), reported that lack of ability to remember passwords was not due to age and a cognitive reduction related to age but rather the number of passwords in use. Related to this challenge is the fraudulent methods of colluding and work with others or even provide login details to others in order to pass the course. This academic dishonesty is a primary area of concern when it comes to assessment (J Moten Jr., Fitterer, A, Brazier, E, Leonard, J, Brown, A., 2013).

A few key areas for improvement can be:

Introducing new technologies such as iris scanner or fingerprint scanner as alternative login methods to e-learning software. While this will have a cost aspect, it will mitigate the password overload experience by many as well as ensuring that the right person is present at the other side of the computer when learning is supposed to take place.

Install the e-learning management system software on internal server networks, making them inaccessible outside the networks, allowing for single sign on or use of the same username and password that was used to login to the computer.

## 5.3 Learning outcomes post-course completion

Emphasis should be placed on strengthening the post-course assessment such as tests, student performance and tailor made follow up courses based on the areas where the learner failed to achieve knowledge. Assessment reinforce the learning approach that a student will adopt and students who are often tested are likely to adopt the deep holistic approach to e-learning (Twomey, 1996). Conventional learning theory is based on three main elements; transforming, framing and emergence. If learning has occurred may be possible to observe if the learner change behavior, writing or even other forms of work after learning (Haythornthwaite & Andrews, 2011). Other research on the effectiveness of e-learning has shown that the most used way to measure effectiveness in e-learning is

with pre- and post-tests (Noesgaard & Ørngren, 2015). Hence, a focus on improving the efficiency of these tests will be an area that effectively can increase the learning, thus meeting the whole intention of attending the e-learning course itself.

A few key areas for improvement can be:

Introduce text response section in the test where the learner can express learning by other means than attending to a multiple-choice computer test. This will allow the learner to express in writing what has been taught. While this also serves as a repetition exercise for the learner which is positive for knowledge retention, it also establishes evidence of prior learning for future competence assessment schemes.

Introduce a revised version of the course based only on the learning objectives that the learner failed to achieve through the test, making the re-testing more relevant for the learner, also improving the cost efficiency by reducing the time spent on re-taking the course.

Introduce a light refresher course a few months after attending to an e-learning course, to ensure that the framing and emerging of the learning which occurs after the course has had the wanted effect.

## **5.4 Methodological Discussion**

Reliability of a study is connected to its results, to what is being studied and the possibility to repeat the study with the same methodology. Also, that the results are consistent over time (Joppe, 2000). Charles (1995), argue that consistency with which questionnaire items are answered can be determined through the test-re-test method at two different times. While the design of this study aims to repeat the study over time, it currently is not repeated, other than with the use of a pilot study. It is clear however that it can be repeated. The reliability of this study will therefore focus on the transparency to the research process in where an accurate representation of the participants has been described, to include their selection for participation in the study and the development of the questionnaire. Finally, the data collection as described and how the recommendations are supported by theory add to the reliability of this study. It is the hope of the author that repetition of the study over time, as intended with its design, will further improve the reliability. Joppe (2000), explain validity in quantitative research with

the following description: “Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are” (p. 1). The validity of this research is strengthened by the number of respondents and that the respondents represented the population under study. Although the number of respondents were small in a global scale they are representative in a Master thesis study. A Master thesis study also have limits on time which makes it challenging to get a high number of respondents. Questions asked in the study was given in the exact same order to all respondents and the response to the questions were within a short time period which adds to the validity of this study.

## 5.5 Practitioner summary

The aim of this thesis has been to improve the current e-learning offerings in the maritime and offshore industry by understanding through research what these improvement areas are. The findings of the study have been presented and prioritized improvement areas have been suggested. Through this practitioner summary I wish to capture the learning outcomes from my study held against what I already knew about e-learning and describe the future related to e-learning as I see it.

For practitioners in e-learning and for anyone who is interested in understanding more about the subject of e-learning, an enormous amount of research exists on e-learning from related books, academic papers, journals and theories. Through my literature review I have referred to only a few. I would strongly recommend to begin with visiting the New Zealand Government Education Counts web page related to e-learning at: <https://www.educationcounts.govt.nz/publications/e-Learning> .

This web page contain articles and publications where best e-learning practices are shared, is free of use and easy to navigate.

For the learners, e-learning is by some seen as a useful source of knowledge that they can tap into, even revisit at their own will to refresh their memory. This is in line with the need for lifelong learning in a knowledge society. By others it is seen yet another management initiative in where they will do their outmost to avoid having to sit through an e-learning course. Some are even committing to fraudulent activities to achieve recognition of completion by having an answer sheet prepared in advance by others or paying colleagues off to complete the e-learning on their behalf. This may also be linked



to key performance indicator, KPI settings on e-learning completion, in where it is more important to achieve the KPI then to ensure learning. While Learning Management Systems can register the IP address used to access the software and record the time used to complete it, few are able to confirm the identity of the learner. Initiatives exist in the industry to tackle this by appointing invilgators and setting up what appears to be accredited centers for invilgation. This exercise however is also built on trust with little or no means to verify the actual presence of the learner. It is important to address this issue to the learners themselves, trying to gain a common understanding of why e-learning is offered, it's limitations and the benefits. Communication with the learners from Management level and support to learners from management to undertake their e-learning activity in a stress-free environment where they are given the time required to complete the e-learning in their own pace may get the learners to see the full benefit of completing all e-learning activities themselves.

As mentioned in the introduction to this thesis, the answer to the 2009 audit finding on the need to document that learning had taken place by maritime and offshore workers prior to embarkation, was e-learning. With crew and offshore personnel coming from all over the world, living in different time zones with varied background from young Able-Bodied seamen to highly experienced and qualified Offshore Installation Managers, I now consider e-learning to be only part of the answer. It is truly cost effective compared to traditional classroom training. It is environmentally friendly not to fly crew across the globe to attend training. It can be made available almost anywhere, almost at any time, and to many. But removing the traditional teacher or instructor has obvious challenges considering how learning occurs. The limitations to e-learning as discussed in this thesis should therefore be of great concern for other practitioners in the industry. Performing this study has been a truly educational travel. While I have now read a huge amount of research that exists on e-learning from related books, academic papers, journals and theories, and anyone who reads this thesis will hopefully also know a lot more about e-learning than they did before reading it, I feel it is appropriate to humbly end this thesis with a saying known as the Socratic Paradox derived from Plato, "I now know that I know nothing."

## 6 Conclusion

The use of e-learning as tool for knowledge transfer has gained a foothold within the maritime and offshore industry. E-learning is now a recognized method of documenting learning by the regulatory bodies, flag states, class societies, standard setting bodies and the companies within. While a lot of research exist on e-learning, this study has taken a practitioner approach to suggest a few but effective improvement areas considering the limitations discussed. This study points to several areas where e-learning efficiency can be improved. It is thought that removing the two obstacles identified in the study, access and language, may in turn remove the need for fraudulent activities undertaken by some to document learning. Without these obstacles, the learning should become more relevant for this group since they will then manage to access the learning and understand the content of it too.

While the author, as a practitioner in the field, will make own efforts to improve the current e-learning offerings based on the findings of this study, future researchers are encouraged to repeat the study. The effect of repeating this study presents an opportunity to strengthen its validity as well as continuing the efforts of improving the current e-learning offerings in the maritime and offshore industry.

E-learning makes knowledge available through electronic devices, be it smart phones, tablets, laptops or computers. But it also requires a learner on the other end. A learner that needs to be able to access the learning, understand the content, be intellectually curious and acknowledge that there is always more to learn. In a professional life, this learner must be supported by leaders at all levels with the same desire to learn, improve and adapt. E-learning is one of the tools in the toolbox for lifelong learning in the 21<sup>st</sup> century. But this study also reflects on its limitations. E-learning is not the only tool. Learners should in addition to e-learning seek mentors and subject matter experts within their organizations to enhance their learning. They should read manuals, procedures and instructions. They should seek articles, journals and books for further knowledge acquisition. Only when learners and leaders understand the need for lifelong learning and are humble to what they do not know, a learning culture will evolve within an organization and make it a true learning organization. The future of e-learning then lies in our understanding of its efficiency, our acceptance of its limitations and the type of organization within it is used.

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Annexes

Annex 1: Questionnaire

### **Master Thesis Main Study, Efficient E-learning Improvements**

This survey aims to answer what the most efficient improvements could be when considering the current e-learning offerings in the maritime and offshore industry.

It will begin with a demographics section followed by five sections related to possible improvement areas considering

#### **1. Time**

#### **2. Pedagogical Enhancements**

#### **3. Layout & Design**

#### **4. Language**

#### **5. Learning Outcomes**

It is a known challenge that the internet speed is slow on ships and in the offshore environment. This survey will therefore exclude internet speed as a factor.

Your identity will be hidden.

When hidden identity is used in surveys, no identifiable information, such as browser type and version, internet IP address, operating system, or e-mail address, will be stored with the answer. This is to protect the respondent's identity.

#### **1) Demographics Section (Please remove text or numbers that are not appropriate)**

Gender Female / Male / Other

Age 18-24 / 25-29 / 30-39 / 40-54 / 55-70 / 70 +

Current role Employee / Manager / External Staff

Years of experience in using e-learning 1-5 yrs / 6-10 yrs / 11-20 yrs / 21 +

Level of elearning usage Weekly / Monthly / Annualy

Number of companies where you have used elearning 0 / 1-3 / 4+

Education level High School Diploma / Bachelor Degree or equivalent / Master Degree or equivalent / Phd

Years worked in the Maritime or Offshore industry 1-5 / 6-10 / 11-15 / 16-20 / 21 +

The survey will now begin, discussing each of the five improvement areas with eight questions in each section.

This first section aims to consider possible efficiency improvements related to **Time**.

Please respond to all eight questions in this part.

**2) It takes too long time to login to use the elearning portal**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**3) I often find myself struggling to remember the user name required to login**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**4) I often find myself struggling to remember the password required to login**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**5) It takes too long time to get support to login if login does not work**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**6) It takes too long time to navigate within the elearning portal**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**7) My experience is that the course duration is appropriate for the content presented**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree

5. Strongly disagree

I don't know

**8) The time limit for an elearning course should preferably be:**

Less than 15 minutes

15- 30 minutes

30- 45 minutes

45- 60 minutes

Above 60 minutes

I don't know





This second section aims to consider possible efficiency improvements related to **Layout and Design.**

When preparing elearning courses, the authors can make use a number of technical tools to improve the learning outcome. In this part you are asked to consider such tools and how they may help increase your own learning.

Please respond to all eight questions in this part.

**9) Audio voice-over in the courses help to increase my learning**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**10) Sound used in the courses are clearly audible**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**11) More use of subtitles in the courses would increase my learning**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**12) Use of animations in the courses would increase my learning**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**13) Courses are easy to navigate**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**14) Courses are visually clear**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**15) There are too many divider slides in the courses with no relevant information**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**16) There are too many clicks to perform before the course begin**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know



This third section aims to consider possible efficiency improvements related to **Pedagogical Enhancements**.

Please respond to all eight questions in this part.

**17) Learning objectives are clearly explained in the courses**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**18) The desired learning results of the course should be made more clear**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**19) Introducing the course author before the course start would increase my engagement on the course subject**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**20) Use of Virtual Reality, i.e. VR goggles, would improve the course experience**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**21) Further use of sketches in the courses would improve my learning outcome**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**22) Use of case studies in the courses would help me to gain a clearer understanding of the content**

1. Strongly agree
2. Agree

- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**23) A one-page fact sheet summarizing the course content would be more helpful than going through an entire course**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**24) It should be possible to review the assessment after the course**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know



This fourth section aims to consider possible efficiency improvements related to **Language**.

Please respond to all eight questions in this part.

**25) Courses presented in non-native languages are hard to grasp**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**26) The learning outcome would improve if the courses were in my own language**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**27) Subtitles in my native language would be beneficial**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**28) Native languages should be used in all parts of the elearning portal (Login, menu structure, etc)**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**29) The English voice-over also help me learn more English**

1. Strongly agree
  2. Agree
  3. Neutral
  4. Disagree
  5. Strongly disagree
- I don't know

**30) The English used in the courses is too complex**

1. Strongly agree
2. Agree
3. Neutral

- 4. Disagree
- 5. Strongly disagree
- I don't know

**31) There are too many technical words used in the courses**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**32) The text in the courses contain a lot of spelling errors**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know



This fifth and last section aims to consider possible efficiency improvements related to **Learning Outcomes after the course completion.**

Please respond to all eight questions in this last part.

**33) There should be more feedback on student performance of the various parts of the course**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**34) Feedback should be provided after the course test on which part of the test you did not respond accurately to**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**35) A more tailored follow up course based only on the areas where you failed in the test would be helpful**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**36) The course test is irrelevant as it only covers part of the course content presented**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree
5. Strongly disagree
- I don't know

**37) Tests should occur more frequently during the course, not just at the end of the course**

1. Strongly agree
2. Agree
3. Neutral
4. Disagree

- 5. Strongly disagree
- I don't know

**38) The questions asked in the course test are relevant to the learning objectives set for the course**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**39) The course test should be more comprehensive**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**40) The 70 % pass score for the test is too high**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know

**41) Knowing there is a test to pass after the course increase my awareness to the course content**

- 1. Strongly agree
- 2. Agree
- 3. Neutral
- 4. Disagree
- 5. Strongly disagree
- I don't know



## Annex 2: Invitation to Participate in Pilot Study

### **Master Thesis Pilot Study, effective elearning improvements**

This is a pilot study for a master thesis on efficient improvements of current elearning in the Offshore and Maritime industry. You are asked to attend it for the purpose of testing it's suitability and provide any improvement feedback on the study itself to [author.study@company.com](mailto:author.study@company.com)

The below text will be shared with all participants in the main study

Information about data processing

### **Request for participation in research project**

### **Master Thesis study on efficient improvements of current e-learning in the offshore and maritime industry**

#### **Background and Purpose**

The undersigned, [REDACTED], is a part time student at the University College of South East Norway, attending a four-year Master of Science study in Maritime Management. The final part of this study is to prepare an individual Master Thesis on a chosen subject. In cooperation with USN and by guidance of Associate Professor Salman Nazir, the Master Thesis will discuss the types of efficient improvements that can be made to the current elearning offerings within the offshore and maritime industry.

In his professional life, [REDACTED] is employed with [REDACTED] as [REDACTED]. Key responsibilities include management and administration of the [REDACTED] elearning portal and the [REDACTED] online e-learning portal provided by [REDACTED] for [REDACTED] employees.

#### **What does participation in the project imply?**

You are requested to participate in this research project by actively (but voluntary) participate in an online survey of approximately 10 minutes duration. You must be above 18 years of age. There will be no personal information requested by the participants, but a demographic section is included. The data to be collected will be

related to five types of efficiency improvements using a 5 point Likerts scale for respons.

### **What will happen to the information about you?**

All personal data will be treated confidentially. The online survey will be carried out using this Questback online survey for public entities and the educational sector. <https://www.questback.com/no/bransjer/offentlig-sektor-og-utdannelse/> Access will be mainly for the undersigned but the student supervisors will also be able to review the details upon request. Personal data, meaning IP Addresses for this survey, will be stored only on questbacks database and the survey data will be deleted 5 years after the study is complete.

Participants will not be recognizable in the publication but the study aim to differentiate between the roles held by the participants, asking them to voluntarily categorize themselves as either Manager, Employee or External staff.

The project is scheduled for completion by 2018, after which personal data will be deleted. The response data itself will be kept for five years as the method chosen for the study is Time Series Design, aiming at repeating the study over a series of time in order to note if the suggested efficiencies described by the study has any effect.

### **Voluntary participation**

It is voluntary to participate in the project, and you can at any time choose to withdraw your consent without stating any reason. If decided to withdraw, all personal data collected up to that point will be made anonymous.

If you have any questions concerning the project, please contact [REDACTED] at +47 [REDACTED] or [REDACTED]@[REDACTED].com or the assigned Supervisor, Associate Professor Salman Nazir at +47 [REDACTED] or [REDACTED]@usn.no

The study have been notified and approved to the Data Protection Official for Research, NSD - Norwegian Centre for Research Data with project Id 60137. Consent to reach out

to you as current elearning user of the [REDACTED] Academy elearning portal has been given from [REDACTED], [REDACTED].

### **Consent for participation in the study**

By continuing in this survey I acknowledge that I have received information about the project and am willing to voluntarily participate in the project

#### **How to contact us**

University of South Eastern Norway  
[REDACTED]@usn.no

#### **Our EU representative**

N/A

If you would like to obtain more information about the processing of your personal data click here

I agree to the processing of my personal data in accordance with the information provided herein.

I don't want to participate

### Annex 3: Invitation to Participate in Main Study

As a current user of the [Company] Academy elearning portal, you are invited to attend a brief survey on improving elearning efficiency.

The survey is a part of a Master Thesis research study.

The aim of the study is to reveal by research the most effective improvement areas that can be made to the current elearning offerings in the maritime and offshore industry.

Your participation will be most appreciated

#### Master Thesis Main Study, Efficient Elearning Improvements

This is the main study for a Master Thesis on efficient improvements of current elearning offerings in the Offshore and Maritime industry. You have randomly been selected as one of the registered users of the [Company] Academy elearning portal at <http://elearning.company.com/>

Information about data processing

Request for participation in research project

#### **Master Thesis study on efficient improvements of current elearning offerings in the offshore and maritime industry**

##### **Background and Purpose.**

The undersigned, [Name] is a part time student at the University College of South East Norway, USN, attending a four-year Master of Science study in Maritime Management. The final part of this study is to prepare an individual Master Thesis on a chosen subject. In cooperation with USN and by guidance of Associate Professor Salman Nazir, the Master Thesis will discuss the types of efficient improvements that can be made to the current elearning offerings within the offshore and maritime industry.

In his professional life, [Name] is employed with [Company] as an [Position]. Key responsibilities include management and administration of the [Company] elearning

portal and the [redacted] online e-learning portal provided by [redacted] for [redacted] employees.

### **What does participation in the project imply?**

You are requested to participate in this research project by actively (but voluntary) participate in an online survey of approximately 6-8 minutes duration. You must be above 18 years of age. There will be no personal information requested, but a demographic section is included. The data to be collected will be related to five types of efficiency improvements using a 5 point Likerts scale for respons.

### **What will happen to the information about you?**

All personal data will be treated confidentially. The online survey will be carried out using this Questback online survey for public entities and the educational sector. <https://www.questback.com/no/bransjer/offentlig-sektor-og-utdannelse/> Access will be mainly for the undersigned but the student supervisors will also be able to review the details upon request. Personal data, meaning IP Addresses for this survey, will be stored only on questbacks database and the survey data will be deleted 5 years after the study is complete.

Participants will not be recognizable in the publication but the study aim to differentiate between the roles held by the participants, asking them to voluntarily categorize themselves as either Manager, Employee or External staff.

The project is scheduled for completion by 2018, after which personal data will be deleted. The response data itself will be kept for five years as the method chosen for the study is Time Series Design, aiming at repeating the study over a series of time in order to note if the suggested efficiencies described by the study has any effect.

### **Voluntary participation.**

It is voluntary to participate in the project, and you can at any time choose to withdraw your consent without stating any reason. If decided to withdraw, all personal data collected up to that point will be made anonymous.

If you have any questions concerning the project, please contact [REDACTED] at +47 [REDACTED] or [REDACTED]@[REDACTED].com or the assigned Supervisor, Associate Professor Salman Nazir at +47 [REDACTED] or [REDACTED]@usn.no

The study have been notified and approved to the Data Protection Official for Research, NSD - Norwegian Centre for Research Data with project Id 60137. Consent to reach out to you as current elearning user of the [REDACTED] Academy elearning portal has been given from [REDACTED], [REDACTED].

### **Consent for participation in the study**

By continuing in this survey I acknowledge that I have received information about the project and am willing to voluntarily participate in the project

#### **How to contact us**

University of South Eastern Norway  
[REDACTED]@usn.no

#### **Our EU representative**

N/A

If you would like to obtain more information about the processing of your personal data click [here](#)

I agree to the processing of my personal data in accordance with the information provided herein.

[I don't want to participate](#)

N/A

If you would like to obtain more information about the processing of your personal data click [here](#)

#### **Top of Form**

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I agree to the processing of my personal data in accordance with the information provided herein.