



UNIVERSITY OF AGDER

E-LEARNING IN CORPORATE TRAINING USING INTERACTIVE COURSES

by

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This master's thesis is carried out as part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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Abstract

Health, safety, and environment (HSE) is an important term in industrial- and corporate context. A company focusing on their employees sharing the same values and attitudes regarding HSE can experience a working environment where employees feels safe, and perform their work without unnecessary risk-taking. There are often seen examples where HSE training relies on traditional classroom teaching, and keeps the focus on “do’s and “don’ts”, but the key to get employees to share a common goal on HSE, is to provide a deeper meaning for each employee on what this term actually mean. The purpose of this research is to investigate if HSE training with the use of eLearning technology such as a learning management system (LMS) and digital, interactive courses can quality assure training and certification. It will be investigated if demographically different employees can use and accept such technology for training purposes. A questionnaire has been distributed digitally and printed, and has provided valuable feedback on employee’s demographical diversity, ownership of digital artifacts, perception on the current situation regarding training, and their willingness to use web based learning for training purposes. The current HSE course has been developed into a web-based HSE course, and has been tested and evaluated by company employees on usability such as user interface (UI), user experience (UX), and technology acceptance. Results of this research implies that even though there is a wide diversity among employees, a significant majority of employees are used to, and like to use digital artifacts in their everyday life, and their job. A significant majority implies that the current situation on training is not working well, and that there is room for improvements. Results of usability testing also indicates that employees are engaged when testing the digital HSE course, and are motivated to use this form of training. Employees imply that this type of training can support change in behavior regarding HSE, and the willingness to accept such a system is high.

Keywords: Corporate training, Health, Safety & Environment, web-based learning, adult learning, technology acceptance, human-centered design

Preface

The last five years up to this writing moment has been a journey where we have learned a lot about digital tools and how these can be used to support web-based learning. Especially the master program has been valuable because of its many pedagogical and practical courses, where valuable knowledge on interaction- and human-centered design, pedagogical approaches, learning in the 21st century, and project based work has been a huge part of the existence.

The original job with this project was to help Benteler Automotive Farsund identify digital systems that could support them streamline and automate training processes. Initial meetings revealed that it is not only a digital system that is needed to quality assure training and documentation, but a new approach to training employees. With great help from our supervisors, Ghislain Maurice Norbert Isabwe and Rune Andersen, we managed to identify several important areas to investigate in this research.

A special thank you is therefore aimed at Ghislain Maurice, and Rune for their support and guidance in the project period. A special thank you is also aimed at Benteler Automotive Farsund, and especially Monika Elin Schopmeier for being our connection and contact person at Benteler, helping us with all our needs and requests. We would also like to thank Harry Danielsen at Benteler for his time and support on the topic of HSE.

Others who has contributed to this project, and deserves a thank you is Morgan Konnestad, Helge Wehus, Sven Kjetil Haaø, Gunhild Haugland Byremo and UNIVERN Arendal.

Last, but not least, I (Daniel) would like to thank my beloved partner Janne for taking care of our son who was born just before the start of this research project. Without her support, I would not have been able to complete this project. Thank you.

Elise Birgitsdatter Haugland & Daniel Møller-Stray

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List of abbreviations

BAF	- Benteler Automotives Farsund
HSE	- Health, Safety, Environment
SME	- Small- Medium enterprises
HR	- Human resources
UiA	- Universitetet i Agder
ROI	- Return of investment
LMS	- Learning management system
CMS	- Content management system
LRS	- Learning Record Store
UX	- User experience
HCI	- Human computer interaction
LFP	- Low Fidelity Prototype
HFP	- High Fidelity Prototype
IS	- Information system
UTAUT	- Unified theory of acceptance and use of technology
TAM	- Technology acceptance model
SUS	- System Usability Scale
PU	- Perceived usefulness
PEE	- Perceived ease of use
PE	- Performance expectancy
EE	- Effort expectancy
SI	- Social influence
FC	- Facilitating conditions
BI	- Behavioral Intention
UB	- Use behavior
ILO	- Intended learning outcome
n.d	- no date

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1.0 Introduction

1.1 Background

Benteler Automotive Farsund¹ (BAF) was originally founded under Alcoa in 1996 with its primary purpose to service Volvo with hollow core sub frames. Since then BAF has grown in its intellectual capability and manufacturing capacity to its current position as a global provider of highly complex hollow and solid lightweight aluminum castings. Customers today are car producers such as Volvo, BMW, Porsche, Bentley, Ferrari, Rolls Royce to mention a few. Benteler Automotive overtook Farsund Aluminum Casting, as was their previous name, and in September 2012 they became Benteler Automotive Farsund. BAF is located in Farsund in Vest-Agder, Norway.

BAF operates with 270 employees as their official number, where approximately 65% works in manufacturing. A rough division classifies four sections; administration, manufacturing, maintenance and support functions. Preliminary studies show that men represent approximately 85% of the employees, and the largest group of employees range between 35-44 years of age (about 40%). Mainly, employees are Norwegian, but BAF is well represented from a variety of countries both inside and outside of Europe such as Albania, Poland, Netherland, Iran and Iraq amongst them. The variation of nationalities represents a great diversity. Cultural differences can be treasured and add value in some areas, but in others it must be put aside.

BAF reached out to University of Agder (UiA) due to prior projects with UiA students. Three employees in the UiA staff visited BAF in the fall of 2016, where BAF expressed that they wanted help finding a system which can support them in automating various processes regarding training and competence maintenance and documentation. Immediate thoughts were a project comparing learning management systems (LMS) to find a learning platform supporting BAF's needs and requirements expressed in initial meetings. In these meetings, discussions revealed that BAF has issues with employees ignoring elementary HSE rules such as bringing their water bottle, cellphone and other prohibited equipment with them to the manufacturing area. Due to this, the project derived from the original task, and has now become a project where the research revolves around how to train and educate adult corporate employees with different demographical background.

¹ Benteler Automotive Farsund - <http://www.fac.no/index.htm>

1.2 eLearning and health, safety, environment in corporate training

1.2.1 eLearning

eLearning can be defined in many ways. Ellis & Kuznia (2014) groups eLearning in different categories such as; purely online- blended- or hybrid- learning. Other forms of eLearning may include web-based, computer-based, self-study, instructor-led group, and video/audio. Learning through using computer network technology primarily via the internet, supports delivering instructions to an individual. Easy and on-demand access to courses online are important drivers of this “new” way of learning (Sambrook, 2003). The use of corporate eLearning is rising, and especially for small- and medium-sized enterprises (SME's), eLearning can be successful due to traditional barriers such as lack of finances, expertise, time and facilities (Ellis & Kuznia, 2014; Sambrook, 2003). Ellis & Kuznia (2014) further states that corporate leaders look at eLearning implementation for different reasons. Some to create a competitive advantage in a tough industry, others to address the need for globalization, and some company leaders wanting to meet the increased demand for training, and reduce budget constraints. No matter the reason, Ellis & Kuznia (2014) argues that the intent of corporate eLearning is to improve job performance and satisfaction, and to create a productive and competitive workforce. A report by Docebo (2016) states that the global eLearning market was estimated to be over USD 165 Billion in 2015, and that is expected to grow by 5% between 2016 and 2023, reaching USD 240 Billion. Docebo (2016) mention the possibility of allocating a lower budget for eLearning purposes and increasing flexibility as important factors to the expected growth. Corporations tend to look at eLearning as the global nature of business today, due to the ability to reach large groups of employees stationed at different locations, reducing cost of training and environmental impact due to travelling (Ellis & Kuznia 2014). Despite the enormous numbers invested in eLearning, and the potential of this technological tool, research reveals that many applications perform poorly in motivating employees to learn. Wang et al., (2010), Brink, Chen (2014) and Servage (2005) managed to identify significant gaps between corporate interests and learners needs when it comes to eLearning. Results of Brink's et al., (2002) study, indicated that even though participants in eLearning activities believes that using such learning resources can aid them in increasing their knowledge base and better their performance given the right subject, time and encouragement, it does not match the intention of the company. By introducing technological tools to training it could be tempting for a company to look only at the return of investment (ROI) by quantifying learning in tracking of employee performance, or to assume that implementing software alone can contribute to an increase in knowledge among employees. Corporate training increasingly employs instructional technology, and recognition of the social factors in relation with training seems to disappear. Companies investing significantly in eLearning, and its

infrastructure on how to implement it, can benefit of a more holistic perspective on how learners interact and learn in online environments (Servage, 2005). Important factors to consider before implementing such systems into an organization is the employee's acceptance towards technology, as well as organizational and managerial support in the implementation.

eLearning contributes on keeping employee's skills and knowledge up-to-date, and are by many corporate leaders considered to be a necessity to meet educational and training needs of their stakeholders and organizational strategies (Ellis & Kuznia 2014). In the information- or digital age, society is formed on knowledge and information. It is because of the advancements in information and communication technologies that eLearning can deliver learning and instructions to a large audience, and although eLearning is recognized to contribute to the gap in current training, learner's perception is critical to successfully implement eLearning (Chen, 2014).

1.2.2 Health, safety and environment

All employees must be ensured a safe working environment, and it is the Norwegian Working Environment Act² that shall ensure this. It is the employer's responsibility to provide their workers with the proper HSE culture. The core of a great HSE culture is management-, organization-, and employee participation. These factors are fundamental to identify potential accidents, and how to avoid them. There are demands on how certain work are performed and potentially dangerous machines require documented training and certification. HSE work should be continuous, and be a natural part of an organizations business (Arbeidstilsynet). In Norway, there was more than 77.400 foreign employees in the fourth quarter of 2015. The largest group constitutes of young males from 25-39 years of age, mostly from Sweden, Poland and Lithuania, mainly working in construction industry (Statistisk sentralbyrå, 2016). Petroleum Safety Authority³ (2003) mentions that they often see employees from different countries, which can cause challenges and concerns regarding HSE, because they may have different knowledge and values. Employees from previous communistic countries often show signs of a different mentality related to e.g. reporting of deviation. From their cultures, it might be easier to "cover it up so no one will notice", and continue as usual (Helge Wehus, Responsible for HSE training and certification at the University of Agder. Interviewed 20.03.17). Employees from other countries should have access to HSE training in a language they understand, which should generate a deeper meaning. An informative introduction on HSE can contribute to create the correct attitudes and values towards this area before employees move on to specific training related to their work processes. One common mistake employers often do when training an employee, is not following the correct "recipe"

²Arbeidsmiljøloven

³Petroleumstilsynet

(Helge Wehus, Responsible for HSE training and certification at the University of Agder. Interviewed 20.03.17). All training must be completed according to The Norwegian Working Environment Act and Internal Control Regulation⁴ (1997), and must be documented. HSE training used as an eLearning resource makes documentation and certification easy because of technological benefits such as automatic reporting-, progression tracking- and automatic renewal features, often found in learning management systems (LMS) and content management systems (CMS). Training without proper documentation is worthless in case of accidents. All machines and equipment in an organization must be risk analyzed. Risk means *“the likelihood and consequences of that something undesirable will happen or evolve”* (Norwegian Labor Inspection⁵, n.d). Internal Control Regulation (1997) § 5 states that *“Internal control should be adapted to the nature, activities, risks and size to the extent necessary to comply with requirements in or pursuant to the health, safety and environmental legislation”*. Regulations for execution of work⁶ (2011) § 10 states that after an employer has conducted a risk analysis of a certain machine or equipment, and finds that it demands especially carefulness at use, it can only be used by employees with documented safety training by § 10-2. By adding these legislations together, a clear picture of a “living and moving” working environment paints itself. It is a non-static working environment where the employer has a responsibility to create a support service around employees that ensures HSE are moving in the right direction. Norwegian Directorate for work⁷ has created a system where we “raise each other”, meaning when a main contractor or a company hires external contractors to perform work, the main contractor may ask to see the external contractors Internal Control Regulation Documentation⁸, for review to examine their documentation on e.g. training and machine usage. Prior to Internal Control Regulation, Norwegian Labor Inspection conducted these examinations. This could often result in rare examinations, and in worst cases, once in twenty years. Consequences of this old system were often relapse in training and procedures (Helge Wehus, Responsible for HSE training and certification at the University of Agder. Interviewed 20.03.17).

⁴ Internkontrollforskriften

⁵ Arbeidstilsynet

⁶ Forskrift om utførelse av arbeid

⁷ Arbeidsdirektoratet

⁸ Internkontroll dokument

1.3 Hypothesis and research questions

Hypothesis: Implementation of a digital solution for facilitating web based learning can quality assure HSE training and have a positive impact on employee's memory retention.

RQ1: How can the use of a digitalized HSE course quality assure training and certification?

RQ2: Which factors are important to consider for enabling technology acceptance among corporate employees?

1.4 Thesis structure

Following the introduction chapter, chapter two is dedicated to explain how the HSE learning resource is built to support this thesis. The result of this thesis depends so much of this resource, and is the rationale for giving it an own chapter. Chapter three explains different theories used to support this thesis, such as andragogy, technology acceptance, and eLearning design theory. Chapter four describes the different methods used for data collection, and a brief explanation on how this is executed in this research. Chapter five presents results and findings from three different methods, accordingly questionnaire, usability test, and user test. For the two practical tests, methods and procedure is elaborated, and a short conclusion of each test is drawn. Chapter six discusses the results up against research questions and theory as one combined discussion. Chapter seven draw conclusion(s) based on results and discussion from chapter five and six. This chapter also provides a paragraph for suggested future research. Chapter eight and nine lists references and appendixes.

2.0 Creation of digital learning resource

The Norwegian HSE course module is available on: <http://home.uia.no/danimo12/> until 01.08.2017.

Results of this study relies on the HSE course module that has been designed. A chapter has therefore been added to describe design choices for the HSE course module. Theories supporting design choices can be found in 3.6 eLearning design theory. The process follows an iterative human-centered design approach illustrated in Figure 1, where the first steps are context analysis and defining requirements. Next steps are to develop a solution, test and evaluate design against requirements, and iterate back between these steps until the designed solution meets the user requirements. This chapter will not include results of testing, but it will include feedback from context analysis and prototyping.

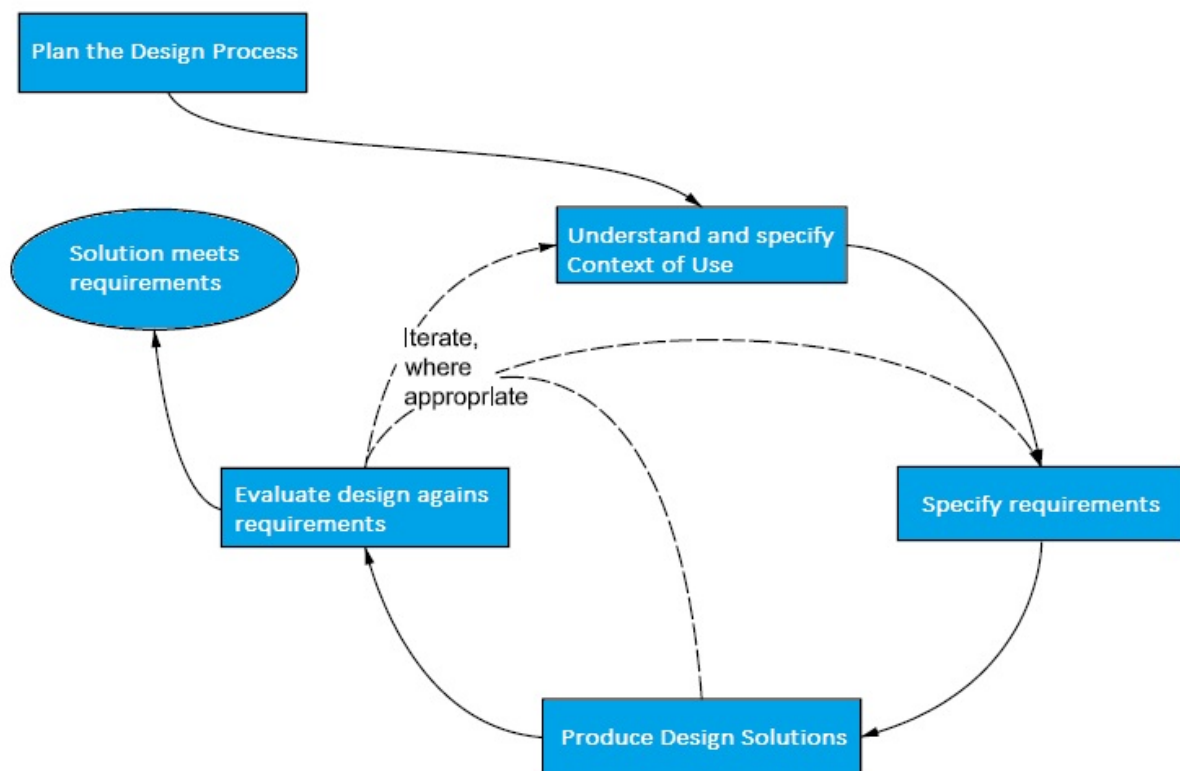


Figure 1. Human-centered design process from ISO-9241 (2010) Retrieved and redrawn from:

<http://2011.hci.international/index.php?module=webpage&id=35>

2.1 Context analysis of health, safety and environment training

To design a functional solution, a small focus group was created with one HR representative, HSE manager, department leader for casting, one IT representative, and one independent safety delegate, besides the two authors of this thesis. The HR rep and HSE manager expressed that among the 270

employees, there are 27 nationalities, all with different level of education, where only a small number of employees are holding a university degree. Of 270 employees, approximately 65% works in manufacturing. All focus group participants agree on aluminum casters being a dying trade, and that new employees are trained within the company. Employees at BAF are full time and part time shift workers and holiday workers. Beside regular BAF employees, there are external contractors working on BAF site. Everyone residing or performing working activities at BAF must undergo HSE training. The HSE manager states that HSE training is often done one on one or in small groups. Bigger groups (10-15) can be trained together, but this is not desirable. The HSE manager also adds that everyone visiting BAF needs a minimum of safety training where they must know where the meeting point is in case of a fire alarm. The current HSE training is a power point, presented by the HSE manager to the trainees, and lasts for approximately 30 minutes, followed by a written test. Table 1 illustrates the topics in the current HSE course.

1. Hva er HMS - holdninger og verdier.	12. Fallsikring*
2. Benteler politikk	13. Mobilt utstyr (truck, traverskran og lift)*
3. Brann- og evakueringsinstruks.	14. Farlig Rom*
4. Nødnummer BAF	15. Maskinsikkerhet.
5. TABU regler	16. Regler for bruk av verneutstyr.
6. Rapportering av ulykker og nestenulykker.	17. ISO-14001 og kildesortering av avfall.
7. Farer forbundet med varmt metall.	18. Maskin, Robot og propansikkerhet
8. Tag-/Lock Out (LOTO)*	19. Kunnskapstest.
9. Forbud mot brusflasker, lighter og mobil tlf.	
10. Adgangskontrollsystemet og nøkkelkort.	
11. Kjemikalier og HMS-sikkerhetsblader.	

Table 1. Current HSE topics overview

The test must be passed before the HSE training is considered valid. If the test is failed, the HSE manager orally guides the participant(s) through the test and the wrongly answered questions. Together they assure the participant(s) has understood the content and the meaning of the wrongly answered questions. The then the test is considered as passed. The same procedure is repeated for external contractors performing work at BAF site. Figure 2 illustrates the cycle BAF employees and external workers must go through before being allowed to perform work.

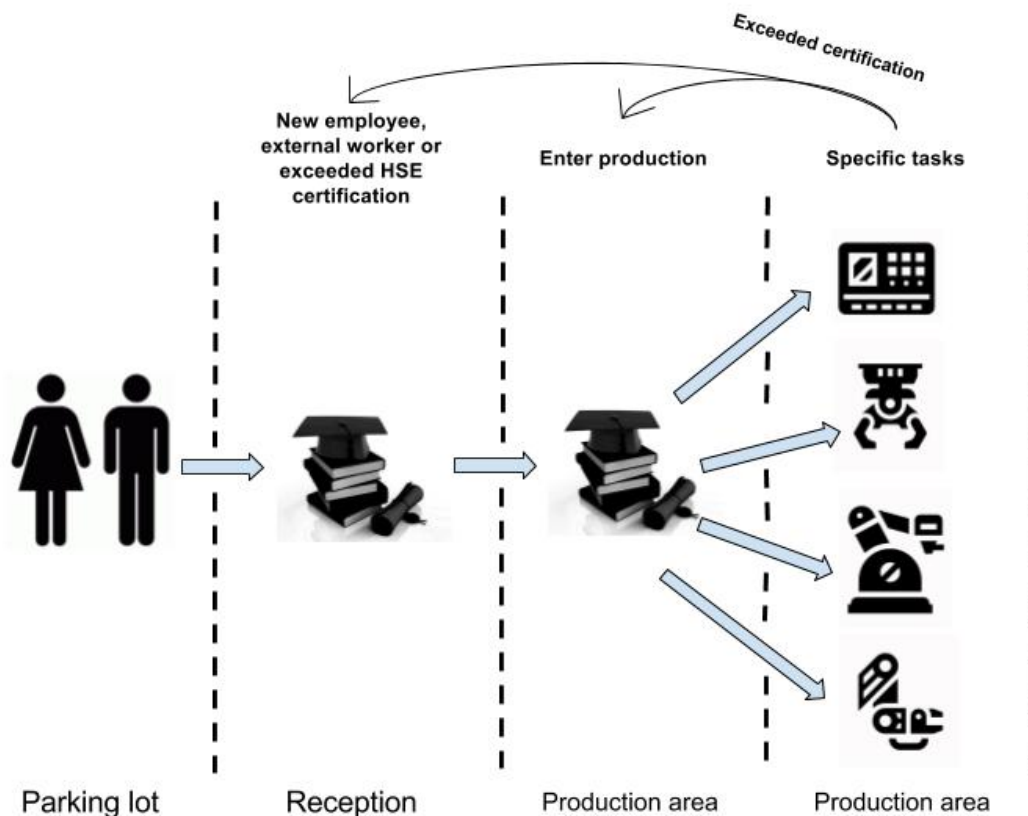


Figure 2. Training and competence cycle at BAF

According to Norwegian Working Environment Act §3-5, “the employer shall undergo training in health, safety and environmental standards”, and §3-2, first paragraph, letter b, “that employees charged with directing or supervising other employees have the necessary expertise to supervise the work being done on a health and safety conscious manner”. The safety delegate points out that himself and department leaders have attended a legally required, 40 hour HSE course, and that they cooperate to oversee this being maintained. The safety delegate adds that they can shut down manufacturing, and/or come with pointers on how to improve and quality assure HSE in the manufacturing area. For BAF employees and external contractors, HSE training is valid for three years, or if there are major changes either at BAF, or new procedures required by law. Summer employees and employees returning from an extended period of sick leave must also renew their HSE certification. The HSE manager are in control of everyone who has completed HSE certification. HSE certification is handled manually, and Microsoft Excel is used to handle list of names which are certified and who is closing in on renewal dates. An employee marked with green, has a valid certification, and employees marked in red, needs to renew the certification. The same goes for external contractors. A list of names of who is coming to work at BAF is sent in advance by the external company, and the HSE manager can check the names against his list. When asked about the course structure, and if there are any intended learning outcomes (ILO) tied to the course, HSE manager replies that the course is only in Norwegian, built up with text and

pictures, which needs renewal. Since the course is only in Norwegian, HSE manager underlines that he explains the content in English as they go through it. This leads to all representatives agreeing that a digital HSE course must be in Norwegian and English. He adds that normally employees participating in this training are only listening and seldom or never asks questions. In the current situation, the employees have no access to the HSE course before they see it being presented. By acting as the only source of information, the HSE manager explains how time consuming it is to handle this process manually, and express an urge for a system to automate this process, and that he is open for employees being able to contribute to a digital HSE course.

2.2 Requirements specification

A set of functional- and non-functional requirements has been developed to describe what the learning resource must do and should do. Since the intention of this project is to look at how the implementation of a digital solution will affect HSE training, the preferred LMS and the learning resource must be described in the requirements specification.

Three major requirements expressed by BAF on web-based learning as a solution for maintaining training and certification are:

1. Simplicity (Learning resource & platform)
2. Logging of activity (Learning resource & platform)
3. Warning of exceeded competence (Platform only)

2.2.1 Functional requirements

2.2.1.1 Logging of activity

Based on requirement 2, a decision to distribute content on a learning platform was made. Course instructors and other section leaders must be able to easily check their employees' certifications from various training. If documentation of completed training can be stored digitally, it will be easy to locate in case of a potential request by authorities due to accidents or regular check-ups. For this purpose, a choice was made to use an LMS, where individual users can log in and access the courses they are assigned to. External learning resources created with an authoring tool such as Adobe Captivate⁹, can be wrapped inside a standardized package which makes it possible to send data from the learning resource to the LMS. The two most common standards for wrapping eLearning content are SCORM and xAPI (TinCan). SCORM, or Sharable content object reference model, is a technical standard used to create eLearning products. When something is SCORM compatible, it means that it can "play well"

⁹Adobe Captivate – eLearning authoring tool: <http://www.adobe.com/no/products/captivate.html>

with other eLearning software. SCORM lets an eLearning software communicate and report to an LMS. It does not “speak” to instructional design or any other pedagogical concern – it is only a technical standard (scorm.com). SCORM can exchange important user data, such as where the user is in the system, time spent, passed/failed, scores etc. Despite the positive aspects with SCORM, there are no options for the eLearning resource to signal to the LMS when negative results occur, saying it should reset/not send if e.g. a score is too low and not passing the user (Bohl et al., 2002).

xAPI (TinCan) is a newer eLearning specification, which is designed to aid the learning community with a standard collection both formal and informal distributed learning activities (Kevan & Ryan, 2015). xAPI reports more detailed statements on the user’s activity using statements built up by a minimum of three parameters such as “Name”, “Verb”, and “Object”, saying e.g. John (Actor) read(Verb) Lord of the rings (Object) (Kevan & Ryan, 2015; TinCanAPI.com). xAPI uses a Learning Record Store (LRS) to store collected data and can be used without an LMS. xAPI is not bound to any device, and can be run through a smartphone application, serious game, simulations etc. It tracks data offline and reports to the LRS when it connects to internet (TinCanAPI.com) Kevan & Ryan (2015) addresses data policy and security as still a challenging area when implementing xAPI in an application, especially when trying to maximize student protection, and still be able to gather vital data and learning analysis. Alternative to using an LMS is to distribute the eLearning resource on a stand-alone web-site programmed from scratch, but for this project an LMS does the job required.

2.2.1.2 Warning of exceeded competence

Requirement 3 will automate the manual process BAF operates with today. As mentioned earlier, HSE manager must manually check his excel sheet and “flag” everyone with exceeded certification red, and invite them to retake the training before new certification are registered. To clarify, the platform used to test the digital HSE course module for this project, does not support this feature. Reason for continuing testing without this feature is because the University have access to enterprise version which lets students easily use the system with all its functionality. There are alternative providers which support this functionality, and one of them, DOCEBO¹⁰, has been tested. In the DOCEBO LMS, the instructor or administrator can specify number of days a certification is valid before it needs renewal. Course instructor can pre-write a message and schedule how close to the expiration date it will be sent out to participants of that course. Participants can also view how long their training are valid in different courses on their personal profile pages.

¹⁰ DOCEBO LMS. Available on www.docebo.com

2.2.2 Non-functional requirements

2.2.2.1 Navigable

To make navigation better for the learner, a navigation menu containing tabs for each main topic is available on each page. It allows the learner to freely navigate to the content they want, and complete each module in the way they want. If a learner gets interrupted, or need to exit the module before completion, it will automatically remember where in the module he or she left off, and continue from there the next time they enter the course.

2.2.2.2 Language

BAF employees represents a broad population of different backgrounds. Age differences from 18-62+, and educational level that varies from primary and secondary school, high school, and higher education. Also, a broad variety of nationalities sets requirements for an easy and understandable language.

2.2.2.3 Product quality

The HSE course module is implemented into a cloud-based LMS, and content exists of high quality videos and pictures which requires a stable high-speed connection either via WI-FI or mobile networking such as 4G or 4G+. It is important that this works well to be able to log in and attend the HSE course. Also, the HSE course reports progress, scores, and passed/failed status to the LMS. The usability test will reveal if these features work properly and without any critical errors.

2.2.2.4 Learnability

The users should quickly and intuitively understand how to execute the tasks, hence interacting with the HSE course.

2.2.2.5 Effectiveness

For the HSE course to be considered as effective, the users should be able to solve the tasks by themselves.

2.2.2.6 Usable

Participants being introduced to this method of training, should experience how easy attending an online course could be, which in some cases can be a barrier to not using eLearning. It is important for participants to quickly understand where to click to locate and start the course, hence completing the tasks. Important information should be clear to the participants leaving them to feel no confusion on where to click to progress.

2.2.2.7 Desirable

Since HSE course are mandatory for all employees and external workers at BAF, they are all forced to attend. Content should cause a desire to use eLearning, hence attending this HSE course as active learners, and evoke emotions with the participant letting them witness fatal consequences of not thinking HSE when working.

2.2.2.8 Findable

eLearning resources must be findable, meaning the participant should easily be able to locate specific content, navigate to the topic they prefer, or to pick up where they left off caused by interruptions. Findable goes very much hand in hand with usable, meaning an eLearning resource not being findable are also not usable.

2.3 Learning platform and course design

A learning platform, or learning management system has been selected for deployment of the HSE course module. Cypher Learning NEO LMS¹¹ provides the platform, and was selected due to UIA's access to enterprise version with all functionality and features. Other provides has been tested to identify specific functionality required from BAF Note that NEO is primarily a platform for educational institutes, and its twin MATRIX LMS is intended for business, but offers all the same functionality. MATRIX LMS does not offer any free trials and has not been tested. An LMS can be software- and cloud-based, and provides a platform for housing all types of eLearning content, and can track completion and score (Litmos¹²). In an LMS, an administrator or instructor can create their own space for learning with the support of HTML5, files, videos, quizzes, peer collaboration and so on. Administrators and instructors can also schedule reports, create assignments or send notifications to participants.

2.3.1 Course content

The content is based on the current HSE course at BAF. The Media in the current HSE course consists of text and pictures. To get a better understanding on the current situation on training, the HSE manager held the course for the design team as he would do for BAF employees and external workers. The design team was given access to the power point presentation and other relevant videos. After information was collected and suggestions for changes was discussed between design team and the HSE manager, the process of implementing and reshaping the course began. Changes has been made

¹¹ NEO LMS - <https://www.neolms.com/info/features>

¹² Litmos LMS - <http://www.litmos.com/>

where pictures and video has been reproduced, and text content has been rewritten and updated. The course is now an interactive module imported to an LMS platform. A decision to update pictures and create informative videos was based on the outdated- and low-quality material used in the original HSE course. Pictures was taken at BAF, to give the learners authentic material as reference when taking the digital HSE course. All pictures are taken with Canon EOS 700D and edited in Adobe Photoshop.

Videos in the module are shot at UiA with Sony EX1 XDCAM, and edited using Adobe Premiere. In some videos, voiceover is used to describe the action seen on the screen. Voiceover is recorded in an authentic sound studio using AKG studio microphone and Logic Pro X for Macintosh.

All videos are created using authentic workwear, such as fireproof clothing, helmet, eye- and ear protection, safety shoes, and without any “prohibited accessories” that are not allowed at BAF manufacturing area. Safety equipment are borrowed from Univern Arendal¹³. Videos are shot at UiA due to difficulties in filming at BAF, since all visitors need to be under supervision by BAF employees whenever visiting the manufacturing area, and this made it difficult to plan and execute filming there. UiA’s basement were used to illustrate a locker room.

2.3.1.1 Interactivity

As an attempt to engage the user, various interactive elements have been added which require the user to be active learners. One exercise is a drag and drop task, where the user is asked to place different equipment or accessories in their locker or in the manufacturing area. By letting the user “play” with these exercises, he or she must activate their cognitive processes, and physically put items in the correct place. In addition to this, links and buttons to show/hide content and play audio are used to provide the user with additional information on a topic. Interactivity also includes a menu containing tabs for each of the main topics in the module. This is accessible for the user through the module and lets him or her navigate as they please.

2.3.1.2 Videos

Videos used in the HSE course module are informative, and is meant to give users a clear understanding to a topic. To minimize effort needed to view a video and increase the amount of information retained by watching, they are kept short. There are different types of video, where you in one video can see and hear a “course-instructor” providing the user a short lecture about a given topic. In other videos, the user can hear the same instructor explaining what is happening when seeing an actor dressing

¹³ Univern Arendal, provider of work wear and safety equipment for carpenters and oil- and offshore industry. <http://www.univern.no/nor/Verneutstyr>

accordingly, or witnessing a real-life accident. These techniques are used to create authentic content. Videos are also used as an addition to text, to provide the user with more information.

2.3.1.3 Images

As a supplement to text, different images have been used to provide the user with realistic graphical content to enhance the effect of information from the text. This can be examples of injuries, correct use of equipment and other.

2.3.1.4 Audio (voice-over)

Buttons triggering short optional information audio captions is applied to provide the user with information which might be perceived as “too much” if it were presented as text. This information is not redundant, but provides the user with additional information on a topic.

2.3.1.5 Text

Text is kept to a minimum as an attempt to reduce amount of reading required by the user. Long sentences and phrases are translated into shorter, more informative, topics, sentences, and/or bullet points. Text is never used as the only source of information, and is always supplemented with pictures, video, or audio (voice-over).

2.3.2 Course structure

According to Govindasamy (2001), eLearning content must be shaped into smaller chunks known as learning objects. Learning objects are small units of instruction that can be taken as stand-alone units. The course is therefore divided into five small modules with a test after each, as well as a finishing test to verify HSE training. The user must have an 80% score within each module to advance to the next. The built-in tests inside one module, are not constrained to x number of tries, with the option to review the answers. These tests are intended to help the learner to evaluate if he or she has understood the content. Inside the LMS, the module is marked as “passed” or “completed” as soon as the learner has passed the test. The final test acts as documented HSE training, and is only available after each of the five modules are completed. This test is set up within the LMS, and makes it possible for each learner to navigate back to a specific module to review necessary information before completion. As mentioned, this test works as HSE documentation and will be stored to the LMS, on the specific learners account, accessible for HSE manager and section leaders to check the employees HSE documentation. Each module follows a non-linear storyline, giving the learner the freedom to complete the course as they want to.

2.3.3 Course schedule

The course is divided into five modules. The modules were originally intended to be finished within 5-8 minutes, but due to further development the estimated time frame has been increased to 8-12 minutes.

2.3.1.1 BAF employees

All employees must in the beginning of their career at BAF, and every third year undergo HSE training. When using the digital HSE course, the HSE manager is not required to be present.

2.3.1.2 External workers

HSE manager can generate users within the LMS, and send an email to access the platform prior to their arrival. Training must be completed and passed before they can perform work at the BAF site.

2.4 HSE course prototype

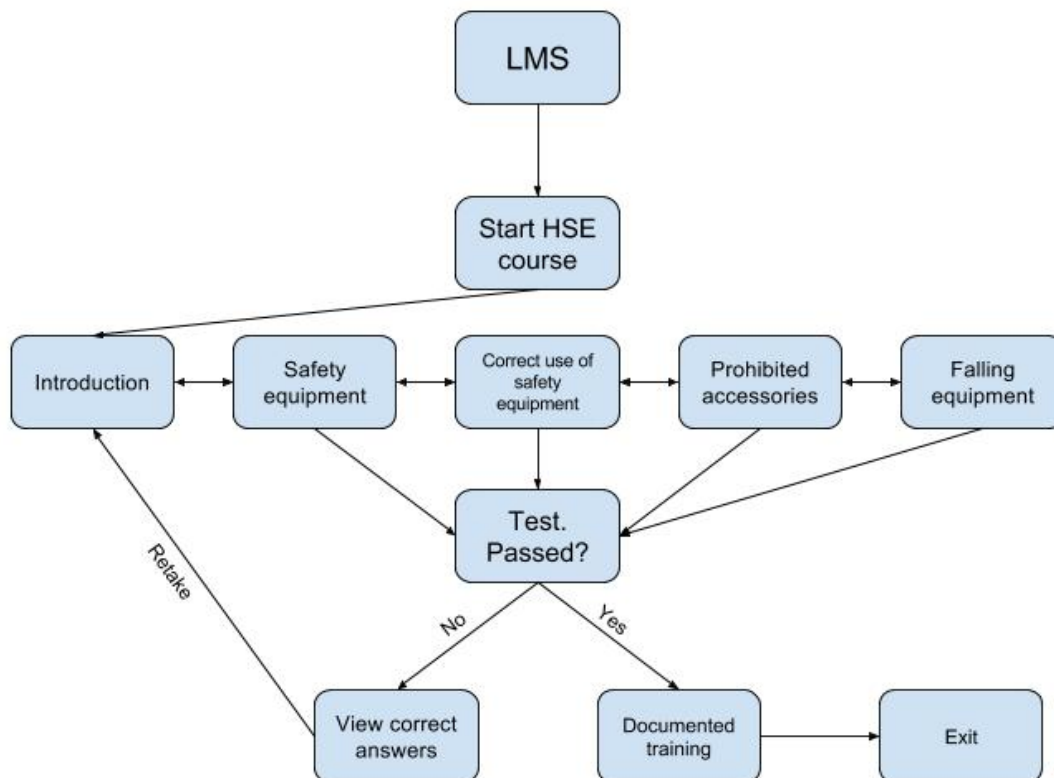


Figure 3. HSE course conceptual model of prototype

Prototype testing was conducted with the focus group. The purpose was to evaluate the design of the resource against the requirement specification at an early stage in the design process. Figure 3 illustrates the HSE course conceptual model which is used to illustrate the superior representation. The test assumes that the user has logged in to the LMS and navigated to where the HSE course module is located. User feedback starts from that point. The first impression was a positive attitude towards the “natural” build-up of the introduction screen, with keywords of the content and the specified ILO’s. The highlighting of active- and clickable tabs that help users to be aware of where they are in the module, and makes navigation to a specific topic easy was mentioned. When progressing through the module, ILO’s are always available in the bottom left of the module. “An important factor”, stated by HSE manager. Both HSE manager and HR representative pointed out that there is too much text in some of the slides, which can confuse or demotivate employees to read it. Suggestions to make it shorter or support it with video were made.

It was informed that videos would be implemented to the module. One feature within the resource is the drag and drop exercise, where the employees should take their personal belongings which are illegal to bring with them to the manufacturing area, and place it in their locker. The HSE manager and HR representative showed their concerns on the drag and drop feature, in the way that they fear that the employees would not understand what they should do. Designers explained that this potential challenge will be examined further in the usability testing. The design team had before the prototype test identified this as a potential challenge, and due to the concern that the users may not understand how to interact with the drag and drop feature, an informative text box is presented before start.

Overall, the focus group was happy with the resource, and again emphasized that they were satisfied with the course being divided into small modules. It is important to add that prototyping was conducted based on needs and requirements from the BAF administration. A usability test will reveal if the structure and design, hence the UX of the HSE course are well received by employees.

3.0 Theoretical considerations for multimedia supported learning

3.1 Andragogy - adult learning

According to Knowles (1973) andragogy is the theory of adult learning, and as he understood, andragogy is "*the art and science of helping adults learn*" (Knowles, 1973, p.54). A person is adult to the extent that he or she perceives themselves as responsible for their own life (Wlodkowski, 2004) - hence their own learning. Theories regarding adult learning is based on the characteristics of adults as learners, and therefore result in a differentiated educational practice than other learning theories that are based on research on learning children (Knowles, 1973). Adults learn different from children as they have knowledge, values, relationships and intentions that can influence the way they learn (Lowy & Hood, 2011, p. 267). Since individual differences between people increase with age, adult education must make optional provision for difference in style, pace of learning, time and place (Knowles, 1973 p.31). On the contrary, it does not mean that learning theories based on teaching children is irrelevant. 21st century skills¹⁴ is seen as a requirement to be successful today, according to Rotherham & Willingham (2010). The 21st century learning framework describes the skills, knowledge and expertise students should have to succeed today (Johnson, 2009). This also applies to adult learning concerning digitalized learning solutions (eLearning). With new approaches to learning which has been increasing the last decades, concerns about technology acceptance and digital literacy has appeared.

Prensky (2001), and Vodanovich et al., (2010) suggest that there is a difference between people being born in the digital age, and people being born before the time of internet and all the technology being used today. They refer to them as "Digital natives" and "Digital immigrants" and states that digital natives born in the digital age, are assumed to be inherently technology-savvy. Digital immigrants are not born in this digital era, and have learnt to use technology and information systems at some stage in their life. Digital immigrants may even resist technology, or at least having difficulties accepting it. Adult learning is not a new phenomenon, as Wlodkowski (2004, p. 141) stated, "*Today, for most adults, formal learning - whether through workplace training, a college class, a website, or an elderhostel course - is a way of life*". We learn as long as we live, but how do we *help* adults to learn? According to Wlodkowski (2004), motivation is the key to adult learning, as adults want to make sense of their world, find meaning, and be effective to what they find valuable in their life. The "*need to know*" paragraph from the andragogic model assumes that adults need to know why they need to learn something before learning it (Knowles, 1973). If the learner knows how to apply their taught knowledge in

¹⁴ Partnership for 21st century learning. Available at <http://www.p21.org/our-work/p21-framework>

practice, they will also probably learn more. When adults see what they learn makes sense and is important to their perspective and values, their motivation rises (Wlodkowski, 2004).

3.2 Pedagogical approaches in online education and training

Behaviorism, cognitivism, and constructivism are according to Siemens (2005), the three most used learning theories when creating educational environments. Siemens underlines the important fact that these theories were developed in a century where technology was not near the advanced levels where it is today. He indicates with this a need to look for alternative theories which utilizes the technology we live side by side with today i.e. high speed wireless internet, smartphones and social media. Siemens (2005) introduced "connectivism" as a more applicable term for the learning theory needed to succeed in the 21st century. The HSE course must attempt to reach higher on the Blooms taxonomy pyramid than only the first level where learners should remember and recall facts and basic concepts. There are many ways to look at learning, but the resource developed for this research is a generic resource, and is not intended to measure any learning outcome. Therefore, the traditional learning theories lapses. It could have been an option to discuss Siemens (2005) term, connectivism and 21st century skills, but for this thesis, it is peripheral, and it has therefore been chosen to leave this out.

3.2.1 Blended learning

A combination of face-to-face and technology based learning, referred to as blended learning, are increasingly being adopted in higher education (Porter, Graham, Spring & Welch, 2013). While blended learning in many cases overtake traditional learnings place in education, it is tempting to see if this learning style is adoptable for company training. Within a blended learning approach lies classroom learning, informal learning and micro learning. Classroom learning, which are the classical face-to-face interaction between employees and instructors. It is a time-consuming process, and can be costly due to preparation and execution. Memory retention in this kind of learning environment are often low (Avery, 2016). Informal learning with the 70:20:10 model (Avery, 2016; Docebo, 2015), where 70% are informal, on-the-job training, 20% are coaching, mentoring and/or peer review, and the last 10% are formal learning interventions and structured courses (Docebo, 2015). This model emphasizes employees to enhance their learning effectiveness with a focus on experiential activities (Avery, 2016). Micro learning, where managers and employees takes charge of their own learning with smaller and more digestible content not lasting longer than the average span of attention (Avery, 2016). Amory (2012), mentions that the use of technology as a tool in blended learning, must not be used to extend

the behavioristic approach, using technology to act as the teacher, only delivering content, but instead function as an object of the learning, supporting learners in their progression.

3.3 Digital literacy and technology acceptance

A concern which is important to consider when designing an interactive system, is the level of digital literacy amongst users. Gilster (1997, p.33) defined digital literacy as *“the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers.”* A more current definition of digital literacy concerning functionality, claims that digital literacy specifies the basic skills required to initiate activities using digital devices (Buckingham, 2006). This definition is mainly concerning certain functions the user must be able to operate, not the whole aspect of digital literacy. Digital literacy is a major issue concerning the use of digital devices considering that only 5% of the population has high computer-related abilities (Nielsen, 2016). A research conducted by The Organization for European Co-ordination and Development (OECD) reports that there is a major difference in digital literacy between the tech elite and the broad population. The study is based on 215,925 adults (16-65 years old) in 33 industrial countries. The results of the research indicated that 29% of the adult population has poor technology proficiency and 14% is below level 1 in technology proficiency. The tasks required to reach such low levels of digital literacy was to be able to delete an email, or search for emails from a specific sender. Only 5% of the adult population are considered digital literate, where the participants in the research managed to use tools that is required to solve a problem that involves multiple steps and operators (Nielsen, 2016). Because of the variety in age, nationality and level of education in the workplace, digital literacy considerations must be considered when designing an interactive system that is intended for all employees within one corporation. The user may not be able to use the system, and to rely on your personal capability while designing an interactive system is misleading and irrelevant for the actual users (Nielsen, 2016).

3.3.1 Technology acceptance

Technological acceptance models try to explain to which degree a user of information technology and information systems accept this technology or system. Such models can support managers and leaders to assess the success of the introduction of technology to the organization, and motivate users to accept the systems (AlQudah, 2015). Tan (2013) writes that if a user of eLearning systems believes that the use of it can help them increase their performance, and that these systems are easy to use, it can result in an increase in the user's intention to use it. Tan (2013) suggests that because of this, designers of such systems should work to improve knowledge management functions and user interfaces to be

easier to operate. Venkatesh, Morris, Davis & Davis (2003) developed a model for measuring technology acceptance among users of technology based Information Systems (IS). Venkatesh et al., based this new model on the most important factors from prior technology acceptance models such as Theory of Reasoned Action (TRA) by Fishbein et al., from 1975, Theory of Planned Behavior (TPB) by Ajzen from 1991, Technology Acceptance Model (TAM) by Davis from 1989 and other models (Long, 2010). Venkatesh et al., (2003) states that researchers must often “pick and choose” constructs from different models, or they must select a favored model and more or less ignore alternative models. By doing this, Venkatesh and his peers aimed to develop a unified view by eliminating redundancy and repetitions since many of the constructs in other theories were common. Like the previous theories and models in the field of technology adoption, Unified Theory of Acceptance and Use of Technology (UTAUT) facilitates in examining user’s intentions to use IS and eventually usage behavior (Dwivedi, Rana, Chen & Williams, 2011). Two significant factors from the TAM, illustrated in Figure 4, by Davis from 1989, and the extended TAM, TAM2 by Venkatesh and Davis from 2000, perceived ease of use (PEOU) and perceived usefulness (PU) played an important role in defining this new model, UTAUT.

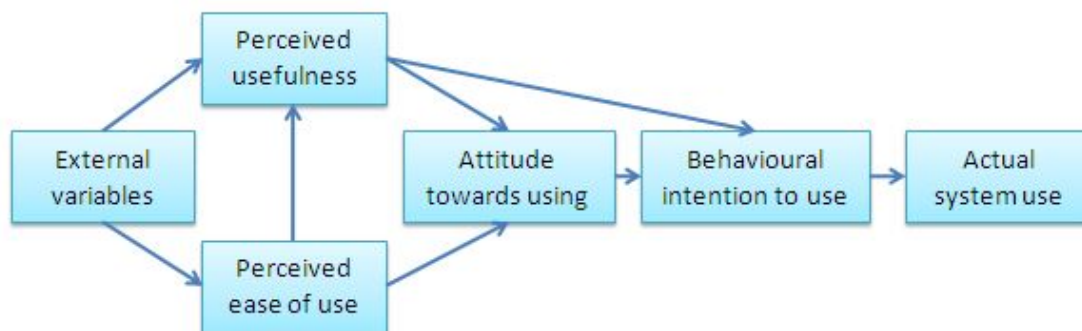


Figure 4. Technology Acceptance Model by Davis et al., (1989) Retrieved from: <http://www.informationr.net/ir/16-2/paper478.html>

Perceived usefulness - “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320)

Perceived ease of use- “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320)

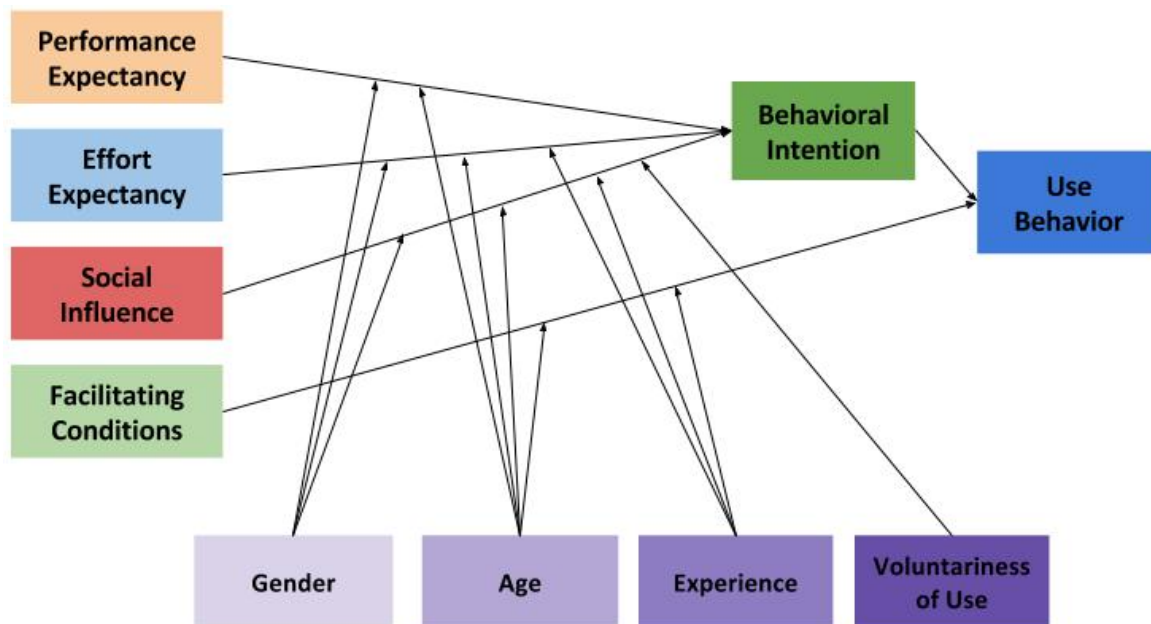


Figure 5. Unified Theory of Acceptance and Use of Technology by Venkatesh (2003) Retrieved and redrawn from:
http://www.jstor.org/stable/30036540?seq=1#page_scan_tab_contents

It is suggested by the UTAUT model, illustrated in Figure 5, that behavioral intention (BI) is affected by three main constructs. These three are performance expectancy (PE), effort expectancy (EE) and social influence (SI). These constructs are defined as followed:

Performance expectancy - *“The degree to which an individual believes that using the system will help him or her to attain gains in job performance”* (Venkatesh et al., 2003, p. 447).

Effort expectancy - *“The degree of ease associated with the use of the system”* (Venkatesh et al., 2003, p. 450).

Social influence - *“The degree to which an individual perceives that important others believe he or she should use the new system”* (Venkatesh et al., 2003, p. 451).

UTAUT also suggests that facilitating conditions (FC) influences the actual use of the IS, or more specifically the use behavior (UB). This construct is defined as following:

Facilitating conditions - *“The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system”* (Venkatesh et al., 2003, p. 453).

These in total four key independent constructs are all direct determinations of usage intention and behavior. They are all affected by four moderating variables; gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). Suggested by Venkatesh et al., (2003), gender, age and experience are the three variables with the most influence on the different constructs. Akbar (2013) writes that UTAUT study focuses on newly introduced technology, and will capture users first

perception of it. Akbar (2013) writes that if a user has previous experience with using similar technology, the perception will change. One objective in this thesis is to investigate factors in the UTAUT model and how employees at BAF think and feel with regards to them. PE, EE, SI, and FC are being measured with the use of pre-defined items or statements which the participant should relate to and answer. Two constructs (PE and EE) are matching very well with UX, and will therefore be emphasized further than the two last constructs. PE and EE are both influenced by gender and age, which will be the two main variables when interpreting results from surveys. Items in the UTAUT model by Venkatesh et al., (2003) are collected from eight previous models. Venkatesh and his peers did this to move towards a unified view where one model could replace eight old ones. UTAUT was then tested by participants at BAF through two iterations of usability testing where the first iteration focused on UX and UI, whereas the second iteration also focused on technology acceptance. However, SI and FC are not to be forgotten. Each participant responding to the survey regarding UTAUT items are also responding to constructs on SI and FC. Further, HR department at BAF has expressed big interest in the field of eLearning and seems to be welcoming new trends when it comes to technology-based learning. HSE training is mandatory for all employees and external workers performing work at BAF. Therefore, BI and AU are not addressed at all. All employees must comply with BAF guidelines. Even so, training should be perceived as valuable by the employees.

3.4 Usability and user experience in online learning

"The original definition of usability is that systems should be easy to use, easy to learn, flexible and should engender a good attitude in people", according to Shackel, (1990), (Quoted from Benyon 2014 p.76). Usability means to focus on the users, where the users determine if a product is easy to use. *"Usability is an attribute of every product - just like functionality. Functionality is what the product can do, and testing functionality is making sure the product have the functionalities required to the specifications"* (Dumas & Redish, 1999 p.4). Usability can be designed when the user's needs are known and understood. The functionality may be high, but it must be usable so the people can use them quickly and easily to accomplish their tasks (Dumas & Redish 1999). Goals of usability is mainly concerned with efficiency and effectiveness of systems (Benyon, 2014, p.76). Usability must be built into design from the beginning of the design process by including the users. Usability is highly connected to human-centered design.

3.4.1 User experience (UX)

User experience regards meeting the exact needs of the customer. Norman & Nielsen (n.d.) defines UX as *"encompassing all aspects of the end-user's interaction with the company, its services and its products"*. Product design is often developed in terms of aesthetic appeal and functionality. A product

that looks great and function well are considered a good product design. Aesthetic appeal creates a first impression as well as attention, and a product must work and be functional to its purpose (Garrett, 2010). UX design looks beyond the functionality and aesthetics of the product, and must be distinguished from usability and user interface - as these are minor elements to the overall UX. UX includes the whole spectrum of interacting with a system or a product, from the moment you first see it in a store or on a website, until you are done using it. This also includes how easy or pleasurable it is to use (Leavoy & Biraghi, 2017; Norman, n.d.). The users should not experience errors which may lead them to feel stupid due to an incorrect use of the system, which originally comes from poor design. Terms, such as usable, desirable, findable etc., described by Morville (2004), in his “honeycomb”, illustrated in Figure 6, should be taken into consideration when designing a product or a system.



Figure 6. The User Experience Honeycomb (Morville, 2004), retrieved from http://semanticstudios.com/user_experience_design/

For the design of the HSE course module, the UX honeycomb are used as inspiration on how to provide the user a good UX. To limit the scope of this project, focus on UX elements are; usable, desirable and findable. These factors emphasize that the system should be easy to use (usable), desirable in terms of implementing design elements that evoke arousal to the user, and navigable where the user easily can navigate in the system and find what they need (User Experience Basics, n.d; Morville, 2004). Concerns regarding digital literacy may rely on the UX, if the UX is good, this may implicate that the user most likely could use it, as well as they would want to use it again. The practice of creating great UX can be found in the user-centered design process (Garrett, 2010). Specifications, user requirements, interaction design and interface are all elements that together construct the basis of UX design.

Besides from the importance of UX, *learner experience* is another element regarding the UX in this context. UX and learning experience goes hand in hand when designing eLearning resources. Leavoy & Biraghi (2017) describes learning experience in their report as something that builds on UX towards learning and eLearning. Learning experience although, is not limited to computer-based interactions, but covers the entire area of the learning experience which includes learning methods like eLearning, social learning, classroom learning and experiential learning. Elements of a great learning experience are somewhat akin to the elements of UX. The elements regarding learning experience within eLearning according to Leavoy & Biraghi (2017), are that it should be easy and fun to use, with a minimum of training needed.

3.5 Memory retention

Memory is the mental ability that enables one to retain and recall previously experienced impressions, information, and ideas. The ability to retain and use gained knowledge is essential in the process of learning. (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition, 2003). In multimedia learning, where material is presented using words, video, audio and pictures, learning is involved placing presented information into one's memory for long-term storage (Mayer, 2009). Multimedia learning takes place in the working memory, which is used for temporary holding and manipulating knowledge, and has a limited ability to hold onto and process a certain amount of knowledge at one time (Mayer, 2009, p. 62). Working memory refers to the ability to store new information, retrieve stored information and hold information without awareness, according to Lesch, (2003, p.495). Information must be brought to the working memory to be stored in the long-term memory (Mayer, 2009). Long-term memory can hold large amounts of knowledge over long periods of time. Figure 7 illustrates *"the cognitive memory model of multimedia learning, intended to represent the human information-processing system"* (Mayer, 2009 pp.61-62). The information provided is seen or heard in sensory memory, where the cognitive senses are stimulated and information gets transferred to the working memory, where the central work of multimedia learning takes place, then stored in the long-term memory with some structural steps along the way.

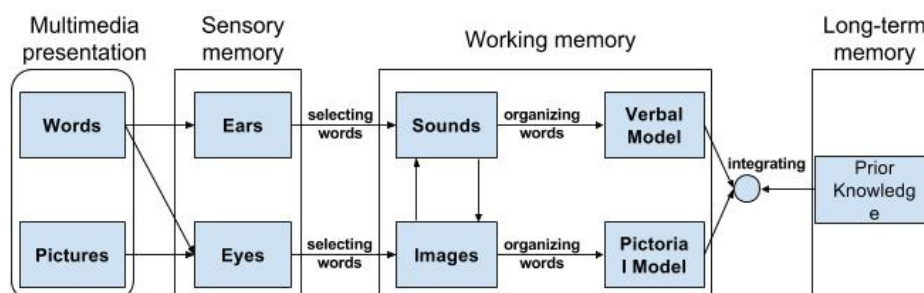


Figure 7. Cognitive theory of multimedia interaction. Retrieved and redrawn from "Multimedia Learning" R.E. Mayer (2009)

3.6 eLearning design theory

For the purpose of this research, one complete HSE course module were developed and tested. The module is an interactive learning resource which is developed based on ISO-9241, design theory, learning theories and requirements from BAF.

3.6.1 Interactivity and multimedia

Evans & Gibbons (2006) claims that interactive systems promote deep learning by engaging the learner in the learning process. *“Interactivity is a complex, dynamic coupling between two or more intelligent parties”* (Palacios & Evans 2013 pp. 23-24). Interactivity change the way an individual behaves by increasing individual control over his or her own learning (Rogers, from Palacios & Evans 2013, p.1), and enhance the quality of educational material, which can promote learning (Domagk, Schwartz & Plass, 2010). People are interacting with their environment and absorbing knowledge or creating new experiences based on previous experiences from an early age (Hofer & Pintrich, 1997), due to this, an interactive eLearning resource can promote learning where the user are active within the system, and exposed to realistic experiences as they would in real-life, with acting upon the tasks and interactions. Interactivity promotes self-paced learning, and students that can control their own pace while learning in a computer-based environment, are more likely to be engaged in complete cognitive processing, hence achieve deeper learning (Mayer, 2003).

In the attempt to achieve learning effectiveness and preserve the requirements to the eLearning module, multimedia was added to the module to create attention and motivation for the user. The goal is to avoid information overload, in which the HSE course is self-paced, hence the user will experience individual learner control. Different types of media are often combined in eLearning resources. The aim is to engage the learners to be focused on the content by promoting arousal and engage the learner with the media components that are implemented. Multimedia presentations engages the user since they stimulate human senses by combining sounds and images, and by applying multimedia to eLearning can offer new perspectives compared to static content presentations (Palacios & Evans 2013). Another argument of why multimedia has been added, is with basis of theory on memory retention, not only for the purpose of arousal and excitement, but to increase the chance of memory retention to the trainee which is described in chapter 3.5. The multimedia that is integrated in the module, is based on recommendations created by Sutcliffe (2012) from the Human-Computer Interaction Handbook. Multimedia learning is described as an effective method for meaningful learning, by achieving memory retention and understanding (Mayer, 2009).

3.6.2 Video and images

Video is a powerful medium often used in eLearning, which can present information coherent and attractively (Zhang, Zhou, Briggs & Nunamaker, 2006). Educators have recognized the power of using audio-visual materials to capture the attention of learners to increase their motivation and enhance their learning experience. Non-interactive video has not been sufficiently effective in learning, because the learners are passive in the learning process. Because of the lack of individual control where the learner cannot jump to a particular part of the video, the linearity of non-interactive video may severely reduce the potential effect of video in online learning (Zhang et al., 2006; Choi & Johnson 2005). Non-interactive video can have a negative effect because the learners lose the opportunity of self-paced learning and may lose their focus and motivation to finish. Videos used in the HSE course module are linear, but the user can watch the videos in their own pace with a play bar, and the option to skip the entire video. This does not mean that the videos is interactive, an interactive video supports user interaction with hotspots or other clickable areas, which video in the HSE course module does not. A rule of thumb when using videos in education and training is to keep them short and concise (Avery, 2016). When using video as a tool to transfer information, the length of the video is essential to keep the viewer focused. If a video exceeds the attention span of humans, the viewer is likely to lose focus, hence not acquiring necessary information. Gou (2013), writes that students engages more in shorter videos, claiming six minutes are the ideal length. Gou further states that there are minor differences when it comes to certificate-earning students, which may indicate that extrinsically motivated viewers attend a video longer because they “have to”. Hornung¹⁵ (2014), founder and CEO of veed.me¹⁶, states that different types of video will have different optimal length, but informational videos, where the intention is to provide the user with an overview of something, should last between 45-90 seconds with a maximum of two minutes. Videos longer than two minutes can result in decreased engagement. Even though there is a gap between the ideal length of an informational video, referenced by Gou & Hornung, they both agree that videos should be kept short, and that videos may serve different purposes which might require it to be shorter or longer.

Images are used to draw attention and increase interest. "*Design that stimulate arousal are more likely to be memorable and engaging*" (Sutcliffe, 2012 p.390). The goal of the images is to be perceived as

¹⁵ Yoav Hornung is not a known researcher, and his article on <http://tubularinsights.com/optimal-length-tutorial-video/> has only been used as inspiration due to his knowledge about film and video.

¹⁶ Veed.me is a video creation marketplace that connects any business who needs a video with talented videographers. www.veed.me

realistic, arousing and engaging, therefore, realistic images have been implemented to the HSE course module to serve this purpose.

3.6.3 Audio - voiceover

As an addition to text and video, audio was implemented to promote additional information about the given topics on each slide. The audio in the module are represented as voiceover to videos (video-audio) and to compliment text paragraphs (text-audio). Audio content can be used as supplementary tool in eLearning because of its pedagogical advantages (Cebeki & Tekdal, 2006). Pedagogical advantages can be supporting those without the possibility to see content due to reduced vision, and can be a calm way to sit back and relax using hearing sensory.

3.6.4 Text

Considerations when adding text is the legibility, readability and highlighting of the text. Text inputs are reduced to a minimum. The goal is to make text as readable as possible. Guidelines based on Nielsen (2015) are used when rewriting curriculum for the course, where he guides to use a large font size, contrast between characters and background, shorter plainspoken words and short sentences. These considerations are considered because of the gap in educational levels at BAF, age gap and different nationalities. Users preferred method of reading text online is by “skimming” the text, which is enabled by chunking (Meyer, 2016). Chunking in UX design usually refers to breaking up content into small distinct units of information, where the text content is divided into smaller chunks to help users process, understand and remember it better (Meyer, 2016). Chunking can have a positive impact of the memory retention and ability to comprehend information for the users. The text in the module is divided into small chunks by using short paragraphs in bullet lists and short text lines to avoid walls of text where the user gets bored and confused.

4.0 Design research methods

4.1 Human-centered design

The design of an interactive system must be customized to fit the users' needs and requirements. There are several factors to consider when designing interactive systems like human factors, ergonomics, usability and techniques. To achieve human-centered design, the users should be included to participate in every step of the development, from the design planning to the testing and evaluation process (ISO-9241-210:2010, 2010)

4.1.1 Context of use

A description of the users characteristics and the actual conditions under which a given artifact or software product is used in a normal day situation (Interaction Design Foundation, n.d.).

4.1.2 Requirements

Requirements to the system must be defined based on the user needs that emerge in the research of their characteristics. Requirements should contain functional requirements, what the system must be able to do with the functional constraints of a system, and non-functional requirements, a quality the system should have (Benyon, 2014). Feedback from usability tests, user tests and the focus group must be considered in the following development of an interactive system.

4.1.3 Design solutions

After context analysis and specifying system requirements the development starts with implementation of functionality and content.

4.1.4 Evaluation

When the design process is finished, the designers should include the users in a usability test session, giving feedback in forms of questionnaires and interviews after the test has been conducted. The evaluation process determines if the requirements are fulfilled, or further development is required to satisfy the user's needs.

4.2 Usability testing and prototyping

Usability testing is a method used in human-centered design, a systematic way of observing actual users testing a product. A usability test will determine if the product is easy or difficult to use (Dumas & Redish 1999). The goal of usability testing is to find out if the system is successful for the job it was designed for, to improve the usability of a product, and to diagnose problems in the system (Rogers, Sharp & Preece, 2011; Dumas & Redish, 1999). A central component to usability testing is collecting information about user performance on a predefined task (Rogers et al., 2011). The participants represent real users with real tasks that are being monitored by the design team. Data is analyzed and problems are diagnosed to make changes (Dumas & Redish, 1999). There are several methods to conduct usability testing. For this project, two iterations of usability testing have been completed.

4.2.1 Prototyping

To develop a prototype and invite users and stakeholders to participate in a trial-run of your application can provide the design team with important feedback on your design choices and the UX. Prototypes are not only minimalistic editions of a software or a house, it can be drawings, videos, a collection of wires or even a paper prototype where the reason for testing is purely conceptual (Preece, Sharp & Rogers, 2015). A prototype can support stakeholders while discussing and evaluating ideas, and are often more easy to relate to than discussing ideas. Prototypes are valuable for the design team and can be effective when exploring new ideas. Low- and high-fidelity prototypes are two common types within interaction design and prototyping. Low-fidelity prototype (LFP) has lower development cost, and is usually a proof of concept where multiple design concepts can be evaluated. An LFP will normally only provide the user with an overall image of the product which are limited for usability testing. High-fidelity prototypes (HFP) represent the systems complete functionality and are fully interactive. This prototype can and should represent the look and feel of the final product, and only minor changes/updates are required before launching. HFP are time-consuming to create, but will generate reliable feedback after a usability test (Preece et al., 2015).

4.3 Quantitative and qualitative research

Quantitative study design is specific and well structured (Kumar, 2011). In quantitative research, the term reliability means that results are generalizable, and another researcher can achieve same results by transferring the experiment to a similar target group. *“Reliability, is used for consistency or stability of the measurements”* (Store Norske Leksikon, 2016). Qualitative study design only has a few or none of the attributes mentioned about quantitative research. Qualitative research is less specific and precise, but aims to understand, explain, explore and clarify situations, feelings, perceptions, attitudes, values, beliefs and experiences from a group of people (Kumar, 2011). Findings through quantitative

study designs can be replicated and re-tested whereas this cannot be done easily by using qualitative study designs (Kumar, 2011). To confirm that the questions from a quantitative study really answers what the researcher are asking, the degree of validity is being discussed. *“Validity, to what extent, from the results of an experiment or study, it is possible to draw valid conclusions about the purpose of investigating”* (Store Norske Leksikon, 2015). A combination of quantitative and qualitative study design has been applied in this research. Data retrieved from questionnaire was used to get an insight on who the employees are, how they perceive eLearning in the workplace, what they think about the current training situation, and motivation towards this method of training. The qualitative research was conducted with a focus group, usability test and user test with semi-structured interviews. To increase the degree of validity, interviews of participants who expressed their self in a very positive or negative direction, can be conducted to get a deeper understanding and clarification about their actual thoughts. If the interview reveals that the participant is answering what you are looking for, it contributes to a higher degree of validity. The method is flexible and invites the focus group and interview participants to express and explain their feelings and perceptions towards the topic that is being researched. To slightly increase the validity of this research, usability- and user tests with follow-up interviews are conducted.

4.3.1 Questionnaires

Questionnaires is a series of questions that is designed to be answered without the presence of the investigator. Questionnaires can be delivered on paper or online and is a well-established technique for collecting demographic data and users' opinions. It can be distributed to a major set of participants (Preece et al., 2015); hence more data can be collected. The questionnaire used in this study is digital and on paper. The digital version is sent out to employees registered with either a private email or BAF mail. Not all employees are registered with email, and to be able to reach them, a paper version identical to the digital version was created and presented by section leaders in weekly meetings.

4.3.2 Pilot study

Before sending out questionnaires to the main study, a pilot study should be conducted to make sure that the proposed method is viable before launching the real study (Preece et al., 2015). A pilot study of the questionnaires was conducted where the questionnaires were sent out via email to members of the staff at the faculty at UiA and peers from the study program. Respondents pointed out important issues with the questionnaire, which lead to re-phrasing and other adjustments.

4.3.3 Interviews and focus group

Six semi-structured interviews were conducted on the usability participants prior- and post usability test to investigate the design and usability of the HSE course, hence UI and UX. A semi-structured approach is a method chosen based on the desire that the test persons should be open and honest about their opinion and their perceptions of the system. Predetermined questions are presented the participant, but this method allows the participant to explore issues they feel are important (Longhurst, 2003). The interviews are based on an interview guide containing 19 questions that was formed concerning their perceptions of the system and current situation concerning HSE training, their relationship to HSE and suggestions for improvement of the system. The interview guide was used consistently, with follow-up questions where relevant. Of six participants, three were women and three were men with an age span from 31-60 years, where one of the participants was foreign. The participants were chosen on a basis that it was desired to test and interview people from different departments as they represent different groups of people with different competence and values regarding digital literacy, eLearning and HSE training. After finishing all interviews, they were transcribed and analyzed.

When there is a need for a deeper understanding than a survey or questionnaire can provide, a focus group can be a good idea. A focus group is a part of qualitative research where the aim is to dig deeper, rather than skimming the surface. This should be a small and safe environment where participants feel safe and relaxed, and can freely speak their own words and add meaning to their answers (Elliot & Associates, 2005). The idea behind a focus group methodology is when being a participant in a group, people may explore and clarify their views in a way which might not be as easy in one-on-one interviews. In such groups, researchers might also be able to communicate in other ways such as jokes, teasing and arguing. These are day-to-day interactions which people are familiar with and can encourage participants to speak more freely. When analyzing information from a focus group, it is important that the researcher distinguish statements and opinions expressed by individuals in spite from actual group consensus (Kitzinger, 1995). The focus group was formed by the design team with contribution from HR manager. The focus group was mainly used in the early stages with prototype testing before any surveys or contact with employees found place. A union representative was invited to join the focus group because there would later in the project be contact with employees in form of surveys and usability testing. To clarify and approve ways to communicate with employees, union must be brought to the focus group and informed about the projects purpose, and what employees who decided to participate to the research was partaking. Union representative is BAF employees, hence they can function as participants to evaluate prototype design on the same terms as other participants in the focus group.

4.3.4 Data analysis method

4.3.4.1 Transcription

Transcribing guidelines was applied when transcribing feedback from participants. Five interviews were in Norwegian and translated to English. The interviews are transcribed with the intelligent verbatim method where the transcriber does light editing to correct sentences and remove redundant or irrelevant words (Salonga n.d.). Based on McLellan, MacQueen & Neidig's (2003) article about data preparation and transcription, some guidelines for transcribing the interviews was constructed;

If an analysis focuses on providing an in-depth description of the knowledge, attitudes, values, beliefs, or experiences of an individual, a greater number and possibly tedious units of text need to be included in the transcript (p. 67).

What to include in the transcription should be driven by the research question that an analysis attempts to answer (p. 67). In these interviews the questions regards usability of the HSE course.

Basic information about the interview participant, covering a set of characteristics (pp. 67-68).

Establishing a format template so each transcript has an identical structure and appearance (p. 69). The interviews were transcribed by only one of the researchers by using one template for consistency reasons.

4.3.4.2 Data coding

When data is collected and there is an understanding of key experiences from a user study, coding can help with organizing unstructured data in a formal system, which can lead to discoveries of certain links between concepts or phenomenon's occurring during the test (Bradley, Curry & Devers, 2007). Codes can be keywords, tags or labels assigned to characterize an action, a sentence or behavior. Data coding in this research has primarily been used to identify positive and negative feedback on UI elements, and UX. Data coding has also been used to look for and identify specific happenings or phenomenon's in the user test, where participants were only asked to complete the HSE course as they would by themselves.

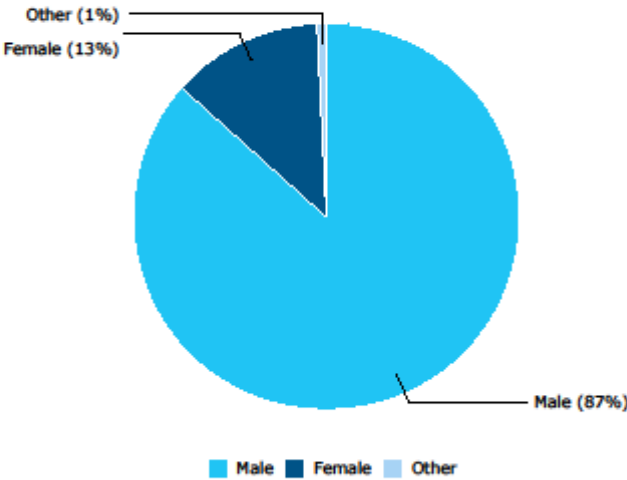
5.0 Findings and results

5.1 Findings from context analysis

n = 129 respondents.

Vital to this research is to look for indications of technology acceptance. The UTAUT model (Venkatesh et al., 2003) uses gender and age as two variables influencing the PE, EE and SI. The questionnaire shows that the ratio between men and women at BAF is approximately 85:15 in general, and the biggest age group is 35-44 (n=129), illustrated in Figure 8. Among these, almost 90% (n=129) answer that they own a digital artifact such as a computer and/or a smartphone as shown in Figure 9.

1. Gender



2. Age

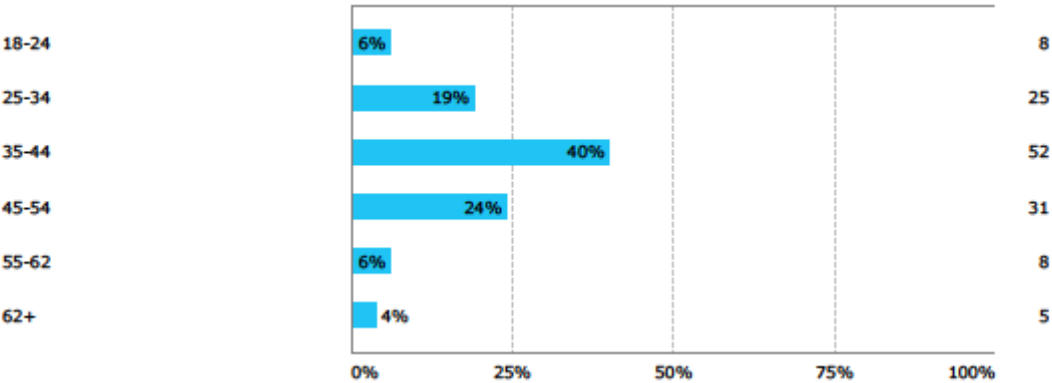


Figure 8. Gender and age representation at BAF.

Do you own a computer, smartphone or tablet? (Multiple Choice)

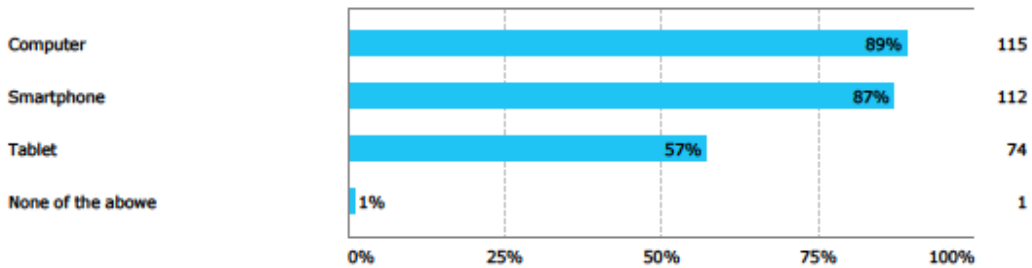
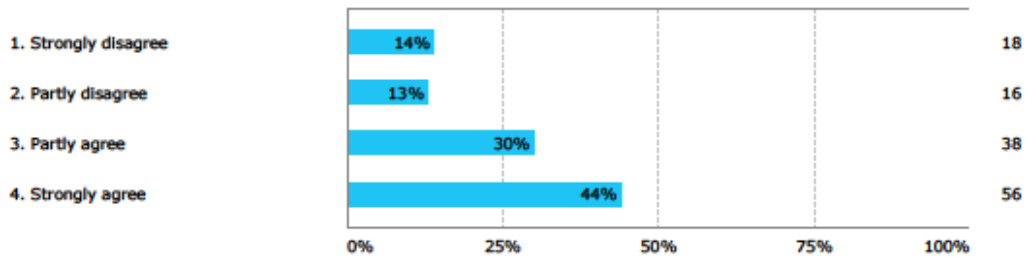


Figure 9. Digital artifacts owned by employees.

Employees are further asked if they like to use these devices for web surfing and social media. As Figure 10 illustrates, there is a significant positive attitude to employees partly- or strongly agreeing to this statement.

13. I like using my computer for web surfing and social media (News, Shopping, Facebook, YouTube etc.)



14. I like using my smartphone/tablet for web surfing and social media (News, Shopping, Facebook, YouTube, etc.)

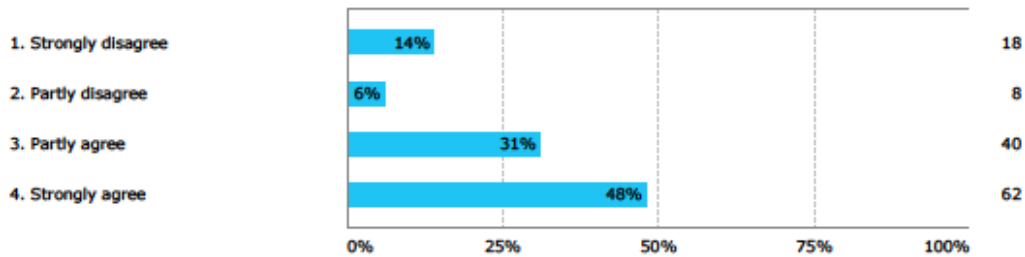


Figure 10. Employees attitude towards using devices

Male and female employees were asked if they must use computers at work to do their job. By grouping "Strongly and partly disagree", and "strongly and partly agree" together and looking at them as "Yes" and "No", Figure 11 illustrates that 82% (105 respondents) responds "Yes" and only 18% (23 respondents) responds "No" (1 respondent N/A).

15. I must use computers at work to do my job

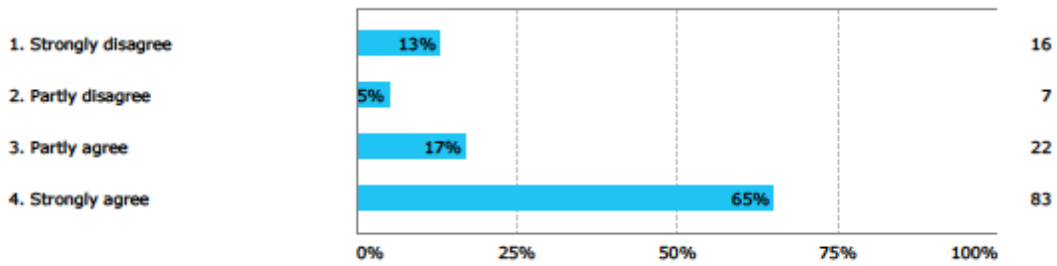


Figure 11. Men and woman needs to use computer in their job.

Even though men represent the majority of the respondents, Figure 12 and Figure 13 illustrates that there is a small difference in answers about computers making employees feel uneasy and/or confused. 100% of the women (16 respondents) states that they "Strongly disagree" with this statement, whereas only 76% males (82 respondents) states the same.

16. Using computers in my job make me feel uneasy and/or confused

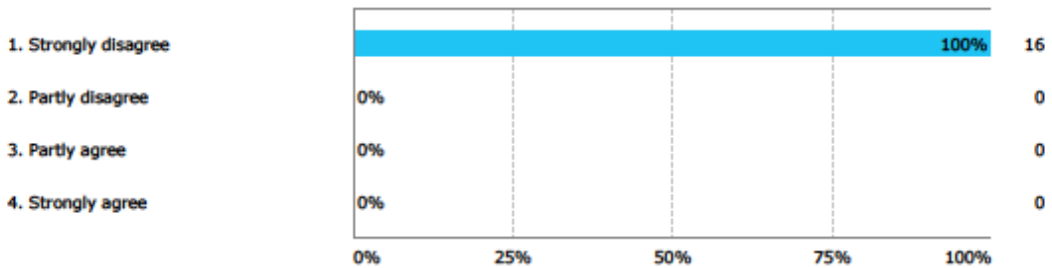


Figure 12. Female, feeling uneasy/confused by computer usage in their job.

16. Using computers in my job make me feel uneasy and/or confused

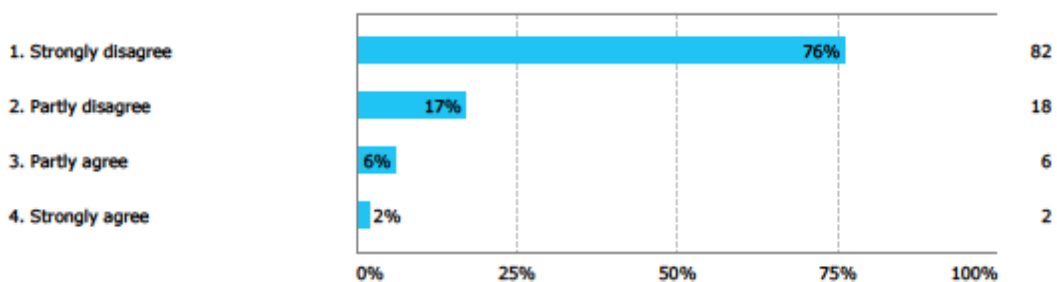


Figure 13. Male, feeling uneasy/confused by computer usage in their job.

Level of education varies, and in manufacturing (n=72), illustrated in Figure 14, 73% (52 respondents) have high school or lower, and 27% (19 respondents) have some form of higher education (university degree).

5. Education

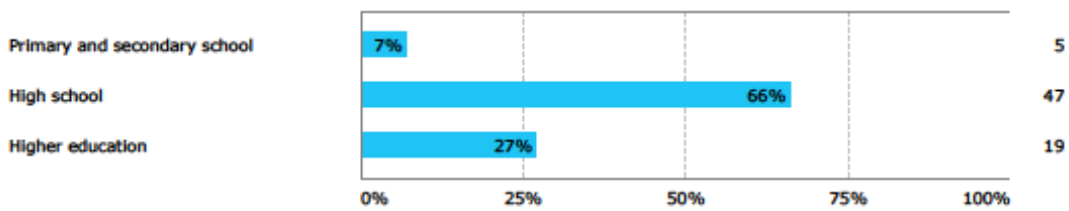


Figure 14. Educational level, manufacturing employees.

When being asked about how often employees are being trained in their job, a significant difference between administration- and manufacturing employees implies that training is not widely used for manufacturing employees. Figure 15, shows that 85% (11 respondents) of administration employees states that they are being trained in their job one to two times – or three or more times each year.

10. How often do you participate in mandatory training/courses of some sort in your job?

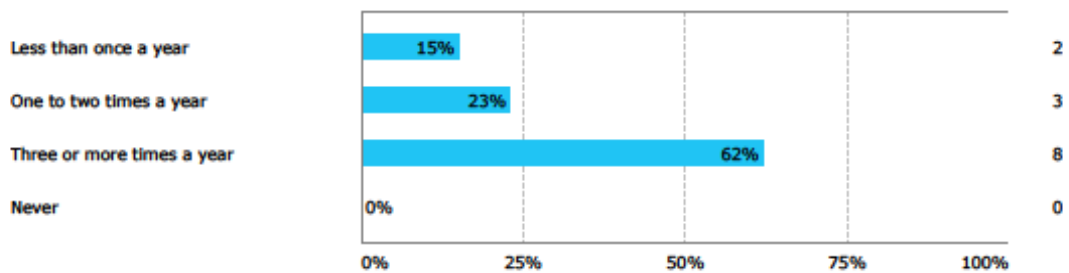


Figure 15. Administration employees and job training.

Figure 16 illustrates that for manufacturing employees, only 40% (29 respondents) states that they are being trained in their job one to two times – or three or more times each year, and 60% (43 respondents) states that they less than once a year – or never participate in job related training.

10. How often do you participate in mandatory training/courses of some sort in your job?

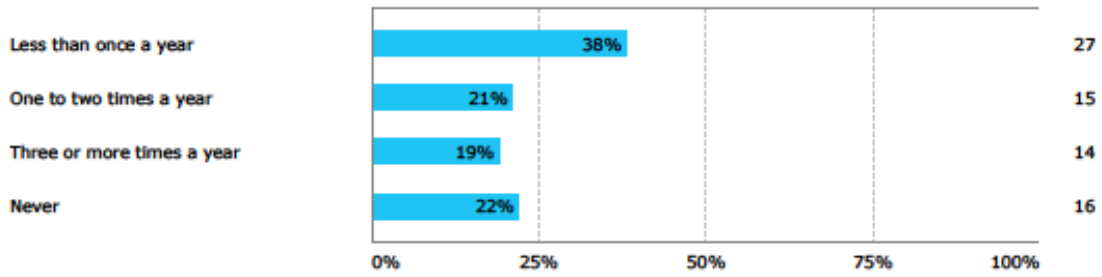


Figure 16. Manufacturing employees and job training

19 employees from manufacturing states that they have leader responsibilities, and of these, 52% (10 respondents) states that they are being trained in their job one to two times – or three or more times a year, and 47% (9 respondents) answers less than once a year, as illustrated in Figure 17. In comparison, 100% (5 respondents) of administration employees with leader responsibilities states that they are being trained three or more times a year, illustrated in Figure 18.

10. How often do you participate in mandatory training/courses of some sort in your job?

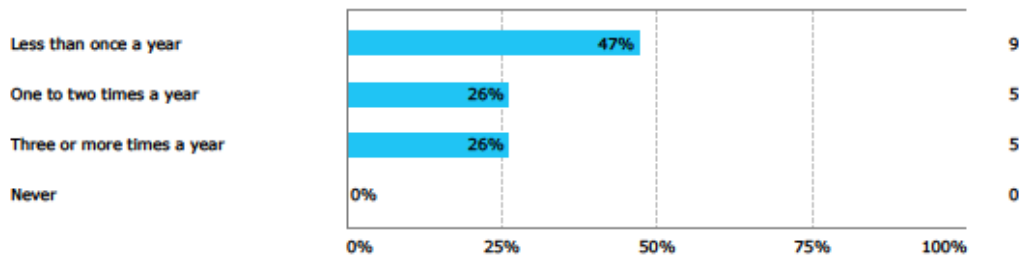


Figure 17. Manufacturing employees with leader responsibilities and job training

10. How often do you participate in mandatory training/courses of some sort in your job?

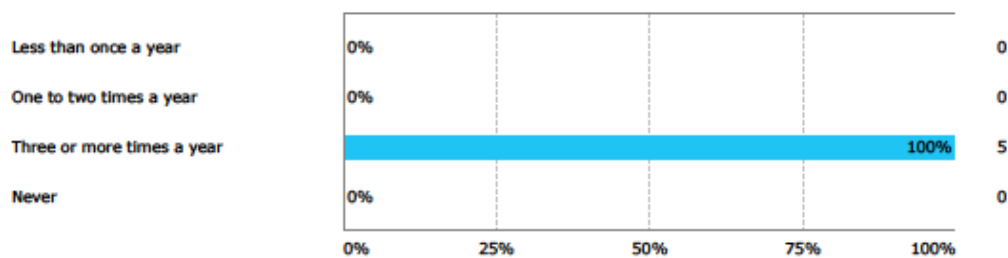


Figure 18. Administration employees with leader responsibilities and job training

Figure 19, Figure 20, Figure 21, and Figure 22 illustrates that across the four main departments, with or without leader responsibilities, manufacturing employees significantly more often states that they never or rarely participate in mandatory training, accordingly 60% (72 respondents) manufacturing, 15% (14 respondents) administration, 32% (19 participants) maintenance, and 32% (27 respondents) support functions.

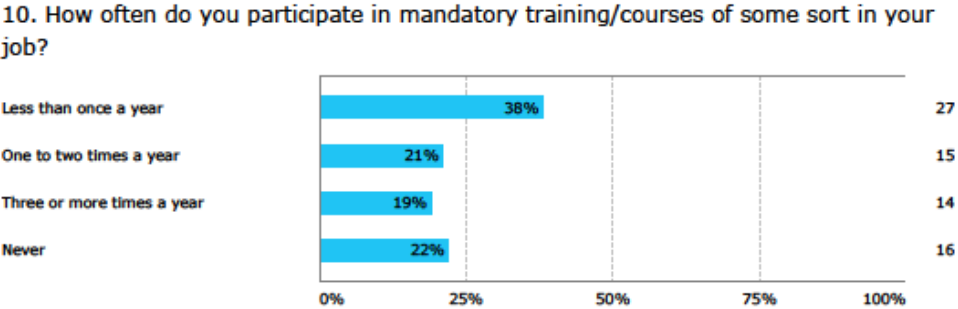


Figure 19. Manufacturing employees with/without leader responsibilities who never participate in training

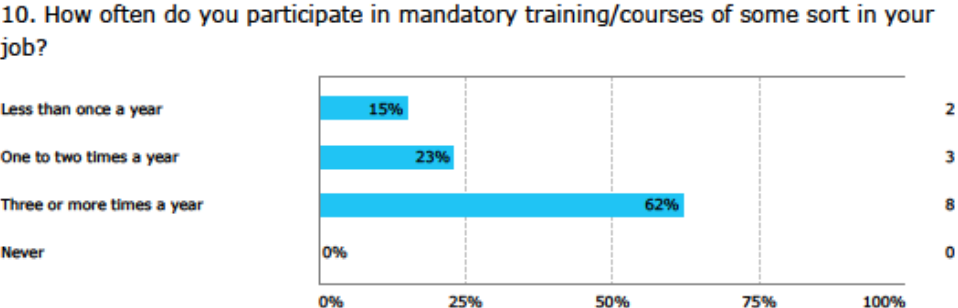


Figure 20. Administration employees with/without leader responsibilities who never participate in training

10. How often do you participate in mandatory training/courses of some sort in your job?

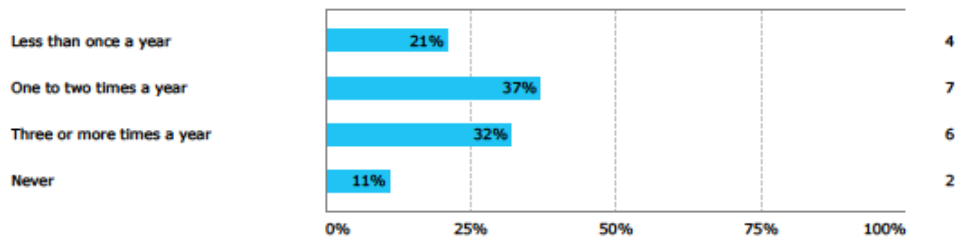


Figure 21. Maintenance employees with/without leader responsibilities who never participate in training

10. How often do you participate in mandatory training/courses of some sort in your job?

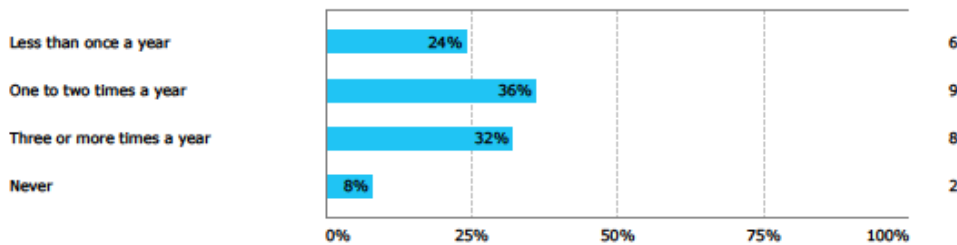
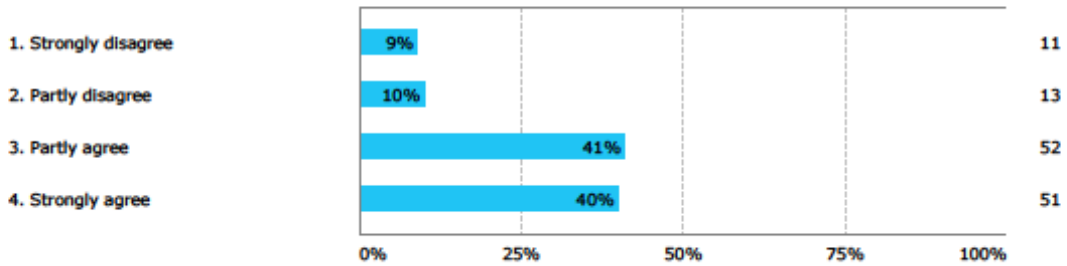


Figure 22. Support function employees with/without leader responsibilities who never participate in training

In all departments, 81% (103 respondents) states that they partly- or strongly agree that their work requires them to stay up to date on procedures, knowledge and/or products. Figure 23 illustrates this, as well as 93% (120 respondents) either partly- (30%) or strongly (63%) agreeing to the statement that it is room for improvements regarding today's situation on training and competence maintenance.

18. My work/tasks require me to undergo training in some way to stay up to date on procedures, knowledge and/or products.



19. There is room for improvements regarding today's situation on training and competence maintenance

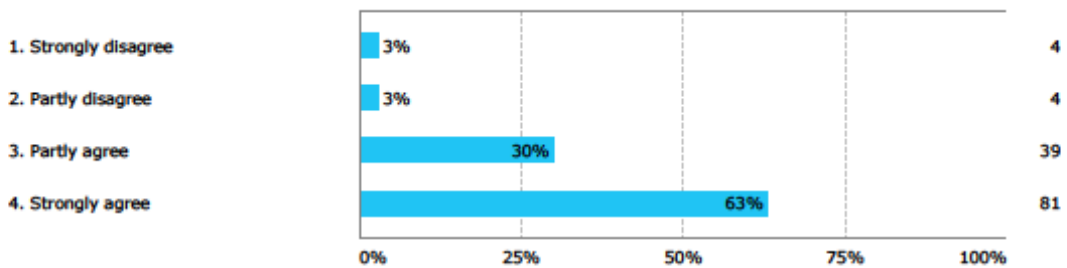


Figure 23. Training required, and current situation

Employees are asked about their motivation to use web based learning for training. It seems that employees in administration are slightly more motivated to use web based learning. 92% (12 respondents) states that they strongly agree to this claim, illustrated in Figure 24. In comparison, manufacturing employees are more spread. 41% (29 respondents) are partly agreeing, and 35% (25 respondents) strongly agree, resulting in a total of 76% (54 respondents) leaning towards a positive attitude towards usage of web based learning, illustrated in Figure 25.

21. I am motivated to use web based learning for training and knowledge improvement

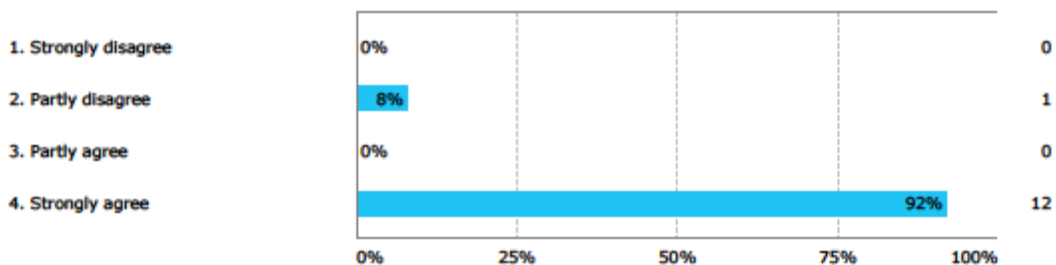


Figure 24. Motivation to use web based learning among administration employees

21. I am motivated to use web based learning for training and knowledge improvement

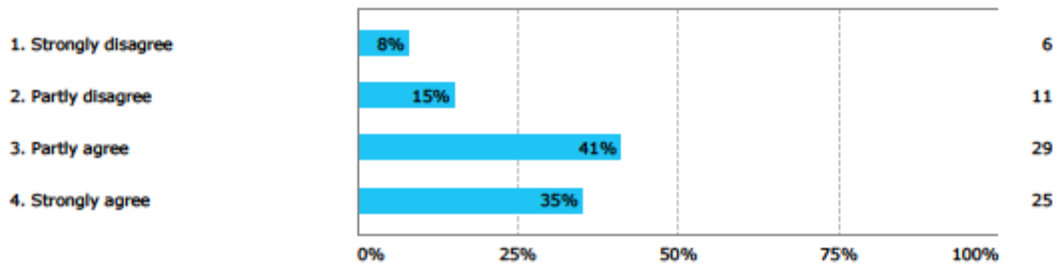


Figure 25. Motivation to use web based learning among manufacturing employees

By including age to this calculation, and look at manufacturing employees above 45 years of age, Figure 26 indicates a tendency leaning towards older employees might not be as motivated to use web based learning as their younger colleagues (Figure 27), with 30% (7 respondents) stating that they partly disagree to being motivated to use web based learning for training purposes. Still, most employees above 45 years (69% / 16 respondents) of age have a positive attitude towards motivation to use web-based learning.

21. I am motivated to use web based learning for training and knowledge improvement

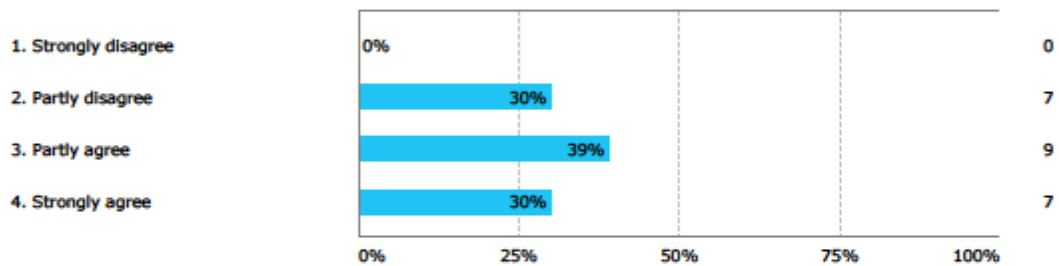


Figure 26. Manufacturing employees above 45 years of age motivation to use web based learning

21. I am motivated to use web based learning for training and knowledge improvement

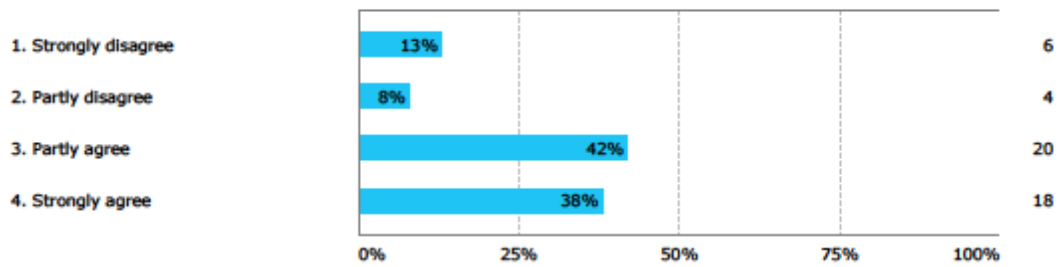


Figure 27. Manufacturing employees below 45 years of age motivation to use web based learning

5.1.1 Limitations to context analysis

Some limitations must be considered when interpreting the results from the questionnaire. The digital survey was sent out to a total of 436 emails. BAF operates with 270 employees. The mailing list contained both employees' private email and BAF email for those who use this, which means that several employees received the same questionnaire both on their private and BAF email account. A total number of 22 emails was returned via mail service due to mail address not being found or is deactivated. 108 respondents of the digital questionnaire, and 21 respondents for the printed version resulted in a total of 129 respondents out of 270 employees (48%). The digital questionnaire contained a link to a Norwegian and English version. Some employees expressed a concern to the HR manager if it was safe to open. The HR manager assured all employees that the links are safe, and encouraged them to answer the survey. The questionnaire was available for 10 days, meaning not everyone have found time to answer or may have forgotten about it. Some might not be willing to answer for personal reasons. To assure confidentiality of the employees lead to the survey being open, meaning no log-in required to participate. This leads to the possibility for multiple answers by the same person. With regards to the printed version, each section at BAF have weekly section meetings. At this meeting, section leaders delivered the printed version to employee's present. BAF employees works in shift, and it is no guarantee that everyone was given the opportunity to answer the printed version. Since section leaders delivered the survey, authors cannot be sure on how the questionnaire was presented to the employees, other than the introduction and explanation as in the digital questionnaire. Since the amount of digital responses on the questionnaires compared to the printed responses represents a much greater amount of the employees, limitations regarding the answers from the respondents must be considered when analyzing the questionnaires. The printed version can represent a different group of people at the workplace because the respondents to these may not be able to answer the digital

version due to lack of access to a computer, non-users of email, or other reasons. This can give the wrong implications, which could influence the overall results of the questionnaires. When analyzing the questionnaires, the digital and the printed version was compared with regards to these concerns, and it should be noted that none of the printed versions had any significant different responses.

5.2 Usability test, execution and results (first iteration)

Approximately one month after the prototype test, the usability test was conducted. In the prototype test, the feedback on the course implied it was too much text, and too little content which excited the user. Based on these comments, HSE course module version 2.0 with less text, more videos, and more interactivity were developed. For the usability test, six participants (Nielsen, 2010) were recruited by the HR manager at BAF. Participant criteria are defined in "Usability test plan" located in Appendix C. The design team were given an office at BAF, where a computer with a remote screen, keyboard, mouse and a headset were set up. During the test, the test-leader can see the screen and support the participant if needed. Due to some difficulties with an unstable internet connection, elements such as videos had to be played manually from VLC player. Prior to testing of the actual HSE course, each participant was made aware of what they were attending. A brief interview was made to understand who the participant is, in what department he or she works in, and how they rate their computer skills. After the interview, testing of the HSE course began. Each participant was encouraged to think aloud and comment on their actions and what they were seeing. A list of tasks each participant must go through, similar for all, together with a semi structured interview and a system Usability Scale (SUS) form are used to measure the level of success. The method used for the usability test includes an interview prior to the usability test to collect demographical data. It was also conducted a post usability test interview where the participants answered questions related to the HSE course. The results were evaluated and analyzed before changes were made for the next iteration. For better documenting, each participant's responses to the HSE course and interviews, a voice and screen recorder was used. To ensure that the LMS, HSE course module, screen, audio, tasks, screen recording, time available for each participant, were working correctly, a pilot test on one teacher at UiA was conducted one day before testing. This revealed weakness regarding formulation of certain tasks and non-relevant tasks. It should also be mentioned that in the pilot test, the design team had a stable internet connection where all content worked as intended. The design team made the choice of bringing back up of videos, and a local version of the HSE course module in case of any hurdles.

5.2.1 Usability test setup

Approximately one week prior to the test day, a usability plan was sent to the HR manager at BAF. The HR manager then recruited participants.

5.2.1.1 Procedure

The usability test was conducted in a controlled environment, with only the design team and participant present. It was a concern from some participants that they would be filmed during the test, but a clarification on the matter was addressed in the introduction where the test schedule is presented to the participant. All participants are informed about the use of screen- and voice recording. Each participant was made aware that no names are gathered, and all collected data will be anonymized in the thesis, and deleted at the end of the project period. For voice recording, a “Zoom, H1 Handy Recorder” was used. As backup in case of functional errors with the audio recorder, the screen recording system, OBS Studio¹⁷, allows for both screen and audio recordings. The design team decided therefore to let the participants use a headset with an internal mic, which functioned as backup audio. Participants then signed a consent form, and from that point the test was considered as active and recordings started.

5.2.1.2 Success factors

As a part for evaluating the success factor of the usability test, each task is graded from 1 - Completed, 2- Completed with help, and 3 - Not completed (Andersen & Wold, 2011). From the moment the participant starts the tasks, he or she are timed from start to finish. Previously stated, one module in the HSE course should be completed within 5-8 minutes. An extra margin of 10 minutes was added due to some tasks telling the participant to play a video again, go back, logout, think aloud comments, and issues with internet connection. Therefore, a total time of 18 minutes spent on the HSE course and completion rate at 80% are considered as contribution to the success of completing the user tasks. The HSE course must be viewed as usable, desirable and findable, according to Morville’s (2004) User Experience Honeycomb, and should be completed without critical errors.

5.2.2 Considerations on usability testing

Some considerations must be kept in mind calculating these results. Some tasks may be poorly formulated, the user may forget to complete every task, and a reminder by the test leader are not considered to be “completed with help”. There was trouble with the internet connection at BAF. After new guidelines from Benteler HQ, all guests must to apply two to three days ahead of their arrival to get internet connection due to security concerns. The guest network was slow, and times out every thirty minute. Since videos are recorded in 1920x1080p, they require a stable network with sufficient

¹⁷ OBS Studio: <https://obsproject.com/>

speed to be streamed nicely without stopping and buffering. Due to this, whenever the participant arrived to the page where a video is displayed, test leader override the participant, switching to VLC¹⁸ player, and played the video from there. This had little to none effect on the progress of the course since it took only 1-2 seconds. Another limitation regards the objectivity of the user. It is clearly expressed before the test begin, that both negative and positive feedback are welcome regarding the HSE course, and that no answers are wrong. Even so, humans tend to be biased, and will often try to please the interviewer with answering questions based on what they think the interviewer want hear. The participant may also react on the observer's body language e.g. nods or encouraging sounds (Andersen & Wold, 2011). The novelty effect¹⁹ must also be taken into consideration, meaning that something new may enhance and boost performance for a short period. It is therefore important to interpret data with caution, and not draw conclusions based on user feedback alone.

¹⁸ VideoLan Media player - <http://www.videolan.org/vlc/index.nb.html>

¹⁹ Novelty effect - the quality of being new and fresh and interesting.

5.2.3 Result of usability test

Participant number:	Gender	Age	Section	Computer skills	Previous experience with eLearning	Good Method?	Motivational?	Engaged?	Change behavior?
Part. 1	Male	46	Manufacturing	Average+	Yes	Yes	Yes	Yes	Yes
Part. 2	Male	49	Manufacturing	Average	No	Yes	Yes	Yes	Not sure
Part. 3	Female	35	Logistics	Average	Yes	Yes	Yes	Yes	Yes
Part. 4	Male	31	Maintenance	Average	No	Yes	Yes	Yes	Yes
Part. 5	Female	60	Administration	Good	Yes	Yes	Yes	Yes	Yes
Part. 6	Female	42	Administration	Good	Yes	Yes	Yes	Yes	Yes

Table 2. Usability test participant data

5.2.3.1 Product Quality

During the usability test, there was issues with the internet connection, as mentioned earlier. Since the design team was only granted access to the guest network, some elements in the HSE course module had trouble loading correctly. All participants were informed about this issue and that it would be solved with the test leader playing the videos manually. As specified in the task sheet, the participants were asked to open Google Chrome²⁰ and navigate to www.UiA.neolms.com. On the start-up screen on this page the participant sees a moving picture and a welcome text asking them to sign up. This button opens a box which asks for an admission code. 50% (n=6) of the participants used this button as their first choice for logging in. All participants who tried this option expressed that they felt this was the obvious choice since it was placed in the middle and welcomed you. Participants were then guided to the correct log-in button where they could log in with their assigned user. Inside the LMS, each participant is assigned to "Benteler Class". The first screen the participant see after logging in is an overview of the classes he or she are assigned to. By clicking on this icon or menu item, the participant gets access to all content made available to them within the class. From there the participant can locate the HSE course module in two different ways. He or she can use the left side

²⁰ Google Chrome web browser - <https://www.google.com/chrome/browser/desktop/index.html>

navigation menu in the LMS, or open Courses and click their way using the “Next” and “Prev” buttons in the top of the LMS. Screen recordings show that this caused confusion for some participants since this navigation did not affect the navigation inside the HSE course module. When the HSE course module is opened, all navigation happens within the module and not the LMS. Participants expressed a concern about the slowness of the system since each page must be loaded when the participant clicks “Next” or “Back”. No pages are pre-loaded, and since the module reports to the LMS, it takes a second or three to jump from one page to the next, as well as to answer a question in the test. This resulted in the first participants clicking more than one time on “Next” or “Submit” button, making the participant jump past a slide or a question. In the content pages, the participant has the option to click “Back” or use the tabs to go back to a specific topic, and did just that. In the test this became a big problem since it made the participant jump past a question, and the participant was not allowed to go back after an answer are submitted. All participants were from this point informed about this issue.

5.2.3.2 Learnability

There were no noticeable issues in regards of learnability. However, there was differences in how the participants navigated in the LMS and into the HSE course module. Since the LMS offers the participants multiple ways to access the HSE course module, some participants used the navigation menu in the LMS, and some participants used the navigation buttons and the menu with listed content. All participants expressed that their computer skills varied from “average” to “good”, when rating their own computer skills. 66% (n=6) of the participants expressed that they have some previous experience with eLearning, and that they are used to work with such courses. There was a consensus among the participants that the HSE course is intuitive. However, some features were pointed at in regards of learnability. Screen recordings and post-interviews revealed that the “drag-and-drop” feature was not as easy as predicted. Some participants were quick to click away the “drag-and-drop” information box, and did not intuitively understand that they could move and drop items. The information box explicitly tells the participant to “place the things you think are not allowed to bring into the manufacturing area in your locker”. The page title states “Which items must be placed in your locker?”, underlining must, and in parenthesis saying “(Drag and drop the right answers in the locker)”. The actual content window is greyed out and are not clickable before the information box is removed. The drag and drop feature offers some built-in buttons such as “Submit” which submit and check answers, “Reset”, which return all items to start position, and “Undo” which undo the last action from the participant. Submit-button has been labeled “Check answers”, and seems to confuse some participants when they are finished placing the items in the locker. Screen recordings also revealed that some participants tried to check their answers on each item. By clicking “Check answer” after placing each item, the drag and drop

thinks that the participant is finished with the whole exercise, and will therefore return a pass or fail text caption, and in this case, a fail caption. This reduces the number of attempts the participant has left to complete the exercise. When the participant finish the drag and drop the way he or she are supposed to, "Check answer" and "Reset" button disappear, and shows the pass caption. A design choice was to include a "Back" button on all pages, included the drag and drop page. This back button does not disappear, leaving it visible for a few seconds. This results in some participants clicking the button and moves back one page. When the participant then clicks "Next" again, he or she end up with completing the drag and drop again. Due to this issue with the drag and drop exercise, all participants agreed that once the exercise are fully understood it is a nice and practical way to be taught what not to bring with them to the manufacturing area, instead of only seeing pictures or being told something, as they are today. One participant states in the post-interview that *"in this course you must participate by clicking and being active. In a course with the HSE manager you get read out to. Here you must click on things actively."*

5.2.3.3 Effectiveness

All participants combined, leaves an average completion rate of the provided tasks on 75%. Not all participants completed the tasks in order, leaving them confused and asking the test leader if they should go back and do them. There may be different explanations to why not all tasks were completed, but all participants managed to complete the HSE course with an average time spent 17:37 minutes. The task sheet does not measure how usable the HSE course is. It is only meant to test specific functionality in regards to UX, meaning if a user forgets to play a video again, or forget to navigate back to a specific topic, this will not affect how usable the HSE course is.

5.2.3.4 Usable

A consensus among participants is that the HSE course is easy to use. One participant stated in the post-interview that *"in the beginning you had to think a little bit, but a very good arrangement. I would like to highlight that it was easily explained, and no hard words. Easy to understand", "a good way to learn, but there can be improvements regarding text and content", and "detailed and good explanations"*. In general, participants were satisfied with the HSE course, but highlighted some elements which at times made the HSE course confusing. Especially the unclear distinction between the LMS and the module was mentioned by several participants with statements like *"it was not difficult to navigate in the course, but some of the next/previous buttons (LMS) combined with the menu on the left (LMS) was a bit confusing", "too much long text". "Less text but still receiving the same information would be more desirable"*. As a part of the HSE course, learning outcomes are included on each page to help the participant to understand what he or she is supposed to learn. 83% (n=6) stated that they did notice the learning outcomes. Most of the participants added that the focus lies with the

content in the middle of the screen and not on the learning outcomes in the left corner. Several participants also expressed that the learning outcomes was available both in text and orally in the introduction, and that this was sufficient. One participant expressed that *“they were to small and hard to read, and it should be a rollover function for them”*, not placing to much text on the screen. Most participants also in some way expressed that they think it’s nice to access the HSE course on a computer. When asked about behavioral change regards to HSE training, one participant responded that *“this is a bit too general for my specific tasks, but you start with attitudes on safety protection which is good. You create attitudes from first moment, and I think this can cause awareness in regards to HSE. The most important part is management follow-up I believe. Leaders must work parallel with the HSE course to create attitudes”*. Figure 28 illustrates the number of positive and neutral/negative findings commented by each participant in the post test interview.

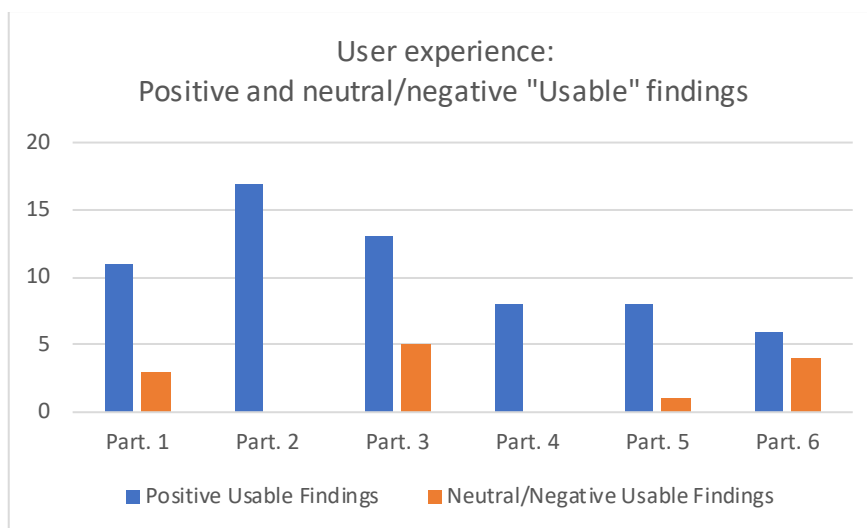


Figure 28. Positive and neutral/negative Usable findings

5.2.3.5 Desirable

Many participants highlighted and reacted positively to the different videos and pictures. All participants expressed that they found the videos to be realistic and informative. One participant stated in the post-interview that *“the videos and the drag and drop was a really good way to show what to remember before you start to work, and that they help me a lot because it actually shows you how to do things and what you must avoid to bring into the manufacturing area, and what consequences your actions can have”*. It was also well received that the “course-instructor” from the beginning of the introduction follows you as a guide throughout the module with his voice, explaining what is going on in the videos. One participant expresses that using text in the videos and listing key-points of what the course-instructor is saying, can be valuable for others which might not follow videos as easy as someone else. On the task-sheet, the participants were asked to play the video of the steam

explosion again. Only 33 % (n=6) of the participants did this, or clicked the “play again”-button to illustrate this, due to internet connection issues. Several participants stated that they in some way reacted to this video due to its realistic footage and voiceover explaining what is happening. One participant expressed that *“the content is very calm and focused on the topic, which lead to an understanding of the content, and that the grotesque pictures of the ring and the video with the explosion was really good”*. Feedback on desirable indicates that it is still too much text-based information. Comments were made on the background picture to be disturbing and causing confusion towards the content, which should be in focus. Figure 29 illustrates the findings commented by each participant in the post test interview, and show indications of the course being desirable, but also implies that some content and elements are not well appreciated by all.

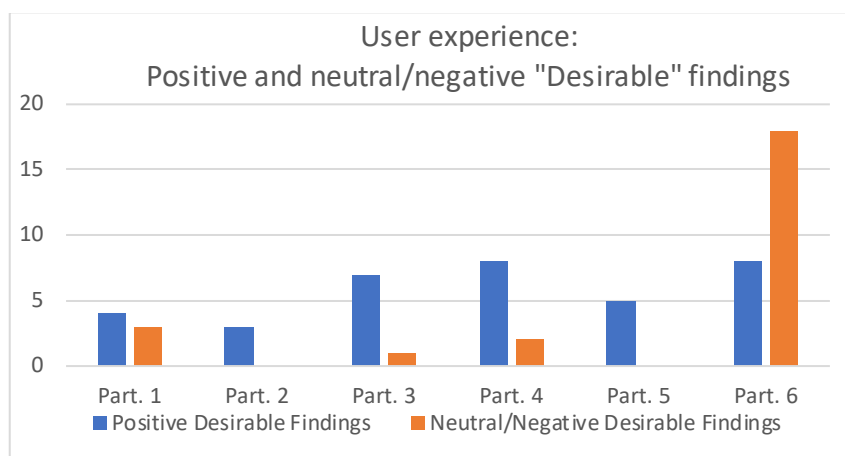


Figure 29. Positive and neutral/negative Desirable findings

5.2.3.6 Findable

As mentioned, some participants expressed that it is hard to distinguish navigation in the LMS and in the HSE course module. The general feedback from the participants is that once it is understood, it gets easier. Participants expressed that when isolated in the HSE course module, navigation is easy since there are big and clear “Next” and “Back” buttons. Users was also able to navigate back and forth through the main topics using the navigation tabs on the left. Screen recordings show that most participants only use the “Next” and “Back” button, and rarely or never uses the navigation tabs. One task asks the participant to navigate back to the tab “Protection equipment” to read something they do not remember prior to the test. Screen recordings show that only one user does this, and when the participant tries to navigate back to the test, the button does not work. Post-interviews reveal that participants who commented on navigation back and forth using the tabs, are divided approximately 50/50 in weather they should be allowed to go directly to the test and skip the content, or if the test tab should be “locked” until the participant have visited all pages. One participant states that *“I think it is the employee’s responsible to decide how to navigate to the test, if the test covers everything that*

should be taught". Another participant expressed that *"this is a good way to make sure you have gone through everything"*. In the middle of the HSE course, the test leader interrupted the participant to create a perception of being interrupted at home resulting in the participant having to log off. When the participant logged back in, the participant picked up right where he or she left off prior to logging off. This feature was well received by most of the participants. Some participants expressed a concern regarding this feature, where you might have been away for a significant amount of time and not remembering everything up to this point, hence the participant should be able to start over, or be offered a short version of what has been covered. One participant stated that *"this feature is expected, and I would be really annoyed if this was not the case"*. Another participant stated that *"Yes, that was good. I have to know where I left off, so it was a great feature"* and *"I use these kinds of functions every day, so I think this was great"*. With regards to distinction between the LMS and the HSE course module, one participant suggested that the HSE course module should run in full screen mode to hide the LMS. Figure 30 illustrates the positive and neutral/negative findings, commented by each participant in the post test interview. This feedback is with regards to the course being findable. This illustrates that almost all participants expressed that they were happy with the navigation in the HSE course, but expressed concern of the LMS and HSE course module navigation menu being a disturbing element which could cause confusion, illustrated in Figure 31

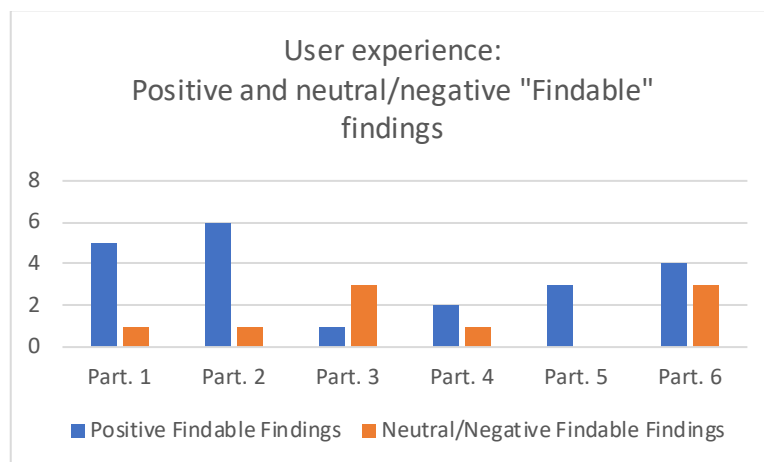


Figure 30. Positive and neutral/negative Findable findings

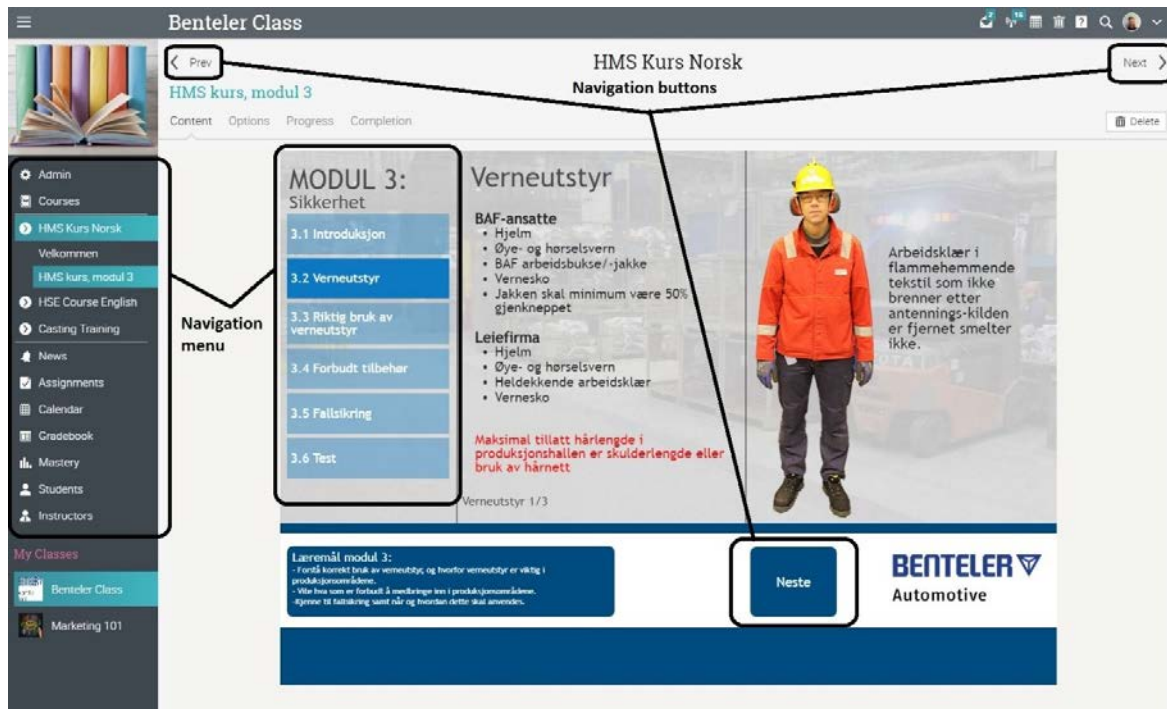


Figure 31. Navigation menu and buttons inside LMS and course module

5.2.3.7 System Usability Scale

It might happen that during testing, participants complete the tasks with no problems occurring. This might not mean that the participant is satisfied with the system. To better reveal participant satisfaction, the common system usability scale (SUS) form is used. SUS has been used to measure subjective usability in various research projects, and has proved itself to be a robust and valuable evaluation tool (Brooke, 1996; usability.gov²¹). The form contains ten questions regarding the satisfaction of use, and questions have been fine tuned to give as unambiguous results as possible (Andersen & Wold, 2011). Each question is tied to a 1 – Strongly disagree to 5 – Strongly agree Likert scale. If a participant is unsure of what to answer, number three will not affect the result positively or negatively. All questions must be answered. By calculating the numbers, following the SUS formula, you end up with a “SUS-score” ranging from 0-100. It is important to express that this score is not to be viewed as percentage, rather as a score where above 68 is considered as above average (usability.gov²⁰).

²¹Usability.gov. SUS calculation: <https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>

Participant no.	Score	Average	Age	eLearning experience
1	92,5	88,75	42	Yes
2	95	88,75	60	Yes
3	87,5	88,75	31	Little to none
4	77,5	88,75	35	Yes
5	95	88,75	46	Yes
6	85	88,75	49	Little to none

Table 3. SUS score table

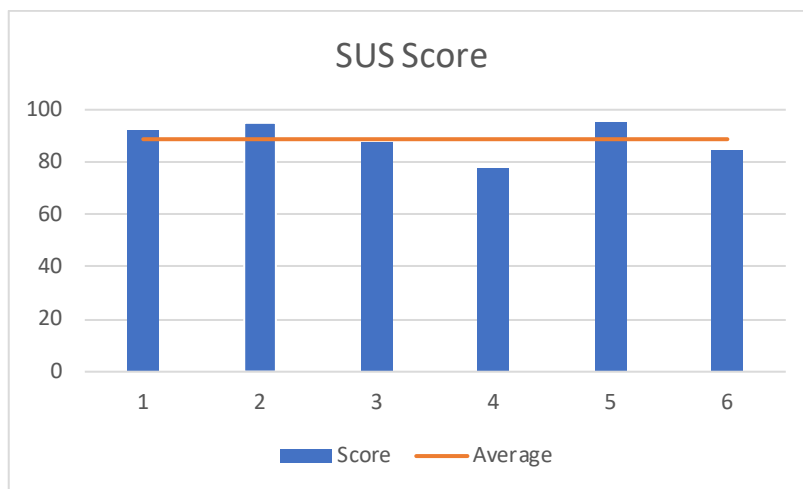


Figure 32. SUS score and average score

Results from the SUS, illustrated in Figure 32, shows that the participants are overall satisfied with the HSE course, with an average of 88.75, considered as above average on the SUS score table.

5.2.4 Conclusion of usability test

Results shows that the HSE course and the use of web-based learning is on the right path. Valuable feedback on UI and UX from participants allows the design team to further improve the HSE course, hence improving the UX. Participants agrees to this being a good method for teaching, but some participants emphasizes that it is impossible to ask the system any questions or elaborations, pointing at a need for supplying with classroom teaching where employees can be aided by an instructor. All participants agree that the HSE course is engaging and motivational due to the realistic content and the fact that they must be active learners. All participants except one agree that this method of learning can have a positive impact, hence behavioral change. The last participant does not disagree, but answers *“not sure, because attitude and behavior is something that must be taught and explained in a working environment, and someone must set a good example. Some employees might need to be*

approached often, and some never. Attitudes and behavior occurs when people talks to you and show you, and these online courses". Some participants still express a concern about the large amount of text, and the unclear distinction between the LMS and the HSE course module, and these comments will help shape the HSE course for the next iteration.

5.2.5 System changes/updates post usability test

After the usability test, necessary changes were made before conducting a second user test. The changes are based on the feedback provided from the usability test.

The LMS was excluded and replaced with an independent browser where the HSE course module was uploaded. Therefore, there was no need for internet connection. The module was uploaded with a higher resolution 1280x720 as desired from some participants, which should promote focus on the HSE course module with less to no confusion regarding LMS menus and navigation. It is important to note that the choice to exclude the LMS from this test is only because the participants should be allowed to take the course in full-screen mode. An option which can be selected when uploading external resources to the LMS.

It was produced and implemented voiceovers as additional info to the slides that primarily contained text. The voiceovers are explanatory, and lasts from 10 to 20 seconds. The purpose of the voiceovers is to give additional information to the user about the given topic. The user is free to choose if he or she wants to listen to the voiceovers with a button-click.

Information on drag and drop functionality was changed, where the text inside the information box that explains what the user is supposed to do was simplified. The drag and drop interaction was also changed, where some of the usability test participants desired to make an option where they could drag and drop items that can be brought inside the manufacture area.

To decrease confusion and increase focus on the content, a button was added in the footer for the participants to see the learning objectives. The learning objectives was previously always visible, and some of the participants did not find them very useful, rather disturbing, while others wanted to have the option to look at the learning objectives if they felt the need of it.

The language was simplified for an easier understanding of the text-based content, and the amount of text was drastically decreased.

The background picture on the slides were made more transparent for a higher focus on the content.

The test was made available at any given time, so the test participant did not have to go through the whole module before taking the test.

5.3 Testing, evaluation and results of high fidelity prototype (second iteration)

Three weeks after the usability test, a second iteration of testing was conducted. The user test was mainly focused on usability testing and evaluating UX and indications of technology acceptance. Based on the results of the first iteration, the HSE course module was further developed, and the time approximated to finish each module was extended to 8-12 minutes. In the user test, the HSE course module was portrayed as finished and ready to be released. Five of the same participants from the usability test attended the second iteration.

5.3.1 Technology acceptance

Results from technology acceptance measurements implies that there is a consensus between participants that an interactive HSE course could be accepted at BAF. A form containing 16 questions were distributed to the participants post testing and answered with support from the instructors in case of confusion towards the form. The claims in the form were measured from "totally disagree", "disagree", "agree" and "totally agree".

Rating scale	Value	Total respondents	5
Totally disagree	1		
Partly agree	2		
Partly agree	3		
Totally agree	4		
Statement:			Average score
Attitude towards using technology			
Using this HSE course is a good idea.			4,00
This HSE course will make work more interesting			3,80
Working with this HSE course is fun.			3,80
I like working with this HSE course.			4,00
Performance expectancy			
I find the HSE course useful for my work.			4,00

Using this HSE course will enable me to accomplish tasks at work more quickly.	3,80
Using this HSE course will increase my productivity at work.	3,40
Effort expectancy	
It will be easy for me to become skillful at using this HSE course.	4,00
I find the HSE course easy to use.	4,00
Learning to operate the HSE course is easy for me.	4,00
Social influence	
People who are important to me (leaders/co-workers/family) think that I should use this HSE course	4,00
People who influence my behavior (leaders/co-workers/family) think that I should use this HSE course.	3,80
I think BAF supports the use of this HSE course.	3,80
Facilitating conditions	
I have the resources necessary (PC/smartphone/tablet) to use the system.	3,80
I have the technical knowledge necessary to use this HSE course.	3,80
Personnel at BAF is available for assistance with system difficulties.	3,80

Table 4. Technology acceptance score

5.3.2 Attitude towards using technology

Attitude towards using technology measures to which extent participants were willing to use the HSE course. In regards of the participant's attitude towards using, a strong positive attitude was found, illustrated in Table 4. These finds imply that the attitude towards using the technology regarding the HSE course is highly positive.

5.3.2.1 Performance expectancy

Regarding PE, all participants totally agreed that they found the HSE course useful for their work, as illustrated in Table 4. Overall, participants implied that the HSE course is valuable in their work, and may increase productivity.

5.3.2.2 Effort expectancy

All participants responded "totally agree" to all the claims regarding EE, illustrated in Table 4. These implications show a high potential in learning to use such systems, and the measures gave no implications on errors or learnability.

5.3.2.3 Social influence

There was not implied any doubt about SI on using the HSE course. Table 4 illustrates indications of BAF and important others being supportive towards such HSE course.

5.3.2.4 Facilitating conditions

Statements regarding FC indicates little to no sign of personal resources, technological knowledge, or BAF support being a hurdle to using this HSE course, as illustrated in Table 4. This correspond with participants earlier rating of their personal computer skills and previous experience with web-based learning.

5.3.3 Usability

To measure the usability of the system, the participants did a usability test on the finished HSE course module with one predefined task, saying they should take the course as they would do by themselves. The participants were time measured while testing the HSE course module. User test results implied that the final version of the HSE course module was more efficient than before additional changes was done. The additional elements added as the information button containing explanatory voiceovers was also positively welcomed, and all participants made use of it.

5.3.3.1 Product quality

There were little to none implications of lack in product quality. The system worked efficiently through all the tests except one where there was a sudden error on one of the “next” buttons. This error was quickly recovered by the test leader. Since the module was self-sufficient with no internet connection required, the system worked efficiently through the whole procedure without interruptions. There was no need for technical support to watch videos or load pages, which was a major constraint in the previous usability test.

5.3.3.2 Learnability

In the user test, there were no major issues regarding learnability. Even though the drag and drop interaction was better understood in the user test than the first usability test, there was still some issues with understanding the exercise. Based on user feedback, it was added a new component to the drag and drop test where the user must place what was legal to bring into the manufacture area. This feature added some confusion, where three of the participants only placed the elements that was not allowed to bring into the manufacturing area. One participant attempted four times before he was asked to go back and read the instruction properly and try again. As soon as the instruction was read, the participant understood the task and passed. The same error happened to both the other participants who did not pass the test on the first try, but after reading the instructions, they passed

the test immediately. Screen recordings shows that the participants who failed the drag and drop did not read the introduction text properly. The "submit", "next" and "previous" buttons did not cause any errors in this iteration of the usability test, and the participants actively used the "reset" button to start over if they failed the drag and drop. All the participants were generally satisfied with the changes that was made.

5.3.3.3 Effectiveness

All four participants who did the finishing test, passed on their first try. Time was measured to determine if the system was effective enough for the participants to finish within the time frame of 8-12 minutes. Average time spent on the HSE course module was measured to 10:21 minutes. The fastest participant used six minutes while the slowest participant used 12:45 minutes. The slowest participant experienced errors in the interaction of the drag and drop test, which can determine why the approximated time for finishing the course was not complied. Based on the findings from the user test, the system seems to be much more efficient considering that internet connection was not required, which resulted in few to no errors. This finding implies that these types of courses need a stable high-speed internet connection, or being ran on a locally installed learning platform or intranet.

5.3.4 User experience

To evaluate UX, a data coding method for revealing and structuring phenomena was used, as well as a semi-structured interview post-testing. The setup of the test environment was the same as in the previous usability test. The design team formulated questions regarding the participant's behavior towards the system in a form. The data coding form contained 26 questions that was ticked off with "yes" or "no" regarding the questions asked. The data coding form also had a section for comments. The UX evaluation indicated that the users were more satisfied with the HSE course module in the second iteration of user testing.

5.3.4.1 Usable

Results from the measurements of UX implied that all participants enjoyed using the HSE course module. All participants watched the videos and used the optional voiceover-function. The implementation of info-buttons with voiceover was well received with positive feedback from the participants, where one quotes " *The voiceovers was great for a more informative input about the topic. I also liked that it was optional to use them.*", and " *The info-buttons with the voiceovers made it possible to play around in the module, and it made me curious.*" In addition to the voiceover function, the learning outcome textbox was replaced with a button the user could click if it was needed. The

button was not used by any of the participants, but in the post interviews it was mentioned by some that they noticed it but did not feel the need to use it because it was available in the introduction, as well as the course was finished within a short amount of time.

5.3.4.2 Desirable

All the participants stated that they were overall satisfied with the updated version of the HSE course module. It was expressed that the realistic videos and pictures promoted arousal as they were showing consequences on what can happen if one does not obey HSE rules. The only negative feedback that was given on the video and pictures was that, *“The video of the steam explosion and the injured fingers and body parts can overshadow other important topics regarding HSE.”* There was also added that the amount of text should be reduced further and replaced with more audio and video.

5.3.4.3 Findable

None of the participants used the navigation menu. In the post test interview, one of the participants said *“I did not notice the navigation menu bar, but it is good to have it available.”* To navigate within the system, the “next” and “previous” buttons was used by all participants. The test at the end of the module was made available through the whole course. The immediate access to the test was not used, even though 50% of the participants from the first usability test proposed a desire to make this possible.

5.3.5 Conclusion of user test

The second iteration of testing the HSE course module was measurements on usability, UX and technology acceptance. There are still minor changes that should be made in the HSE course module concerning UX, where some of participants were still not fully satisfied due to lack of multimedia elements. The drag and drop function was well received with added functionality that were missing earlier. Even though changes were made from the first version, participants expressed that they were still missing some elements, and had minor errors with the drag and drop test. For this user test, the HSE course module was available as an offline resource on full-screen without an LMS, which made the highest impact on the UX and technology acceptance. Participants found it easier to navigate within the module, and saved a lot of time since the course is now “opened in a new tab” illustrating full-screen mode, and being kept separated from the LMS. On behalf of the usability measurements, there were no system errors that could determine the course to not be applicable. All functions were running efficiently throughout the course, which also increased the overall UX. The technology acceptance measurements from the UTAUT form, indicates that the system is highly desired at BAF.

6.0 Discussion of results

RQ1: How can the use of a digitalized HSE course quality assure training and certification?

RQ2: Which factors are important to consider for enabling technology acceptance among corporate employees?

According to Lowy & Hood (2011) adults learn differently than children because adults use their knowledge, values, relationships and intentions as factors which can influence how they learn. This corresponds with results found in usability testing, where almost all participants in some way reacted to the graphical content presented in the HSE course. Expressed by participants in the usability tests, a strong positive side with this way of learning, is that you can do this in a location best suited for the individual, and not limited to undergo training only at work. This corresponds well with Knowles (1973) theory that individual differences increase with age, which require adult education to be adjustable in style, pace, time and place. Digital literacy was initially seen as a potential hurdle for implementation of eLearning at BAF. By looking at Buckingham's (2006) definition of digital literacy, indications point to BAF employees being digital literate because they acquire the basic skills necessary to participate in activities using digital devices. This indicates that BAF employees are not illiterate as first expected. With regards to technology acceptance among employees, Akbar (2013) states that *"perception changes with increased experience of using the technology"*. This corresponds with results found in questionnaires, usability- and user tests. In the questionnaire, respondents are not directly asked about their computer skills, but they are asked if they own different technological devices such as smartphone, tablet, and/or computer. A significant number of employees own such devices, and accordingly, approximately 75% responds (128/129 respondents) that they partly agree, (approximately 30%) or strongly agree (approximately 46%) that they like using their device for web surfing and social media. This implies that a big part of the employees has sufficient technical skills to operate and use these devices, and usability- and user-test reveals that employees have little to no trouble using digital tools for training, regardless of age and gender. Participants in the two practical tests are the same, which could mean that the perception of the HSE course has changed from the first time where participants did not know what they were attending. This also supports Akbar's (2013) statement about a change in perception if the user is familiar with the technology or system. As Venkatesh (2003) suggest, gender and age are important factors influencing technology acceptance. In this research, there are few to no signs of this. Reasons might be that there are so few female employees relative to male employees. Even older employees' states in the questionnaire, and in interviews that they are willing to use technology for training purposes, even though they are perceived as digital immigrants. This finding goes against Vodanovich's et al., (2010), assumptions that

digital immigrants may resist technology, or at least having difficulties accepting it. Even so, Vodanovich's et al., (2010), states that digital immigrants may have learned to use technology and information systems in their adult life, and this statement corresponds with results from this research. Both HR manager, and HSE manager has expressed that eLearning and a digital HSE course is wanted, indicating that managerial and organizational support is indeed present. This also correspond with results from UTAUT questionnaire, where respondents clearly show a positive attitude towards SI as presented in Table 4.

BAF has expressed a concern about employees bringing their water bottle, ring, cellphone, and other prohibited accessories with them in to the manufacturing area. If the general stock of employees in manufacturing area rarely or never participate in training regarding HSE, or only participate every third year, in training which might not provide the wanted results, it is not strange that employees tend to fall back to old habits quickly after being taught not to. It appears that employees in manufacturing, with leader responsibilities, participate in training more often than employees without leader responsibilities. By looking at the current situation of training and competence maintenance at BAF, indications show that employees undergoing HSE training are mainly finding themselves in the lower part of Blooms taxonomy pyramid, where they are emphasized to remember and memorize information, and repeat it with a written test after. It is because of this method of teaching and training employees, some evidence indicate that employees forget the information for various reasons, such as being presented with too much information, and without putting it to context. Palacios & Evans (2013 p. 13) reference Skinner from 1953, where Skinner states that; *"information should be presented in small amounts"*. "Small amounts" is a relative term, but a 30-40-minute session with being presented speech, text, and pictures is being perceived as too much by some employees according to results from the questionnaire, and usability test interviews. BAF employees varies significantly in age, and is male dominated in all departments except administration where it is an approximately 50/50 split. HSE certification is valid for three years before it needs renewal following the same training process with instructor lead training and a written test. Even so, 29% (15 respondents) of those working in manufacturing states that they never participate in mandatory training in their job. This indicates, and corresponds with results from the questionnaire that the current situation is not working well, and employees in charge of training, may for unknown reasons not provide employees all required or necessary training. Why this is, has not been thoroughly investigated in this research, but some indications from early talks with HSE manager points to time being a factor which can influence the amount of training and quality.

Of the 19 employees in manufacturing with leader responsibilities, none of them states that they never participate in mandatory training. Compared to the other departments, only in manufacturing does

the number of employees who states that they never participate in training reach above 20%, with and without leader responsibilities. Manufacturing 22% (16/72 respondents), administration, 0% (0/13 respondents), maintenance 11% (2/19 respondents), and support functions 8% (2/25 respondents).

Docebo (2015) and Avery (2016) discusses the 70:20:10 model where blended learning is being used as a method for teaching. Results from usability- and user tests shows evidence of blended learning being a method worth investigating further. By flipping this model from 70:20:10 to 10:20:70, it looks a little like Figure 2. "Training and competence cycle at BAF", from chapter 2.1 where you need a short course (10) to be allowed to progress in to manufacturing area for training with section leaders (20), before you eventually can perform work by yourself or together with others (70), which also is learning, and even better learning if every employee share a common belief and attitude regarding HSE. The biggest part of this model, the 70 part, is called experiential activities, which Avery (2016) states that will enhance learning effectiveness.

Interactive, eLearning courses for training can promote deep learning by engaging the learner in the learning process, claimed by Evans & Gibbons (2006). Even though this research did not measure any learning outcome, indications towards this claim being true reveals itself. Direct feedback from usability- and user tests imply that by using interactivity as a tool in eLearning courses, adult employees seem to motivate and engage themselves in learning activities. Multimedia elements plays a big part in eLearning courses. To engage the learner deeper, informative videos and realistic pictures has been used. Theory by Avery (2016) states that a rule of thumb is to keep videos for education and training short and concise. This is supported in articles by Gou (2013) and Hornung (2014). Gou and Hornung does not agree on the length, but both argues that videos should be kept short, but videos may vary in length due to different purposes. Videos in the HSE course module is kept short, lasting from 30 second to 4 minutes, which both is within the timeframe suggested by Gou and Hornung. The videos in the HSE course module are non-interactive, meaning that the user can not influence the story presented, which is argued by Zhang et al., (2006) and Choi & Johnson (2005) to leave learners being passive in the learning process due to lack of individual control. Even though the videos are non-interactive, the user has the option to pause, rewind, fast forward, and skip videos using a playbar. Results of usability- and user tests imply that it is the content of the video that decides if that is true. Participants agreed on videos showing real-life accidents may cause awareness, and some participants even stated that these videos made them feel a little sick. This argues for non-interactive videos to be effective information containers if presented correctly. The use of realistic images of hands with their fingers ripped or cut of in accidents, caused arousal for the participants. Some mentioned in post interviews that they still see these pictures in their head, and that these would increase chances of

participants being more careful in the future. This is supported by Sutcliffe (2012) where he states that design causing arousal are more likely to be remembered and engage the user.

Obviously, the novelty effect must be taken into consideration when interpreting these results, meaning putting employees through the same course time after time may result in a decrease in motivation and usage. All results in this research implies that courses like these, created with the support of eLearning design theory from chapter 3.6, can contribute to quality assure training and certification. Combined with an LMS, or other systems which can help streamline and automate training and certification, the process on training company employees and external workers can be significantly improved.

7.0 Conclusion and further work

The aim of this research is to investigate if implementation of a digital solution for facilitating web-based learning can quality assure HSE training, and have a positive impact on employee's memory retention²². User studies has been a part of the research process to collect user data and context analysis. Based on the context analysis, one module of a digital HSE course were created for testing and evaluation on BAF employees. The design process followed an iterative human-centered design approach where the designers can continue developing the system between tests based on user feedback. The HSE course module was tested using a Learning Management System (LMS) from Cypher Learning called NEO. Important for BAF is to streamline and automate parts of the training and certification processes. An LMS offers functionality such as automatic reporting of passed/failed courses, notification of new/updated course material, documentation etc., and this is the rationale for selecting to distribute the course on an LMS, besides company requirements on streamlining and automating training and certification processes.

The HSE course module was developed in Adobe Captivate 9 with rewritten content from the current HSE course. Old content is updated with new pictures, videos, audio voiceover, interactive exercises and built-in quizzes, supported by design theory on multimedia content usage. The HSE course was tested and evaluated against User Experience (UX), User Interface (UI), and technology acceptance using the Unified Theory of Acceptance and Use of Technology (UTAUT).

Results from this research shows that BAF employees varies in demography, educational level and their perception of web-based learning. Initial findings imply that the amount of job-related training varies based on department and leader responsibilities. Most employees with higher education (University degree) are found in administrative positions, and these employees respond that they participate more often in job-related training compared to other departments. Manufacturing employees represents the significantly biggest group of employees (65%), and among these, most are considered as unskilled (High-school or lower). In general, employees respond that they do not feel the current situation with regards to job-related training is working well or that it could be better.

Even though employees at BAF are significantly different in age, nationality, and previous experience with technology, results indicate that there are little to none technical barriers to implement web-based learning. Important factors are employee's perception on ease-of-use and usefulness of web-

²² Memory retention has not been measured in this research. Theory on memory retention has been investigated to design a HSE course which can facilitate and support learners to retain provided information.

based learning. Employees must feel that they have sufficient technical skills and knowledge to use it. Results and evaluation from two practical tests of the HSE course module imply that employees enjoy learning with web-based learning. Findings shows that employees feel motivated and encouraged to use such courses with its authentic and realistic content. Participants also respond positively when being asked if such courses can change their behavior towards HSE. With regards to memory retention, indications points to employees not being trained sufficient to be aware of different HSE topics as prohibited accessories, safety equipment and falling equipment.

This supports the hypothesis saying that such a digital solution can quality assure HSE training and have a positive impact on employee's memory retention.

7.1 Further work on HSE course

All five modules must be developed before the course is ready for launch. Framework for this has been developed for this project, but there are always room for improvements on design and UI. Suggestions for improvements of the HSE course is to add more media content to the course module where actors are dressed in authentic BAF clothing performing activities in BAF manufacturing area. It could be an option to use interactive videos where one action affect the story. There were also suggestions for using questions in between pages to "break up" the information flow. The course should be responsive and fit tablets to make it easy to access without a computer. Content in these courses can be anything from pictures to simulations, but is important to remember that too much is not necessarily better.

7.2 Further research

For further research, it is suggested to investigate if participating in web-based training over an extended period can affect employee's memory retention. It would also be interesting to investigate which type of courses is ideal for training of company employees. BAF has external contractors performing work. It would be interesting to investigate how they will relate to using such courses compared to the traditional method of training.

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8.0 Appendix

Note: Appendix B with results from questionnaire is presented without any grouping and comparison of different variables. The form was sent using Google Forms, and transferred to Survey XACT for further work.

Results from Survey XACT is available on request.

APPENDIX A - Questionnaire

SPØRSMÅL SVAR 129

Del 1 av 5 ✕ ⋮

Spørreundersøkelse for Benteler Automotive ansatte

Frist for å delta: Torsdag 23 Mars
Tidsbruk 7-15 minutter

Denne undersøkelsen er ment som en kartlegging av ansattes forhold til teknologi og nettbasert læring*
*Nettbasert læring er en måte å lære på ved hjelp av nettbaserte teknologier og verktøy. Med andre ord bruker deltakeren hovedsakelig datamaskiner til å kommunisere med læreren, andre deltakere, samt det faktiske lærestoffet. Kanskje du har tatt et matlagingskurs på datamaskinen din, eller fulgt en YouTube video som guide for å fikse bilen din. Du har kanskje brukt smarttelefonen din eller nettbrettet ditt til å lære om fotografering. Alle disse karakteriserer nettbasert læring.

Undersøkelsen er en del av en masteroppgave skrevet ved Universitetet i Agder våren 2017. Undersøkelsen er frivillig og alle svar vil bli behandlet konfidensielt, og vil kun benyttes til statistiske formål, men vi understreker at din deltakelse er viktig for oss. Hvis du bestemmer deg for å delta i denne undersøkelsen, kan du hvis du vil, sette din private e-post i bunnen av dette skjemaet og du har sjansen til å vinne 2 middager i kantinen på Benteler Automotive. 3 vinnere vil bli kontaktet.

Kort om undersøkelsen:
Du skal besvare 23 spørsmål hvor de 12 første er rene avkryssingsoppgaver. Spørsmål 13 til vurderingsoppgaver hvor du blir presentert med en påstand som er rangert fra 1 Helt uenig - 2 Delvis uenig - 3 Delvis enig - 4 Helt enig. Velg alternativet som passer best for deg i forhold til påstanden.
Spørsmål 23 spør etter din epost. Denne fyller du bare ut om du ønsker å være med i trekningen av 2 middager i kantinen hos Benteler. Hvis du ikke ønsker dette lar du denne være blank.

1. Kjønn

- Mann
- Kvinne
- Annet

2. Alder

- 18-24
- 25-34
- 35-44
- 45-54
- 55-62
- 62+

3. Nasjonalitet

Kort svartekst

4. Morsmål

- Norsk
- Engelsk
- Annet

5. Utdanning

- Barne- og ungdomsskole
- ☰ Videregående skole
- Høyere utdanning

6. Eier du en datamaskin, smarttelefon eller nettbrett? (Flere svar kan velges)

- Datamaskin
- Smarttelefon
- Nettbrett
- Ingen av delene

7. Ansettelsesforhold

- Fulltid
- Deltid

8. Lederansvar

- Ja
- Nei

9. Arbeidsområde

- Administrasjon
- Produksjon
- Vedlikehold
- Støttefunksjoner

10. Hvor ofte deltar du i obligatorisk trening/kursing i jobben din?

- Mindre enn en gang i året
- En til to ganger i året
- Tre eller flere ganger i året
- Aldri

10. Hvor ofte deltar du i obligatorisk trening/kursing i jobben din?

- Mindre enn en gang i året
- En til to ganger i året
- Tre eller flere ganger i året
- Aldri

11. Hvor ofte deltar du i den samme obligatoriske treningen/kursingen? F. eks HMS trening

- Mindre enn en gang i året
- En til to ganger i året
- Tre eller flere ganger i året
- Aldri

12. Har du brukt nettbasert læring i tidligere situasjoner relatert til jobb eller utdanning?

- Ja
- Nei
- Vet ikke

13. Jeg liker å bruke datamaskin til surfing på nett og sosiale medier (Nyheter, Shopping, Facebook, YouTube etc.)

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

14. Jeg liker å bruke smarttelefon/nettbrett til surfing på nett og sosiale medier (Nyheter, Shopping, Facebook, YouTube etc.)

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

15. Jeg må å bruke datamaskiner på jobb til å utføre mitt arbeid

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

16. Bruk av datamaskiner på jobb får meg til å føle meg usikker og forvirret

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

17. Jeg føler meg komfortabel med å bruke nettbasert læring

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

18. Min jobb/oppgaver krever at jeg må gjennomgå trening/kursing i noen form for å holde meg oppdatert på prosedyrer, kunnskap og/eller produkter

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

19. Det er rom for forbedring i forhold til dagens situasjon relatert til kursing og vedlikehold av kompetanse

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

20. Dagens situasjon relatert til kursing og vedlikehold av kompetanse fungerer bra

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

21. Jeg er motivert til å bruke nettbasert læring for kursing og kunnskapsforbedring

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

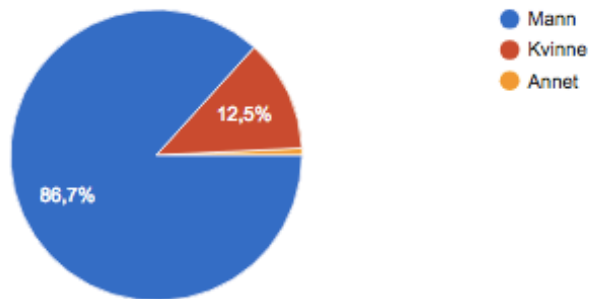
22. Jeg er villig til å bidra til å øke kompetansen min rundt Helse, Miljø og Sikkerhet ved å bruke 20-40 minutter måntlig på kursing uten lønn

- 1. Helt uenig
- 2. Delvis uenig
- 3. Delvis enig
- 4. Helt enig

APPENDIX B - Summary of questionnaire

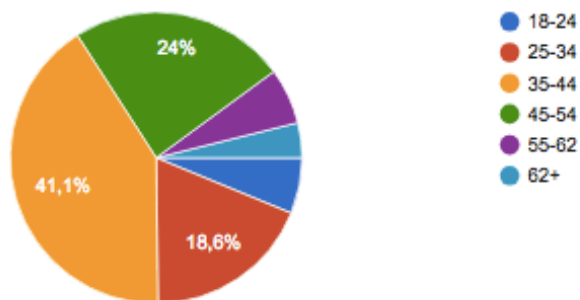
1. Kjønn

128 svar



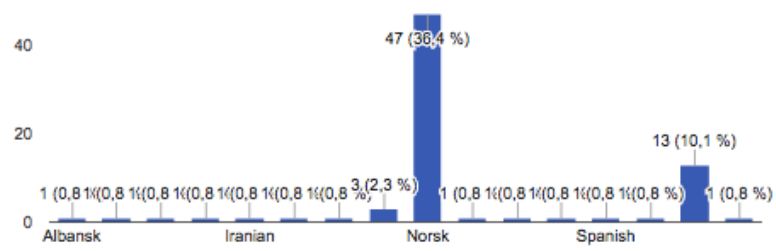
2. Alder

129 svar



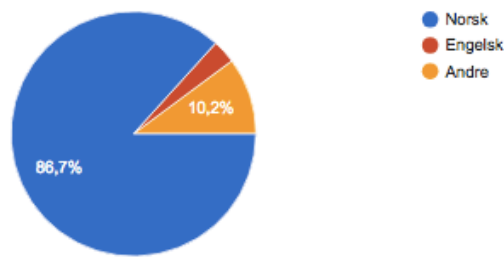
3. Nasjonalitet

76 svar



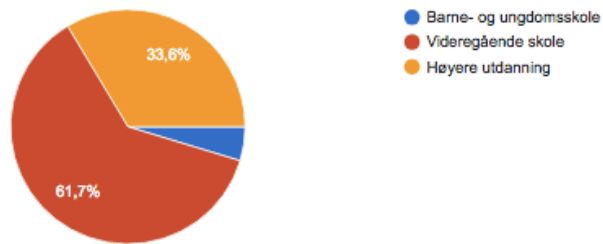
4. Morsmål

128 svar



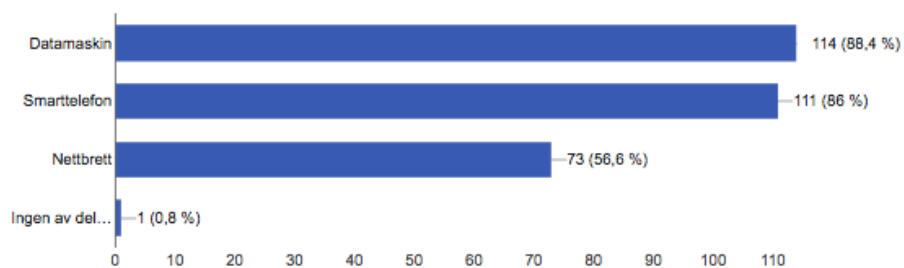
5. Utdanning

128 svar



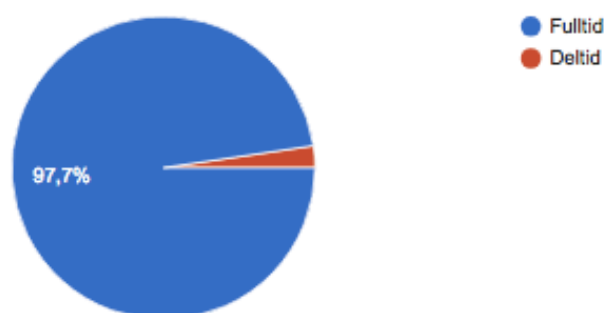
6. Eier du en datamaskin, smarttelefon eller nettbrett? (Flere svar kan velges)

129 svar



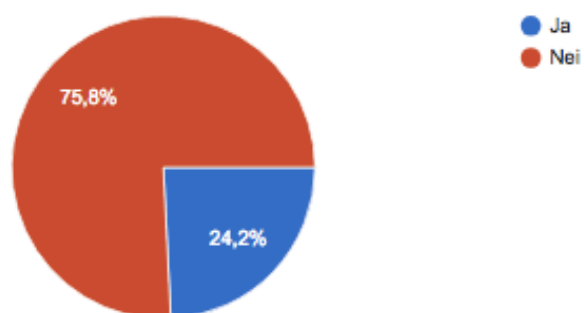
7. Ansettelsesforhold

129 svar



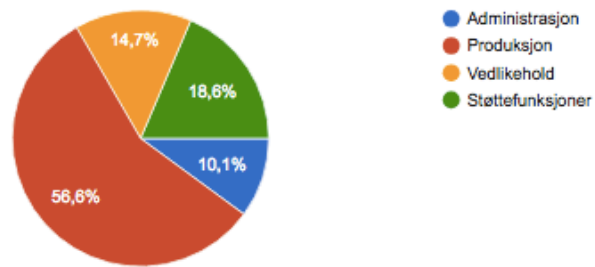
8. Lederansvar

128 svar



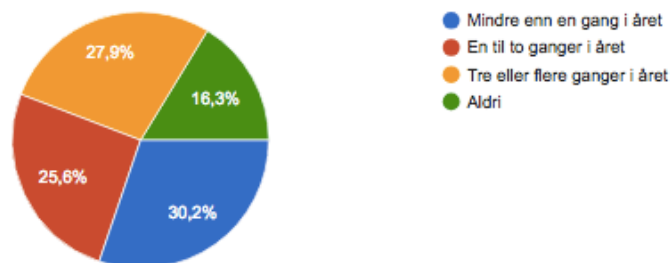
9. Arbeidsområde

129 svar



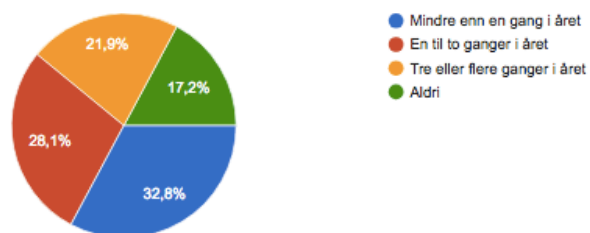
10. Hvor ofte deltar du i obligatorisk trening/kursing i jobben din?

129 svar



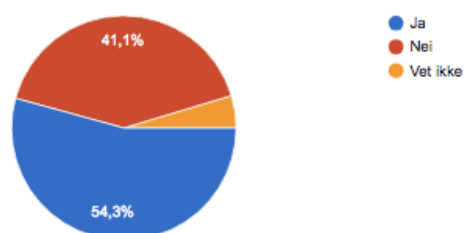
11. Hvor ofte deltar du i den samme obligatoriske treningen/kursingen? F. eks HMS trening

128 svar



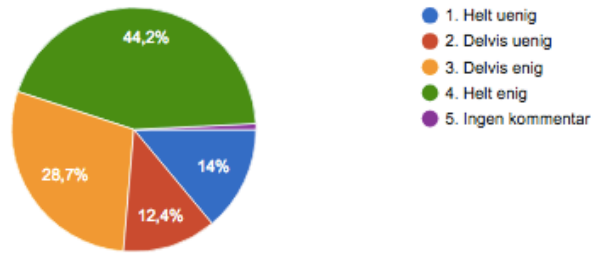
12. Har du brukt nettbasert læring i tidligere situasjoner relatert til jobb eller utdanning?

129 svar



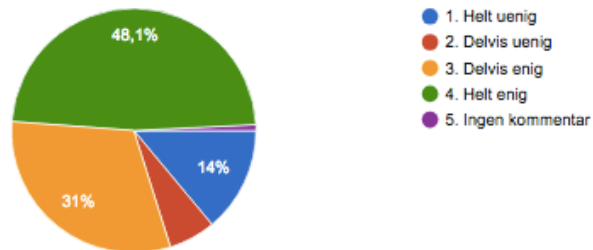
13. Jeg liker å bruke datamaskin til surfing på nett og sosiale medier (Nyheter, Shopping, Facebook, YouTube etc.)

129 svar



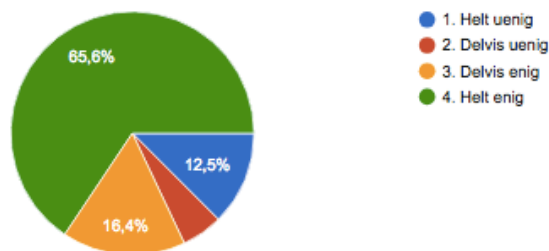
14. Jeg liker å bruke smarttelefon/nettbrett til surfing på nett og sosiale medier (Nyheter, Shopping, Facebook, YouTube etc.)

129 svar



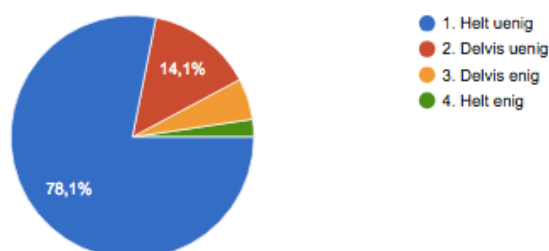
15. Jeg må å bruke datamaskiner på jobb til å utføre mitt arbeid

128 svar



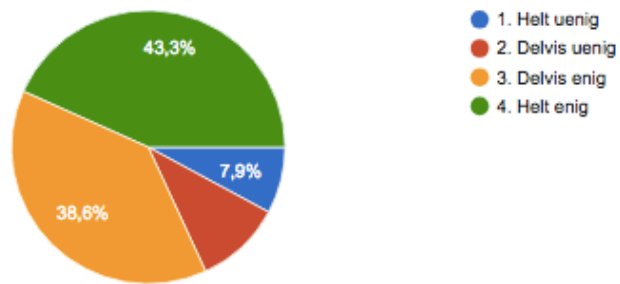
16. Bruk av datamaskiner på jobb får meg til å føle meg usikker og forvirret

128 svar



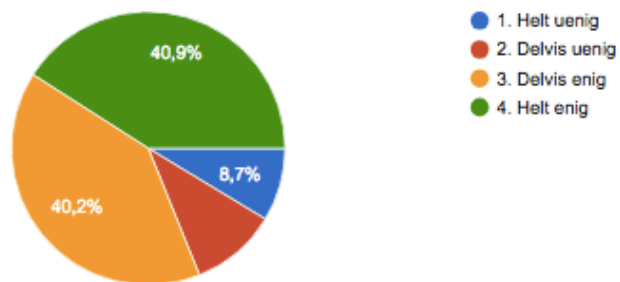
17. Jeg føler meg komfortabel med å bruke nettbasert læring

127 svar



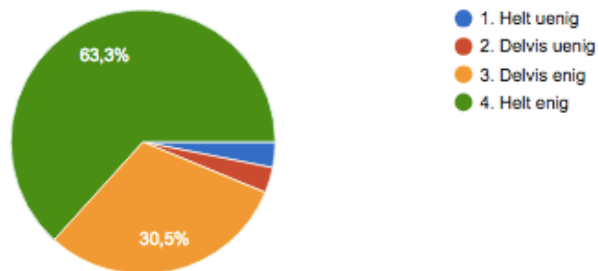
18. Min jobb/oppgaver krever at jeg må gjennomgå trening/kursing i noen form for å holde meg oppdatert på prosedyrer, kunnskap og/eller produkter

127 svar



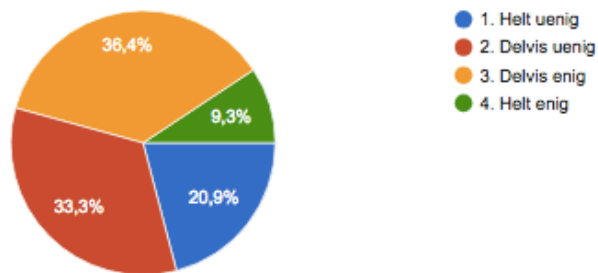
19. Det er rom for forbedring I forhold til dagens situasjon relatert til kursing og vedlikehold av kompetanse

128 svar



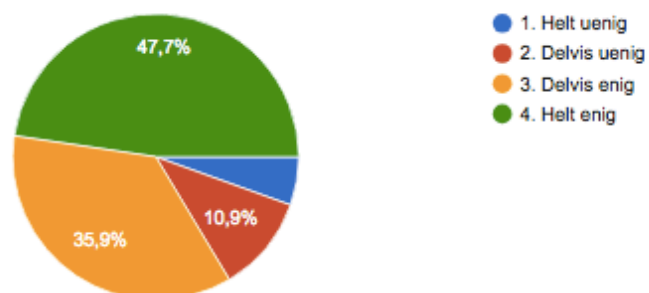
20. Dagens situasjon relatert til kursing og vedlikehold av kompetanse fungerer bra

129 svar



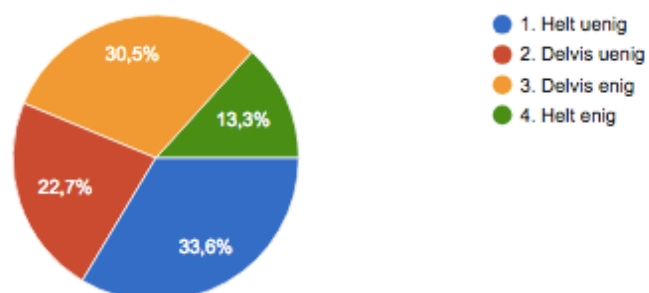
21. Jeg er motivert til å bruke nettbasert læring for kursing og kunnskapsforbedring

128 svar



22. Jeg er villig til å bidra til å øke kompetansen min rundt Helse, Miljø og Sikkerhet ved å bruke 20-40 minutter måntlig på kursing uten lønn

128 svar



APPENDIX C - Usability test 1 plan

Usability test plan – 1st iteration

1.0 Purpose

The purpose of this usability test is to test and evaluate end users and stakeholder's acceptance and willingness to use a digital training tool for HSE training. The test should also include end users and stakeholder's perception and thoughts of the digital tool, meaning user interface (UI), hence placement of buttons, content, videos, pictures etc., and user experience (UX), hence usable (easy to use), desirable (Image, identity, brand, and other design elements are used to evoke emotion and appreciation), and findable (Content needs to be navigable and locatable onsite and offsite).

Content language, interviews and forms will be conducted in Norwegian or English, based on participant's preferences.

2.0 Functionality

Candidates are presented with a laptop where the first task ask them to open Google Chrome and navigate to an URL. They each have access to one username and a matching password. From there, the user logs in, interact with the system, attempts to locate the HSE training tool, interacts with the tool, takes the "HSE test", submit the answers and logs out.

2.1 Tested functionality

- Do the user see what they can do in the system?
- Do the user manage to complete a provided course?
- Do the user understand what different names and terminology mean?
- Do the user understand the steps necessary to log in, find the course and complete it?

3.0 Systems to test

The HMS course is implemented in to NEO LMS, and is a learning resource created in the authoring tool Adobe Captivate.

4.0 Participants

Participants are recruited from Benteler Automotive by their HR representative. A selection of 5-6 participants from departments "Administration" and "Production" are requested. Participants should represent the diversity of employees working at Benteler. There should be a 70/30 split where the majority of participants represents the production staff.

4.1 Criteria's for selection:

1-2 representatives from administration

HMS manager should be included

4-5 representatives from production

Minimum 1 woman

Minimum 1 foreigner speaking and understanding English.

Variety in age 18-60

5.0 Facilities

Usability tests are conducted at Benteler Automotive in Farsund in one of their offices. The office needs to be closed, and have access to cabled internet.

6.0 Equipment

1. Laptop with external mouse and keyboard.
2. Screen recorder software.
3. Audio recorder and backup recorder.
4. Closed room with cabled internet

7.0 Tasks

We would like you during the tasks to think aloud. If you get stuck on a task, we want you to try as best you can to complete it, but if it is impossible, you can ask for help.

- 1. Open Google Chrome and navigate to www.uia.neolms.com.**
- 2. Log in using your username and password.**
- 4. Locate and start HMS Module 3.**
 - a. When you have come to 3.4 “Forbudt tilbehør”, you get interrupted and you decide to log out and close the browser.**
 - b. Resuming course (Follow steps 1-2).**
 - c. Replay the video with the steam/damp explosion**
 - d. When you have come to the page where you can start the test you are uncertain of the safety protection that applies to BAF staff and for external workers. Use the tabs to the left to navigate to the page where you can figure this out. Then finish course.**
 - e. Complete the course**

8.0 Schedule

Step	Time	Content
1	2-3 min.	Greet participant and explain what's going on, and sign consent form
2	4-6 min.	Pre-interview
3	15-20 min.	Present tasks and let participant solve these
4	4-5 min.	System usability scale (SUS) form
5	4-5 min.	Post-interview
6	1 min.	Thank the user for contribution
Total	30-40 min	Total time

Time	Participant number
08:30 – 09:15	Participant 1
09:30 – 10:15	Participant 2
10:30 – 11:15	Participant 3
11:30 – 12:30	Participant 4
12:30 – 13:15	Lunch
13:30 – 14:15	Participant 5
14:30 – 15:15	Participant 6

9.0 Pre- and post-interview and SUS form

Before interview start, an explanation of terminology such as web based training is completed so each participant share the same beliefs on different terms. Interview are semi-structured which allows for participants to elaborate his or her answers.

9.1 Pre-interview

Demographics

1. Age
2. Workspace
3. How would characterize your computer skills?
4. Have you previously used web based learning?
5. What is your relationship with the HSE?

9.2 Post-interview

HSE course

1. What were your first impressions of HMS course?
2. Were any of the tasks too difficult to solve?
 - a. If yes, which ones?
3. Was there anything in the HMS course that did not work the way you thought it would?

a. What?

4. Was there anything in the HMS course that was difficult to understand?

a. What?

5. When you were in the HMS course, did you notice that the learning objectives were available in almost all the pages?

6. If you noticed the learning objectives, did you find it useful?

a. Why?

7. What did you like best HMS course?

a. Why did you like it?

8. What did not you like the HMS course?

a. Why did not you like it?

9. Did you notice that you left of where you exited the HMS course when you had to leave for the store?

10. What did you think when you exited the HMS course and you automatically picked up where you left of when starting the HMS course again?

11. Were there any elements such as text, photos, or videos that you think was disturbing?

12. What did you think when you were solving the task where you placed the "prohibited" accessory in your closet?

13. Did you feel that the information provided in the course was useful to solve the tasks?

14. Was it easy or difficult to navigate inside the HMS course?

a. What was easy?

b. What was difficult?

15. Did you enjoy doing HMS training in this way?

16. Do you feel motivated to use this method to complete the HMS courses?

17. Do you feel engaged in training using such a HMS course?

18. Do you have any suggestions to improve this HMS course?

19. In your opinion. Can such a HSE course do something about your attitudes to perform work safely?

9.3 SUS form

System Usability Scale (SUS)

Please answer the following statements by circling the option of strongly disagree (1) to strongly agree (5), that best matches your opinion of this web-based learning system

Statement:	Strongly disagree				Strongly agree	SUS
I think I would like to use this system frequently	1	2	3	4	5	
I found the system unnecessarily complex	1	2	3	4	5	
I thought the system was easy to use	1	2	3	4	5	
I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5	
I found the various functions in this system were well integrated	1	2	3	4	5	
I thought there was too much inconsistency in this system	1	2	3	4	5	
I would imagine that most people would learn to use this system very quickly	1	2	3	4	5	
I found the system very cumbersome to use	1	2	3	4	5	
I felt very confident using the system	1	2	3	4	5	
I needed to learn a lot of things before I could get going with this system	1	2	3	4	5	

APPENDIX D - Consent form



Consent Form

I agree to participate in the study conducted by master students at the University of Agder

I understand that participation in this usability study is voluntary and I agree to immediately raise any concerns or areas of discomfort during the session with the study administrator.

Please sign below to indicate that you have read and you understand the information on this form and that any questions you might have about the session have been answered.

Date: _____

Please print your name: _____

Please sign your name: _____

Thank you!

We appreciate your participation.

APPENDIX E - Task completion and note form

Oppgave nr	1. Fullført 2. Fullført med hjelp 3. Ikke fullført	Tid	Notat
Oppgave 1			
Oppgave 2			
Oppgave 3			
Oppgave 3a			

APPENDIX F - Participant username and password

Brukernavn til norske kontoer	Passord
benteler1nor	
benteler2nor	
benteler3nor	
benteler4nor	
benteler5nor	
benteler6nor	
benteler7nor	
Username for English accounts	Password
benteler1eng	
benteler2eng	
benteler3eng	
benteler4eng	

APPENDIX G - Transcribed data from interviews in usability test first iteration

Kandidat 1:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Førintervju

Alder: [REDACTED]

Arbeidsområde: [REDACTED]

Hvordan vil du karakterisere dine dataferdigheter?

På pluss-siden

Har du tidligere brukt nettbasert læring?

Ja, litt

Hva er ditt forhold til HMS? Gjerne utdyp

Vara til hovedverneombud, vært verneombud i flere år

Notater:

Ser i menyen i Neo etter kurset

Finner link til kurset

OK

Ser ikke hele video1 - går videre til introduksjonstekst

Bruker neste-knappen til å gå videre

Logger ut og inn - fortsetter å navigere i lms før han finner kurset

Ser video på nytt om dampeksplasjon

Tvil om hva e-sigaretten er i drag and drop

Spørsmål om testen i fallsikring slide

Ser på bilder i fallsikring-slide og lukker de enkelt igjen

Navigerer tilbake med menyen til en slide (verneutstyr 1) – går videre med neste knapp

Ser hele introvideoen til quiz

Spørsmål 3 -> forstår oppgaven med en gang

Spm 7 = feil svar?

Besto ikke testen

STOPP!

Etter-intervju

Hva var førsteinntrykket av kurset?

Syns egentlig det er ganske greit. Vil trekke fram å kombinere tekst med noe visuelt i forhold til bruk av verneutstyr, men er ikke vanskelig å forstå

Var det noen av oppgavene du synes var vanskelige å løse (på arket)?

Nei, tenker litt men skjønner fort. Punkt D) ville heller hatt referanse til det punktet, hvis jeg evt satt her alene hadde det vært lettere å se

Var det noe i HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva? Nei, i grunn ikke. Helt greit

Var det noe i HMS kurset som var vanskelig å forstå?

Hva? Nei

Når du var i kurset, la du merke til at læremåtele var tilgjengelig på nesten alle sidene? Ja merke til det, need til venstre

Hvis du la merke til det, synes du det var nyttig?

Hvorfor? Ja egentlig, men var i innledinga og. Fokuset er på selve oppgavene

Hva likte du best med HMS kurset?

Hvorfor likte du det? Greit å kunne se det sjøl, gå fram og tilbake om man lurer på noe, får best læring om det. Kan alltid gå tilbake og korrigere svar, lærer noe av det og

Hva likte du ikke med HMS kurset?

Hvorfor likte du det ikke? Det var kun navigering inn til kurset (LMS) kan være vanskelig om du ikke er vant til bruk av pc

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

Nei, videoene med voiceover, litt ufokusert, og om alt blir oppfattet tydelig nok?

La du merke til at du automatisk fortsatte der du var når du måtte logge av for å dra på butikken?

Tenkte ikke over det

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Det er jo veldig greit at man kommer tilbake om en har flere oppgaver å gjøre å slippe å bla gjennom alt på nytt

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

Syns den var veldig grei, visuelt preg, veldig forståelig på tvers av språk, kunne kanskje ha ten grønn/rød side for å gjøre det "mer"

Førte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene?

Ja. Forsåvidt. Det er jo om du fanger opp det du har lært og sitter igjen med det du har lest. Men kan jo evt gå tilbake og gjøre det på nytt = da husker du det bedre

Hvordan synes du det var å navigere i kurset?

Lett? Veldig greit når jeg kom inn i selve kurset

Vanskelig? nei

Likte du å bli kurset på denne måten?

Ja syns det var enkelt framfor å kurse. Man må få med seg det som er på skjermen, det må bli husket. Kan du ikke noe med en pc er det spørsmål om det er en grei måte å gjøre det på.

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Ja, det må jo være greit. Du kan bruke det når du føler deg komfortabel med de tog den tiden du treng.

Føler du deg engasjert i opplæringen ved bruk av et slik HMS kurs?

Ja, du må jo delta på en måte med å klikke og være aktiv. Er du i et kurs med herry blir du opplest ting på. Her må du klikke på ting aktivt.

Har du noen forslag til forbedringer av HMS kurset?

Likte den drag and drop meget godt, og bruke mer tekst + bilder er ønskelig

Etter din mening, kan et slikt HMS kurs gjøre noe med dine holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Jeg synes det er for generelt for mine spesifikke oppgaver, men du begynner jo med holdninger på personlig verneutstyr som er bra. Skaper jo holdninger fra første øyeblikk. Tror dette kan bevisstgjøre mine holdninger i forhold til HMS. Den viktigste delen tror jeg er ledelsens oppfølging av holdninger i hverdagen, har opplevd flere ting i forhold til holdning. Leder må gå parallel med kurset i holdninger.

Andre ting du vil tilføye?

Present riktig: skrevet feil. Skriveleif. er det å bruke en iPad f.eks mer intuitivt? Det varierer veldig med datakunnskaper. Nye generasjoner tar dette veldig lett.

Kandidat 2. [REDACTED]

09:53 – 10:01 (Intervju)

[REDACTED]

[REDACTED]

Førintervju

Alder: [REDACTED]

Arbeidsområde: [REDACTED]

Hvordan vil du karakterisere dine dataferdigheter?

middels

Har du tidligere brukt nettbasert læring?

Nei, vært innom qui/opppgaver men ikke brukt det aktivt

Hva er ditt forhold til HMS? Gjerne utdyp

Godt forhold. Man må bruke det man har for å beskyttes.

Notater:

Gikk inn på registrer deg istedenfor log inn

Bruker tid på dette og tror muligens det er feil password/brukernavn og prøver på nytt.

Får instruksjon av Daniel og finner riktig innlogging

OK

Har logget inn:

Finner kurset med en gang på forsiden, nøler med å trykke på det og ser seg litt rundt. Trykker på kurset og finner hms kurs norsk med en gang.

Trykker på start

Lener seg bak og ser hele introduksjonsvideoen

Bruker nesteknappene til å navigere til neste slide,

Ser hele video av verneutstyr

Fortsetter

Skal logge ut av kurset og gjenoppta:

Logger inn riktig

Finner kurset med en gang- men vurderer inn på et annet kurs, får veiledning til å gå inn i same kurs. Kommer opp til en video, fortsetter til første slide, havner ikke på siden han var på slik det skal (feil brukernavn???)

Ser video av dampekspløsjon

Går videre til drag and drop

Nøler i et øyeblikk – forstår oppgaven meget kjapt og har alt riktig

Dampekspløsjon dukker opp igjen så blar videre, kommer igjen til d&d, trykket på tilbake forrige gang istedenfor å gå videre. Gjør d&d på nytt.

FALLSIKRING – ser ikke på bildene, går videre til quiz-intro

Går inn i “oppgaver” i neo, må tilbake til kurset og finner det med en gang, ser fortsatt på “oppgaver” i neo igjen, blir forklart at han skal holde seg inni selve kurset. Starter test.

Spm 3 → forstår oppgaven etter et øyeblikk nøling,

Litt i tvil på spm 4 “det er jo begge deler, men vi gjør dette”

Ikke bestått testen

Ser fasit

Tid: 19 minutter

Etter-intervju

Hva var førsteinntrykket av kurset?

Bra, litt forvirrende med en gang. Men veldig bra opplegg. Vil trekke fram: let forklart, let å forstå

Var det noen av oppgavene du synes var vanskelige å løse på arket?

Evt hvilke

Nei, lett å gå igjennom

Var det noe i HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva?

Ikke helt sikker på hva jeg kom til, visste kun om intervjurunden men var greit.

Var det noe i HMS kurset som var vanskelig å forstå?

Hva?

Nei

Når du var i kurset, la du merke til at læremåtene var tilgjengelig på nesten alle sidene?

Læremål? De star jo forklart i rute ned i hjørnet (blir vist en slide, så det vel i grunn ikke før vi viste det fram)

Hvis du la merke til det, synes du det var nyttig?

Hvorfor?

Hva likte du best med HMS kurset?

Hvorfor likte du det?

Filmene var bra, let å forstå og informative

Hva likte du ikke med HMS kurset?

Hvorfor likte du det ikke?

Nei, i grunn ikke, matte bare sette meg inn i "systemet" ikke bruke NEO, kunne skilt neo og module bedre

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

Nei

La du merke til at du automatisk fortsatte der du var når du matte logge av for å dra på butikken?

Ja, kom jo rett tilbake.

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Det er veldig bra, slippe å starte på nytt som tar med tid

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

Matte bare lese teksten så skjønnte jeg oppgaven

Følte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene?

Ja, ikke noe problem. Matte bare lese litt så var det greit

Hvordan synes du det var å navigere i kurset?

Lett?

Vanskelig?

Det var greit, alt star jo på den side og det er alltid en neste/tilbakeknapp der man kan gå fram og tilbake

Likte du å bli kurset på denne måten?

Ja jeg synes det er greit å bruke denne måten

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Ja, en må jo bare begynne med sånne ting og aldri vært borti det før så må man bare sette seg ned å begynne og lære seg. Kjekt å lære det.

Føler du deg engasjert i opplæringen ved bruk av et slikt HMS kurs?

Du kan ikke stille spørsmål til noen, men ja. Syns det.

Har du noen forslag til forbedringer av HMS kurset?

Enkel navigering + test, så det var lurt. Ikke noe å utsette på det i farta

Etter din mening, kan et slikt HMS kurs gjøre noe med dine holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Holdninger er jo noe som må forklares og læres på en trykkelig måte, ting må vises for å få gode holdninger, ikke alle hører etter og holdningene kommer av bade folk som prater og viser fram, og sånn et kurs med video kan vise det fram.

Andre meninger?

Nei. Ser jo at det er enkelt å bruke, er bare å sette seg ned med det. Fornuftig. Gå igjennom det et par ganger så er det bra.

Kan sjekke opptak for siste spørsmål

Kandidat nr 3:

████████

████████

████████████████

██████████

████████

Førintervju

Alder: ██████

Arbeidsområde: ██████████

Hvordan vil du karakterisere dine dataferdigheter?

Could be much better in excel, but okay

Har du tidligere brukt nettbasert læring?

Yes

Hva er ditt forhold til HMS? Gjerne utdyp

Thinks it is important to take care of the environment and be protected

Notater

Logg inn: går til register I NEO, blir forklart at det er oppe I hjørnet

Logger inn

Leter litt etter selve kurset I NEO I sidemenyen, finner det relativt raskt etter litt peking med pila

Trykker på feil kurs, men får instruks om riktig kurs

Går videre etter introvideo, leser over introslide

Bruker neste-knapp til å navigere

Ser verneutstyr-video

“videos are much more useful than just simple text”

logger ut

logger inn

finner kurset umiddelbart

ser dampeksplasjon

går videre

drag and drop → forstår testen kjapt

alt riktig

går tilbake til dampeksplasjon – trykker next og må gjøre d&d på nytt

skjønte ikke umiddelbart at en må vente til neste slide etter å ha gjort teste og trykket på submit

ser ikke på bildene i fallutstyr

ser introvideo til quiz

spm 3, ville gå tilbake til 2 men kom seg ut til NEO-tilbakeknappen, men kommer tilbake der hun er i kurset etter å ha trykket på “neste” i neo

forstår oppgave 3 umiddelbart

“it’s a bit strange that it jumped over Q2 when I clicked after Q1 since I clicked too fast and couldn’t go back”

failed the test.

Etter-intervju

Hva var førsteinntrykket av kurset?

It really detailed and good explanations, videos are good to remember content

Var det noen av oppgavene du synes var vanskelige å løse?

Evt hvilke

No

Var det noe i HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva?

It was a bit slow (tech probs) when it jumped over the question

Var det noe i HMS kurset som var vanskelig å forstå?

Hva?

No

Når du var i kurset, la du merke til at læremåtene var tilgjengelig på nesten alle sidene?

Yes, those with small letters

Hvis du la merke til det, synes du det var nyttig?

Hvorfor?

Yes, because we have to know why we sit here and what we have to learn

Hva likte du best med HMS kurset?

Hvorfor likte du det?

The videos, they help a lot, because it actually shows you how to do things and what you try to avoid to take with you in the manufacturer, and what consequences

Hva likte du ikke med HMS kurset?

Hvorfor likte du det ikke?

The test was a bit slow but okay

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

No

La du merke til at du automatisk fortsatte der du var når du måtte logge av for å dra på butikken?

Yes, it jumped back. Very usual, do not have to waste time to repeat everything again

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

It was okay, easy to do, some confusion of which button to press when finished but okay

Førte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene?

Yes. Helped a lot

Hvordan synes du det var å navigere i kurset?

Lett?

Vanskelig?

It was not difficult, but understandable combined by the nest/previous button, I saw the tabs on the left to jump to other slides.

Likte du å bli kurset på denne måten?

Yes. It was really good. Easy to use and remember the things that was taught, the videos and the drag and drop was really good way to show what to remember before you start to work.

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Yes. This was really good and I find it especially good that the course is short so you don't lose your interest, good content, technically a bit confusing (pga probs)

Føler du deg engasjert i opplæringen ved bruk av et slik HMS kurs?

Yes, I can explain to others what to do/not to do after doing this course

Har du noen forslag til forbedringer av HMS kurset?

Only the technical stuff, and the previous button and the test, that you cant go back.

Etter din mening, kan et slikt HMS kurs gjøre noe med dine holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Yes of course. So I can remember about the bottles lighters etc. especially with the videos.

Evt hør på opptaket til siste del av intervju, [REDACTED]

Kandidat nr 4:

■

■

■

■

Førintervju

Alder: ■

Arbeidsområde: ■

Hvordan vil du karakterisere dine dataferdigheter?

Helt grei

Har du tidligere brukt nettbasert læring?

Nei, ikke så mye. Litt på skolen med oppgaver og innleveringer.

Hva er ditt forhold til HMS? Gjerne utdyp

Syns det er veldig bra, prøve jo hele tiden å følge reglene og kravene some er, ser at det stadig er rom for forbedring. Hvis alle gjør det de skal gjøre så gir det effect, men I det siste kanskje vært en del som "skal bare" og tenker bare at "han låste ikke av så da trenger ikke jeg". Fort misforståelser. Viktig at alle følger HMS reglene

Notater

Logger inn

Finner og åpner kurset umiddelbart

Ser introvideo

Neste → introslide

Bruker nesteknapp til navigering

Ser verneutstyr-video

Fortsetter

Logger ut – logger inn

Finner fort tilbake til kurset – kurset starter på nytt fra starten

Pga interenetttrøbbel

Finner tilbake til riktig slide

Ser eksplosjonsvideo

Går videre

Drag & drop → forstår med en gang, alt riktig, går videre

Fallsikring → åpner ikke bildene

Quiz-intro

Skal navigere → Tror først det er faner i NEO, blir navigert til kurset

Quiz → trykker på et eller annen i sidenemyen i NEO. Går bra, tilbake til quiz

Spm 3 → forstår oppgaven med en gang

Quiz OK.

Besto testen.

Etter-intervju

Hva var førsteinntrykket av kurset?

Bra. Ser ut til å fungere greit, henger litt men det pga dårlig nett

Var det noen av oppgavene du synes var vanskelige å løse?

Evt hvilke

Nei.

Var det noe i HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva?

Nei

Var det noe i HMS kurset som var vanskelig å forstå?

Hva?

Nei

Når du var i kurset, la du merke til at læremåtene var tilgjengelig på nesten alle sidene?

Ja, når du spør for såvidt

Hvis du la merke til det, synes du det var nyttig?

Hvorfor?

Hva likte du best med HMS kurset?

Hvorfor likte du det?

At man kan gå igjennom det selv, kanskje enklere å kunne gjøre det selv på pc

Hva likte du ikke med HMS kurset?

Hvorfor likte du det ikke?

Kunne vært mer animasjon og bilder

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

Nei

La du merke til at du automatisk fortsatte der du var når du måtte logge av for å dra på butikken?

Var error, men ideen om det er god og veldig let, er det snakk om et par dager er det kanskje greit å starte på nytt, men bare et par timer er det veldig greit.

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Samme som i spørsmål 10

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

Må vel bare finne det som ikke skal med og sette de i skapet. Funket fint. Veldig grei oppgave, enklere enn bare en tekst, men der man fysisk må gjøre noe også.

Førte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene på arket?

Ja.

Hvordan synes du det var å navigere i kurset?

Lett?

Vanskelig?

Funket fint, alt var greit. Burde kanskje endre litt på menyen ift. test

Likte du å bli kurset på denne måten?

Dette tror jeg bil funke veldig bra. Syns det var greit. Fordeler med at man får mer forståelse på hvor alvorlig ting er, ser mer alvor. Kanskje det må være med en instruktør å svare på spørsmål.

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Ja. Det er jo greit å kunne se filmer og bli introdusert til hva som skal skje ved bruk av video

Føler du deg engasjert i opplæringen ved bruk av et slik HMS kurs?

Joda. Man ser jo tingene. Filmene er bra og det illustrerer at du må følge med for å unngå konsekvenser

Har du noen forslag til forbedringer av HMS kurset?

Kommer ikke på nå.

Etter din mening, kan et slikt HMS kurs gjøre noe med dine holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Ja. Det vil jeg si.

Hva sitter du igjen med? – filmer, at man ser konsekvensene så kanskje du tenker mer over det som kan skje istedenfor på et kjedelig papir. Du blir klar over hva som kan skje om du f.eks tar med en flaske.

Finner fort fram tilbake til kurset og er på sliten hun var tidligere

“hva er e-sig?”

spillervideo på nytt (dampexp)

drag and drop → nøler litt med “trykk her for å starte”

litt treg på drag and drop → men forstår fort hvordan hun skal bruke det

alt riktig

fallsikring → klikker på bildene

I tvil om hun skal trykke på tilbake for å lukke bildene eller “klikk her for å lukke” (mulig de er litt vanskelig å se)

Quiz – intro: leser teksten før hun ser video

Finner fanene til venstre

Test

Spm 3: forstår oppgaven

I tvil om det er flere alternativer i oppg 5

Stryker på testen, men prøver på nytt →

Virker usikker ved interaksjonsoppgaver, spør ofte spørsmål om tillatelse til å fortsette eller “skal jeg trykke her nå?”

Etter-intervju

1 Hva var førsteinntrykket av kurset?

Det var greit. Hvis ikke folk vet noe fra før kan det skape usikkerhet (angående påkledning, håndtering av deler, skarpe kanter etc)

2 Var det noen av oppgavene du synes var vanskelige å løse?

Evt hvilke

Nei.

3 Var det noe i HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva?

Ikke noe annet enn den usikkerheten hvis du ikke vet noe om produksjon her på BAF

4 Var det noe i HMS kurset som var vanskelig å forstå?

Hva?

Nei, ikke som jeg ser det

Når du var i kurset, la du merke til at læremåtene var tilgjengelig på nesten alle sidene?

Nei. Viste de fram til henne etter spm. Fulgte mer på andre bilder og elementer i kurset.

Hvis du la merke til det, synes du det var nyttig?

Hvorfor)

Hva likte du best med HMS kurset?

Hvorfor likte du det?

Nei, synes all info var grei og konkret. Kun grensetilfeller og tilleggsinformasjon som bør legges til

Hva likte du ikke med HMS kurset?

Ingenting, alt var greit.

Hvorfor likte du det ikke?

La du merke til at du automatisk fortsatte der du var når du måtte logge av for å dra på butikken?

Ja, helt ålreit. Må vite hvor jeg har vært så dette var bra.

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Ja bare bra. Bruker det hver dag

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

Nei

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

Jeg fant jo ut at ting ikke skal ta med inn i produksjonshallne. Kan det ha effect? JA, egentlig. En del folk glemmer å ta av giftering etc. helt nødvendig.

Følte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene?

Ja. Du får en påminnelse på hva du ikke skal ha på deg, ikke ta med inn i produksjonen, alle bør være igjennom det minst 1 gang i året for oppdatering

Hvordan synes du det var å navigere i kurset?

Lett?

Vanskelig?

Det fungerte bra. Er man ny trenger man å se tilbake og det er veldig viktig. Greit å kunne gå tilbake.

Det var okei

Likte du å bli kurset på denne måten?

Ja.

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Ja egentlig, fordi da hadde ikke hms-lederen trengt å holde alle kursene. Det gjør det lettere for innleide og besøkende

Føler du deg engasjert i opplæringen ved bruk av et slik HMS kurs?

Ja, så lenge det har noe med mitt arbeidsområde å gjøre. Det er viktig med riktig utstyr. For å trekke fram noe spesielt?: påminning om du ikke har lov å ta med deg inn. Nei, men det manglet en ting, MOBILTELEFON.

Har du noen forslag til forbedringer av HMS kurset?

Det burde ikke være forskjell på innleide og de som skal inn i produksjonen, det bør være same regler uansett.

Etter din mening, kan et slikt HMS kurs gjøre noe med dine holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Ja. Kontra dagens info: egentlig ikke. Vet ikke hva det skulle være på. Jeg bruker alltid verneutstyr og er nøye på det.

Annet:

Informasjon skulle vært mer "spisset" til temaet. Ex. Verneutstyr

Notat: leste veldig nøye over hva som stod skrevet

Kandidat nr 6:

■■■■■

■■■■■

Førintervju

Alder: ■■■

Arbeidsområde: ■■■

Hvordan vil du karakterisere dine dataferdigheter?

Ganske høyt

Har du tidligere brukt nettbasert læring?

Ja

Hva er ditt forhold til HMS? Gjerne utdyp

Veldig engasjert, svært viktig for meg

Notater:

Logger inn

Surre litt på forsiden, synes ikke det va intuitivt med å trykke inn på kurset det

Bildet på forsiden trenger seg ikke på, og skjønner at det er hms

Starter modul 3

Ser introvideo til modul: likte videoen, hyggelig å bli ønsket velkommen. Må ha bentelerklær I produksjon hvis det er til benteler. Kunne hatt litt tekst under I tillegg som støtter opp de than sier. Syns bildet I bakgrunnen av kurset gjør det vanskeligere å lese. Bra at intro blir gjentatt I tekstformat.

Verneustyr 1: bilde av harry vises godt, konkret. Syns det er vanskelig å lese læremål I den lille ruten nede til venstre.

Verneustyr 2: ville byttet overskrift, en tekst som er mer relevant til innholdet.

Verneustyr 3: samme som ovenfor

Navigerer med bruk av nesteknapp

Verneutstyr video: kombinasjonen av at en annen snakker enn at hovedpersonen snakker er VELDIG bra. Bra å sette inn video på dette tidspunktet av kurset for da får man "hvile" i form av å slippe å lese f.eks.

Riktig bruk: vis bilde av det du lister opp av ting

Sikkerhet/smykker: god plassering, bildet med ringen fanger oppmerksomheten umiddelbart.

Forbudt tilbehør: rød skrift kanskje ikke hensiktsmessig. Rødt kryss = bra

Dampexplosjonsvideo: god effect av video, hjertet banker og holder pusten.

D&D → skjønner umiddelbart → trykker feil og havner tilbake på eksplosjonsvideo → går videre til d&D igjen, starter test sjekker svar etter å ha puttet en ting i boksen -> nytt forsøk? Reset? Tilbake? IKKE INTUITIVT. Skjønner ikke at alt skal plasseres med en gang → gjør alt riktig når hun ikke tester produktet (forstår!)

Fallsikring → første setning er unødvendig komplisert, gjør språket enklere

Logger ut og inn → havner på samme slide som før

Sjekker ikke bilder i fallsikring

Leser tekst på quiz-intro først → ser video

Går videre til test

Spm 3: skjønner umiddelbart interaksjonen i oppgaven

Usikker på svaralternativer, vanskelig å skjønne oppgaven

Oppgave 4: innholdet er et annet spørsmål enn selve brukervennlighet og test

Spm 5: utydelig svaralternativer

Vil helst ha ja/nei spørsmål om det er mulig

Bestod testen

ferdig

Etter-intervju

1Hva var førsteinntrykket av kurset?

Det var en grei måte å lære på, egentlig i forhold til tidsbruk : lite innhold. Kan ha med meg selv å gjøre. Stort sett intuitivt og lett å forstå intuitivt sett. Kan forbedres i forhold til tekst og innhold.

2 Var det noen av oppgavene du synes var vanskelige å løse?

Evt hvilke

Arket er relativt uoversiktlig og mye tekst, bort ifra arket synes jeg hele prosessen var VELDIG bra. Ble godt forberedt om innhold og forventninger og hva som skulle bidras med. Godt strukturert og enkelt å skjønne.

Var det noe I HMS kurset som ikke fungerte slik du tenkte det skulle?

Hva?

Forvirra angående garderobeskapet,

Var det noe I HMS kurset som var vanskelig å forstå?

Hva?

I forhold til det enkle læringsinnholdet kunne det vært gjort enklere, enda mer kombinasjon av bilde og tekst. Min forventning er at min 2 år gamle datter skal kunne gjøre dette selv, og fått informasjon selv om hun ikke kan lese. For å sette det på spissen.

Når du var I kurset, la du merke til at læremåtene var tilgjengelig på nesten alle sidene?

Jeg la merke til det – for liten plass, og litt utydelig og vanskelig å lese. Kunne hatt en overfunksjon av dette. Jo mindre informasjon på en gang jo bedre. Vil gjerne ha fullskjerm. Ser plattformen I tillegg.

Hvis du la merke til det, synes du det var nyttig?

Hvorfor)

Nei, det var så korte sekvenser og visste alltid hva jeg holdt på med med overskrifter og informasjon. Var alltid informert på et vis.

Hva likte du best med HMS kurset?

Hvorfor likte du det?

Var veldig flinke å få fram noen "keys", ting vi ville poengtere. Og de var veldig viktige og innholdet var rolig og veldig fokusert på akkurat dette som gjorde at vi fikk det med oss. Eksplosjonsfilm, øredobber, flaske, fallsikring var minst tydelig, manglet eksempler, en person,

Hva likte du ikke med HMS kurset?

Hvorfor likte du det ikke?

Lange tekster, bruk av bilder bak tekst,

Var det elementer som tekst, bilder eller videoer du syntes var forstyrrende?

Videoene var utelukkende VELDIG BRA. For mye tekst, teksten var formulert på en for komplisert måte, spørsmålene kunne vært JA/NEI spm, navigasjonen var delvis misvisende, spesielt angående skapet I d&d

La du merke til at du automatisk fortsatte der du var når du hadde logge av for å dra på butikken?

Ja. Hadde forventet dette, og hadde blitt irritert om ikke.

Hva tenker du om at du fortsatte der du slapp når du måtte logge av for så å logge på og automatisk fortsette der du var i HMS kurset?

Utrolig komfortabelt, vil gjerne at det er markert hva du har vært igjennom.

Hvordan tenkte du da du skulle løse en oppgave hvor du skulle plassere "ulovlig" tilbehør i skapet?

Jeg liker måten å gjøre det på, ordensmennesker, liker ikke når noe ikke passer inn i skapet (OCD), like ikke funksjonaliteten, ideen er kjempegod. Kunne gjerne plassert i to skap: en til produksjon og en til skap.

Førte du at informasjonen tilgjengelig i kurset var nyttig for å løse oppgavene?

Nei. Fram var veldig rett, vet ikke med andre vei.

Hvordan synes du det var å navigere i kurset?

Lett?

Vanskelig?

Har kun gått framover, helt topp, tilbake vet jeg ikke. Bør være tilgjengelig bør ha mulighet til å gå rett til testen.

Likte du å bli kurset på denne måten?

Ja. Syns det er det mest hensiktsmessige utenom klasserommet. Å lese hadde vært mindre effektivt.

Føler du deg motivert til å benytte denne metoden til å gjennomgå HMS kurs på?

Ja. Man liker jo å se på ting, husker enklere.

Føler du deg engasjert i opplæringen ved bruk av et slik HMS kurs?

Ja. Selve innholdet engasjerer meg, brenner for innholdet, syns det er gøy å utforske det som er på neste side osv.

Har du noen forslag til forbedringer av HMS kurset?

Har nevnt det meste.

Etter din mening, kan et slikt HMS kurs gjøre noe med dine/ansattes holdninger ifht til å utføre arbeidsoppgaver på en trygg måte?

Ja, absolutt. Jeg tror at det å bli minnet på hva som er viktig om HMS i produksjon er viktig uansett.

Mer video og bilder, gjerne mer snakking i film istedenfor tekst.

Svare etter hver film om spørsmål som går på innhold istedenfor mer tekst.

APPENDIX H - User test plan

Plan for usability-testing of digital HSE training tool – second iteration.

Note: The second iteration will be conducted on Norwegian and translated to English for the purpose of this thesis. This is due to time limitations to create and update content for both Norwegian and English version. Some elements in the test is equal to the first iteration, and the two plans will therefore not differ too much in planning and execution.

1.0 Purpose

The user testing was conducted to address previous issues that has been changed with accordance to the participant's feedback from the usability test (first iteration). Changes were made in the module concerning layout, aesthetics, content and multimedia. The test should also include end users and stakeholder's perception and thoughts of the digital tool, meaning user interface (UI), hence placement of buttons, content, videos, pictures etc., and user experience (UX), hence usable (easy to use), desirable (Image, identity, brand, and other design elements are used to evoke emotion and appreciation), and findable (Content needs to be navigable and locatable onsite and offsite). Measurements on technology acceptance was also included in the user test, with an UTAUT form which the user should answer after the user test.

Content language, interviews and forms will be conducted in Norwegian.

2.0 Functionality

Participants are presented with a screen, a keyboard, a computer mouse and a headset. On the screen the participant will see the "Start" screen of the course and will on their own complete the course as they please. For the second iteration, due to previous issues with internet connection and based on previous comments that the course should be ran in "full-screen" the course will run locally in the web browser "Google Chrome". This eliminates past issues with videos not being loaded due to low internet speed, and will also work as a simulated full-screen.

2.1 Tested functionality

- Do the user see what they can do in the system?
- Do the user manage to complete a provided course?
- Do the user understand what different names and terminology mean?

3.0 Systems to test

The HSE course is a learning resource created in the authoring tool Adobe Captivate. It is this HSE course that is the system to test.

4.0 Participants

Participants are recruited from Benteler Automotive by their HR representative. A selection of 5-6 participants from departments "Administration" and "Production" are requested. Participants should represent the diversity of employees working at Benteler. There should be a 70/30 split where the majority of participants represents the production staff.

4.1 Criteria's for selection:

1-2 representatives from administration

HSE manager should be included

4-5 representatives from production

Minimum 1 woman

Variety in age 18-60

5.0 Facilities

Usability tests are conducted at Benteler Automotive in Farsund in one of their offices. The office needs to be closed, and have access to cabled internet.

6.0 Equipment

1. Laptop with external screen, mouse, keyboard and headset.
2. Screen recorder software.
3. Audio recorder and backup recorder.
4. Closed room with cabled internet
5. Stopwatch

7.0 Tasks

The participants are only given one task each which is to go through the course as they would if they were to take the course by themselves. If the participant get stuck somewhere, he or she will be emphasized to try as best as possible to complete it, but if it is impossible, the participant can ask for help.

Task 1: Start the course and go through it as you would if you were on your own. Finish the test and exit the resource.

8.0 Schedule

Step	Time	Content
1	2-3 min.	Greet participant and explain what's going on, and sign consent form
2	4-6 min.	Pre-interview
3	15-20 min.	Present tasks and let participant solve these
4	4-5 min.	UTAUT form
5	4-5 min.	Post-interview
6	1 min.	Thank the user for contribution
Total	30-40 min	Total time

Time	Participant number
08:30 – 09:15	Participant 1
09:30 – 10:15	Participant 2
10:30 – 11:15	Participant 3
11:30 – 12:30	Participant 4
12:30 – 13:15	Lunch

13:30 – 14:15	Participant 5
14:30 – 15:15	Participant 6

9.0 Pre- and post-interview

Before interview start, an explanation of terminology such as web based training is completed so each participant share the same beliefs on different terms. Interview are semi-structured which allows for participants to elaborate his or her answers.

9.1 Pre-interview

Time:

Date:

Demographics

1. Age
2. Workspace
3. How would characterize your computer skills?
4. Have you previously used web based learning learning?
5. How long have you worked at BAF?

9.2 Post-interview

The post-interview in the user test was shortened and used as a guideline to a semi-structured interview method.

HSE course

1. Hva var førsteinntrykket av (Det oppdaterte) HMS-kurset?
2. Hva likte du best med HMS-kurset?
3. Hva likte du ikke/minst med HMS-kurset?
4. Var det enklere å bruke dette kurset enn det forrige?
5. hva synes du om lydsporene?
6. Noe annet du vil tilføye/kommentarer?
7. Hvordan reagerte du på dampeksplasjonen? Har sett videoer av det før,

9.3 UTAUT form

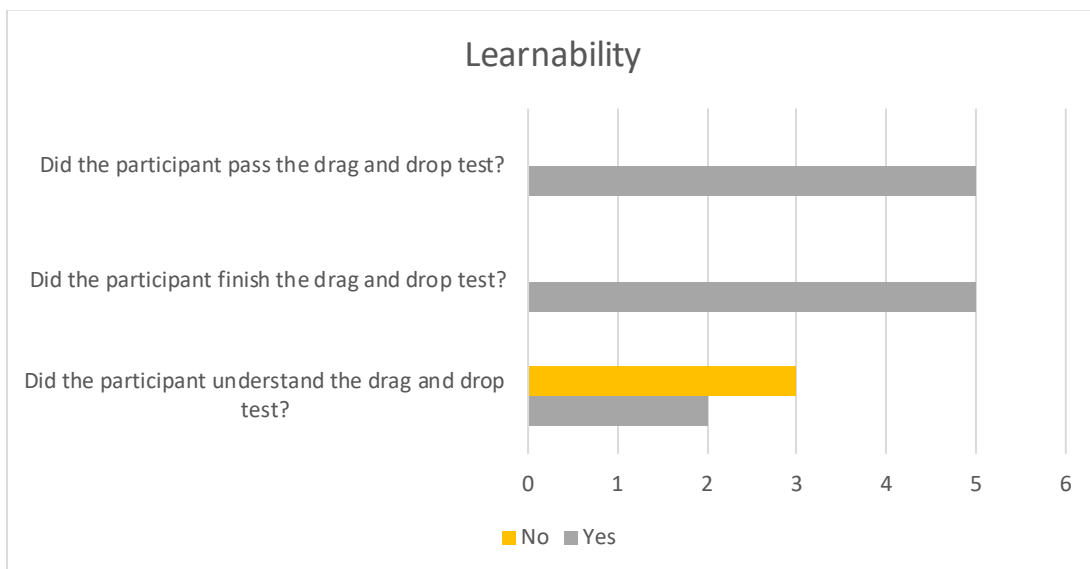
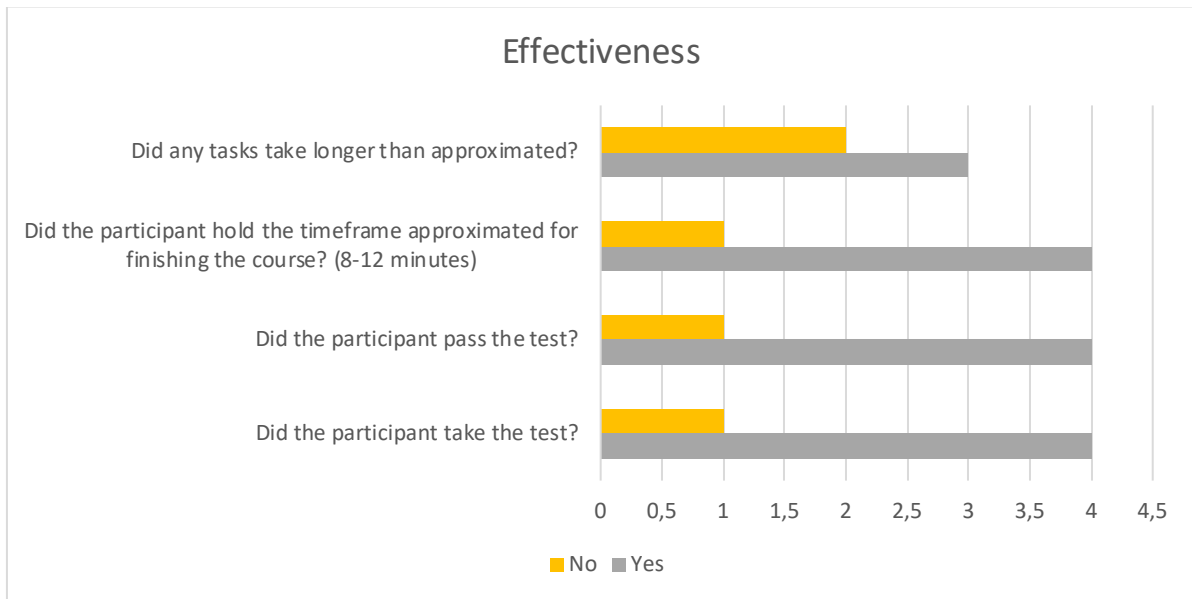
Item	Totally disagree	Partly disagree	Partly agree	Totally agree
Attitude towards using technology				
Using this HSE course is a good idea.				
This HSE course will make work more interesting				
Working with this HSE course is fun.				
I like working with this HSE course.				
Performance expectancy				
I find the HSE course useful for my work.				
Using this HSE course will enable me to accomplish tasks at work more quickly.				
Using this HSE course will increase my productivity at work.				
Effort expectancy				
It will be easy for me to become skillful at using this HSE course.				
I find the HSE course easy to use.				
Learning to operate the HSE course is easy for me.				
Social influence				
People who are important to me (leaders/co-workers/family) think that I should use this HSE course				
People who influence my behavior (leaders/co-workers/family) think that I should use this HSE course.				
I think BAF supports the use of this HSE course.				
Facilitating conditions				
I have the resources necessary (PC/smartphone/tablet) to use the system.				
I have the technical knowledge necessary to use this HSE course.				
Personnel at BAF is available for assistance with system difficulties.				
Behavioral intention to use the system				
N/A	N/A	N/A	N/A	N/A
Actual use				
N/A	N/A	N/A	N/A	N/A

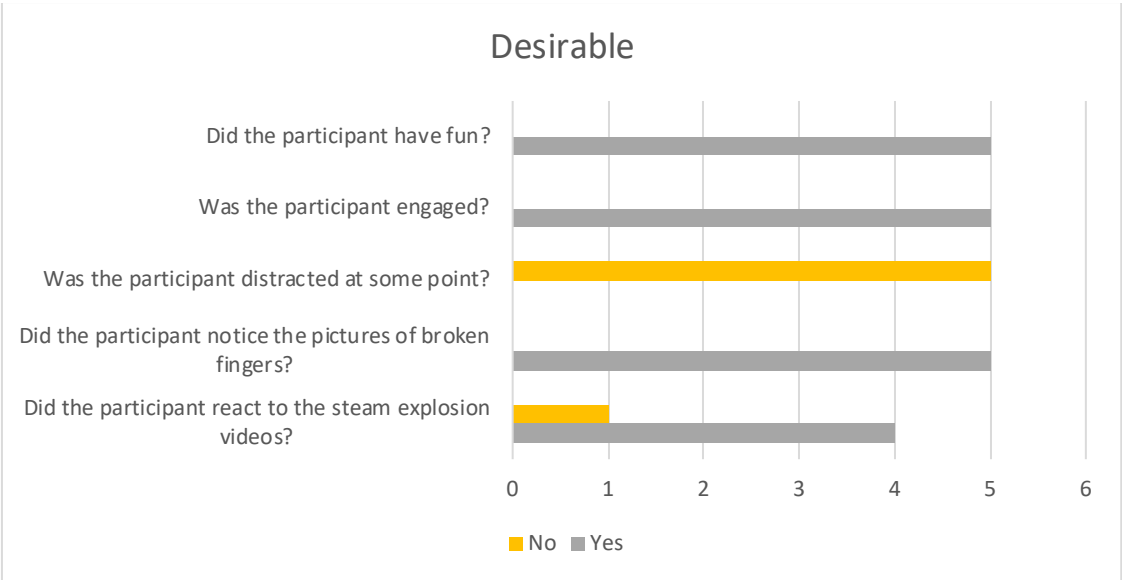
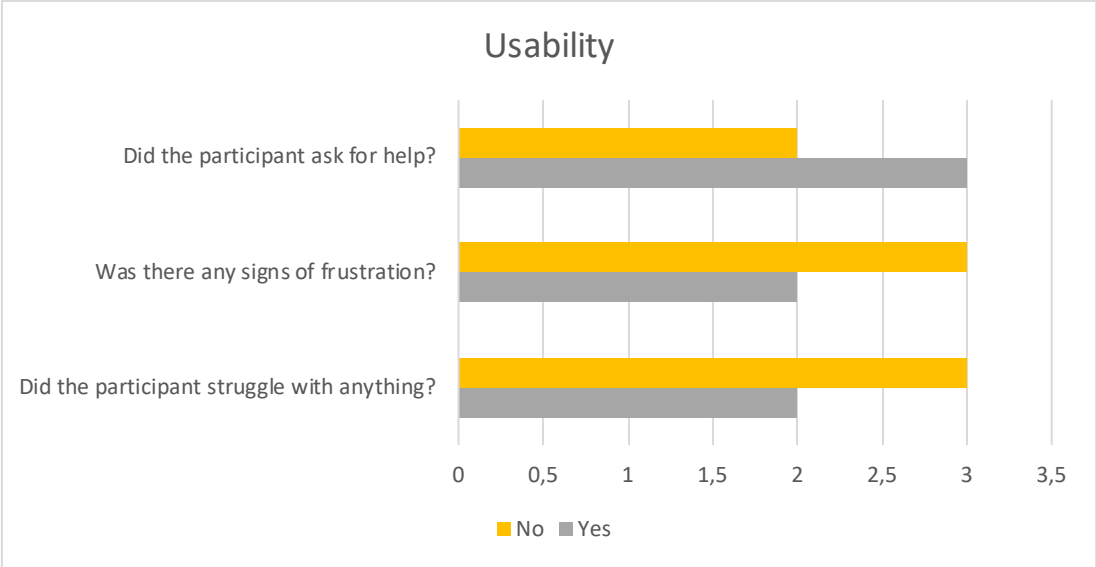
9.4 Data coding questions (to be filled in by the facilitator/instructor)

Question	Yes	No
Did the participant watch the videos?		
Did the participant re-watch any of the videos?		
Did the participant use the button to look at the learning objectives?		
Did the participant skip the reading?		
Did the participant navigate in the HSE module by using the menu?		
Did the participant notice the learning objectives in the down left?		
Did the participant finish the drag and drop test?		
Did the participant understand the drag and drop test?		
Did the participant pass the drag and drop test?		
Did the participant react to the steam explosion videos?		
Did the participant notice the pictures of broken fingers?		
Did the participant go through the slides before taking the test?		
Did the participant take the test?		
Did the participant pass the test?		
Did the participant hold the timeframe approximated for finishing the course? (8-12 minutes)		
Did the participant experience errors of some kind in the module?		
Did the participant go back to repeat the course when the course failed?		

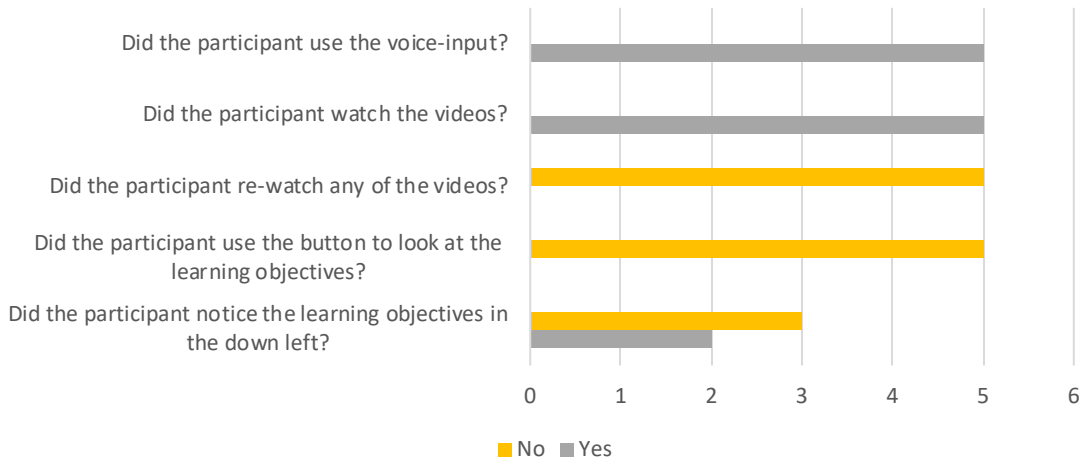
Did the participant review the test after finished?		
Did the participant use the voice-input?		
Was the participant distracted at some point?		
Was the participant engaged?		
Did the participant have fun?		
Did any tasks take longer than approximated?		
Did the participant struggle with anything?		
Was there any signs of frustration?		
Did the participant ask for help?		

APPENDIX I - Data coding results

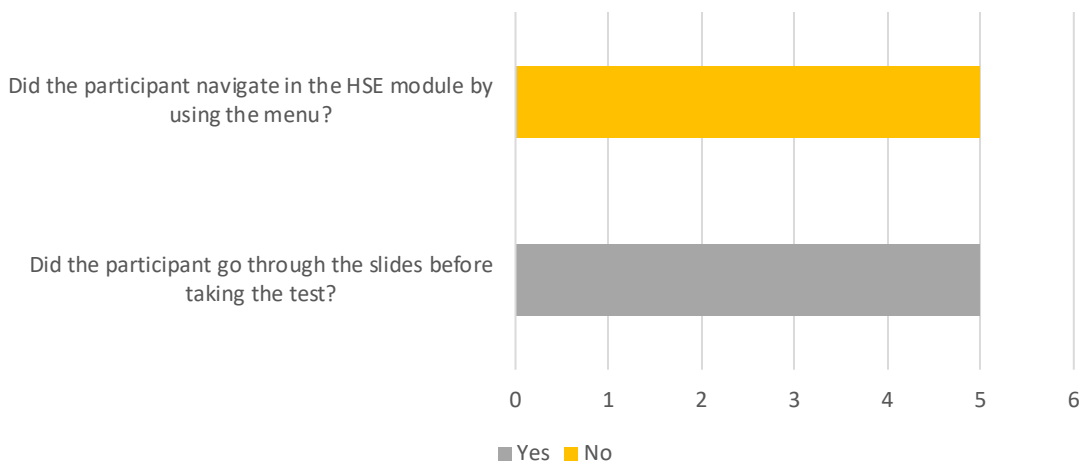




Usable



Findable



APPENDIX J - Transcribed data from user test, second iteration

User test, second iteration

Mandag [REDACTED]

Kandidat 1 kl 0900-0926

Før test:

Navn: [REDACTED]

Alder: [REDACTED]

Stilling på BAF: [REDACTED]

Hvor lenge har du vært ansatt i BAF?: [REDACTED]

Under test:

Observasjoner:

Brukte ikke voiceover-funksjon

Dempet lyden på verneutstyr-video, synes den var litt høy.

Litt treg å komme i gang med d&d – forstår ikke å plassere ting som får lov å være med i produksjonen – spør hvorfor dette ikke stemmer, og bes lese igjennom introduksjonen igjen da hun også forstår hva hun skal gjøre umiddelbart etterpå.

Klikker tilbake da hun skal lukke bildet av rekkverk på “fallsikring” for å se stort bilde.

Forstår umiddelbart “feilen” og navigerer seg tilbake. (error/recover)

Besto kurset 85%

Etter test:

Tid brukt: 11:00

Hva var førsteinntrykket av (Det oppdaterte) HMS-kurset?

Veldig greit. Hadde en opplevelse at det var letter å svare på spørsmålene denne gangen enn forrige gang

Hva likte du best med HMS-kurset?

Tenkte ikke på det, men det er i grunn veldig greit. Gir veldig mye informasjon. Og hvis du skal bruke dette på noen som er nye, du er mer konsentrert enn om du ser på et lerrett. Dette er mye mer givende. Du får det mer inn i systemet. Kurset var bedre nå.

Hva likte du ikke/minst med HMS-kurset?

Ingenting å tilføye, besvart over.

Var det enklere å bruke dette kurset enn det forrige?

Ingenting å tilføye, besvart over.

hva syns du om lydsporene?

Ingenting å tilføye, besvart over.

Noe annet du vil tilføye/kommentarer?

Ingenting å tilføye, besvart over.

Hvordan reagerte du på dampekspløsjonen? Har sett videoer av det før, veldig bra med video av realistiske hendelser. Bildene også.

Kandidat 2

10:00-1020

Før test:

Navn: [REDACTED]

Alder: [REDACTED]

Stilling på BAF: [REDACTED]

Hvor lenge har du vært ansatt i BAF? [REDACTED]

Husker forrige versjon av kurset.

Under test:

Observasjoner:

Tar ned volumet på verneutstyr-video

Venter etter videoen at noe skal skje, men trykker seg videre etter noen sekunder

Bruker info-knappene til å høre på voiceover med tilleggsinformasjon

Trykket feil på d&d-infomasjonstekst, trykker på "neste" istedenfor start. Spør om man kan trykke på neste men får svar at du må trykke på start. Gjorde feil i d&d testen og surret litt med å finne tilbake for å ta den på nytt, besto på andre forsøk.

System error! Nesteknappen i spm. 1 henger seg opp, kommer seg ikke videre.

Etter test:

Tid brukt: 11:00

1. Hva var førsteinntrykket av (Det oppdaterte) HMS-kurset?

I think it's really good, not a very big change compared to the last one. I like the information buttons, its useful. I think it's better.

2. Hva likte du best med HMS-kurset?

Not interrupted, and the plus information is more informative

3. Hva likte du ikke/minst med HMS-kurset?

It was okay

4. Var det enklere å bruke dette kurset enn det forrige?

Yes, more useful.

5. hva syns du om lydsporene?

I used all of them, it's a possibility, giving more information about the topic. Its useful, and optional.

6. Noe annet du vil tilføye/kommentarer?

No.

7 Hvordan reagerte du på dampekspløsjonen?

I Noticed it.

hva syntes du om språket, som fremmedtakende?

Easy to understand the language, i think i understood almost everything.

Kandidat 3

11:20-

Før test:

Navn: [REDACTED]

Alder: [REDACTED]

Stilling på BAF: [REDACTED]

Hvor lenge har du vært ansatt i BAF? [REDACTED]

Under test:

Observasjoner:

Trykket på feil knapp første gangen med VO, men brukte det.

Bruke litt tid etter video til å gå videre (VU)

Etter test:

Tid brukt: 6 min

What was your first impression of the updated HSE-course?

Var fin. Usikker hva vi har fjernet, men ser hva vi har lagt til. Gir mulighet til å leke med infopunkter, nysgjerrighet og var veldig positivt. Likte veldig godt d&d og skremmende bilder. (hør på opptak)

What did you like the best?

Ingenting å tilføye, besvart over.

What did you not like?

Enda litt for lang tekst som kunne formateres. Kunne gjerne hatt mer visualisering

Was it easier to use the updated version?

Jeg tror det

What did you think about the voiceover?

how did you react to the explosion video and the bizarre pictures?

Veldig sterkt

anything else you'd like to add?

To ting: langtidsskade på mangel av bruk av hørselsvern

Veldig bra med arbeid i høyde over 2 meter – men mangler noen personer som gjør noe. Identifikasjon med andre mennesker trenger man, fungerer bra på andre ting.

Kunne gjerne hatt tekst i videoen spesielt i VU og introduksjon

La ikke merke til navigasjonen, ble aldri brukt men er fint å ha. Bakgrunnsbildet, det er ikke negativt og mye bedre når det ble endret. Bra med knapp til læremålene

Ting kan bli lagt i skygge når man ser så bizarre ting som ringene og brannsårene.

Kandidat 4

1220-

Før test:

Navn: [REDACTED]

Alder: [REDACTED]

Stilling på BAF: [REDACTED]

Hvor lenge har du vært ansatt i BAF? [REDACTED]

Under test:

Observasjoner:

Vernter på at noe skal skje etter VU video men går videre.

Etter test:

Tid brukt: 10:00

What was your first impression of the updated HSE-course?

Mye mer "rett på" og klikke seg igjennom, veldig enkelt

What did you like the best?

Trenger ikke tenke på noe rundt modulen, veldig intuitivt

What did you not like?

Det var i grunn greit, de i-ene du kan klikke på var veldig grei for informasjon. Får tale også og ikke bare tekst

Was it easier to use the updated version?

Ja.

What did you think about the voiceover?

Det var greit.

how did you react to the explosion video and the bizarre pictures?

Noen vil nok reagere mer enn meg, men det er ubehagelig å se på og får en avskrekkende effekt. Jeg har jo sett det før.

Anything else you'd like to add?

Nei , enkelt å fange opp informasjon

Kandidat 5

Før test:

Navn: ■■■■

Alder: ■

Stilling på BAF: ■■■■■■■■■■

Hvor lenge har du vært ansatt i BAF? ■■■■

Under test:

Observasjoner:

Demper lyd i VU-video – venter også der på at noe skal skje før han trykker på neste

D&D gjør feil og plasserer kun i skapet – ikke i produksjon på 4 forsøk – leste inn introduksjonen godt nok! Forstår ikke hvorfor han gjør feil og blir forklart at han må lese teksten skikkelig før han starter – forstår det når han har gjort dette og gjør riktig.

Etter test:

Tid brukt: 12:45 min

What was your first impression of the updated HSE-course?

Mer informasjon tilgjengelig, sps med de infoboksene. Formuleringen av spm kunne vært bedre

What did you like the best?

Er en grei framstilling.

What did you not like?

Nei helt greit

Was it easier to use the updated version?

Ja.

What did you think about the voiceover?

how did you react to the explosion video and the bizarre pictures?

Ikke spesielt. Man reagerer jo, man skjønner jo at man ikke må hive vann i for da kan ting skje (eksplosjoner)

anything else you'd like to add?

Var raskere denne gangen.