



Web Interface Design and Testing
for the MineHealth Training and Education Material

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Hyvinkää 18.5.2013

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ABSTRACT

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| <p>Usability and user experience are the driving concepts behind the web user interface design today. This thesis explores web user interface usability as a concept as well as how to apply it to a wide range of multilayered and lengthy material of the MineHealth project. The objective of this thesis is a pleasant and useful design for the MineHealth training and education material website. This thesis presents the process of web interface design commissioned by the MineHealth Kolarctic ENPI CBC project.</p> <p>The main focus of this thesis is on exploiting different usability methods undertaking and explaining the web design process and decisions made to create the user interface design for the MineHealth website. The aim is to explore and understand the key issues of the MineHealth material and its objectives as a single cases study, and represent the material on a website following good usability standards, and enhancing great user experience. In the course of this thesis process I have pursued the point of view of the human-computer interactions, usability, and user experience for the project as well as given visual design elements for the website.</p> <p>The first phase of the web interface design process consists of clarifying and scoping the purpose of the MineHealth website as well as end user analyses, material and content analysis, and requirements specification. The second phase schemes the visual design, functionalities, information architecture, user interface elements including navigation, links, and search, and the use of page template. The third phase discusses about the implementation, evaluating and testing of the MineHealth website. The MineHealth website is implemented with Joomla! content management system. In the implementation, a ready-made Viewpoint page template was capitalized.</p> <p>This thesis shows that web interface design requires relentless iteration of the different phases of the design process. Analyses of the purpose as well as end users, and practical prototype testing will help to sort out the requirements for structure and visual design.</p> | |
| Keywords: usability, user experience, web interface design, information architecture, content management system, human-computer interaction | |

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1 INTRODUCTION

The power of the Internet lies in the fact that the use of it is totally depended on users' decisions. Usability guru Jakob Nielsen starts his book "Designing Web Usability" (2000a, 9) with this perception:

"Usability rules the Web. Simply stated, if the customer can't find a product, then he or she will not buy it.

The Web is the ultimate customer-empowering environment. He or she who clicks the mouse gets to decide everything. It is so easy to go elsewhere; all the competitors in the world are but a mouseclick away."

Since the year 2000, the use of the Internet has grown both in numbers and in ways it is being used. Emergence of E-commerce and social media with a great impact on customer behavior is among the most influential changes of the past decade. By the year 2011, the number of Internet users had exceeded 2 billion. The growth has been faster than expected and the number will keep on rising. (Nielsen 2005/2012.) Since the use of the Internet has become part of people's everyday lives and since the services and websites available have multiplied by hundreds, users have also become increasingly demanding. They know good web service, and they expect to get it everywhere in the Web. They know that often the same service or product can be found in many other websites. They will use the site that is convenient, trustworthy, and easy to use and access. (Nielsen & Loranger 2006, Preface xv-xx.) This makes usability and user interface design an important tool in product and service development.

Well-implemented usability often goes unnoticed by users. It becomes an issue if the product, service, or system does not meet the expectations of users. This thesis research is aiming to demonstrate the impact of usability design on service providers and widen the understanding of how to demonstrate the implementations of usability for user experience, utilization of web services, and increase productivity.

Web services are, at least in theory, available everywhere in the world. For service providers that means more competition; for users that means more variety, possibilities, and equality. Web services that are built for better user experience are easy to use and

access as well as trustworthy from the users' point of view. Investments in usability on web design makes users return to the service. Therefore, usability equals customer loyalty, and loyalty means increased business. Taking user experience in to account approves competitiveness for companies. (Nielsen & Loranger 2006, Preface xxiv; Sinkkonen, Nuutila & Törmä 2009, 17-29.)

1.1 MineHealth project

This thesis work is commissioned by the MineHealth project to create web interface design for the training and education material produced in the project. The MineHealth project is aiming to influence the mine industry and mine workers in the Barents region who are working in arctic conditions and environment. The goal of the project is to provide long term sustainability of well-being, health, and work ability among mine workers and therefore improve the overall productivity of the mining industry. The MineHealth project is funded by Kolarctic ENPI CBC Programme. The project is coordinated by Umeå University from Sweden; other partners are Finnish Institute of Occupational Health, Finland, Kemi-Tornio University of Applied Sciences, Finland, Northwest Public Health Research Center, Russia, University Hospital North Norway, Norway, Norut Alta As, Norway, SINTEF, Norway. The Kolarctic ENPI CBC Programme is one of the ENPI financing instruments of the European Union. The ENPI programmes are being implemented on the external borders of the EU. (Kolarctic ENPI CBC 2013; MineHealth Project 2013a; MineHealth Project 2013b; MineHealth Project 2013c.)

During the course of the MineHealth project the project partners are gathering and producing research material on what the risks, exposures, and human responses in the mining work are, and how to prevent the risks and improve safety, working conditions, health, and well-being of mine workers in cold i.e. in the arctic open pit mine conditions. The outcome of the project is to provide training and education material for the miners, students, training companies and institutions, occupational health services, and mining industry. All the provided training and education material will be represented on the MineHealth website, as a paperback guide, and a multimedia DVD. The material will be structured to suit the needs of various end user groups, but all material is available for anyone interested in the subject.

1.2 Phases of the work

User-oriented usability design revolves around three different and iterative cycles i.e. design, implementation, and evaluation. The whole cycle is called HCI process. (Oulasvirta 2011, 33; Väänänen-Vainio-Mattila 2011, 102-103.) In this thesis I have slightly varied and stretched the cycles according to Ashrafi and Ashrafi (2009, 148-156, 160-162, 336-349) to better suite this individual design case and thesis work.

In the first phase of the MineHealth web interface design process, I aspired to clarify and scope the purpose and function of the MineHealth website, as well as do end user analyses, material and content analyses, and requirements specification. In the second phase, I schemed functionalities, information architecture, user interface elements e.g. navigation, links, and search, visual design and the use of the page template. I have capitalized the research information on usability, web design, information architecture, user research, and evaluation and testing. In the third phase, I have had the role of a project manager overseeing the implementation of the MineHealth website done by a fellow student as his internship work and cooperating with another fellow student who has provided the graphics for the site.

The evaluation and testing of the MineHealth web design was mainly done inside the project group since the project did not provide enough content material during this thesis process to engage more profound testing. Nevertheless, I have drafted some guidelines for accomplishing further testing for the site when the material and site are ready for it. The project can utilize specialists and end users from the MineHealth project network for the evaluation and testing.

1.3 Thesis structure

The topic and motivation to this research along with the structure and phases of the work are introduced in chapter 1 of this thesis. Chapter 2 discusses different research approaches and the scope of this thesis as well as introduces the main research problems and methods. The concepts of web interface design are processed in chapter 3. They

include topics such as Human-Computer Interactions, usability, user experience, user-oriented design, information architecture, visual design, and website evaluation and testing. Chapter 4 justifies the use of content management systems and specifies the features and advantages of Joomla! as well as requirements and restrictions for its use. Chapter 5 starts the description of the practical part of the thesis. The message of the MineHealth website, material and end users are analyzed there. The visual design solutions including page hierarchy, navigation, and page layout are explained in chapter 6. There are also some guidelines on writing for the Web. Chapter 7 gives short guidance for the MineHealth project on how to conduct user testing later on. In chapter 8 there are some design ideas that did not fit in the scope of this thesis, but might have been interesting to explore. Chapter 9 concludes and gathers together all the results of this thesis work.

This thesis presents the phases of web interface design process chronologically for the sake of clarity. Naturally, in the course of the thesis process, all the phases have more or less overlapped each other, and been repeated if and when it was necessary to get the best and satisfying results.

2 RESEARCH QUESTIONS, SCOPE, AND METHODS

The main focus of this thesis is on exploiting different usability methods undertaking and explaining the design process and decisions made to create user interface design for the MineHealth website. As a field of study usability is a subset of Human-Computer Interactions. ACM SIGHI's HCI Bibliography defines Human-Computer Interaction (HCI) as: "...a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them." (ACM SIGHI 2013). A broader view of HCI research includes research elements from ergonomics, computer science, information systems, behavioral science, user interface research, computer-mediated communication, and design (Oulasvirta 2011, 17-18).

Usability assessment methods such as inspection methods and user testing aim to support software development by examining users and user interfaces. They are part of Usability Engineering Methods (UEM) which range from design and modeling to assessment methods, and are being constantly developed and expanded. (Ovaska & Aula & Majaranta 2005, 5-6.) UEMs can consist of inspecting user actions systematically, measuring user activities and collecting quantitative data of it, identifying and analyzing good and bad use case situations, questionnaires, interviews, thinking out loud, group assessment, creative methods like workshops or brainstorming, and analytical methods like document, model based, specialist, and automated analysis (Väänänen-Vainio-Mattila 2011, 102-126; Sinkkonen et al. 2009, 33-35). For enhancing the usability of MineHealth website, user-oriented web design methods are employed by typifying different groups of real life users of the system. The expected behavior of the generalized user personas while they are using the system have been displayed at the user stories. Use case diagram and user stories are introduced more closely in sub-chapter 5.3. Website evaluation and testing methods as part of designing tools are discussed in sub-chapter 3.4.

The practical part of this thesis is exploring how to represent wide range of multilayered and lengthy material on a website and still follow the guidelines of adequate usability and user interface design methods. Likewise, the aim is to support the enjoyable and useful user experience of end users visiting the upcoming MineHealth website. The substance and nature of the material is unfamiliar for me and partly still in the making,

which has made the whole designing process challenging. Yet, from users' point of view the user interface and all of its aspects need to follow rational and learnable logic and be fresh, interesting, and approachable. In this thesis I am justifying reasons for implementing and maintaining the site with a Content Management System, CMS, and contemplating ideas of how well the CMS and ready-made website templates are suitable for this kind of large material and for the website designing that is needed here.

In addition to the usability methods, this thesis is a qualitative single case study of the MineHealth education and training material, and its web interface design. The aim of the thesis is to explore and understand the key issues of this material and its objectives, and represent the material on a website following good usability standards, and enhancing great user experience. Case study research method is approaching one case, company, problem, process, or entity trying to find an explanation for why some decisions were made, how they were made and what the outcome was after these decisions. As this thesis is mainly only concerned of the MineHealth project and its goal of developing a website as education service environment, it qualifies as a single case study. (Yin 2009, 2-23.)

Likewise, this thesis also shows characteristics of an action research. The MineHealth project approaches the website from a pedagogical point of view as well as a distribution channel for the MineHealth material. In the course of this thesis process I have tried to influence some of the proceedings, goals, actions, and implementations on how to construct the website pursuing the point of view of the human-computer interactions, usability, and user experience as well as given visual design elements for the site. The influences include, for example, the conceptual approach to the undertaking of the upcoming website, the handling of the content material and writing style of the website. The design process has had features of a co-operative effort with the MineHealth project rather than just my research observations and conclusions of the subject. One of the main goals of this thesis is to contribute benefit to the MineHealth project and its objectives as is typical of action research. (Sagor 2011; Stokes 2011.)

3 WEB INTERFACE DESIGN

Usability and user experience are two of the key questions in the website interface design. To create an efficient and accomplished information system and appealing countenance, it is necessary to analyze and understand the purpose of the system - what the information provider wants to deliver through the system - and then find the way to present that in a way that is useful, comprehensible, easy, and pleasing for end users. Maybe this sounds obvious or unpretentious, but it is central for the design process to understand the aspects of the information intended to put on the site and to whom this information is meant for and what the key questions and requirements for it are. As seen in figure 1, Ashrafi and Ashrafi (2009, 148-157, 336-345) distinguish the process of creating an information system to a problem domain and a solution domain. In the problem domain, the problem questions are analyzed, and objectives and requirements are specified thus defining the overall concept for the information system. The analysis phase is followed by the solution domain where the requirements found in the analyses are satisfied and the web user interface design is created. In addition to the analysis of the purpose of the site, it is vital to define and analyze the possible end users and their needs

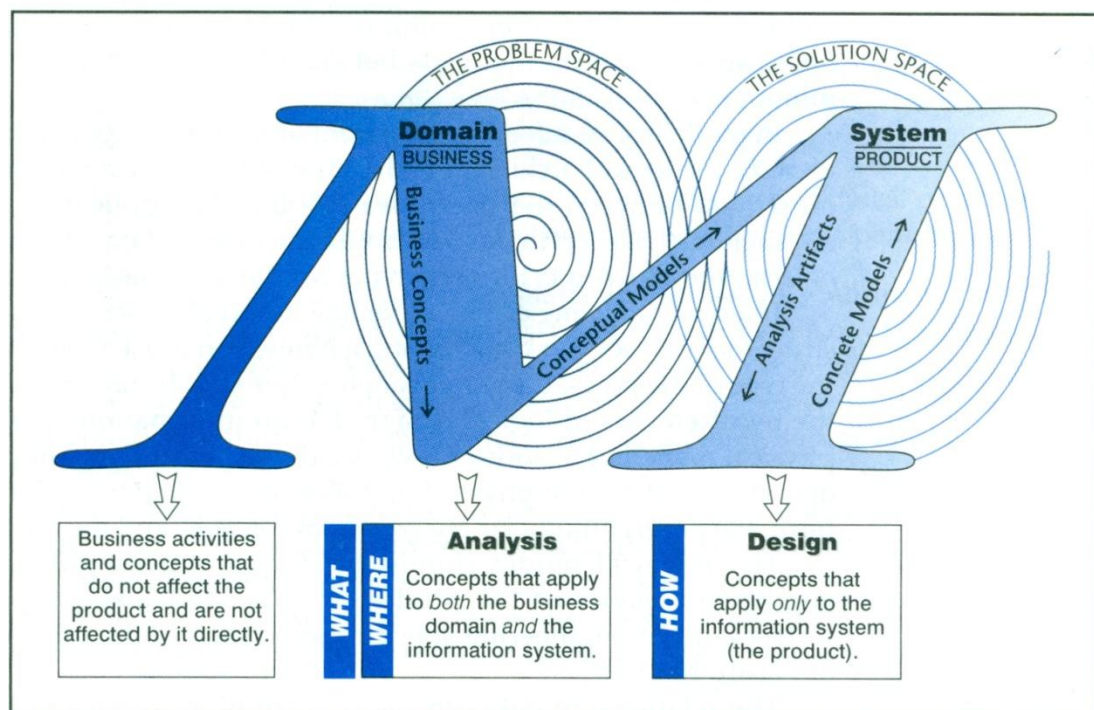


Figure 1. Solutions to the problems found in the analysis phase are offered in design phase (Ashrafi & Ashrafi 2009, 341)

for the system. Good usability is in the end defined by users and their satisfaction with the web service. Therefore, user-oriented interface design requires knowledge of who are the end users and what kind of information and experience is to be offered to them through the website. (Sinkkonen et al. 2009, 17-24.)

Designing the information architecture for the web user interface consists of organizing the information and the navigation of the website according to a chosen logic. The logic should be easy to follow by end users of the information, and with every action it should get users closer to the information that they are looking for. The information architecture design includes the layout, page structure, and visual design. The information architecture offers the solutions to the problems and requirements defined in analysis phase. (Ashrafi & Ashrafi 2009, 338-342; Nielsen & Loranger 2006, 171-174, 329; Sinkkonen et al. 2009, 36-37, 183-190.)

It is advantageous to expose the web interface design for outside evaluation and testing. During the design process and implementation of the site the usability is assessed by the designer and others working in the process. However, one can grow “blind” to the design when constantly involved with it. Evaluating and testing a website with outsiders helps to assess, if the website design reclaims the expectations of the procuring party and the expectations of end users, as well as to find errors and suggestions for improvements and changes needed for improved usability of the site. (Ovaska et al. 2005, 9; Sinkkonen et al. 2009, 285, 297-300, 302)

3.1 Usability and user experience

As a subset of HCI the main interest of usability study is to understand ways to create systems and their user interfaces to serve users’ needs and expectations as effectively as possible. During the design process it is important to notice limitations and abilities of users as well as their perceptions and information processing systems where possible. Designing usability is aiming to be user-oriented, therefore trying to find an approach most suitable for users of the system. (Nielsen & Loranger 2006, 172-174.)

Usability methods manifest in user interface design. User interface, as shown in figure 2, is “the point of interaction between the problem domain and the solution domain,

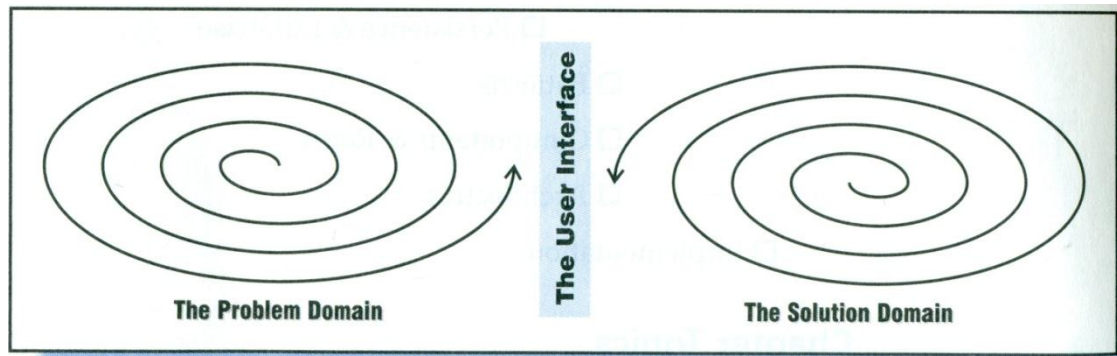


Figure 2. User interface: The boundary between the real and the virtual (Ashrafi & Ashrafi 2009, 400)

between the virtual world of the software and the real world of users. The user interface is the concrete realization of messages passed between actors and the system.” (Ashrafi & Ashrafi 2009, 439.) Practically this means that the usability and availability of any device and software, or the information they carry, is tightly linked to the user interface that particular system and to the experience that users will have using it. Figure 2 depicts the user interface as the contact surface for interaction between the problem domain and the solution domain (Ashrafi & Ashrafi 2009, 400-404).

Usability studies explore how the system and its user interface could be designed to help end users to gain what they need and want from the system easily and without remarkable efforts. Since the 1970’s and 1980’s when computers started to be available for mass-market users, the development of graphical user interfaces (GUI) for software applications also came inevitable. Before, users had been computer professionals who would know how to use command-line interfaces. Now the “average Joe and Jane” needed easier approach. They did not know much how the computer or system worked - they just wanted the services it could offer. Along came GUI and user-orientated design i.e. aiming to design systems that are created from users’ point of view considering what would be the most useful, beneficial and rational design for users. Otherwise the system or service would not be utilized by intended users and is more or less vain. By centralizing the good user experience as a key objective of a product or a service and therefore getting intended users to utilize it, is money well-spent; fruitful for the business and its brand. Also the reputation of the service provider is at stake; modern users blame the system and abandon it, if it is difficult, time consuming, or incoherent. Bad user interface design and bad user experiences give competition - or anything else users can think of - more chances to charm users away from your service. Modern users share

both good and bad experiences with other users online contributing straight to the popularity of the service. Notably though, if the user experience on the site is generally remarkably favorable, users can even endure a few(!) usability flaws in it. (Ashrafi & Ashrafi 2009, 403; Nielsen 2000a, 9-15, 380-390; Saariluoma, Kujala, Kuuva, Kymäläinen, Leikas, Liikkanen & Oulasvirta 2010, 41-50; Sinkkonen et al. 2009, 17-30.)

One of the pioneers of usability, Jakob Nielsen, explains the meaning of usability as an assessment of quality attributes that define ease-of-use of the user interface. In his article “Usability 101: Introduction to Usability”, he defines five quality components for good usability as follows: learnability, efficiency, memorability, errors, and satisfaction (Nielsen 2012). Nielsen elucidates these components with relevant questions:

“Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?

Efficiency: Once users have learned the design, how quickly can they perform tasks?

Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency?

Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

Satisfaction: How pleasant is it to use the design?” (Nielsen 2012).

In addition to the usability’s ease-of-use and pleasantness, Nielsen also discusses the functionality of a web design. The site has to accomplish functions that users need; it has to have a purpose and appropriate content. After all, these are the reasons why users come to the site in the first place. Nielsen names the functional aspect “utility” asking if the site does what users need or whether it provides the features users need. Employing these two main components, usability and utility, together, he determines whether the web site is “useful” or not. (Nielsen 2012).

The objectives of usability extend and evolve quite naturally to user-oriented design, putting the users’ needs and wishes in the central role. For example, it is not enough that a company has a website, but the website has to meet the needs and expectations of users as well as offer extra value for users. The site needs to appeal to users - it has to offer quality to the user experience. User experience refers to feelings and perception of a

user while they are using the service. A good user experience is offered when the web service and its users are compatible; users find the web service useful, easy-to-use, efficient, corresponding as well as compelling. A good user experience means that users are content with the service. Better yet, if users get a uniquely pleasing experience. User experience can be affected by not only the service that is being used - its prestige, content, memorability, or visual effects - but also the environment where users are applying the service - the social, mental, and spiritual atmosphere. Users' mood, attitude, previous experiences of the site or its provider, personality, motivation, or expectations as well as importance of the task also play a significant role. (Saariluoma et al. 2010, 41-50; Sinkkonen et al. 2009, 17-24.)

3.2 Information architecture

Discussion about information architecture (IA) in this thesis concerns mainly the information system structure of the MineHealth website. As a broader term information architectures can portray the structure of organizations as well as information systems and applications. The chosen IA can be swayed, for example, by the changes in information technology or revisions in requirements. (Perks & Beveridge 2003.) Information architecture handles areas such as labeling, navigation, and searching systems, and is less interested of the substance of the system. Rather, the IA is concerned about the efficient, competent, and coherent representation frame of the substance whatever it might be. IA together with visual design creates a functional space where the substance information exists and is represented to users.

Information architecture determines relations between the elements of a website. It is organizing the information, and creating the navigation between pages or other states of the site according to a chosen logic. IA should be built to match the expectations of users. The information architecture includes coherent labeling and naming of things on the website, and easily accessible search system. The logic should be easy to follow by the end users of the information, and guide users in the task of finding and using the information. If the information is not easily available, modern information searcher is easily frustrated and might simply abandon the site. If users are frustrated in the first place, they are likely to stay away and never to return to the site again. Information architecture is the first phase of the web interface design. The information architecture design

for the web user interface is completed with page structure, layout, and other visual elements design. (Nielsen 2000a, 14-15, 163-260; Nielsen & Loranger 2006, 171-174, 329; Saariluoma et al. 2010, 135; Sinkkonen et al. 2009, 183-202.)

Creating the information architecture generates solutions to the problems or requirements that were found in the analysis phase of the process, as seen in the figure 1. In beginning, the problem is analyzed – *what* is or needs to be and *where* it is or needs to exist. After analysis, creating conceptual models of the product or service moves the process towards the solution – to concrete models of *how* the product or service is going to be implemented. (Ashrafi & Ashrafi 2009, 336-345.) The requirements and analysis for the MineHealth website is discussed in the chapter 5 of this thesis and the design in the chapter 6.

3.3 Visual design

The importance of visual design on a website is usually a topic with some controversy. Everyone agrees that websites need visual designing. However, others find visuals and form less important and put more weight on practical functionalities of the site. There are references made with slight condescend to too many flashy images and fancy graphics on a website. It has to be admitted that visual elements should not take the leading role on a website at price of functionality or usability. On the other hand, boring and bland pages may look outdated and are not likely to lure lots of traffic and revisits to the site. Well and elegantly designed visual elements support the site structure and help users' mission on the site. That does not rule out contemporary, fun, and stylish design. Visual design is prominent part of the system's interaction with users. Users grow to be delighted with good form and design, and that contributes to the good user experience. (Nielsen 2000a, 11-12, 15; Saariluoma et al. 2010, 17-24, 258-259; Sinkkonen et al. 2009, 242-243.)

Form and design can also be seen as the structure of the site, or at the minimum supporting the structure of the site, much the same way as information architecture. Visual elements are closer to the substance than IA, though, directing users' actions with e.g. metaphors, colours, pointers, buttons, decorators, and patterns. Visual elements can greatly enhance the aesthetic experience on the site as well as create consistency - and

of course also ruin them! Visual elements must be functional and give tips to users of what is important on the page. For most cases, visual elements should not exist on the site merely for their own sake but they should bring some functionality to the site and support users' conception of the information. (Ashrafi & Ashrafi 2009, 404-419; Sinkkonen et al. 2009, 249-255.)

One very practical method of visual design includes sketching the product and then testing the design with people in the design team, the procuring party and/or with outsiders. It is far easier to get comments and development suggestions for sketches and drafts, and later for prototypes, than for an intangible idea or for an "empty paper". Sketches and prototypes help to communicate ideas between various parties of the product design process, and they help to solve technical solutions. However, sketches or prototypes do not include all the features or elements of the end product. Therefore, they might also lead to misinterpretations of product features as testers have to imagine how the system will work as a finished product. To avoid dissension, it is important to document the diverse stages and changes made during the development process, and to be able to trace back the decisions made during the process. (Kuutti 2003, 104-109; Saariluoma et al. 2010, 160-161, 174, 177-179.)

Visual design or visual usability communicates, also inattentively, the brand, atmosphere, personality, and overall appearance of the service to its users. Depending of the nature of the service different design elements and messages are valued. Some websites intent to be more entertaining, some have more academic or businesslike value. The visual design should support the message that the organization wants to give. Also, the visual elements cannot differ too much from the users' expectations for that type of service. Very playful appearance when users are looking for serious and trustworthy may seem unprofessional and not convince users to choose the service. Vice versa, too matter-of-fact approach is probably not what users' desire for example from a homepage of a comedy film. (Sinkkonen et al. 2009, 249-251.)

The composition, size, and colour of elements on the website impact how users perceive the importance of the information. Bigger size or certain colours have generally more value, and users pay more attention to them. Some colours have higher attention value; they are warm and seem to come closer to the viewer, or they are cold and seem to escape away from the viewer. This could create pseudo movement and unintentional rest-

lessness on the site. If the elements are actually moving and not just appear to do so, one should be careful – too fast or blinking movement annoys people, because it's distracting and is associated with advertisement and untrustworthiness. Also, the higher up on the page the element or text is more likely it is to be noticed and assimilated by users. It is also noticeable that colours are associated diversely in different cultures. The amount of different colours should not be too high. Instead, the colours should be used consistently. Also, there should not be more than three typefaces on a webpage. (Kuutti 2003, 90-101; Nielsen & Loranger 2006, 344, 380-381.)

3.4 Website evaluation and testing

Evaluation and testing can have different uses during the product design process. Throughout the design process the implementation of the web design is tested to assure the quality, to see what still needs to be done, and if everything functions as it should be. Some elements might need to be changed and developed further before placing them on the site. Sometimes things need to be removed or abandoned altogether. Technical and visual issues need to be solved through testing. In the web design these could include testing compatibility with different browsers and screen sizes, making sure the site is secure, and testing the performance capabilities like with stress and load testing, and usability evaluation. Evaluating and testing are iterative parts of the design process, and give valuable information on how further develop different aspects of the design. If the design renews an old system, the old system is evaluated to see what improvements are needed. During the development and when the product is ready to be published, evaluating and testing give considerable information about users' expectations for the product. Using evaluation and testing methods iteratively in the course of the development process helps to recognize problems that were impossible to see at the beginning or otherwise went unnoticed before. Iterative evaluation and testing are likely to ensure more usable results at the end. (Kuutti 2003, 47-49, 68-69; Saariluoma et al. 2010; Sinkkonen et al. 2009, 285-287, 295-302.)

Evaluation and user testing of website usability means running trials on the sketch or prototype of the website and getting second opinions of the website's design and usability. It is advantageous to know early on in the design process, if outsiders i.e. people who are not involved with the design process are able to catch the logic of the site and

how they assess the site. The evaluation methods concentrate on assessing the site without direct end user contact. Evaluation can be done, for example, with the help of usability experts. Evaluation can also be based on heuristic guidelines and rules, or on check-lists which help to consider various usability aspects of the site. One of the most commonly cited and still highly applicable lists is the Jakob Nielsen's heuristic list from the year 1995. It can be found in his current website in article "10 Usability Heuristics for User Interface Design" (Nielsen 1995). Other typical evaluation methods comprise of standard reviews, consistency reviews, and cognitive walkthroughs. User testing of a website usually includes intended end users to the design process. Testing situations have direct interaction with users asking and observing their actions and reactions to the site, or the sketch or prototype of the site. This includes user testing the navigation and information layers, what kind of problems users possibly have or what kind of errors they make on the site, if they find the site easy and satisfactory to use, what catches users' attention, and so on. (Kuutti 2003, 47-49, 68-69; Ovaska et al. 2005, 9-12; Sinkkonen et al. 2009, 285-287, 295-302.)

Evaluation and testing should be a natural part of the product design process. They do not necessarily need to happen in a fancy laboratory or require huge efforts or large number of representatives from end user groups. It is important that they are done and that the design gets feedback from outsiders of the design project. Since the designer already knows the problem domain, the evaluation and test users offer much needed fresh pair of eyes to tell where to focus the development efforts on. Steve Krug points out in his book "Don't Make Me Think!: A Common Sense Approach to Web Usability" (2006, 134-140, 143) that testing with one user is 100% better than not testing at all, and that testing even with that one person is better done iteratively from the beginning of the process rather than with 50 users after the design is ready. He claims that testing is a necessity for any good website design.

Much along the same lines with Krug, Jakob Nielsen argues that using more than five test users in a website user test is a waste of money. After learning what the first five users have to say about the design and what errors they find in it, the next test users will mostly give the same insights over and over again providing nothing new to the results, as demonstrated in figure 3. Nielsen claims that the first test with five users will find 85% of the usability problems on the site. He also says that after applying requisite changes, the second test with same five users will reveal the rest of the original prob-

lems as well as give feedback from the new design. He warns, though, that leaning only on one person's insights might be risky; personal sentiments, visions, or behavior of just one tester may be misleading and may not represent larger audience. (Nielsen 2000b.)

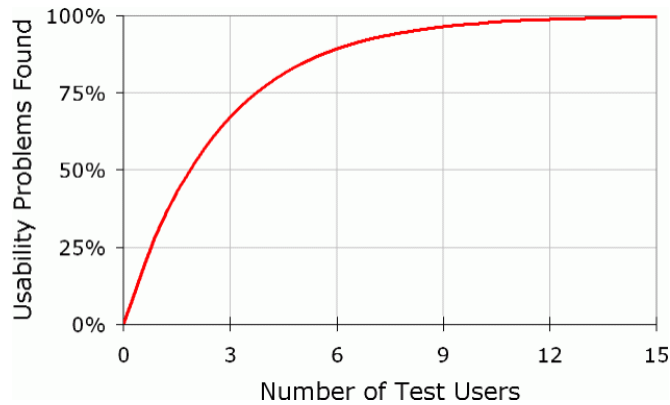


Figure 3. 85% of the problems on a website are found by five test users in the first test (Nielsen 2000b)

As can be seen in figure 3, the effect of using more than five test users does not result significantly better feedback results. Therefore, Nielsen emphasizes the importance of frequent small tests done from the beginning of the design process. They are more cost effective and give good results. Easiness of arrangements and low costs of small scale testing will help to implement tests more often and make them natural part of the design process. (Nielsen 2000b.)

4 JOOMLA! CONTENT MANAGEMENT SYSTEM

Before I joined the MineHealth project it was already decided that the MineHealth website would be implemented with Joomla! – an open source (Web) Content Management System (CMS). Web content management systems offer lots of features, support, and alleviation to website admins and other backend users. Users do not need to have high skills in development and maintenance of a website. Instead, they can use existing publishing tools with relatively little knowledge of web technologies to create and update a website. In the following I introduce the idea of open source software development together with features, advantages and performance requirements of using Joomla!. I also explain some assumptions, dependencies, and constraints concerning the installation and maintenance of the website operating on CMS like Joomla!.

Joomla! is an open source software which means it is being build up and constantly developed in the Joomla! Project by the community of volunteer developers and users. The software programme is freely available to download for everyone, and the programme code is accessible for users to edit. Behind the Joomla! development is also Open Source Matters, Inc (OSM). Development of Joomla! is divided into two working groups known as Production and Community. OSM established to offer organizational, financial, and legal support to Joomla! open source project. It is New York based not-for-profit organization to ensure that Joomla! project keeps on existing beyond individuals' personal distributions for the project. OSM finances its operations by advertising on the joomla.org websites, sponsorships, royalties on books, the Joomla! Shop etc. (Open Source Matters, Inc. 2012.)

The Open Source Matters, Inc. Board of Directors and Leadership Team govern Joomla! Project (Joomla.org 2013a). The project's Mission is defined as follows: "Our mission is to provide a flexible platform for digital publishing and collaboration." Its Vision qualifies the open source ideology:

- "People publishing and collaborating in their communities and around the world
- Software that is free, secure, and high-quality
- A community that is enjoyable and rewarding to participate in
- People around the world using their preferred languages

- A project that acts autonomously
- A project that is socially responsible
- A project dedicated to maintaining the trust of its users” (Joomla.org 2013b.)

Key Values of the Joomla! Project give an inside of in what respect the software is being built: Freedom, equality, trust, community, collaboration, and usability (Joomla.org 2013b).

Joomla! software has wide community of users and developers. It has won the CMS open source award and currently at least 2.8% of all website online are using Joomla! – that is a CMS market share of 8.9% (w3techs.com 2013). The life expectancy of the software and the support for its use is anticipated to be high. (Joomla.org 2013a.)

4.1 List of features

The following list of features is a basic list of Joomla! functionalities. In the “Joomla! Extensions Directory”, users can look up what other features are available to use. There are many possibilities for customization and enhancing making the system adaptable to the MineHealth project’s needs (Joomla.org 2013c):

- **User Management:** up to nine different user groups. Each user group can have their own set of permissions and rights, what they are allowed to access, edit, publish and administrate.
- **Media Manager:** is a tool used to handle media files or folders. It is easily accessible.
- **Language Manager:** Multiple language feature.
- **Banner Management:** can be used to set up banners on the website.
- **Contact Management:** helps customers find the contact information they need and also supports multiple contact forms going to specific individuals as well as groups.
- **Polls:** To get information about the users, polls with multiple options can be created.

- **Search:** Customers can directly search on the website by using a search bar. This feature also provides statistics on what was being searched.
- **Web Link Management:** Providing links for users and counting the clicking rate.
- **Content Management:** Content can be organized as users want and it does not have to align to the organization style of the website. It is easy to design new content due to a feature that allows arranging a new page so it will look the same on the actual web page. Popularity of different articles and pages can be shown separately.
- **Syndication and Newsfeed Management:** Allows create newsfeeds for RSS readers.
- **Menu Manager:** This tool helps to create and structure menus while giving the possibility to integrate all popular navigating tools. A menu path is created automatically.
- **Template Management:** Templates help to customize the site. Either one or even different ones can be created and used for a website.
- **Integrated Help System:** The Help includes a glossary to look up terms, a version checker to always keep the whole system updated, a system information tool and additional links to online resources. Since the software is open source, there is no direct support from Joomla! like a Hotline.
- **System Features:** The system allows loading pages fast, has feature for the administrator to troubleshoot, is secure and is able to allow the administrator to chat with users.
- **Web Services**
- **Powerful Extensibility** (Joomla.org 2013c.)

With these functionalities it is possible to integrate the features that are proposed to be implemented on the new website of the MineHealth project. These features include providing education and training material, practice tasks, pictures, videos and possible other media, research articles, and information about laws, rules, and regulations of the mining industry, the administration of backend users, creating, and maintenance and up keeping of the pages. It is possible to integrate the site with social media like Facebook or Twitter on sharing and communication purposes, and print the pages i.e. articles.

4.2 Advantages of Joomla!

- Easy to use – also for users that do not have a lot of experience with programming or maintaining a website
- It is a full functioning content management system
- It is free – Joomla! is open source, so there are no license fees to pay. This does not concern the costs incurred for setting it up or customizing it, if external services are needed
- Customization – users have possibility to add new features to the basic functionality of Joomla!
- The basic features already cover many requirements of a website for the MineHealth project material. Should there be a need to expand, the system should be able to handle the change
- There is a lot of extra help available online for beginners
- The role of the administrator is “out of the box” (ready-made)
- The software is fresh and flexible as it is being developed constantly by the user community and the Open Source Matters, Inc.
- Search engine optimization is easy

(Lamin 2011.)

4.3 Assumptions, Dependencies, and Constraints

Joomla! is an open source software developed in the Joomla! community mainly by volunteers. The continuity of development and support for the product cannot be guaranteed. Nevertheless, the constant evolution of the Joomla! system and the strong organization behind the development work gives strong indication of continuity and innovation for the latest technologies.

The repository server where the MineHealth site will eventually locate will be decided later by the MineHealth project. Things such as the site’s information security, up-

time/downtime, maintenance, backups as well as long term availability are strongly linked to the provider of that server.

Once Joomla! and the page template in case have been installed to the repository server the party assigned by the MineHealth project is responsible of making sure that the site available on the server, maintaining the delivered software, and of up keeping of the content of the website.

4.4 Performance Requirements

In order to assure a good end user i.e. frontend user and maintenance user i.e. backend user experience, some performance requirements of the system have to be met. It is important to ensure smooth operation of the system.

- Response time

In general, accessing specific pages should not take longer than 1 second, preferably even less. This is especially important for the frontend aspect of the system, since web users today are used to responsive and fast site loading. If the web site makes a slow appearance, it can annoy, bore or drive away potential customers. Navigation must be smooth, since interested users might browse through different articles, practice tasks, video etc. extensively. For the backend, response time can be a little longer. The system must still be workable efficiently though. (Nielsen 2000a, 44.)

- Changing content

For employees who add article, change content or delete content, the effects of their action must be visible right away in order to ensure proper functioning of the frontend. This can be done with a WYSIWYG editor of Joomla! for the text and the page layout.

- Mobile performance

The mobile version of the site should load as fast as the main version. The content of the pages should be adaptable or scalable to the size of the screen. While the provider of the ready-made template that is used as basis for the MineHealth site states that the

template features scalability for the mobile platforms, the mobile performance is not in the scope of this thesis.

- Number of users

At the backend the MineHealth system, not a large number of simultaneous users are expected: 1-2 should be a good estimation. According to the MineHealth project mining industry employs around 35 000 people in the Barents area. Together with the students of the field potential users of the frontend of the website could amount up to 40 000 or even more. Estimated monthly use of the site could vary between few hundred and few thousand individual users.

5 PHASE 1: STARTING THE WORK

The first phase of the practical part of this thesis is about analyzing of the MineHealth education and training material and generating the concept to build the website on. Subchapter 5.3 also discusses about the analyses of the intended users via user stories and use case diagram. The information for these analyses has been gathered from the MineHealth project plan and other project material as well as in meetings with the project staff.

5.1 Purpose of the MineHealth website

The MineHealth project's intent is serving the mining industry in the Barents region in the Northern Norway, Sweden, Finland, and Russia. Therefore the content of the website is focusing on impacts of cold temperature and arctic circumstances to the workers in open-air pit mines, and on different aspects of the work in these conditions. The mining work is considerate to be a risk for health. Among other things, it involves exposures to cold and other weather conditions, vibration and operating heavy machinery, airborne dust and chemical exposures. By increasing awareness of the exposures and risks of the work, and by providing updated researched knowledge of how to improve safety, health, and wellbeing in the mine work the project strives to long-term sustainability of work ability among mine workers. By influencing the work force also the mining industry and society can benefit from lower costs and increased productivity and profitability in the mining industry. (MineHealth Project 2012a, 2012b, and 2012c.)

The main purpose of the MineHealth website is to provide education and training material for the mine workers. It will enhance the perception of the exposures and risks that the mine workers meet in their work every day. In addition, it will guide workers in safe working practices through articles, pictures, videos, research papers, and by introducing laws, rules and regulations concerning mine work. Articles will contain practice tasks for users to test their knowledge on various topics. The website also aims to provide material and tools for occupational health care providers, and for mining companies. All the material on the site will be available to all users, even though alternate parts of it are indicated to different user groups. The material is wide, and it is aiming to serve three different user types, which are introduced under "5.3 Users and user stories". The pro-

ject is providing the material in English, and the partners in different countries are free to translate the material into their respective languages later, if they wish to do so.

5.2 Analyzing and organizing the material

The training and education material for the MineHealth website is extensive. The material is produced by the different specialists and researchers who are participating to the MineHealth project. At the beginning, the challenge was to get hold of all the aspects of the material and realize what kind of base structure and possible template it would require. Explaining the dimensions of hypertext structure on paper is also challenging, since what is possible in hypertext with links may not look very clear on paper, and vice versa. That is why the web interface should not be made only to mirror the company structure or paper material, but it should be treated as its own entity while it still supports the organization's business idea and brand (Nielsen & Loranger 2006, 173).

In the MineHealth training and education material the miners' work is approached through three main schemes. All of the main schemes consist of four approaches to the topic according to the subjects of the material: Exposure, Human Responses, Prevention of Risks, and Health & Safety, and their three subcategories. During the analysis of the material it became obvious that the Exposures are in fact the same as the three main schemes, and these exposures each include the areas of Human Responses, Prevention of Risks, and Health and Safety. Therefore, the material hierarchy is as follows:

1) Cold Protection & Wellbeing = Exposure: Temperature & Wind

- Human Responses – Neuromuscular Responses; Cardiovascular Responses; Respiratory Responses
- Prevention of Risks – Clothing; Personal Protection Equipment (PPE's); Risk Management; and
- Health and Safety – Accidents; Working Capacity; Health & Wellbeing.

2) Cold & Vibration = Exposure: Vibration & Work load

- Human Responses – Neuromuscular Responses; Cardiovascular Responses; Respiratory Responses

→ Prevention of Risks – Clothing; Personal Protection Equipment (PPE's); Risk Management; and

→ Health and Safety – Accidents; Working Capacity; Health & Wellbeing.

3) Airborne Exposures = Exposure: Dusts, Fumes & Chemicals

→ Human Responses – Neuromuscular Responses; Cardiovascular Responses; Respiratory Responses

→ Prevention of Risks – Clothing; Personal Protection Equipment (PPE's); Risk Management; and

→ Health and Safety – Accidents; Working Capacity; Health & Wellbeing.

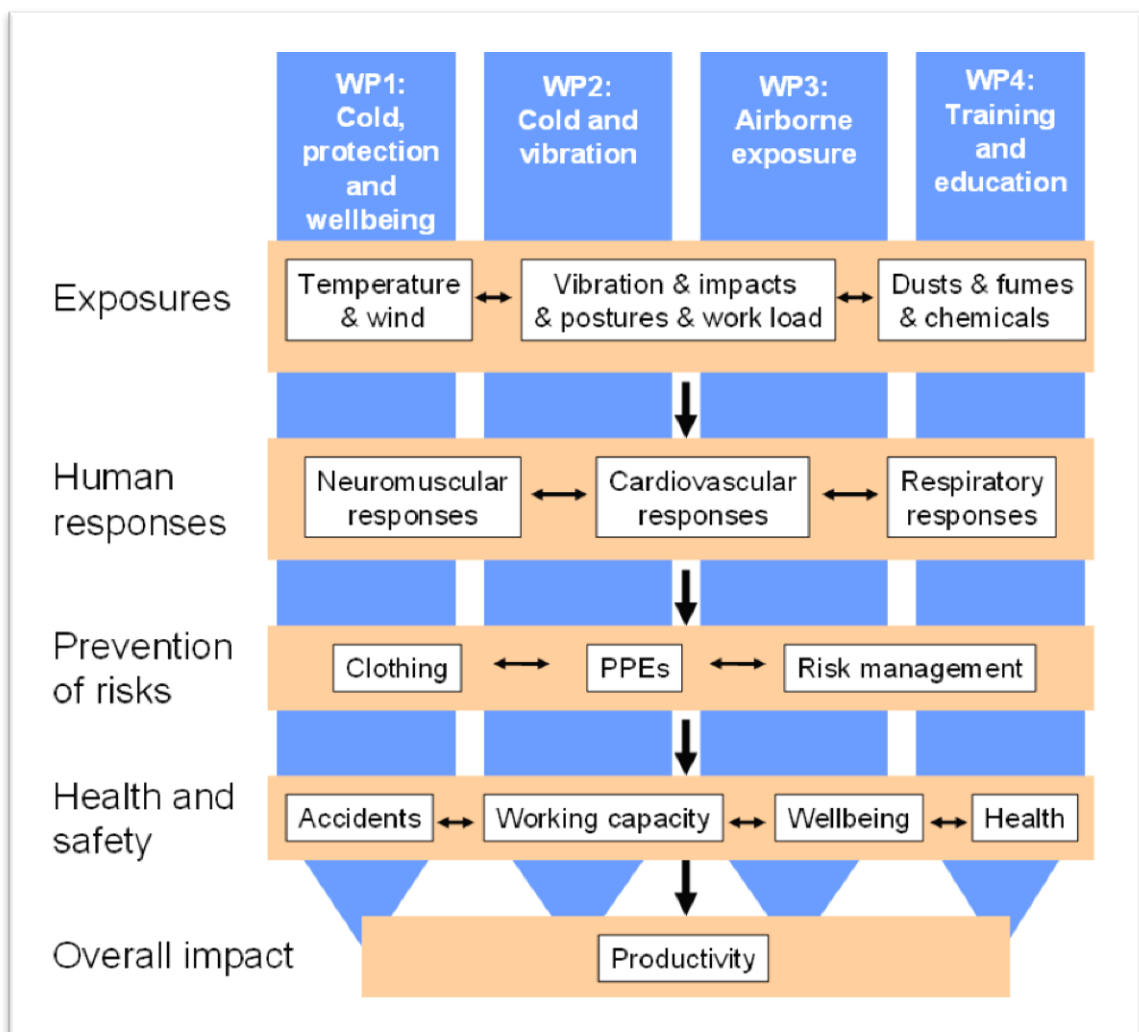


Figure 4. Overview of MineHealth Project work packages, WP 1-4 (MineHealth Project plan 2011, 9)

The same topics, categories, and subcategories can be found in figure 4 explaining the MineHealth project's work packages (WP 1-4) and proceedings of the material gathering.

In addition to the work package categorization, the MineHealth material is arranged to basic level, special level, and leadership level information. The information levels correspond with the intended user groups and their needs. In the website hierarchy, the basic level articles are the first confluence with each topic. From there users can then reach the special and leadership level information associated with that topic. This structure allows all the levels of one topic to be glued together. It is also easier for users to make sense of the site structure and keep track of all the topics. By using this structure users are forced to choose topic before the level of information. Downside of it is that those users coming only for the special or leadership level information need to use an unnecessary click or two to get where they want. In other words, the information they may be looking for is one level deeper into the interior page hierarchy that one would hope for. This is a trade-off for the clarity. Otherwise the front page would be packed with even more categories and the site would be repeating the category headlines redundantly. That would become confusing and frustrating for users. Alternatively, users would have to choose their role on the site, which might be confusing for them, if they are not familiar with the content. Choosing a role could lead to creation of three parallel sites according to the user role, and difficulties to navigate between the levels. Since the aim is that all levels of the material are available to all users, choosing a role is not a good solution. Of course, testing the structure with more users will give better understanding of how users appreciate the logic that is now in use.

5.3 Users and user stories

According to the MineHealth project the mining industry employs around 35.000 people in the Barents area. Together with the students of the field the potential users of the frontend component could amount up to 40.000 or even more. Not all of the potential users are going to use the website, or visit it constantly on a daily basis. The MineHealth project approximates that the main users of the website will be the education institutes and their students. The site will be used for the orientation of new employees and for the further education of current employees by mining companies as well as by

health care specialists at their work. The material will also be capitalized by individual users as a self-study material. In addition to the primary users in the field of mining, the material and research are applicable for other professionals working in cold, arctic conditions. Cold is considered to be an adverse or a risky exposure when working in +10 C degrees or lower temperatures. That widens the potential secondary user groups significantly.

To help capture the behavior and actions of different users while using the MineHealth website I have created user stories for them. The users or personas are generalized from user groups as model users and their behavior is described in the form of a story. User stories help to define functional requirements for the service. (Ashrafi & Ashrafi 2009, 73; Kuutti 2003, 134-135; Sinkkonen et al. 2009, 171-174)

The MineHealth project is proposing three main groups of end users for the site. End users are using the frontend of the website i.e. the public side of the system. The material is classified by the nature of user groups: basic level, special level, and leadership level. Nevertheless, all the frontend material is available to all users interested in it. The system also has backend users who will maintain the site. At this point there are two types of backend users: administrators and basic users. More backend user types can be defined later by the project, if they see it necessary.

The first group of frontend users is the mine workers and students of the industry. The basic level material on the site is targeted mainly for them. On the site they will find useful and practical information and study material concerning their own health and wellbeing in their everyday working situation including choices they can make to improve protection, working habits and methods, and ergonomics. They can also test their knowledge with practice tasks provided on the site. From the point of view of the site's information architecture, the basic level users form the dominant user group and they are first served on the website. Read Mikke the Miner's user story from Appendix 1: User stories.

The second group of frontend users is the occupational health services, health care institutions, and education and training institutions providing the mining industry. The special level material on the site is mainly targeted for them. The special level material is located under "Dig deeper" section on the site and it consists of latest research infor-

mation and articles. Read Olga the Occupational Safety Specialist's user story from Appendix 1: User stories.

The third group of frontend users is the mining industry; mining companies and their management. The leadership level material on the site is mainly targeted for them. The leadership level material is located under "Laws & Regulations" section on the site and it consists of laws, rules, and regulations concerning mining industry with possible national differences.

The MineHealth website backend has two or more different user types. The basic user of the backend can, for example, login and logout of the system, create / update / remove pages and articles. The latter privilege extends to uploading files, photos, and videos to the server, creating links between articles and pages, and publishing / unpublishing articles and pages. The basic users' access to different functions at the backend can be allowed or restricted according to their duties.

The administrator as a backend user has access all the areas of the backend. They can perform all the tasks of the basic user as well as manage the system, and create / update / remove backend user accounts.

Figure 5, the use case diagram of the MineHealth website, depicts goals that primary actors have when interacting with the MineHealth website. Primary actors are stakeholders of the system, who have direct contact with it, in this case the users. In the use case diagram, the use cases depict the interactions of an actor that happen within the system limits. Frontend users have been generalized as one primary actor since despite different target information they share the same user interface and can perform all the same tasks on the website. The backend users are also generalized to one primary actor since the project has not defined backend users' duties yet.

6 PHASE 2: DESIGNING THE MINEHEALTH WEBSITE

The content for the MineHealth website is drawn together in consideration of the pedagogical purpose of the site. The site information architecture and functionality, though, have to correspond to the web usability expectations of users. In sub-chapters to follow, I will try to motivate the design decisions for the MineHealth website from the point of view of the visual and usability design.

6.1 Basis for the visual design

The prime goal of the MineHealth website design was to create as professional look and feel as possible. Sloppy and negligent design, whether functional or visual, relates to undervaluing users. How to determine the professional look then? Everyone has their own opinion of it, of course. The following offers my perceptions and requirements for the visual design. The visual design should respect users as well as the content giving them the main role on the site. Professional design is invisible in a way that it supports users in their tasks on the site, but do not distract them on their mission. At the same time, the good visual design enriches user experience with fun, lightness, or easiness that users are not even expecting. The elements and metaphors are simple and understandable; they are composed nicely and aligned in a strict and consistent grid that eye finds easy to follow and remember. The font is easy to read and consists of only a few different sizes used consistently. The colour, graphics, and picture choices support the concept of the site. The elements of the visual design are consistent on every page. Creating successful visual design is a hard practice, even for professionals. It often seems quite intuitive work, and it is influenced at the very minimum by the designer's view and the procuring organization. Yet, the final success in it is strongly linked to the perception, expectations, and experiences of users. I have found it beneficial to sort out different aspects of the visual design to get a better grasp of the process. I have also used numerous drafts and prototypes in iterative cycle to get second opinions of the design.

On the MineHealth website, the overall atmosphere is designed to match the mine work with big solid elements and graphics, and with a clear and big font. Bright and solid, but quite basic colours give the site some cheerfulness and relaxed feeling as well as steer

the users' comprehension of the site structure. The boxes on the front page remind of colorful Lego blocks. In contrast to the strong colours of the elements, there is enough white space to give an airy and contemporary feel for the site. The elements are clearly composed and there is no clutter. Since the project is funded with public money, there is no advertisement on the site. The functional elements such as the sliding pictures on top of the front page and hover-over function on the topic boxes and the moving menu, add to the modern sentiment. Consistency in navigation, colours, and in composition of elements eases the learnability, efficiency, and memorability of information architecture, and allegedly enhances user satisfaction as well as users' intuitive conduct on the site.

Colours on the MineHealth website are used to group topics together. Usually one's short term memory can hold approximately 7 things. Therefore, it cannot remember as many topics as there are on the MineHealth site. Colours can help users to connect subjects and therefore take hold of the whole information easier. (Kuutti 2003, 53.) The general colour of the site elements is turquoise. The main three categories have their own colour schemes. The colours from the front page elements follow each category to the interior pages helping users to group topics and keep track of where they are on the site. On the front page the colours are used in the topic boxes. In the interior pages, the colours are used in the background of the big headline box on top of the page as well as in the headlines of truncation boxes. Corresponding colours are represented in the icons of the small, moving navigation bar on the left on every page.

The MineHealth website content will contain photographs and videos. The project will gain new photographic material and videos shot in one of the participating mines. Whenever pictures are used on a website, they should associate with the topic at hand and enhance consistent realm of the site. They should also be consistent with each other in terms of size and style. The pictures in use on the front page at present time are from old archives. Nevertheless, they regenerate the site and create realm that users are familiar with.

6.2 Use of the ready-made page template

The Joomla! page template called Viewpoint was chosen to the MineHealth website (FavThemes 2012). The template was a good starting point for the design. It was con-

templated by professional designers, and it offered good visual design elements to support my design work. Also the functional design elements were apt for the purpose; the template had good number of modules that could be varied and positioned on the pages quite freely. The colour schemes for the MineHealth website were tuned by me. At first, the intention was to use the colour schemes from the template, but they turned out to be unsuitable for the overall design. Therefore, the colours were tuned especially for the purpose of the MineHealth website.

The fonts of the Viewpoint template, called Bebas Neue and Oswald, corresponded with my perception of the style that was suitable for the MineHealth website. They can be described as clear, modern, no-nonsense, and strong. The fonts look readable as all-cap on the labels, and friendly and round as a normal text. To support the tone of the MineHealth website, the text size is bigger than currently fashionable.

The Viewpoint template design had lots to offer in terms of possibilities to organize, prioritize, or pinpoint the extensive and multi-layered MineHealth material. The template offered alternative tools for aggregation, summarization, filtering, truncation, and example-based representation. This will help cutting the content material in smaller and more digestible portions for users, and creating scannable interface for the website. The original template is responsive i.e. it adapts itself to users' devices whether they are using computer, laptop, tablet, or mobile. The responsiveness to different devices is not in the scope of this thesis, but the project may apply funding for further development on serving different devices later on.

6.3 Page hierarchy

The page hierarchy of the MineHealth website is divided into A, B1, B2, and C level pages. The A level is the homepage. There are two different B levels: the B1 has the page structure of the main category, which means one of the Cold Protection & Wellbeing, Cold & Vibration, or Airborne Exposures. The B2 has the page structure which presents a particular topic, for example Clothing, and then directs users to choose a category. The C level page structure is used as an article page as well as with the pages in About section. The page hierarchy is introduced in figure 6.

In the page hierarchy level C there are three different articles about Clothing, one article under each three main categories:

- Cold Protection & Wellbeing → Clothing
- Cold & Vibration → Clothing
- Airborne Exposures → Clothing

Figure 6 and the text examples following it clarify the possible paths to the articles.

1) One path from the front page to an article page is to choose first the main category.

The path would go as follows:

- clicking a main category topic from one of the box in the front page - purple, red, or green →
- arriving to B1 page displaying all the topics under that category
- clicking to read more on one of the links proposed on the page, for example Clothing →
- arriving to the article page Clothing, level C
 - The article page has links to practice task pages, research studies in the Dig Deeper section, Laws & Regulations section, all related to the article in question.

2) The second path from the front page to the article page would go through the main navigation bar as follows:

- hovering over one of the links opens the dropdown menu
- clicking the name of desired topic, for example Clothing
- arriving to the article page Clothing, level C

3) The article page can be reached from the front page also by choosing one of the topics instead of a main category, e.g.

- clicking the topic box “Clothing” on the front page →

- arriving to the B2 page Clothing which introduces what the 3 different main categories discuss about the Clothing
- clicking one of the links proposed on the page →
- arriving to the article page Clothing, level C

All of the MineHealth categories and topics are displayed on the front page of the site for the viewer to get a grasp of all the subjects on the site.

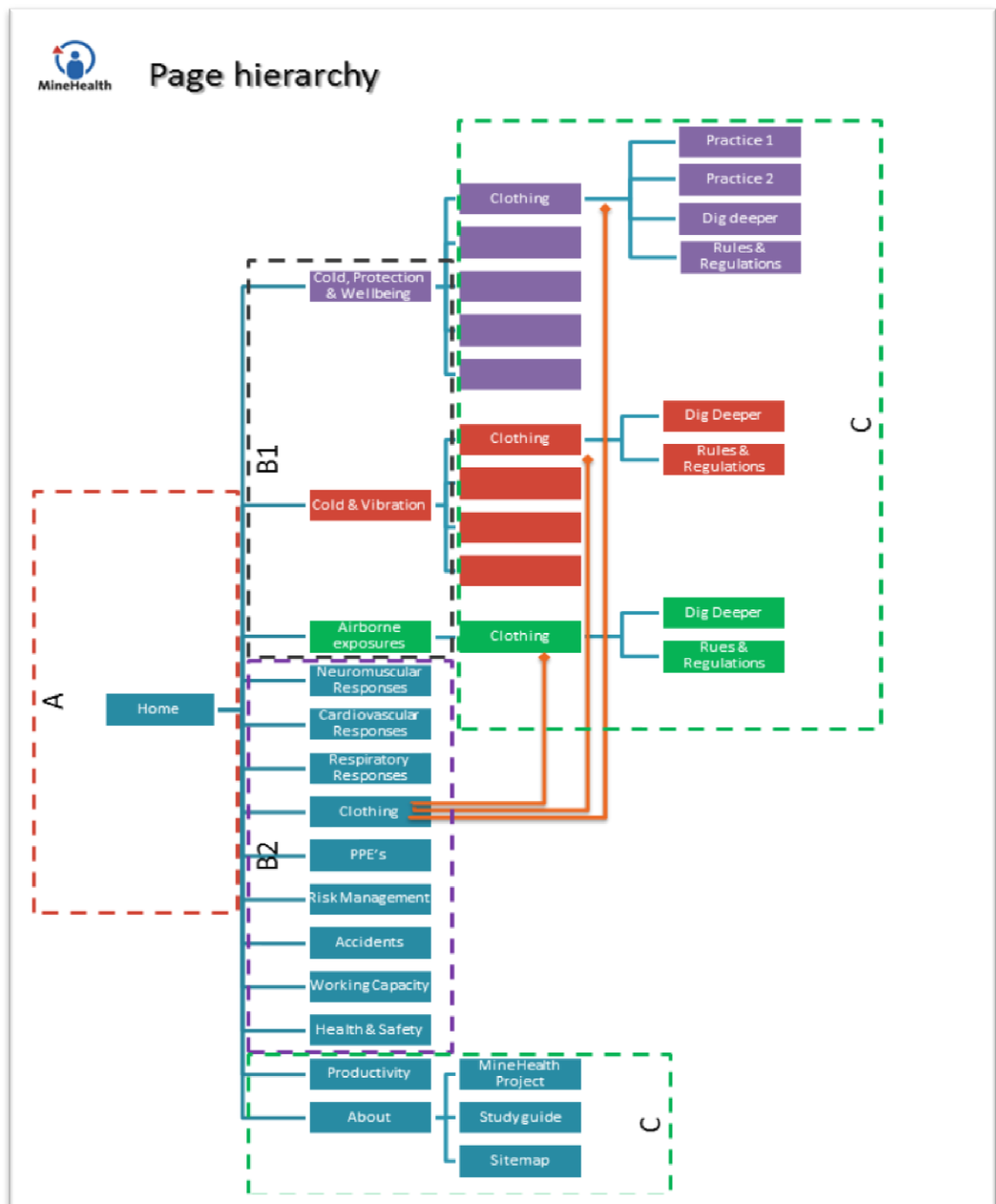


Figure 6. Page hierarchy of the MineHealth website

Figure 6 shows the page hierarchy of MineHealth website as well as demonstrates pages using the same page layout – A, B1, B2, or C. The categories and hierarchy are derived from the MineHealth project’s overview chart displayed in figure 4, which clarifies the proceedings and the topics of the project. The chart functions as a basis for the structure planned for the website.

6.4 Navigation

The MineHealth website has various navigation elements to support users finding what they are looking for and locating themselves on the site. The header and the main navigation bar stay unchanged throughout the website. The header text states what the site is all about – Training and education material for mine workers in the Barents region. The header has the MineHealth logo as well as the Kolarctic logo in it as the financing of the project requests. Clicking the MineHealth logo will take users to the homepage as it is the usual function on any website. The main navigation bar has five link elements – Home, Cold Protection & Wellbeing, Cold & Vibration, Airborne Exposures, and About. Each link in the main navigation bar, excluding the Home link, offer hover-over dropdown menu which reveals all the topics under that category. In the main navigation bar occurs also the search box making search function easily accessible from every page.

There is a moving navigation Menu bar visible on every page of the MineHealth site. The menu has the same links than the static main navigation bar and it provides an easy access to the main hubs of the site i.e. the front page, the starting page of each main category, and the sitemap. Since there is no content on the site yet, the length of the articles is undetermined and therefore the need for scrolling up and down on the pages is also unknown. The moving navigation allows users to access the main navigation wherever there are on the site. On the bottom of the page there is also an arrow that brings user to the top of the page with one click instead of scrolling back.

Users can be ambiguous with their online navigation habits and approach the material from various aspects depending on their need for the information. They do not necessarily follow the path the designer intended them to take. It is possible that they look the

material chronologically from top down or they may have more ambiguous approach going for one topic that interests them. Users may not arrive to the site through the homepage. Generally, users pay more attention to the content when they are on interior pages than on the homepage. (Nielsen 2000a, 15, 214, 217; Nielsen & Loranger 2006, 27-29, 33-35). Therefore, various advances of users are supported from the front page of the MineHealth website to the interior pages, where the actual material and articles are located. If users arrive to an interior page on the site, the header will tell what kind of page they are on and the breadcrumb navigation will help them locate themselves on the site. There is breadcrumb navigation on top of all the pages except on the front page. The breadcrumb navigation is clickable assisting the transfer between pages. Users' different paths are supported also in page hierarchy design. There is a sitemap and search function to help users to find the information they are looking for. The study guide will indicate how the material and site are intended to be used as well as explain the main terminology used on the site. The interior pages do not have large side navigation bars since according to Nielsen and Loranger (2006, 35) users are not interested in the side navigation, especially on the interior pages.

6.5 The front page - Home

The front page of the MineHealth site is intended to give users an overall picture of the available content. The header, which stays the same throughout the site, has the MineHealth and Kolarctic ENPI CBC logo and text that clearly states what the site is all about. The orientation of users on the site is enhanced with clear, friendly, and illustrative graphics, and use of colour in categorizing the topics. The topic boxes on the front page able users to quickly scan the overall content of the site. The topic boxes also show short truncated text introduction of each topic when users hover-over them. This gives users more information fast on the content behind each topic; they do not have to open each link to find what is behind it. The hover-over function allows the graphics to show on the front page most of the time; the graphics add fun and colour to the front page as well as help users with the orientation, memorability, and quicker understanding of the content.

The photographs on the front page are from open pit mines and form a familiar environment for users. The big photos on the slide show on top of the page also have text

info box on top of them. The info boxes are meant to be used for fun questions, quirky statistics, or other suitable subjects that speak straight to users and inspire their interest to the subject. The layout design for the front page can be found in Appendix 2: Front page – A.

6.6 Main category page – B1 and Topic introduction page – B2

There are three main category pages on the MineHealth website: purple for Cold Protection & Wellbeing, red for Cold & Vibration, and green for Airborne Exposures. These pages use the level B1 page structure, each with their respective colours. The B1 structure introduces one main category and all topics related to that category with short truncated text and link to respective article. Truncation adds scannability of the page and increases perception of the main category as a whole. To see the layout of the B1 structure, go to Appendix 3: Main category page – B1.

From the front page of the MineHealth website users can choose one of the subcategories called topics here. There are nine topic pages on the MineHealth site. The topic pages use level B2 page structure, and the turquoise colour scheme. The B2 structure introduces one topic, for example Clothing, and proposes three links to the main category articles that deal with clothing. To learn more about the level B2 page structure, see Appendix 4: Topic introduction page – B2.

6.7 Article page - C

The article pages on the MineHealth website use level C page structure. All the remaining pages use this page structure excluding Sitemap and Search pages which have automated structure from the component they are created with. The article page has a main text area and at the bottom of the page there are three truncation boxes; links to practice tasks, Dig Deeper and Laws & Regulations section can be placed into the boxes.

The main text area of the article page consists of text, pictures, and videos. At the implementation phase there were some functional problems with the video component of Joomla! system. Therefore, it is recommend that the MineHealth project opens a user

account and publishes the videos via YouTube. The YouTube videos can be linked or embedded to the MineHealth website. Creating a user account to YouTube for MineHealth project will appear more professional than videos uploaded by seemingly random individual person. A detailed view of the article page layout is provided in Appendix 5: Article page - C.

6.8 General information pages – About

The MineHealth project, the financier of the project, and the project partners are introduced in the About section of the website. Under the About link there is a Study Guide which introduces how the material on the website is intended to be used, and clarification to the terminology on the site. About the Project and Study Guide pages use the level C page structure.

The sitemap and search pages are also located in the About section. They use an automated structure from the component that they are made with. All the pages in the About section use the turquoise colour coding. Layout of the level C structure is introduced in Appendix 6: About pages - C.

6.9 Writing the content

Inserting the actual content for the MineHealth site will be done by the project staff later in the autumn 2013. Since writing for the Internet differs from writing for the paper publications, I have compiled a guide about Internet writing for the project to use. There are some of the major guidelines for Internet writing listed in the text to follow. More detailed instructions can be found in Appendix 7: Writing for the Internet.

The web interface design made for the MineHealth website is already helping to keep the site consistent concerning the layout, font style and size, colours, information architecture, and structure. What remains to be considered, when inserting the content, are language and labeling as well as functionalities that come from the content itself. It should be ensured that all the pictures, videos, and text links work. The language should be the kind of language that users i.e. mine workers use and are familiar with. The lan-

guage should also be consistent in style. Labels and headlines should be to the point and express what the following content will be, avoiding too general or bland expressions. The text should be written in a succinct style suitable for quick scanning as well as constructed according to users' interests. The text should be broken down into reasonable, short paragraphs and pages. The content should provide meaningful information, talk to users and be intriguing. (Krug 2006, 20-49; Nielsen 2000a, 99-127; Nielsen & Loranger 2006, 192, 254-283; Sinkkonen et al. 2009, 256-269.)

7 PHASE 3: EVALUATING AND TESTING OF THE SITE

As the MineHealth project is still ongoing for at least another year and the content of the site is still underway, the site cannot be tested with end users by the time this thesis process is finished. So far I have checked the consistency as far as possible, and iteratively walked through the site multiple times checking the functionalities and consistency. The programmer has done the same. Also the graphic designer for the MineHealth website has evaluated the site giving me his feedback. He has studied information technologies, usability, and user interface design at a university before now studying for Fine Arts degree. So far, the MineHealth project has indicated that they are very happy with the user interface design I have provided for them, and that it corresponds to their wishes and needs for the website. The structure cannot be really finalized, though, until the content is known more thoroughly. When the inserting of the content material starts there might appear some new needs for the site, for its structure and functions. And some of the current solution may prove to be inapt.

There are no outsiders who have officially tested the site yet, because it is not ready. I as a designer know the logic that I have created for the site, but end users may not get it the same way I intended or they may not agree with my choices. More profound testing should be implemented after the content is inserted, preferably several times. Testing will give useful information on how end users are able to use the site; is it easy to navigate and learn, do they find it useful and interesting, and how to improve and correct the site, its user interface, and overall user experience. The test audience does not need to be huge; some of the project partners should be a good option.

Good instructions for testing web service usability and its user interface design can be found in many resources. There are two that I would recommend for the project:

- 1) Sinkkonen, Irmeli & Nuutila, Esko & Törmä, Seppo 2009. Helppokäyttöisen verkkopalvelun suunnittelu. Hämeenlinna: Tietosanoma Oy.
- 2) Krug, Steve 2006. Don't Make Me Think!: A Common Sense Approach To Web Usability, 2nd edition. Berkley, CA, USA: New Riders Publishing. (Also available in Finnish.)

The first book offers very practical and detailed guidelines on how to implement user testing. The book also offers excellent checklist for site evaluation. The second book offers great advice on who could do the testing and how it could be done, and how the observers can prepare for the testing situations. After the testing(s) necessary changes should be implemented. The site should be published only after the content is inserted and when the site is ready. Unfinished site is likely to cause frustration or disappoint users. The ever so important first impressions should not be ruined with hasty publishing of pages that are under construction.

8 FURTHER DEVELOPMENT IDEAS FOR THE MINEHEALTH SITE

All the desired features for the MineHealth website cannot be introduced to the site at this time. Here are some of the ideas that did not fit to the design during this thesis process. From the beginning of the design process I have found that the site is going to be too static. Modern web surfers want to have dynamic content on the site – they want to feel active and contribute to the experience while online. (Nielsen & Loranger 2006, Preface xix; Sinkkonen et al. 2009, 26-27.) On the MineHealth site there is dynamic content in the form of practice tasks that users can try out to test their knowledge of the material they have just studied and familiarized with. That is suitable for an education material site, but the site could use more functional activities for users to accomplish.

The articles on the MineHealth site can be shared through the most popular social media or to be printed, if users wish to do so. In addition, there could be comments option, and “like” button on the article page. Users could provoke a conversation with each other, for example, on safety issues or occupational practices of different mines, and find peers outside their immediate colleague group. But that would require front end user accounts and moderation of the comments from the administrator of the site. Since there is no certainty that anyone will be actively responsible of the site to moderate the comments or discussion, or to answer comments and messages after the project is over, there is no use on encouraging users to be interactive at this point.

The MineHealth site could have news feed of changing information, for example *Daily dose of safety* that would show on the front page. Users could also order the *Daily dose* to their email. It would concern issues such as safety regulations or ergonomics instruction for the day. The *Daily dose* would keep users connected to the site, and keep them coming back to the site. If the site is not high priority for users, they easily forget it even exists. The *Daily dose* would be a clever and refined reminder of the site, especially for those who are using the site independently as self-study material and not as part of a formal education.

9 CONCLUSIONS

As a process, creating a web user interface and creating an education material have similarities as they both are based on the idea of serving end users and their need for information. From that approach, it was possible to base the MineHealth website structure on the education modules and work packages of the MineHealth project. Web interface design has its own demands and particular characteristics, though. This thesis research indicates that user-oriented design is essential to a successful website creation. User-oriented web interface design which pays respects to usability methods and aims to improve user experience is rational financial investment whether viewed as short term or long term investment. Reputation as well as success of the service and its provider depends on the level of satisfaction the website provides to its users. It could be said that user experience equals to user power; users decide which services they want to use in the Internet. And they base their decisions on their own experience, perception, and need for online services. The Internet offers so much information, so many services and products that users can just abandon poor or unpleasing online services. Online users demand respect for their needs and wishes, and quite rightfully so.

Users interact with the system i.e. the website through the web user interface. Therefore, the interface design is in the core of users' experience. Users visit a website to gain something; information, services, or products. Poor user interface design may complicate, slow down, bore, or prevent users completing their tasks. A web service which provides good overall user experience receives users' respect convincing them to return to the website. Returning users conclude growth in return of investment – financial or other - as a result of increased usage of the web service. Instead, poor usability and ignorance of users' needs and perceptions result as an unpopular website. Time, money, and efforts invested in a web service and in a user interface design are in vain, if the website remains untapped. In addition to financial benefits, providing good usability and good user experience on a website is also humane. As a web service provider one should appreciate users' time and nerves, and offer them sympathetic, usable, useful and pleasing web service that will give users' what they came for efficiently and effortlessly.

During the design process the designer has to be flexible to balance between different stakeholders such as procuring party, end users, and people in the design and imple-

menting process. Since there were different stakeholders working for the MineHealth project to complete the design, it has taken a great deal of project management and also human resources management skills to get all the ends meet during the process. That was not what I expected in the beginning of the thesis process. To manage oneself during the thesis process is one thing. Another thing is to manage other people. It was especially hard to find a justification to give orders to people when one is not their supervisor and they more or less volunteered their time and expertise for my thesis project. For them the timetable of the project or quality of the end product may not matter that much. All the human resources management was time consuming and stressful at times. But also in working life one has to accommodate to other people and to their habits, skills, and needs as well as one's own.

Analyses phase in the beginning of the design process charts the problems and questions that need to be satisfied with the solution i.e. with the web interface design. In the MineHealth case the intended material for the website is extensive and multilayered. The material is also intended for three different user groups. To form an understanding of the wishes and needs for the material use and purpose of the upcoming website required iterating the analyses and the design processes multiple times. The iteration requires fastidious and persistent approach as well as an open mind from the designer to discover and scope the requirements for the web service and its interface.

After the analyses come the actual design phase of the work which includes elements such as usability and user experience design, information architecture design, visual design, and evaluation and testing. On the MineHealth website the essence of the design is fun and accessible atmosphere with big, solid, and strong elements and graphics, contemporary feel, and a clear and big font. Bright and solid, but quite basic colours give the site some cheerfulness and relaxed feeling. Information architecture is built to be consistent and to support multiple ways to use the content and users to locate themselves on the site. Basic search function and a sitemap are offered on the site.

Usability and user-oriented approach form the basis for the MineHealth user interface design. There are no exact formulas or rules that would always ensure success in web user interface design. However, there are methods that ease the design process and further the efforts of achieving good usability and good user experience. Using sketches and prototypes from early on in the design process receives more comments and more

accurate developing needs from evaluators and testers than intangible concepts. Mere verbal concepts or mental images are too vague and difficult to percept and evaluate. Sketches and prototypes are prominent part of documentation of various phases of the design process; decisions on elements and features that are included or left out of the design can be traced back through them. Exposing the design iteratively for outside evaluation and testing during the process provides constant feedback for the design and helps to find blind spots in the design. Evaluating and testing help to uncover user needs and preferences as well as system, design, and implementation flaws. Iterative feedback evolves the web interface design to match the demand of the material as well as the expectations of end users. During the thesis process the MineHealth web interface design was evaluated with the project group as well as with the design team. More profound testing is needed when the website has more content and before the publishing of the website.

The MineHealth website is operated with Joomla! content management system. After the web interface design is created to the system maintaining the website is relatively easy with the content management system even for users with little knowledge of web technologies. The MineHealth website design is built on a ready-made page template acquired from Viewpoint. The ready-made webpage templates offer professional design and latest technology and trends for the convenience of designers less acquainted with graphical design. The templates also have lots of functional features premeditated, and they support customization of the template for the need of the individual design. Problems may arise when the programmer needs to track down the code of the template to change it. The programmer has to implement his/her own ideas or, as in this case, designer's ideas into the code. For the designer, the problem is that the ideas cannot always be implemented due to the restrictions of the programming on the page template or the skills or the will of the programmer. It might be that there just is not suitable module in the template, or it cannot be used in a way that the designer wants, or the programmer is not willing to find the solution. From the designing point of view the template offered elements and features that could be used as they were or with little moderation to support the information architecture and user activities that were wanted for the MineHealth site. The graphical elements of the template are stylish and give the site a modern feel, and the graphical elements that were specifically created for the MineHealth purpose by the graphic designer were easy to fit into the template. The automated search results page gives users possibilities to advanced search functions on the

material. Joomla! also offers an additional element of automated sitemap, which is expected by users from a site with large quantities of articles. From designer's point of view the use of ready-made template was a good solution as a basis for the design. Overall, the use of ready-made template was well-justified, and the particular template in use on the MineHealth site is a success for the purpose.

The answer to how to design a web user interface for material such as the MineHealth material and still provide good usability lies in the persistent analyses in the beginning of the design process. The objective of the analyses is simplicity and clarity. Analyses clarify what the purpose and message of the website is, and for what kind of users the web service is intended to. Simplicity and clarity are achieved by organizing and grouping the content information, and realizing the relationships between the content elements. During the design process it is equally important to get iterative feedback through evaluating and testing the sketches and prototypes of the design. From the moment users arrive to the MineHealth website it is evident that there is a conscious thought behind the design which generates a feeling of trust and confident in users. In successful web interface design, users and their needs, expectations, perceptions, and experiences of the web service are in the core of the design.

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APPENDICES

Appendix 1: User stories

Appendix 2: Front page – A

Appendix 3: Main category page – B1

Appendix 4: Topic introduction page – B2

Appendix 5: Article page – C

Appendix 6: About pages - C

Appendix 7: Writing for the Internet

Mikke the Miner

Mikke is 27 years old Miner/Processing Plant Operator, who has Vocational Qualification in Mining. He works in a mine since about 5 years. He is a solid worker and lately he has been entrusted with assignments of an overseer. He hopes to get promoted soon.



Mikke is an intermediate level computer user; he is quite handy performing his daily tasks with it, but computers aren't in his highest interests. In his free time Mikke does motocross. Mikke uses Internet on daily basis mainly at home, because he works outdoors and does not have his own office. He can use shared computer at work, if necessary. He surfs Internet for recreational purposes, to keep in contact with friends, and to handle daily errands like banking.

Mikke uses MineHealth web service as a self-study platform, mainly as basic level information user. Use of the service is voluntary, but useful to him. At work it is time to procure new winter overalls for outdoor workers. Mikke has been put in charge of finding good work wear retailers and asking for competitive offers from them. He wants to find more information about protective clothing for miners. He reckons the overalls have to offer good weather protection as well as be comfortable to use. He wonders what else to require from quality work wear. He has heard about the new MineHealth website in the last weekly staff meeting. From the first page on the MineHealth website he finds the topic Clothing. Under that topic he learns about various exposures that clothing can protect mine workers from. From the articles Mikke get valuable new information. He then compares the information he found on MineHealth website to the clothing retailers product information. After comparison of products and retailers, he is able to find 4 different options for acquiring. He sends them requests of offerings, and is left waiting for their replies. After getting to know the MineHealth website Mikke's interest to other articles on the site is awaken and he returns to the site occasionally to study and test his knowledge.



Olga the Occupational Safety Specialist

Olga is 43 years old Geologist with Master degree in Geosciences. She works in a mining company since 11 years. She is the Occupational Safety Specialist in the company, and responsible of parts of the orientating new workers.

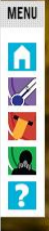
Olga uses computer daily at office, and is quite fluent with it. She surfs the Internet for socialize and to find information.

Olga uses MineHealth web service frequently to find researched information and support to her work in issues of safety and wellbeing. She is mainly a specialist level information user. Use of the service is voluntary, but useful to her. She also uses the site as a tool in the orientation of new employees.

This week Olga will give safety training for employees. She enters the MineHealth site to seek inspiration for the topic. She is happy to find thorough learning schemes from the site that she can utilize with little customization at her training. She can use the MineHealth material as it approaches topics from exposure and human responses to prevention of risks and aspects of overall health and safety. Olga can guide the workers with the basic level articles and practice tasks, and support her lectures with research studies found on the site. She is also content that the MineHealth site is accessible to all workers after the safety training. She can therefore leave the workers to learn some topics independently by themselves later. She visits the MineHealth site quite often and she uses the search option to save time finding the topics she came to site for.



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- NEUROMUSCULAR RESPONSES
- CARDIOVASCULAR RESPONSES
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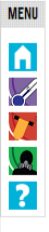
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COLD PROTECTION AND WELLBEING

Our themes use the most advanced web technology. Thanks to the brilliant people who have created awesome projects for the community, our templates use HTML5 Boilerplate, Twitter Bootstrap UI elements and the 960px grid system. Other features include CSS3 techniques like @font-face, transitions, animations or media queries.

Browser compatibility is a major concern with HTML5 and CSS3, so we use graceful degradation or progressive enhancement to make sure our themes work great in all major browsers.

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AIRBORNE EXPOSURES



Our themes provide an extensive set of parameters for easy and fast customization. They are designed to help you customize the theme to suit your clients' needs as quickly as possible.


Using the [theme's parameters](#) you can easily change each element of your website: the template styles, the layout and colors, the fonts, the logo, the module variations and the mobile experience.

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NEUROMUSCULAR RESPONSES

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AIRBORNE EXPOSURES / DUST, FUMES AND CHEMICALS

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DUST, FUMES AND CHEMICALS

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PRACTISE 3

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Cold and vibration thingy thing tingle tingle jungle. Start with vibration impacts and work load. ...

Created on 04 February 2013

4. [Cold protection and wellbeign](#)

(Cold, Protection & Wellbeign)

Cold protection and wellbeign. How to protect yourself from **cold** winds and **cold**. Start from temperature and wind article or choose one from the down ...

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MENU



MENU



Writing for the Internet

The content is the main part of the website

- avoid sacrificing the substance with instructions to follow
- content is the reason for the user to come to the site
- design supports the content's usability

The web service is for the end user

- not about the writer or the company → rather use "you" than "I" or "we" as a subject
- and/or use objective language
- built to ensure good service for the user, not to present the company structure

Be succinct: write 50% or less compared to print material

- reading from computer screen is tiring for the eyes and 25% slower than from paper
- users are resistant to read a lot of text from screens
- less scrolling the better (?)

Write for scannability:

- avoid long continuous blocks of text
- use descriptive headings and subheadings (no cute, meaningless phrases)
- use short paragraphs (max 4-7 lines)
- write most important factors first
- use pictures, bullet lists, charts, diagrams, etc.
- use highlights and emphasis to catch the eye

Write for an easy read

- split long texts and information to multiple pages
- find your substance, say meaningful things, leave the rest of it out
- use short sentences: web users want "hard facts" and fast
- keep it interesting, intriguing, and meaningful for the reader
- use language that the user is familiar with
- aim to simplicity, don't be too fancy
- be concrete
- proceed logically
- avoid negative phrasing



Keep consistency throughout the site

- concerning labeling, navigation, colours, shapes, language style, font style and size, layout
- within the site, between the site and outside features/ commonly known other systems, and between the system and the real world

Proofread the for mistakes and grammatical errors

Publish the site only after it is complete

- empty links or pages, and shallow unfinished content disappoints and frustrates the user driving them away

End user

- is a lazy reader
- wants to feel active and click things
- wants to move around
- wants to move between pages
- doesn't have time, wants to achieve quickly
- is goal-driven
- is easily bored
- ask their comments, experiences



References

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