Abstract

When it comes to simulator training, there are two main target groups, the student and the teacher/instructor. This thesis will cover usability aspects for both of these groups when it comes to tasks related to simulator training. For the student it will mainly be about how they can interact with the interface from the simulator and how results and feedback from exercises are presented to them. For the teacher/instructor on the other hand, usability aspects for managing the students and the exercises will be addressed, along with how results and progress shall be presented in a way that is easy to grasp and understand.

A redesign of the current system used to manage these issues will be performed. Some of the aspects that the redesign will cover are usability aspects, graphical design and workflow.

One of the main outcomes from this thesis is a system that supports many different levels of engagement from the user, allowing users with different background and interest to interact with the system as effortless as possible/wanted.
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Chapter 1

Introduction

There is a lot to gain from using simulations when practicing for operator training, for the student, the employer and not to forget - the environment. By practicing in a virtual environment before testing in the real world, safety, productivity and time are some of the main benefits [10]. But, there are more to this than just sitting down and practice. Managing the system that supports the training in simulator is an important issue when it comes to creating meaningful training sessions for the students.

Figure 1.1: An example of how a simulator looks.

This thesis will mainly address the system used to set up and manage the exercises that are to be used from the simulator. Additionally it will discuss how the exercises are presented in the simulator and how results and how the progress is illustrated in a good way, both for the student and for the teacher. The current system that are used to support these issues are called SMS, which stands for Simulator Management System. This system will be evaluated and redesign. During the process of creating a redesign of the Simulator Management System, evaluations, usability testing and prototyping are some of the main inputs for the new design. The design will cover both the graphical aspects as well as the
functionality and the flow within the system.

1.1 ORYX and the simulator

Oryx simulations are world leading providers of advanced simulations for operators training. The company started in 1999 and has since then delivered over 200 systems, worldwide, and collaborated with several of the mayor machine manufacturers, such as Volvo and Atlas Copco. During 2011 ORYX had a net sale of 47 587 millions.

The thesis project was conducted at Oryx simulations office, in Umeå Sweden during the supervision and guidance of Daniel Wiberg, developer at ORYX.

The main focus for this thesis is a system called SMS, this stands for Simulator Management System and will be described more in the next section, 1.1.1.

1.1.1 Simulator Management System - SMS

The Simulator Management System, that will be referred to as SMS, is used in order to set up exercises that can be executed on the simulators, and also to create and manage groups and users. Another important aspect of the system is the results, the simulator logs data that are represented to the users through the SMS. The system has two main target groups, the teacher and the student. The teacher sets up an account for the student, places the student in a group that gives him or her access to exercises planned by the teacher. Both the teacher and the student can then view the results from the exercises.

In the system users can have different authority; Admin, Instructor, Student or System administrator. A user may also have several authorities at the same time and if a user has several authorities they may flip between them in the menu that forms in the top right corner, see Figure 1.2.

![Figure 1.2: The menu that forms in the top right, when a user has several authorities in the SMS](image)

- **Admin:**
  In this mode it is possible to create groups and users, search for a user and get a overview of all groups. A overview of the admin mode is shown in Figure 1.3.

- **Instructor:**
  In this mode users can view on-going simulator activity, edit learning path, assign learning path and view statistics for the users. Within the heading edit learning path a path may be altered or a new created. In this heading the user also adds "entries" in the path, (entry = exercise, path = folder). Assigning a path to a group is done under the heading assign learning path. A overview of this mode is shown in Figure 1.4.

- **Student:**
  In the student-mode the user can view their results from the exercises. This is shown in Figure 1.6.
Figure 1.3: A overview of the admin mode in the SMS.

Figure 1.4: A overview of the instructor mode in the SMS.
– **System administrator:**
  This is a mode with some technical information and will not be addressed in this thesis.

### 1.1.2 Student Home

The students comes in contact with another system when activating a exercise on a simulator, called *Student Home*, the Student Home is shown in Figure 1.5. The student signs in to the system using a keyboard that are in connection with the simulator. The user then take place in the simulator chair and then from the simulator chair interact with the Student Home using a numpad(Figure 3.3), or the numpad section on the keyboard. The user can choose a exercise with the numpad and after the exercise is completed results and statistics are shown and another exercise may be chosen. If the user wants to view the results again he needs to sign in to the SMS, from a computer, with the same login information. The design on this system Student Home is completely separated from the design of the SMS.

![Student Home](image)

Figure 1.5: The system *Student Home* seen from the side of the simulator.
1.1.3 Target groups

ORYX simulators has users worldwide, all with different computer knowledge background, but there are two main target groups, the instructor and the student.

- **Instructor:**
  The instructor uses the SMS to create groups, creating and adding users in the groups, assign exercises to the group and finally inspecting the results for the students. In order to be able to conduct this the instructor needs access to both administrator and instructor modes.

- **Student:**
  The SMS is only partly used by the student, they only use the SMS when viewing the results of the exercises, see Figure 1.6. The student can also view the results from the most resent run in the Student Home system, shown in Figure 1.7.

![Figure 1.6: This is how the overview of the results are shown in the SMS for the student.](image-url)
Figure 1.7: This is how the feedback from an exercise can be shown to the student from *Student Home*, the results may be presented in an vertical or horizontal view depending on the simulator.
Chapter 2

Problem description

There is a significant need to refine the current systems usability at ORYX, as it works today the user does not get any support from within the system. The fact that this systems is a result from making the simulator online, means that the usability aspects were never put in focus and therefore the system does not support the users activities [16].

2.1 Problem Statement

This system, as it looks today, was delivered to a customer for the first time in january 2012 and has since then been delivered to three customers in total and is used on nearly 20 simulators. Before this version, the system was not connected to the internet, this meant that a user could not change simulator once started, since the information was only stored in the specific simulator. One of the main reasons for this thesis is that when the "new" version of the system was created it was not based on the users true need of the system, rather a way to make the system and the simulators "on-line", and even though online systems has a longer lifespan, the final product did not live up to the quality of a ORYX product [6]. During the development of the "new" SMS the users had no influence on the systems design and work-flow, this meant that ORYX had little insight to the users true needs of the system.

Another important aspects for the design of the SMS is that this system is used world wide, of users with diversified computer knowledge, cultures and age groups, making it hard to satisfy al of the users needs [15]. This means that the system truly needs to be intuitive and also that the use of colors and icons most be well thought-out [15].

2.2 Goals

The goal with this project is to improve the usability of ORYXs SMS. In order to achieve this the current system was evaluated and a redesign of the system conducted, the redesign covers both the graphical appearance as well as the work-flow. The first goal was to present the redesign as a clickable web-based prototype but based on limitation in the time frame the final goal was redefined into presenting the redesign as a static design proposal that includes all of the main functionality.
2.3 Planning and method

Before the work begun it was divided in to phases and the different phases where set up based on the extension and purpose of the thesis. The different phases are pre-study, design, implementation and evaluation. All of the phases where given a time period, total in 19 weeks, that is because 1 week is planed as a control week between the design process and the implantation phase. With that week in account it sums up to a total of 20 weeks. During the hole time period the thesis rapport and the in-depth study is conducted simultaneously as the different phases.

- **Pre-study, 1 week:**
  The project will start with a pre-study in order to familiarize with the given task and to set up a proper plan on how to pressed.

- **Iterative design process, 10 weeks:**
  This phase is the biggest of the four, the basic structure of the design process is shown in Figure 2.1. This design process steps are customized based on experience from working with the design process. The process starts with identifying problem, criteria and constraints. Based on the outcome of first two steps in the design process, possible solutions and ideas for the system will be generated. Those ideas will then be displayed as a prototype which will be evaluated and redesigned until wanted outcome is reached.
  When the design process is completed a design specification will be made before the implementation phase begins.

\[ 	ext{Figure 2.1: The structure of the design process used for this thesis.} \]

- **HTML prototype implementation, 8 weeks:**
  The goal of the implementation phase is to create a clickable prototype based on the design specification. The extension of the implementation is not specified in advance, this is because the time period of 8 weeks also include learning html and css.


2.3. Planning and method

– **Evaluation, 1 week:**

Even though the different phases all feature evaluation, a evaluation phase is planned in the end of the project. A usability test will be performed and compared with results from usability testing that will be conducted in the beginning of the design phase. The conclusions will then be presented for ORYX and based on there responses possible changes or recommendations will be made.

This was the original plan, but as the project proceeded some changes needed to be done. The main reason for this is that the in-depth study and documentation part for the thesis was more time consuming than calculated. This resulted in the following changes; The implementation part was only given three weeks, after these weeks a control was made for the remaining time of the thesis project and a re-planning needed to be done. This led to the decision that the remaining implementation would be but aside and more focus put on the design for the SMS, Student Home, Sign in and the in-depth study. And as a consequence to this the evaluation phase where also put aside. This because the final evaluation where to be performed based on the implementation.

The modified timeline:

– Pre-study, 1 week
– Iterative design process, 10 weeks
– HTML prototype implementation, 4 weeks
– Iterative design process, 2 weeks
– In-Depth study, 3 weeks

2.3.1 Method

Some of the methods that will be used during this thesis are:

– **Iterative design process:** A design process is used to make the work more structured, following the different steps that leads to a final design proposal. The design process is described in Chapter 4.

– **Evaluations:** Within the design process evaluations will be performed in order to make sure that the final design proposal matches the goals of this thesis. The methods used for evaluating the system are listed below, and will be described more in detail in Chapter 4.

  - Hallway testing, 4.1.2
  - Think aloud protocol, 4.1.2
  - Nielsens heuristics, 4.2.1
  - Paper mockup, 4.5.3

– **Activity centered design, ACD:** When designing the system, the activity that are to be performed will be put in focus, more about ACD in section 4.3.1.
2.4 Pre-study and related work

During the pre-study phase literature regarding evaluation methods, interactive systems, simulators, web-based learning where some of the subjects that where looked deeper at. During this week the SMS and the Student Home where evaluated with a expert heuristics evaluation, this evaluation made it easier to understand and grasp the given task.

2.5 Definitions

Some of the terms used in this SMS, that are quite unique for this system are;

- **Path:** A path in this context is similar to a regular folder on the computer, a way to group thing together. A path holds a collection of entrys.

- **Entry:** Exercises are in the SMS called *Entrys*.

- **SMS:** SMS is a short term of the systems full name, SMS stands for Simulator Management System.

- **Student Home:** This is the system that are used from the simulator when choosing exercises to practice on.

2.6 Thesis outline

The different chapters of this thesis will now be described shortly.

2.6.1 Ways to interact with the system from the simulator

Today a numpad are often used when interacting with the system from the simulator, and in this chapter alternative ways to perform this interaction will be reviewed and a proposal for the most suitable solution for ORYX will be presented in the form of guidelines.

2.6.2 Design phase

In this section the process of the design phase will be viewed in detail, all of the different steps of the design process will be addressed.

2.6.3 HTML prototype implementation

Based on the results and findings from the design phase, a prototype where made. The prototype will be shown and described in this chapter, along with some limitations that needed to be done in order to stay within the time frame.

2.6.4 Results

A discussion and conclusions from the results of the thesis will be presented in this chapter along with recommendations for future work.
2.6.5 Acknowledgements

In the last chapter, some special persons will be thanked for their help during the thesis project.
Chapter 3

Ways to interact with the interface from the simulator

This in-depth study addresses ways to interact with the interface from the simulator. The findings from this study will be used when designing the new interface for the system used from the simulators, for the redesign of Student Home. The main purpose of this in-depth study is to come up with new ways to interact with the interface from the simulators.

3.1 Background and problem description

On all of ORYX simulators, the interaction between the human and the interface requires an additional hardware from the one existing in the simulator. Today the system that the user interacts with is called Student Home, Figure 3.1, in this system the user may i.a. choses exercises to practice on, more about Student home in section 1.1.2. The system is used by first signing in, with the help of a keyboard, then depending on the hardware that is connected to the simulator a keyboard or a numpad is used to navigate and select exercises.

On different simulators there are different hardware used to control the interaction, and they are also placed in different locations from simulator to simulator. The different hardware that is used are; numpad, keyboard, wireless keyboard and computer mouse. On some simulators there are a tables on a movable arm so that the user can access the table, from the chair, when in need of the keyboard. Today the hardware have three main tasks:

- **The keyboard**: Create user and to sign in.

- **The numpad**: Navigating and selecting exercises, change the camera angle while driving and some other functions that are needed in order to interact with the running application.

- **The portable keyboard**: Sign in, navigate and select exercises, and in some of the machines used to change the camera view and used when interacting with the running application.

Some of the simulators uses inactive buttons, that are on the machine, in order to control some of the things in the interface, for instance changing the camera angle.

On the simulators that have a numpad, the numpad is positioned "where there was room for
Figure 3.1: A overview of the system Student Home seen from a simulator chair.

\(i^{+}\), but can be picked up and held if wanted. The numpad has velcro taped on the back used to keep it in its position when not held, but the velcro often come loose and needs to be replaced. The placement of the numpad is often hard to reach and in order to get a good look at the numpad, the user needs to change his or her sitting position, the position of a numpad is shown in Figure 3.2. The numpad is placed to the right in some simulators and to the left on others. The numpad can be seen in Figure 3.3.

The placement of the hardware is a big issue, see Figure 3.2, it needs to be in an accessible place without disturbing the controls that are associated with the machine. And at the same time, some kind of standardization regarding the placement needs to be considered in order to create a more uniform feeling in the products. Another issue that needs to be addressed is if it is possible (in the sense that it enhances the experience from using the system), to combine the two hardwares used today (keyboard to signing in and numpad to navigate), to one hardware that manages to support the users thought process instead of intruding on it [9].

### 3.2 Results and Possible solutions

Two different types of solutions will be reviewed in this section, first possible solutions that combines the two hardwares to one, making it possible to use the same hardware for both signing in and for navigation in the system. Second a solution that can replace the numpad and make the interaction easier for the user.
Figure 3.2: The placement of the numpad on one of the simulators.
3.2.1 Combining text entering and navigation

Today there are many options for hardware that can be used which makes it possible to both navigate in the system and also enter text when creating users and signing in. But the task is not to find a hardware that just replaces the two existing hardwares, but to find a better solution for the user when interacting with the system. Therefore it is important to find out how the user actually would benefit from combining the existing keyboard and the numpad.

One way to enter text without using a keyboard is to use a joystick (example shown in 3.4) and a virtual keyboard, and studies have shown that naive users are able to learn quite quickly how to enter text using joystick and a virtual keyboard. But on-screen keyboard often divide the users attention between the virtual keyboard and the typed text [20]. Another way of entering text using a joystick is EdgeWrite, Figure 3.5, this is a way to use the joystick, almost like a pen, and form letters directly with the joystick. It is also quite easy to learn, new users can learn this in under fifteen minutes [21]. EdgeWrite can also be entered using a touch screen, such as shown in Figure 3.6 and 3.7. Studies have also been made where a small touchpad was placed on the steering wheel of a simulator, Figure 3.8, simulation regular car driving with subjects entering text for a GPS using Edgewrite [8]. This way of entering text was shown to be quite effective.

Differences between virtual (keypads without tactile feedback, Figure 3.9) and physical keypads has also been studied and no significant different were found in text entry speed or in accuracy [17].

These examples may be used to enter text, but How intuitive are they? Two another important questions are: Are they a god alternative for navigating in the interface? and Can these hardwares be used to activate functions in a running application? The joystick could easily be used to navigate in the interface, given that the joystick also have buttons
3.2. Results and Possible solutions

Figure 3.4: An example of a multifunctional joystick.

Figure 3.5: The EdgeWrite alphabet that can be entered using a joystick or a touchpad.

To capitalize, make the letter as usual, then finish in the upper-left corner.

Figure 3.6: A hardware that have both touchscreen and buttons.
Chapter 3. Ways to interact with the interface from the simulator

Figure 3.7: A model of touchpad.

Figure 3.8: A small and thin touchpad that can be applied on the steering wheel.

Figure 3.9: A version of a numpad that also can be used as a touchpad, lacking tactile feedback.
and/or if the joystick itself are clickable. But when it comes to activating functions in an running application it fails, this mainly because it does not have enough buttons. One solution would be to use a virtual menu, but this would probably interfere to much and be too time consuming. It has to be taken in account that the exercises can not be paused, and that the functions has to be able to be activated in a quick, easy and believable way. One of the other possible solutions for replacing the keyboard are to use a touchpad and a virtual keyboard or EdgeWrite. But the same problem occur here, to activating different functions buttons or a virtual menu will be needed, of course there are hardwares that have both a touchpad and buttons, but then it will be almost the same as it is for the numpad today, the buttons on these hardwares have numbers or letters on them, and this does not support the users thought process [9] [13]. When it comes to EdgeWrite it is not a suitable solution for this case, it will take to long for the user to learn (15 minutes to learn, just to be used for 30 second while signing in).

3.2.2 Alternative solutions for the numpad

Solution for alternative ways of entering text may not be relevant for ORYX, they rather need a solutions that support navigation in the interface and to control functions when the application is active. Then one may wonder, Why not keep the numpad?. And one of the reasons is that the numpad does not support all of the functions necessary to control the application, nor to support the user. As one of Nielsens heuristics states - A system should help the user to recognize, rather than having to recall, and by connecting a function to a number on the numpad the user are not given a chance to recognize [13]. Another reason that the numpad does not support the user are the fact that the numpad consistes of 17 buttons(and often are all of them used) and as the short-term memory often just holed 5 to 9 items the user will be in need of scanning the on-screen help [9]. By using another type of hardware, the interaction can be made easier for the user, making the connection between the user and the hardware more logical. One possible solution would be to use a hardware that uses icons to illustrate the functions that the user may need to use in the running application, Figure 3.10. By using icons, the user gets help to recognize rather than having to recall, and by designing a icon to represent a function it becomes more obvious for the user what will happen ones the button is used [13], [7]. This concept would make it easy to customize the hardware to fit the different simulators and to create a more unified feeling for all of the simulators.

As a complement to the icons, color coding may be used to enhance the creation of an intuitive connection between the hardware and the interface. This based on the fact that even if designing icons for the functions, there are a lot of functions that needs to be represented, and in order to improve the interaction(and to make it easier) there may be a need for a virtual menu. An example may be for functions that perform tasks outside the machine, for instance stepping out of the machine and turning on the light. These functions are rarely used, and may be categorized to one button with a icon representing "out of the machine actions"; ones pressed a virtual menu may appear and the user may choose a specific "out of machine action". In this virtual menu, color coding may be used, and by representing the colors on the hardware the user does not have to scroll in the virtual menu, they can just click on the color that represent the function that they want to activate.
3.3 Diskussion and Conclusion

One of the important issues is the lack of standardization in ORYX products. By creating a more unified feeling to the simulators a "ORYX" felling can be accomplish. It will also be an improvement for the users as well as for the developers. Today different simulators have different developers, and all of the different projects have their own way of creating the exercises, the information to the user, the placement of functions etcetera. And when a user sometimes comes in contact with simulator made by different developers, some of the basic functions are controlled in different ways. The hardware needs to be a cognitive help for the user in order for the users to remember "neuro-motor" combinations instead of having to scan the on-screen help [9]. And by creating a standardization, the developers will more easily be able to help each other and to switch project if needed.

No matter what text input tool that are used, it is still the user that are the creative force that drives the text forward [9]. By helping the user understand the means of the interaction, and by supporting the users chooses and giving correct feedback, meaningful interaction can be achieved from any system. If a interface gets the user motivated and gives them a sense of satisfaction ones used the system, they will probably come back [7]. But in ORYX case, when the users that are to enter text only will be doing it for about 15 seconds, when entering username and password (except from when they are creating there users, then 1-2 minutes), it is not relevant, nor beneficial for ORYX to implement a solution that replaces the keyboard. And the keyboard would anyway be used, when it also is used for other things than just signing in, inter alia when installing upgrades. So the conclusions that can be made are that the numpad does not support the users thought process, and should be replaced in order to achieve higher usability [13] [7] [9]. Even though a numpad may be a cheaper alternative, the visual appearance of the numpad interfere with the appearance of the simulator. This may decreases the usability experience when the "simple" technology and the cheap appearance from the numpad meets the advanced
3.3. Diskussion and Conclusion

technology and the exclusive feel from the simulator.

For ORYX case, some guidelines that can be given regarding enhancing the usability and the connection between the hardware and the interface are:

- The placement for the hardware is an important issue, the hardware needs to be accessible at all time when using the simulator. Therefor recommendations that can be made is that the hardware should be rigged to a arm on the side of the chair, in order for it to be in a place that makes it easy for the user to both get a god look at the hardware and also have easy access to it.

- The new hardware should have a ORYX feeling, and the new hardware should be developed for ORYX. The hardware should be adaptable, making it easy to customize the hardware to the specific simulator.

- Controls/buttons used for navigation should be separated from the buttons used to activate functions, than the interaction can be made easier for the user [13].

- By color coding and by using icons on the hardware the interaction can be enhanced [13].

- Standardize the functions that are used in more than one simulator, making it uniformed [7]. If the same function appears in more than one simulator it should be represented in the same place in the hardware [9]. This will also help in creating a ORYX feeling to the products.
Chapter 4

Design phase

In this chapter the design phase of this thesis project will be viewed in detail. The structure of this chapter is based on the design process shown in Figure 2.1. The different steps in the process will be revived and explained.

4.1 Identifying the problem

The first step in the design process is to identify the problem and to answer the question; why is there a need for a redesign? In order to be able to answer that question the system needed to be evaluated, this was done with usability testing and by familiarizing with the system.

4.1.1 Screen shots of the SMS

A overview of the current SMS is shown in Figure 4.1, the figure illustrates how many different subpages the system has, many of the subpages can be accessed from different parts of the system but that is not illustrated in this overview.

The most common thing for the SMS is that the teachers has both Admin and Instructor modes access, and those parts are the main focus for this thesis. In order to understand the different modes and the connection between them they will be described more in detail and with screenshots from the system.

Instructor mode

When a teacher with admin and instructor modes signs in to the SMS their start page is the page called Simulator Activity, shown in Figure 4.2, this page is a part of the instructor mode.

Within the instructor mode there are four menu options (the vertical menu to the left); Simulator Activity, Edit Learning Paths, Assign Learning Paths and Statistics.

- Simulator Activity
  This first page illustrates the status for the simulators connected to the SMS along with the latest or current user that used/are using the simulator.
Figure 4.1: Overview of the current Simulator Management System
- **Edit Learning Paths**
  In the heading *Edit Learning Paths* the teacher have three options, to click on the name of a path in order to edit the paths settings, to click the minus icon to the right and delete the path, or to click the link in the bottom called *Create New Learning Path*, this is shown in Figure 4.3. If the teacher clicks on *Create New Learning Path* they come to a new subpage and can enter a name and validity for a path, then they can chose to add entrys to that path, with also is on an new subpage (the teacher are now three steps down in the hierarchy, see Figure 4.1), now the teacher may choose a entry to add to the path, see Figure 4.4, in this view only one entry can be selected at the time, do to the fact that when a entry has been chosen the teacher ends up on a fourth subpage where setting regarding prerequisite and score settings can be made.

- **Assign Learning Paths**
  When clicking the third heading, *Assign Learning Paths*, a list of groups are shown, see Figure 4.5 (groups can only be created in admin mode and in the instructor mode the groups can be assigned to exercises, this is one of the reasons that the teacher often has both admin and instructor modes). The teacher then clicks on a group name and a list of paths are shown, see Figure 4.6. The teacher then choses one or several paths to assign the group.

- **Statistics**
  The last heading in the instructor mode is called *Statistics*, here a list of groups are
Figure 4.3: The second heading in instructor mode - *Edit Learning Paths*. 
4.1. Identifying the problem

Figure 4.4: When a teacher wants to add an entry in a path.

Figure 4.5: The third heading in instructor mode - Assign learning paths.
Figure 4.6: The second step when assigning a learning path to a group, were paths are chosen.

shown, the same list as in Figure 4.5. The only thing that can be done in this mode is to click on of the groups names, then a new sub page appears, see Figure 4.7, here the teacher can get a overview of the group members progress, it is also possible to click on a name to get mer specific information about a group member, shown in Figure 4.8. From this view it is possible to click on a specific exercise, and more information about the results regarding that specific exercise are shown, see Figure 4.9.

Admin mode

This mode also has four heading in the vertical menu to the left, List Groups (witch also is the starting page for admin mode), Create User, Create Group and Find User.

- List Groups
  When changing mode, (in the top right corner, see Figure 1.2), from instructor to admin, the first page is called List Groups, shown in Figure 1.3. from this view the teacher has three options, clicking on a group that leads to a new page where the teacher may edit the group, or to click one of the two links at the top; Show inactive or Show Groupless Users. Both links leads to new subpages.

- Create User
  The second heading “Create User”, as shown in Figure 4.10, is quite strait forward, the teacher fills out the form and choses what authority the user shall have, and also which group/groups that the user should have access to.
4.1. Identifying the problem

- **Create Group**
  Under the third heading, groups may be created, shown in Figure 4.11, the only things necessary to fill out is a group name and the validity for the group.

- **Find User**
  The last heading in the admin mode is *Find User* and here it is possible to type in a search word.

### 4.1.2 Usability testing of the current SMS

The first usability test was preformed using Hallway testing with think aloud protocol, a specification of the Usability test can be seen in Appendix A.

*Hallway testing* is a general methodology that uses random people to test a product or a service [2], and *think aloud protocol* are a method used to receive data from usability testing, the participants are asked to think aloud while preforming given tasks in the system that are under evaluation. Think aloud makes it possible to observe the process of a given task, not just the end result [4]. This test had two main purposes:

1. Observe people using the product and discover errors and areas of improvement.
2. The results from this evaluation will be a reference point further on in the process.

The first test was conducted by four persons [14], since different test persons tends to find different problems it is important to use more then just one test person. Nielsen describes in his article *How to Conduct a Heuristic Evaluation*, [14], the relationship between the number of test-persons, found usability problems and the costs of preforming the tests.
Figure 4.8: More detailed description of a student's results.
Figure 4.9: Results regarding a specific entry(exercise) for a chosen student.
Figure 4.10: The page in the SMS where the teacher creates users.

Figure 4.11: Creating a group in the SMS.
But he recommends to use about five test persons, but at least three.

The test persons used to test the SMS where between the ages of 25-32, none of the participants had any technical education and the sex distribution was 50/50. The test was performed in a calm environment and the test persons were asked to think aloud during the test session with limited help. After the test session was done a discussion was held between the instructor and the test person about the system. The test was constructed in a way that made the test person examining the different parts of the system more than ones in order to generate as much feedback about the system as possible [14]. Some usability problems are easy to find, and some are not, by constructing the test in a way that makes the test persons reexamining some of the parts it is more likely to find more issues.

Some of the tasks may start in the same way or address the same places in the system.

4.1.3 Results from usability test 1

Some of the results from the first usability test of the SMS were:

1. 3/4 of the test persons needed guides in order to find where in the system they could create a group.

2. None of the test persons understood how to add exercises to a group.

   (a) 2/4 felt that they had completed the task ones they had assigned their group a already existing path.

   (b) One of the test persons added exercises in an already existing path, and when assigning to the group the test person assigned four paths, but not the one that the test person had added exercises in.

   (c) Only one of the test persons managed to assign exercises to their group, but was not sure if they were done or not.

3. 2/4 of the the test persons used the browser’s back button a lot, they knew what page they wanted to revised, but not how to navigate from within the system in order to get where they wanted, one of the users used the back button 18 times(!).

4. None of the test persons managed to sing out from the system, 2/4 believed that it was a trick question.(The screenshots that are used in this paper are from a modified version of the SMS, the version that was evaluated did not have a sign out button, the user had to click the ORYX icon in order to sign out).

Some quotes from the users during the test session

- "I would never use this program if I had a choice"
- "Everything is hard"
- "Messy"
- "Uninspiring"
- "Not fun"
- "Admin, weird heading"
- "Weird division of admin and instructor"
Icons

This first evaluation of the SMS also addressed the icons that are used in the system, the test persons had trouble understanding several of them and they did not like the design of the symbols, 2/4 stated that the design of the icons felt outdated. The icons and the results are shown in Figure 4.12.

![Icons](image.png)

Figure 4.12: Some of the icons used in the SMS, and the results from the evaluation of the icons meaning.

Summary of the results

There were many thoughts from the test persons regarding words used in the system, the words were perceived to technical. 3/4 did not dare to click "admin", non understood what a "path" was and "entries" was not associated with exercises. The test persons basically just clicked until they got to the right place in the system, this was the results from them not understanding the technical language, the icons or the work flow in the system.

Grading the system

Between the different tasks, the test persons were asked to grade the system, regarding how satisfied they felt from completing the given task. Each task consisted of two to three smaller tasks, see Appendix A. The score limits where 1-10, where 1=confused, upset and 10=happy, satisfied.
4.2 Identifying criteria and constraints

The purpose of this part in the design process is to find the system’s strengths and weaknesses.

4.2.1 Nielsens heuristics

A method to explain found usability problems, and also in finding some new ones are Nielsens heuristics [13].

Visibility of system status
The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Match between system and the real world
The system should speak the user’s language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
User control and freedom
Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Consistency and standards
Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention
Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

Recognition rather than recall
Minimize the user’s memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use
Accelerators, unseen by the novice user, may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design
Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors
Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Help and documentation
Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user’s task, list concrete steps to be carried out, and not be too large.

4.2.2 SMS according to Nielsen’s heuristics
Results from evaluation the SMS with Nielsons heuristics [13].

Visibility of system status
The SMS has very poor indication to the user regarding where they are navigating in the system, many of the headings has several subpages, but none of the subpages gives the user information to where in the depth they are. This makes it hard for the user to learn the system.

When viewing results there are a column called passed, if a exercise is completed.
the field under the column is marked with a medal otherwise a cross. But as a first time user there are no information about this and if a first time user see a cross it might be interpreted as if the user has passed the task, just because the field is marked.

**Match between system and the real world**

Based on the technical language that are used, the system do not match the users real world. The icons that are used do not make the system any easier for the users, the icons are hard to understand and do not fulfill the purpose with icons [3].

The system is not constructed in a way best suitable for the users need of the system [16]. For instance, when creating users, the teacher needs to have created the group first, but in the system the function create user appears before the function create group.

When putting together a list of exercises they do not appear in the same order as they were chosen. They appear based on the order that they are sorted in the list that the user can choose from.

**User control and freedom**

This is a big issue in the SMS, based on the depth in the system and the lack of breadcrumb trace, the navigation is difficult for the user. Only in two places can the user chose to go back (back to group list), but the button sends the user not one, but several steps backward in the hierarchy. It is impossible for the user to know how deep they are in the systems hierarchy.

If a user mark a exercise in the select learning content to add and changes his mind about adding at all, there is no way to unmark. The only options available are to first proceed and then delete, (Or use the web readers back button).

**Consistency and standards**

Thera are a lack of consistency in the system, for instance the headings in the main menu are in some cases marked as underlined when active, and in some cases not. And links in general are displayed differently through out the system.

When a task is performed the user often ends up on different pages, in some case the user stays on the same page and only get a notification, in other cases the user are send back one or several steps. The user might even get sent forward to a new page containing a notification.

Similar things are illustrated/solved in different ways, for instance when the user are to change something this is sometime done by clicking on a change icon and in other cases by clicking on a change text link.

**Error prevention**

This is partly supported in the system, when the user tries to delete a user, group or path they need to confirm the action, but error prevention it is not supported through the entire system. When creating a new user, they need to get a role(admin, instructor, student or system administrator), but if forgotten to fill out one, or several, of the boxes the user will still be created but not able to sign in.

**Recognition rather than recall**

The icons used in the system are irrelevant to the task that they represent, therefor they do not help the user to navigate in the system. In the system, current status for a user is illustrated with symbols, but there are no explanation for them. Therefor the user needs to recall the meaning instead of recognition the symbol [7].
In many of the pages there are a lot of links that goes to the same subpage. For example by clicking on the different fields name, valid from, valid until and learning paths the user ends up on the same page. And that page is not even about any of the links. This makes it hard for the user to find what is searched.

Help and documentation
In many different places in the system there is a lack of needed information. Some examples are;

- On one of the subpages a score limit are to be set, but nothing describes the top or bottom limit, or what the limit means.
- When choosing different exercises there is a lack of information regarding the exercises purpose and general information like how time consuming they are, the main learning focus area and so on.
- When creating users there is a lack of information regarding what the different rolls means and what rights they bring.

4.2.3 Visions from ORYX
One important step in the design process if to find out what ORYX wants, and also ORYX views regarding what the users wants to do in the system. One wish that ORYX has for the system is that it should be graphical adaptable to fit other companies profiles as, (this because some customers will not allow the system to be profiled as a ORYX product).

Some of the finding from are:

ORYX view of the students desire:
- Having the results presented in a way that increases the students motivation to learn.
- Make it easy for the students to learn from their mistakes, maybe allowing them to watch there simulations from a different camera angle or telling what things they failed on.
- Making the system feel more personalized, the system should be able to keep track of the users last event in the system and give appropriate feedback. Also illustrate how far the user has come in total.

ORYX view of the instructors desire:
- Being able to inspect the results for the student, seeing the development and if anything has been problematic. Also to be able to see how many times it took in order to pass an exercise.
- The teacher should be able to affect the score setting for an exercise (now it is preset and not possible to view what gives scores).
- In a easy way compare the students results in order to be able to detect if any of the students are having difficulties.
- Be able to view group statistics and compare with other groups.
- Being able to see movie captures from the exercises, in order to be able to give correct feedback to the student.
4.3 Generate solutions and ideas

Based on the steps described above, ideas and solutions were generated. During this step in the design process close to 200 idea sketches were made. Sketching has been a on going process during the entire design phase, and many of the sketches has been remade and modified as new ideas and aspects emerged.

This step of the design process is recurrent during the two following parts, Prototype and Evaluate. Some of the main ideas and solution that where generated in a early state was;

- The use of a progress bar to illustrate the progress.
- Applying a groupkey, this will allow the students to create there on users, making it easier for the teacher.
- Merging the two modes admin and instructor.
- Applying a drag and drop to the exercise list when creating "paths".
- Making the language in the system less technical, more in the users own language [13].

4.3.1 Activity centered design - ACD

There is a lack of information about the end user, and it is hard to specify a fictive user based on the fact that the users are world wide, have different prerequisite, different computer knowledge, different sex, age culture and so on [15]. It has also been hard to come in contact with any of the end users, therefor the design of the new SMS will be based on Activity centered design. This means that the activity is put in focus, instead of the end user. And by understanding the activity, the end product will be understandable. A important part of ACD is to have a deep understanding of the real people, but more importantly a understanding for the technology, the tools and the reasons for the activity [16].

4.4 Prototype

4.4.1 First iteration - Balsamiq mockups

Based on sketches a prototype in Balsamiq was made, shown in Figure 4.13, the prototype gave a good picture of how the system would behave.

4.4.2 Second, Third and Fourth iteration - Indesign illustrationer

When the basic flow was created, more focus where put on the design of the system. This was done using Adobes program InDesign.

Second iteration

Several different design proposals were made, see Figure 4.14, some deviant and some more inline of ORYX graphical profile. One of the proposals inline with ORYX profile where chosen to proceed with. As the prototype where under construction, many aspects regarding functions that should be available in the system emerged, both functions that ORYX wanted as well as functions needed to improve the usability of the system. Functions that regarded
both the design and the workflow where addressed. Many decisions needed to be made during this iteration, and a balance between the different views of a question needed to be found. The result from this iteration where presented to ORYX, along with some questions that needed to be answered, more about this in 4.5.2.

**Third iteration**

After the workshop with ORYX, changes where made in the system, then it was time to test the system, the test is presented in 4.5.3.

**Fourth iteration**

Based on the findings from the test, the system where modified. More focus where then put on the result pages in the system. So far has this part only been addressed superficially.

### 4.5 Evaluate

#### 4.5.1 First iteration

The first prototype was shown to the supervisor and a decision was made on how the basic flow of the system would be.

#### 4.5.2 Second iteration - Workshop with ORYX

Based on the second iteration in the *prototype* phase, (see 4.4.2), a workshop was held with some of the employees involved, where design proposal was presented and discussed, certain predetermined discussions issues were also discussed.
Figure 4.14: Some of the different design proposals made.
Words used in the system

One of the big issues in the current system is the technical language used, many of the test
subjects did not understand several of the words used, (the results from this test is presented
in 4.1.3).

- Path:
  Some of the words that could replace path where; exercise-package, package, folder and
collection. A decisions where mad to replace the word path with the word collection.

- Entry:
  In the design proposal shown to ORYX, the word entry had been replaced with the
word exercise, this was accepted.

- Admin:
  The word admin is in the current system a mode, (described in 4.1.1). In the design
proposal, the two modes admin and instructor had been merged, eliminating that the
user needs to change mode when using the system. This was also accepted.

Other issues:

- Prerequisites:
  The question of how to illustrate prerequisites between exercises and also between
collections needed to be addressed, also how de users prefer it to be. During the
workshop a decision where made that exercises as default will be ordered in a linear
way, this means that depending on the order that the user puts the exercises in, in
the collection box, the exercises directly above another are set as prerequisites to that
exercise. It was also decided that collections as default shall not depend on etch other.

- ORYX-design:
  The question regarding the design of the SMS, and how much of a ORYX feeling it
should have where addressed. But this question could not be answered, this is mainly
beacuse of three thing;

  1. The SMS sometimes needs to be customized to fit the customers profile.
  2. ORYX graphical profile will probably be changed.
  3. The current graphical profile is not complete.

- Results/statistics:
  Regarding the statistics that are shown in the current SMS there is a lack of consistency
between the different exercises. So a question for the reason of this consistency lack and
also for what information that are relevant, both for the instructor and the student.
The main things that where answered where;

  1. There is a differens between the things that a instructor and a student want to
view regarding the results of an exercise.
  2. A teacher wants to be able to get a quick overview for the results. Both for the
group i general but also a quick overview for the students results.
  3. A teacher should be able to view the results for a specific exercise for a specific
student.
4. The students should be able to view their results in two ways. First; get feedback regarding the results directly from the simulator, when an exercise is done. This information should contain an overview of the results, and in a clear way illustrate what different things that gave score and what things that made score deductions. Second; If the student wants to view the results more in detail, this should be possible, but not necessary from the simulator.

5. A wish that was expressed during the meeting was to standardize the results, making it look alike for all of the different applications. This standardization could divide the score in two main categories, safety and productivity. The different exercises could then be tilted between these categories, making the purpose of the exercise more prominent.

- Other questions:
  Progress-bar: In the design proposal presented, a progress bar was used to illustrate the progress, both for the group and for the students. In this proposal a fade had been used, along with lines illustrating the top and bottom results and also the average. It was requested to make the bar more specific, making it more prominent to what exercises that have been completed.

  Group key: The concept of a group key was presented and liked, the only criticism regarding this function is that the instructor needs to be able to create users (not possible in the presented proposal), both users with student access and also users with instructor access.

4.5.3 Third iteration - Usability test; evaluating the design proposal

After a redesign had been made, based on the feedback given from the workshop, a paper mockup test was created in order to test the design proposal. Some of the test persons had also performed the first usability test (on the current SMS), and some of the test persons had not. A total of 6 persons were tested, three of them where new test subjects [14].

This evaluation was performed using a paper prototype, this method was most fitted for this evaluation based on the fact that no interactive computer based prototype had been developed and that paper- and computer-based low fidelity prototypes lead to almost the same quantity and quality of critical user statements [18].

The test was constructed in a way equal to the first evaluation test, making the test persons examining the different parts of the system more than ones in order to generate as much feedback about the system as possible [14].

Results from usability test 2

The overall responses from the usability testing were positive. Some of the things that the test resulted in where;

- From the starting page, 4/6 test persons did not use the navigation menu to enter Group, they clicked on the heading Group in the box called The System.

- For 3/6 of the test persons it took a while before realizing that the "icon" with a down worth facing arrow top, see Figure 4.15, stood for menu options.
Figure 4.15: The icon used for menu.

- But two of these three sad ones clicking on it, "aha, of corse!".
- Two of three clicked on the *Save altered version* ones they had changed the minimum score (no saving is necessary at all and the *Save altered version* saves a copy of the exercise with the current settings).

- 2/6 had problem finding where they could accept requests for a group.
- 4/6 understood the progress bar immediately, and the other two after inspecting it for some time.

One of the differences from the two test groups where that the persons that also had tested the current system gave this system a higher score then the new test persons. But the score that where given by the new test persons where much higher then the results from the first usability test.

A conclusion that can be made based on the finding from this test, is that the new design of the system is a improvement, both for new users and for those that has used the system before.

**Grading the system**

In the same way as in the first usability test, the test persons where asked to grade the system between the different tasks, regarding how satisfied they felt from completing the given task. The score limits where 1-10, where 1=confused, upset and 10=happy, satisfied.

- The first task:
  
  10
  
  10
  
  9
  
  8
  
  9
  
  9

- The second task:
  
  5
  
  7
  
  6
  
  5
  
  4
  
  7

- The third task:
  
  6
  
  8
4.6. Final design proposal

When the test was completed the test persons where asked to give a overall judgment for the system.

- Overall judgement:
  10
  9
  9
  6
  7
  7

For this usability test the average score where 8, and in comparison with the average score from the first usability test (1.625) this a good indication that the usability in the system has increased.

4.5.4 Fourth iteration - reviewing all

In the fourth iteration all gathered material was reviewed, along with all of the sketches, results from usability testing, technical demands, graphical requests, wishes from ORYX and of course principles for creating a system with high usability [7].

4.6 Final design proposal

Based on the iterations described in 4.4 and in 4.5 final design proposals where created for the SMS, Sign In and Student Home.

4.6.1 Simulator Management System

The redesign support many different navigation ways throw the system, and when designing a system it is important to remember that the users often have a goal in there minds when entering the system, and that every feature needs to be tightly integrated with the provided solution [5]. But the basic structure of the system is based on the tasks and the order in which the user most often uses the functions, designing the system with ACD in focus [16]. As shown in Figure 4.16, 12 modes appears, but the system actually only have 9 different pages, sign in is out side of the system, and when clicking exercise the user ends up on edit, the same for more. By keeping down the number of pages in the system the interaction is easier for the user, especially for a new user [7].

During the design process a new logotype for the system was created, shown in Figure 4.17, and as a complement to the new logotype a symbol was also designed, also shown in Figure 4.17. By applying a tilt on the word SYSTEM a forward feeling can be accomplished giving the hole logotype a more appealing feel. The colors used in the logo are two shades of gray along with one of ORYX colors, orange. The colors in the logotype where chosen in order for it to be adaptable for other companies profiles if needed(one of ORYX
wishes), and also to be in the same graphical style as the rest of the system.

Some of the things that are consistent throughout the system are;

- When the user needs to confirm something, the background fades out and an information box appears, this makes it easier for the user to focus on the right thing [7].

- All of the buttons used in the system are ordered in a way that always puts the first hand chose to the right (if there are many buttons in line), creating a consistency for all of the buttons in the system [14].

- The colors used in the system are chosen based on the fact that the system sometimes needs to be customized for a specific customer.

In the following parts, the redesign of the SMS will be reviewed more in detail.
4.6. Final design proposal

Start

The system has a home page that gives a new user insight to what kind of system it is and how to navigate. The reason for creating a start page is mainly to give the user a good first impression of the system and as in so many other things, the first impression that a user gets are very important. One thing used to try to enhance the first experience is that the users name appears in the center of the page, greeting the user. This gives the system a more personalized feeling. On the first page there are two boxes, one with information about the system and one with news related to the system. Some of the information fields are clickable so that the user have easy access to wanted destination, based on one of the finding from the usability test performed on the design proposal. In the news section the user gets feedback from current events, such as new requests. In the second section, that is about the system, the user can read about some of the different part of the system. This is especially important for first times users, as a way to learn the system before using it. The starting page can bee seen in Figure 4.18.

![Figure 4.18: The starting page when signing in to the new SMS.](image)

Group

When entering the page called Group, all groups are shown, by clicking on one of the group names, information about the group appears to the right. In this mode it is possible to edit, delete or to add exercises to the group. When creating a new group only two things
are needed, a group name and a group key. It is also possible to write a description of the group or to chose more settings. By clicking more settings, more options appear. Some of the different views from this mode is shown in Figure 4.19.

![Figure 4.19: Some of the views in Group mode.](image)

One of the new functions for the redesign of the SMS is the group key; By using a group key the instructor do not need to create users for all of the students, as in the old system. By connection a group to a key and distributing the key to the students, they may create their own users and get access to the group by entering the group key. Specifications can be made for the key, for instance the instructor can choose that all requests from students first must be approved before the students can get started. This new function will ease the work for the teacher, allowing them to focus on the right thing.

**Exercises**

This page is the first with subheadings, and when clicking exercises the user ends up on the Edit page, which is the first subheading. There are a total of three subheadings under the heading Exercises.

- **Edit:** In this mode the user may edit or delete a collection, or assign a collection to a group. The user may also choose to edit collections for a specific group. The instructor then also gets information about the groups progress. Some images from this Edit can be seen in Figure 4.20.

- **Create new:** In this subheading the user may drag and drop exercises to the different
Figure 4.20: Views from *edit* in *Exercise*.
collections. As default, one collection box appears when entering this subheading, but several collection boxes can be made. The collection boxes are color coded, and the color for the different collections will be recurrent in the results and in Student Home. The exercises can be dropped anywhere in the collection box, and are in default set as depending on each other. This means that in order to get access to the next exercise the student most complete the exercise directly above, these setting are made based on the most common settings used. To the left on the screen, all of the exercises are listed and if the user clicks or hovers the computer mouse over a exercise a describing text appears, shown in Figure 4.21.

When a collection box is empty, it has a text in it saying Drop exercises here, in order to clarify for the user how interact with this part of the system. When a exercise is dropped in a collection box it is illustrated in the exercise list by typing out the name of the collection directly after the name of the exercise, this can be seen in Figure 4.22, in order to help the user to know which exercises that has been chosen. When a exercise is placed in the collection box a menu symbol(Figure 4.15) appears to the right of the exercise name, and when clicking this symbol a option list appears. (When evaluating the design proposal made for the SMS, one of the things that where noted was that the menu icon where not perceived as a menu symbol, so new proposals for the design of this icon has been designed, shown in Figure 4.23, but these has not been tested and even though the menu icon where misinterpreted in the paper test, this might not be the case in a real computer environment, this type of symbol are often used as a menu option symbol.) As the user clicks on the menu icon, options appear and in these settings the user may change the prerequisite, the minimum score, score settings, delete a exercise from the collection, saving a altered version of the exercise and writhing a own description of the altered version of the exercise. There are also settings that can be made for the collection, and in the same matter a menu symbol is placed directly after the collection name. The option box and the basic layout for this subheading can be seen in Figure 4.21. The functions available in the option boxes are categorized, making it easy for the users to find functions for related tasks [1].

One of the things that are recurrent in the system, but starts here, are that the collections are color coded. The colors associated with the different collections will be used when illustrating the results and also in the system called Student Home.

In this redesign of the SMS, collections are created simultaneously as the user are working with exercises. In the current system the user first needs to create a group, then in another part of the system place exercises in that collection(called paths in the current system). By designing the system in this way, it will be easier for the user to understand the connection that a collection and exercises have, this based on the findings from evaluating the current SMS.

- Overview: The last subheading is exercise overview, here the user may read more about the exercises and view the exercises in action. From this mode it is also possible to add a exercise in a collection. The main reason for this mode is that the users shall have quick access to information about the exercises, today they need to look in a external catalog to get more information about the exercises. This part of the system can be seen in Figure 4.24
Figure 4.21: Views from *new* in *Exercise*.

Figure 4.22: Exercises that are in use are marked in the exercise list.
Figure 4.23: Design proposals for icons made to illustrate "menu".

Figure 4.24: Exercise overview in the design proposal for the SMS.
Results

The results page is an extendable page, this means that it starts by giving a overview, the user then can get deeper in the hierarchy by opening up the different options. And when doing so the page expands, which makes in a extendable page. The main reason for designing the result page in this way is that the user shall have full insight to where in the system they are, never having to wonder *how did I end up here?*.

The results page starts by showing results that give a overview of the progress for the different groups. It is then possible to view the results for the students in a specific group, then for a specific user in that group and finally for a specific exercise for the specific user. The system starts by giving the user a overview of the progress and then, depending on interest, the teacher may look deeper in to the details [19] [10]. This is shown in Figure 4.25.

![Figure 4.25: The result view](image)

The results page begins with a overview of the group results, where the progress of the different collections is shown, and by clicking a specific graph, a information box about the exercises in that collections appears. This box show how many students that have completed the different exercises and how much simulator time each exercise has taken.

The graphs used to illustrate the progress for the groups represents the different collections that a group have access to. Where the peak of the graph appear is where the most of the students currently are. This way of illustrating makes it possible for the teacher to see if anyone is falling behind, then the graph would have a tail. A closeup on the graphs can be seen Figure 4.26. At the bottom of the graphs a progress bar are shown, this bar gives information regarding the progress in total for the group.
Figure 4.26: A closeup on the progress graph for the groups.
By clicking *view group members* the page expands and progress information about all the student in the group appears. When clicking *view details for student*, charts for the different collection appears, showing which exercises the student have completed and after how many tries. Each exercise consist of two bars, and the different bars stand for two main categories; productivity and safety. The exercises are divided in to these two categories based on wishes from ORYX, and by illustrating them as two bars it is possible to get a overview of the exercises purpose, productivity, safety or both.

In the results page the collections color coding are co-occurrence, each color are available in two shades when safety and productivity bars are included in the same collection, there for there must be a number of colors that support this. A color palette has been created and the colors have been tested for color blindness, see Figure 4.27, one sees a clear distinction between the different shades of the same color, which is the most important thing in this case. The lighter shade is the color most frequently used.

![Color palette with examples of color blindness](image)

Figure 4.27: The colors used for the collections are shown at the top, the other two are how people with different types of color blindness sees the colors.

All of the exercises are clickable, and when clicking an exercise, details about that specific exercise appears, as shown in Figure 4.25. And in this mode the progress for that specific exercise is shown, as well as exercise specifics. All of the different tries are clickable, in order to be able to view the progress.

In the end of the exercise specifics a time line is shown, by hovering the mouse over the events a explaining text appears, this makes it easy for the instructor to follow the exercise events. In the time line icons may be used to describe different exercise events.

**More**

The last of the main heading is called "More", this heading has three subheadings; new user, edit user and simulator activity. And when clicking "More" the user ends up on the first subheading.

- **New user**: It is possible to create a single user, when creating a singe user it is possible to create a student or an instructor.
A new feature added in the system is the ability to create several user, by letting the system generate information. When doing this the user specifies how many users to create, what the system shall generate and what group the users shall have access to. The teacher may then print out and destitute the user accounts to the students. And depending on what things that is generated the students may need to fill in some information by them self when signing in for the first time, more about this in 4.6.2. This mode can be seen in Figure 4.28.

Figure 4.28: The different views when creating users.

- **Edit user:** In the second subheading, called *edit user*, it is possible to search for a user by entering a search word or by searching in a list of all users, or by searching for a user in a specific group, see Figure 4.29. When a user name is marked, information about that user appears to the right, the user information may now be edited or the user deleted.

- **Simulator activity:** The last subheading is called Simulator Activity, here the instructor can view if any of the simulators are in use at the moment and by who. Some of the ideas of this part of the system is that the instructor should be able to affect a on going simulation. For instance making it rain, or applying some ”human factors” such as making the loading truck drive away to early.

### 4.6.2 Sign in

The redesign of the SMS affects, not only the design of the sign in, but also the functionality. In the redesign of the SMS the teacher no longer needs to create all of the different users for the system, now the students can create there own users and access the group using a group key, this is described in section 4.6.1. Some of the different view of the *Sign in* are shown in Figure 4.30.
Figure 4.29: The different views when searching and editing user settings.

Figure 4.30: The different views of the signing in.
4.6.3 Student Home

The current system used from the simulator are shown in Figure 3.1, and described in section 1.1.2.

The redesign of the StudentHome combines the two systems that the student needed to sign in to in order to get all necessary information, the Student Mode in the SMS and Student Home. The starting page for the student ones singed in are shown in Figure 4.31.

On of the difficulties with combining these two system is that the information shall be viewable both on a computer screen and on the simulator screen. And some parts of the system should only be available from the simulator, for instance the exercises. But on the other hand, the student should be able to view the exercises from a computer as well, but not activate them. The technical issues for this problem has not been addressed nor solved during this thesis, but a design proposal has been made where the two systems has been combined, but can easily be separated having the start page and the result page as parts of the student mode in the SMS, and exercises in the Student Home.

Figure 4.31: The starting page when the student signs in.

Choosing exercises

The exercise page are shown in Figure 4.32, in this view the student are shown exercises that are in the different collections and here the colors of the collections are co-occurrence. In this system the user needs to be able to navigate using a numpad, as a numpad today
are one of the standard equipment that comes with the simulator. And even if the numpad where to be replaced, the interaction with this part of the system whold still need to support interaction made by the numpad, as it is part of all of the simulators today.

![Figure 4.32: Design proposal for the system Student Home.](image)

The different exercises boxes have four states:

- **Active**: The exercise that are in focus are highlighted with a color, ORYX orange. When a exercise are active is also shows a describing text, giving the user insight to what the exercise is about. In contrast with the current SMS, the text and the Start “button” are all in the same place, this makes it easier for the user to focus, as the users attention is no longer divided between the focus area, the describing text and the activate button.

- **Available**: Exercises that the user may chose from are in full color.

- **Completed**: Exercises that the user have completed are illustrated by applying a background color, the color are the same as the collections color.

- **Unavailable**: Some exercises may have other exercises as prerequisites, and not be available at all time, they are then out of focus.

Another feature that the redesign of the Student Home has are a progress bar, placed underneath the name of the collection, as a part of the dividing line. This progress bar
makes it easy for the user to get a quick overview of the total progress in the different collections.

Feedback

When a exercises is completed, results are shown on the screen. In Figure 1.7 the results view from the current Student Home are shown. A design proposal has been made for this view, shown in Figure 4.33. The main purpose with the redesign of the feedback is that it shall be more graphical, making it easy for the student to get an insight to the things gave score, and things that made deduction on the score. In the top of the page the total score are shown, along with information regarding if the student has passed the exercise or not. Then information about the two categories and the total score for the different parts are shown, and finally more detailed information about things in the different categories that where used to set the score in the specific exercise. From this view the user have two navigation choses, the first one is to go to the Next Exercise (if the exercise where completed) otherwise it will say Try again. The second chose that the user has is to go back to the exercise overview page(Figure 4.32), this is done using the button Back to Overview. The design on this page uses lot of graphical illustrations to give feedback to the student, all in order for the student to get a good and quick overview of the results from the exercise.

![Design proposal for the results representation when a exercise is completed in the Student Home.](image)

Figure 4.33: Design proposal for the results representation when a exercise is completed in the Student Home.
Results

In the current system, the user cannot access the results from Student Home, in order to view the result they need to sign in to the SMS. So this feature has been added in the design proposal as a tab. The result page are shown in Figure 4.34. This information in the result view are the same as the one given to the teacher, here seen in a horizontal view. And one of the things that needs to be taken in account, is that this information will be seen on a 46 inch screen, with the user sitting at approximately one meters distance. So the size of the text must be adjusted to best fit these conditions.

Figure 4.34: Results view for the Student Home.

4.6.4 Design specification

When the design process was completed a design specification was made containing specifications about how the system shall work and information about the different design element and design decisions that has been made. This specification will be of help to ORYX when the system shall be implemented. The design specification can be seen in Appendix C.

4.7 The design process linearized

In this chapter, the different steps of the design process has been reviewed, and the design process has been a big help when it comes to working in a structured way. If the process
were to be stretched out, to a linear process, it would look like Figure 4.35. And the thing with a design process it that even if the same design process model may be used in different project, it will look different once stretched out linearly.

Figure 4.35: The design process linear.
Chapter 5

HTML prototype implementation

The SMS is a web based system and in a early state of the project 8 weeks were planed for the implementation of the design proposal, and as it is an web based system the implementation was to be done using html. The extension of the implementation was not specified because of the fact that the author had no prior experience of programing html. The first weeks of the phase was dedicated to learning about html, css and javascript, as well as the connections they have to etch other. This was done by watching tutorials, reading books and on line information, but most of all by try and error.

5.1 Program

Different editing programs was looked at, two programs that where tested was Notpad++ and Dreamweaver.

5.1.1 Notepad++

At first Notepad++ was chosen as the editing program, it is a easy program to learn and it uses color codes, making it easier to read the code. One of the downsides was that it missed some features such as master-pages(it may exist in Notpad++ but not intuitive to find).

5.1.2 Dreamweaver

Dreamweaver is a program in the CS collection and at first it may look more difficult than Notepad++ but ones getting started it was much easier to understand how the html worked. Being familiar in the CS environment made it more natural to navigate in the program. One of the main features that made Dreamweaver more appealing then Notepad++, is that when typing code the program helps by giving suggestions, this feature made it easy learn even more about html and css programming do to the fact that many of the commands that are used in the solution are from the suggestions made by Dreamweaver. Dreamweavers design-view also helped in order to get a better understanding of how different divs behave.

5.2 HTML prototype

This phase was planed to be an 8 week period, but when three weeks in to the implementation phase a control was made for the hole time period and restriction had to be made, it would
not be enough time to complete the implementation. After discussion with the supervisor the implementation was put aside.

During the first week of the implantation phase the basics of html, css and java script was learned and a clickable overview of the system was made. The basic structure, including background, menu, logo, footer and main wrapper was programmed, as well as the information on the starting page. The implemented start page are shown in Figure 5.1.

![Figure 5.1: Part of the results from the implementation phase](image-url)
Chapter 6

Discussion

During this thesis, no contact with the true users has been made, this mainly because they are located abroad, and the few located in Sweden are not using this version of the SMS. A form was sent to some of the users abroad, and some users in Sweden, but none replied, the form can be seen in Appendix D. This lack of contact with the user opposes many of the theories regarding creating user centered design. So instead of having the focus on the user while redesigning the SMS, Student Home and Sign in, focus where put on the activity instead [16]. But one question that are recurrent are how would the system have looked if the end user had been evolved? Therefore I strongly recommend ORYX to try to get some input from the end user before implementing the system, making sure that no essential functions are missing and that the workflow in the redesign matches the real workflow that the user wants.

One of the things that have been challenging during the project is the mixed signals that has been received, regarding:

- The design of the system.
  
  - "Regarding the design of the system, it should be a "ORYX" design, following ORYX graphical design specification and the design of there webpage."
  
  - "The design does not need to have a ORYX feeling, because the customers do not want the system to be a "ORYX product".
  
  - "The design should be flexible, with colors that easily can be changed to fit another companies profile."
  
  - "The design do not need to follow the design of ORYX profile, nor the design of the webpage, because it will be changes in a near future."

- Who the end user are.

- What the user wants from the system.
  
  - What functionality shall the system have, or not have.
  
  - What are the need of the system.

The reason for these mixed signals are mainly because ORYX does not know what they want the system to be, nor what the end user wants the system to do, nor the systems potential. But I believe that the final design proposal tops there expectations and makes ORYX realize
that this type of system may have many different levels of abstractions, allowing the user to start using the system as a beginner and develop in to a expert user, without to much effort.

As ORYX is about to redesign there graphical profile, it is important that this system also have the same appearance. And as the system are designed in a way that makes it possible to adapt the design to other companies graphical profiles, this should not be to big of a problem. But it is important to remember that the system may be perceived in a different way if the design are changed, and therefor important to adapt the system to the new design, making sure that the workflow are not affected.

In the current SMS, icons are used, but usability testing showed that the icons are not perceive in a correct or in a positive way, nor do they fulfill the guidelines for icon design. The use of icons in the redesign are constrained, and as often as possible used along with text, making it easy for the user to understand the meaning of the icons [15] [11] [3]. As the system will be used world wide, it is especially important that the icons are enhanced with text, making sure that they cant be miss interpreted.
Chapter 7

Conclusions

The goal for this thesis was mainly to improve the usability of the SMS. This has been done by evaluating the current system, and by using a iterative design process. The redesigned system supports many different levels of engagement of the user, and if wanted the teacher may quickly create all that is needed in order for the students to get started using the simulator [13]. And, for the more experienced users, the system allows them to make more settings and affect many different part in the system. These qualities make it possible for users with different level of motivation to feel satisfied while using the system [12]. The system is constructed in a way that makes it possible for the user to chose how deep in to the details they want to go, for instance the result page [10] [19].

Overall, the redesign of the SMS supports the activity that the users are to perform in the system, and the system is more intuitive than the current SMS, allowing the users to start from many different directions, but still achieve the same end result. By grouping things together, and limiting the number of pages in the system, the users are at all time able to see where in the system they are. The system will be perceived in a more positive and intuitive way by the user.

7.1 Limitations

Due to lack of time, the work had to be limited. This limitation mainly affected the implementation phases along with the evaluation of the implementation. If more time would have been spent on the implementation phases, the system could have been tested and evaluated as a web based prototype. As a results from this I truly recommend ORYX to perform usability testing on the implemented system before delivering it to customers.

7.2 Future work and Recommendations

One of the remaining things is to fully implement the redesign of the SMS, and perform usability testing on the implementation, preferable in the users own environment. Another important issue that I recommend before realizing the redesign of the SMS, is to review the design on all of the other parts that the user comes in contact with, making sure that all product from ORYX has a ORYX feeling, both physical and virtual products.

I also recommend that the numpad should be replaced, preferable with a hardware that separates the keys that control the navigation from the key that are used for functions.
By replacing the hardware by a more customized "numpad", (a "oryxpad"), the interaction can be eased for the user by creating a connection between the information shown on the screen and the new hardware. This can be done using icons and by color coding functions. The improvement of hardware would make it possible to customize the hardware between different projects, all in order to increase the usability. And regarding different projects, a standardization is needed, inter alia regarding how information are represented to the user, how scores are set and also how the learning process should be structured.

ORYX is a strong technical company, experts in their field, with costumers world wide, but one of the things that ORYX needs to improve in their application, is the usability. By addressing this issue, and realizing the importance that usability has, the experience that ORYX gives to there costumers will be enhanced and result in even more satisfied customers.
Chapter 8

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I would like to take the opportunity to thank my supervisor at ORYX, Daniel Wiberg who have been both helpful and supportive during the thesis project, also thanks to my supervisor at Umeå university, Karin Fahlquist. I would also like to thank ORYX and all of the employes that have made me feel like one of the team, especially the fellows from development.

Thank you!
Bibliography


esting.


 protocol.


Appendix A

Usability testing 1

Usability testing 1 - The system as it is today, 3-5 test persons

Before the test starts, the test persons will be informed that the instructor is not the creator of the system and will not be offended by any bad critique to the system, rather the opposite, the more feedback the better. They will also be informed that their results and comments are anonymous.

**Step one:**

**Task one:**
The test persons will be shown only the icons that are used in the system and guess what they represent.

**Task two:**
Without introduction about the system the test person will be asked to look at the system and express feelings about the systems overall design.

**Step two:**
The test persons will be given information about what kind of system it is. They will be given three tasks to perform in the system, consisting of a number of steps. The test person will only receive one task at the time in order to prevent them to start searching for the answers to the upcoming tasks to early. After each task the test persons will be asked to describe how they feel about the completed task in a scale from 1-10, (1 = sad and confused and 10 = happy and satisfied)

**Task one:**
- Create a group
- Add these students
  - Anna Björkman, password: Ety4J, username: AnnaB
  - Oskar Holmgren, password: gJo87, Username: OskarH
  - Anton Strömberg, password: HKm8t, Username: AntonS
- Assign four exercises to the group

**Task two:**
- Change the minimum score for one of the exercises.
- Change a users name.
  - Anna Björkman -> Anna Björk
- Add the user "Patrik Andersson" to the already existing group "Training".

**Task three:**
- Inspect the results for the student in your class.
- Sign out

**Step three:**
An open discussion between the test person and the instructor. If possible the discussion will be held with the test persons together. The test person will also be asked to express what feeling they have about the system after testing it, both in words and in a scale from 1-10 where 1 is say and confuse and 10 is satisfied and happy.
Appendix B

Usability testing 2

Usability testing 2 - The workflow on the redesign of the SMS, 3-5 test persons

The main focus of this usability test is to test the workflow of the system, and it is constructed in a similar way as usability test one and the task are equal between the two tests. This usability test will be performed with a paper evaluation method.

Before the test starts, the test persons will be informed that the instructor will not be offended by any bad critique to the system, rather the opposite, the more feedback the better. And also that the system is not fully constructed, some of the parts will not be "clickable". They will also be informed that their results and comments are anonymous, and that there are not the test persons that are being tested, it is the system.

Step one:
Without introduction about the system the test person will be asked to look at the system and express feelings about the systems overall design. Some of the test persons will be the same as the ones from usability testing 1, the results will be evaluated separately.

Step two:
The test persons will be given information about what kind of system it is. They will be given three tasks to perform in the system, consisting of a number of steps. The test person will only receive one task at the time in order to prevent them from starting to search for the answers to the upcoming tasks to early. After each task the test persons will be asked to describe how they feel about the completed task in a scale from 1-10, (1 = sad and confused and 10 = happy and satisfied).

Task one:
- Create a group
- Set a maximum number of students allowed in the group to 8
- Assign four exercises to the group

Task two:
- Change the minimum score for a exercises
- Change the name of the exercise collection
- Accept all of the request to Kins super group

Task three:
- Delete group quon virionc
- Inspect the results for the student in Kins super group
- Sign out

Step three:
An open discussion between the test person and the instructor. If possible the discussion will be held with the test persons together. The test person will also be asked to express what feeling they have about the system after testing it, both in words and in a scale from 1-10 where 1 is sad and confuse and 10 is satisfied and happy. They will also be asked to look at the progressbar and express how it works.
Appendix C

Design specification
WORK FLOW
The system supports many different navigation ways through the system, but in fact, the system is designed based on the way that the users often use the system. Create a group, assigning exercises to the group, and improving the results.

In the chart above, 12 nodes appear, but the system actually only have 9 different pages, sign in is outside of the system, and when clicking continue the user ends up on edit, the same for more. By keeping down the number of pages in the system the interaction is easier for the users, especially the new users.

In the upper right corner is an overview of the ol

BASIC DESIGN
The basic design of the system is similar to the design of ORION webpage, (formerly used). The placement of the logo is the same as in ORION webpage, to the top left. And the menu in the same height as the logo but in the right. In the bottom information about ORION is shown. And in the top right corner information about the current user is shown.

BACKGROUND
By using a background picture a connection can be made to the current simulation. It also makes it possible to use the system from the simulator and use the current simulator image as background. In the main area there is a background structure.

MENU
The navigation menu is placed in the same place as in ORION webpage, some of the headings has underlying subheadings, as shown to the right. The active main heading is bolded and a subview in bolding is indented, underlined in the prominent color.
HOME PAGE
The system has a homepage that gives a new user insight to what kind of system it is and how to navigate. Many of the information fields are clickable so that the user has easy access to wanted destination.

PERSONAL CONNECTION
Both in the corner of the first page and in the top right corner the users name appears, this gives the system a more personal feeling.

"NEWS" SECTION
On the first page the user gets feedback from current events, such as new responses.

"THE SYSTEM" SECTION
In this section the user can read about some of the different parts in the system. It is also possible to click on the headings as well as clicking in the navigation menu.

GROUP PAGE
When entering the page called Group all groups are shown, and by clicking on the group name information about the group appears to the right. It is possible to edit a group define or add curriculum to the group. When creating a new group only two things are needed, a group name and a group key. It is also possible to edit a description of the group or to choose more settings. By clicking more settings more options appear, as shown in the picture above.

GROUP KEY
By using a group key the instructor do not need to create users for all of the student. By connecting a group to a key and distributing this key to the students, they may create their own users and get access to the group by entering the group key. Specifications can be made for the key, for instance the instructor can choose to accept all requests from students that create users and uses the group key.
EXERCISE PAGE
This page is the first with subheadings, and when clicking exercises the user sees an edit page, which is the first subheading.

EDIT
In this mode the user may edit or delete a collection. The user may also choose to edit a specific group collection. The instructor then also get information about the groups program.

CREATE NEW
If the instructor chooses to create a new collection (the second subheading) it looks like the picture to the right. In this mode the user may drag and drop exercises to the different collections. The exercises can be dropped anywhere in the exercises list, and are in default set as depending on each other. This means that in order to get access to a the next exercise the student must complete the exercise directly above. If clicking an exercise a describing box appears, shown in the picture to the right.

EXERCISE OPTIONS
When a exercise is dropped in a collection it is shown in the exercises list, in order to help the user to know which exercises that has been chosen. An exercise may be chosen several times. And when an exercise is chosen in the collection list a W appears to the right of the exercise name, and when clicking this symbol a option list appears. In these settings the user may change the pre requirements, the minimum score, score settings, define a exercise from the collection, saving an altered version of the exercise and writing a own description of the altered version of the exercise.

COLLECTION OPTIONS
After the collection name a options symbol is also shown. As shown in the picture above.

EXERCISE OVERVIEW
The last subheading is exercise overview, here the user may read more about the exercises and view the exercises in action.
RESULTS PAGE
The results page is an extendable page that starts with showing results that give an overview of the program, first for the group, then for the students in a specific group, then for a specific user and finally for a specific exercise for the specific user. This will be described more under the coming headings.

GROUP OVERVIEW
The results page begins with an overview of the group results, where the progress of the different collections is shown, and, by clicking a specific collection name, information box about the exercise in that collection appears. This box shows how many students have completed the different exercises and how much simulation time each exercise has taken.

STUDENT OVERVIEW
By clicking view group members results the image to the right appears (the page expands) and program information about all of the students to the group appears.

USER RESULT OVERVIEW
When clicking view details for student, shown for this different collection appears, showing which exercises the student has completed and after how many trials. Each exercise consists of two tables, the different tables stand for productivity and safety.

EXERCISE SPECIFICS
All of the exercises are clickable, and when clicking on exercise details about that specific exercise appears, as shown in the picture to the right. And in this mode the program for that specific exercise is shown as well.

TIME LINE
In the end of the exercise specifies a time line is shown, by hovering the mouse over the events a explaining text appears, this makes it easy for the instructor to follow the exercise events.
MORE!
The list of the main headings, called More, the heading has three subheadings; new user, edit user and simulator activity.

CREATE A USER
It is possible to create a single user, shown in the top left image. When creating a single user it is possible to choose to create a student or an instructor.

CREATE USERS
A new feature added to the system is the ability to create several users, by having the system generate information for you. When doing this the user specifies how many users to create, what the system shall generate and what group the users are in. The user may then print out and distribute the users to the students. And depending on what things that is generated the students may need to fill in some information by themselves when signing in for the first time, more about this under “Sign in”.

EDIT USER
In the second subheading called Edit user it is possible to search for a user by entering a search word or by searching in a list of all users, or by searching in a specific group. When a user name is marked information above that user appears to the right, the user information may now be edited or the user deleted.
SIGN IN
The picture on the left is the first view when entering the page. Here the user can read a short introduction about the system, sign in or create a new account. The front one of the pictures at the right shows the form that the user fills out when creating a new account. This is where the user inputs the group key. The lower one of the two pictures at the right is where the user has received login information from the instructor and are asked to fill out first name, last name and email by themselves.

There are two more features, the first is if the user has forgotten password or username then they can fill in their email and an email will be sent with sign in help. The second is if a user wants to access another group, this can be done from the user profile settings (top right corner) when they are signed in. Or if there account is inactive they will be asked to enter a group key after entering their username and password.

RESULTS COLORS
When the results page has a color coding for different collections, there must be a number of colors that support this. Each color must also be available in two shades when safety and productivity bars are included in the same collection. The lighter shade is the color most frequently used. The colors have been tested for color blindness, and one sets a good distinction between the different shades of the same color, which is the most important.

<table>
<thead>
<tr>
<th>COLOR CODES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>Blue</td>
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<tr>
<td>Purple</td>
</tr>
<tr>
<td>Pink</td>
</tr>
<tr>
<td>Red</td>
</tr>
<tr>
<td>Orange</td>
</tr>
<tr>
<td>Clay</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLOUR CODES</th>
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<tbody>
<tr>
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<td>Red</td>
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<tr>
<td>Orange</td>
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<tr>
<td>Clay</td>
</tr>
</tbody>
</table>
GROUPS

Calendula color cells. In an unusual, it
dexterous, short-caller, minute, rhizome
vortex. The essential nucleus selfgram,
which winds prey, occurs robust, masticate
and elation its, non flare current in
insorptive accounts is debris. Ut quite dit
but ve chummed quik-sublime.

FONT - ARIAL

Within the system all text elements are in Arial, this
font is easy to read on the web. The headings in the
system is in caps and 16 pt. The body text is in
normal case and 12 pt in size.

TEXT AND INFORMATION BOXES

The information text that appears in the system are
displayed in boxes, shown above. The heading are in
caps.

COLORS

The main color palette
contains of three shades of
grey and one prominent color, Oxy orange. The
palettes can easily be modified to fit different compa-
nies profiles, just by replacing the predominant color.

<table>
<thead>
<tr>
<th>NAME</th>
<th>CMYK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>0-0-96</td>
</tr>
<tr>
<td>Black</td>
<td>0-0-100</td>
</tr>
<tr>
<td>Dark grey</td>
<td>0-0-40</td>
</tr>
<tr>
<td>Light grey</td>
<td>0-0-40</td>
</tr>
</tbody>
</table>
Appendix D

Form

Evaluating Simulator Management System

The purpose of this test is to evaluate ORYXs Simulator Management System. This survey is anonymous.

Thank you for participating!

How do you select exercises? Multiple choices can be made.
- Chooses all of the exercises.
- Create paths with different content.
- Chooses exercises suitable to the students knowledge.
- Always/often sets prerequisites.
- Never/rarely sets prerequisites.
- Always/often changes the minimum score.
- Never/rarely changes the minimum score.
- Other:

Would it be desirable to be able to write comments linked to the exercises? (Tips for the students, connection to literature)
- Yes.
- No.
- Other:

How important are the statistics? Multiple choices can be made.
- Very!
- The statistics are used to view the progress.
- The statistics are used in the grading process.
- The statistics are used to see if a student passed an exercise.
- Not important.
- Other:

After a student has used the simulator, what information are of interest to you? Multiple choices can be made.
- If they passed.
- How many tries it took.
- How much time the student spent on each exercise.
- How much time the student spent in the simulator.
- If anything was difficult.
- If any of the students are falling behind.
- Other:

Would you like to be able to communicate with the students through the system? (Give feedback)
- Yes.
- No.
How do you perceive the functionality of the system?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>B</td>
<td>a</td>
<td>d</td>
<td>G</td>
<td>o</td>
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</tbody>
</table>

What is your overall perception of the system?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>i</td>
<td>f</td>
<td>c</td>
<td>u</td>
</tr>
</tbody>
</table>

Which features in the system do you think is good?

Is there anything that you would like to see different?

What do you call the system?

What do you think the students would like to be able to do in the system?

Would you recommend this system to others?
- Yes.
- No.
- Other:

Other comments?