Fire prevention and emergency application

Interaction Design – MM403-G

Link to prototype: https://www.figma.com/proto/wTP7NYKVnRSUJNYGzz5B7f/Brannvern?node-id=200%3A223&scaling=scale-down&page-id=200%3A2&starting-point-node-id=200%3A223

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Abstract

This project aims to develop an application for fire prevention and fire emergency for the housing complexes in Agder. The goal is to make the residents more aware of fire prevention measures to avoid unnecessary triggering of fire alarms. This report includes requirement specification and context of use analysis based on the stakeholders, a conceptual model, and a paper – and Figma prototype of the application. With a focus on human-centered design and universal design, the prototype has been developed and improved throughout the process, based on feedback from iterative user testing. As a result of the user testing feedback, the icons, navigation, and wireframing of the application were improved.

Introduction

The student housing of the University of Agder (SiA Housing) has a big problem with fire alarms being set off. This is a direct result of the lack of adequate knowledge on measures to ensure fire safety and prevent these alarms among the tenants. In many cases, the tenants are fresh out of their parents' grasp and new to living independently and being responsible for themselves. Currently, SiA is only relying on the mandatory EHS course provided by the university, directed by the fire department. This course is only required to be completed once.

The new solution presented in this report would make it possible for the tenants to access a digital interaction course, at any time, and be able to learn from scratch or refresh their knowledge of fire prevention and safety. By implementing video, pictures, quizzes, and navigation, the product will have a captivating character that lets the tenants delve into what we aim to have a gamified and esthetic sense. To minimize the risk of fire alarms, there will be focus on comprehensive learning on the items that cause these alarms for the most part and what to do in case of an emergency.

The design will adopt a human-centered approach and start with uncovering the stakeholders' fundamental needs.

Context of use analysis

Project drivers:

The project drivers can be divided into two segments: stakeholders and the motive behind the project. Within stakeholders, there are groupings of individuals with different contributions and purposes:

1. The Client, SiA, wishes to create a solution to the problem of fire alarms triggered.

2. The developer wishes to meet or exceed the client's expectations.

3. The tenants wish for adequate training and a safe stay.

4. The fire department wishes to lower the statistics of fire alarms and increase knowledge on fire prevention and safety.

The motive behind this project is to increase the tenants' knowledge of fire prevention. As of now, SiA facilitates physical training at every building. However, this new solution would make it possible to have e-learning modules to replace physical training.

User stories

To get a better understanding of what the users will need from the product, as well as consider the stakeholder's needs, it is important to consider the product from their view. Creating user stories is a great tool for achieving this, showing who the user is, what they want to be able to do and why. The following user stories were used in this project:

"As a tenant, I want to receive proper training in fire prevention and safety, and to know how to act in case of a fire, so that I can feel confident in case of an emergency."

"As a tenant, I want both me and the other tenants to know what precautions to take when it comes to fire preventing and safety so that I can feel safe in my own home."

"As a tenant, I want to be able to quickly locate my nearest emergency exit, so that I can easily evacuate when needed."

"As a tenant in the student housing, I want to know how to best put out different types of fires, in order to minimize the damage."

Hierarchical task analysis

It is important to imagine how the user is likely to act when using the application, as well as how they expect the application to react to their navigation. Figure 1 is an example showing the subtasks to finding information on how to safely use kitchen equipment. Multiple tasks and subtasks were taken to consideration when designing the product, however, considering the similarity of the steps of the main tasks, showing only one figure will be sufficient to explain the concept in this report.

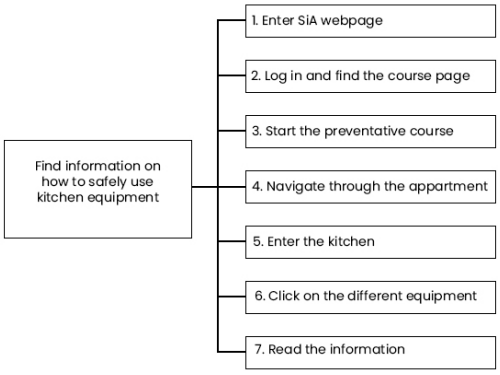


Figure 1: Hierarchical Task Analysis presenting the steps to finding information on how to safely use kitchen equipment.

Use case

To further specify the scenario of use and understand how to please the users' needs, use cases are put in place. Figure 2 and 3 shows example of use cases considered during this project.

Use case	Get information on how to use the fire alarm
Actor	Student
Precognitions	The student has technology, and internet connection, to view the website/application
Flow	The student opens the course and click the "Start course" button on the preventative course. He clicks on the navigation symbols to move through the apartment's different rooms. When he enters the hallway, he notices the fire alarm on the wall. He clicks on the question mark symbol and reads the information.
Alternative flow	The student opens the emergency course and navigate through the rooms, but he can not find any fire alarms. He clicks the symbol in the top right corner and click on the "Start course" button for the preventative course. He continues to navigate through the apartment until he finds the fire alarm and get the information he seeks.
Termination outcome	The student has the correct information on how to use the fire alarm.

Figure 2: A use case specifying a particular course of use of the product, from the user's perspective.

Use case	Confirm, through the application, that the entrance door instructions/blueprint have the correct information.
Actor	SiA Employee
Precognitions	The employee has a PC or mobile device, and internet connection, to view the website/application.
Flow	The SiA employee logs in on the SiA webpage and finds the course. They click the "Start course" button for the preventative course. They know the layout of the apartment and can easily navigate to the hallway where they click the question mark icon for the front door instructions. The overlay for the instructions open and they read the text to confirm that the information is correct or not.
Alternative flow	The SiA employee navigates to the hallway and open the main door instructions overlay, but the wrong overlay opens. The employee sends an email to the developers to report the problem.
Termination outcome	The SiA employee confirms if the information on the front door instructions are correct or not.

Figure 3: A use case specifying a particular course of use of the product, from the client's perspective.

Conceptual design

Conceptual scenario

After considering the users' perspective and needs concerning the design, a conceptual scenario is constructed. This is "useful for generating design ideas and for understanding the requirements of the system." (Benyon, 2019, p. 64). The conceptual scenario of this project was as followed:

The tenants in the student housing complexes of SiA will receive proper training and get access to information and courses on fire prevention and safety, at any time, using a computer with internet connection, and thereby reducing the risk of fires in the apartments.

Conceptual model

With the context of use and user requirements in place, a conceptual model was developed (Figure 4). This model shows a high-level description of how the design operates and how elements relate to each other and gives insight into how the prototype will present its information to the user.

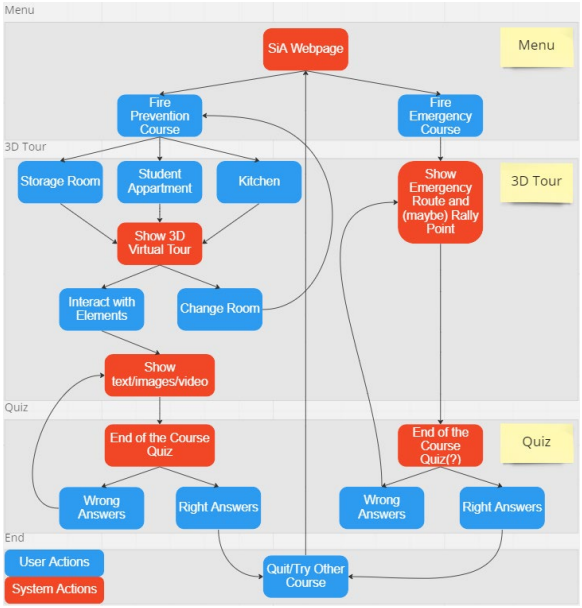


Figure 4: Conceptual model of how the system is organized and operates.

Paper prototype

When the conceptual design was in place, the findings were used to create a low fidelity prototype, a paper prototype (Figure 5). The paper prototype is used as a first draft of the prototype, presenting the hierarchical structure of the system, and is to be presented for user testing.

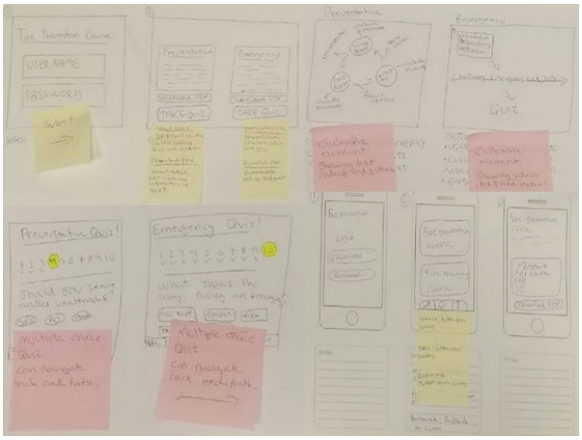


Figure 5: Paper prototype of the system

Interaction patterns & interaction styles.

The system has a click-based interaction style, where a process is called after. The prototype contains three modules: preventative, emergency, and quiz. The preventive and emergency modules are built

similarly, with circles showcasing the next or previous area. When the user wants to navigate to other parts of the course, this interaction is showcased by expanding the element and adding text highlighting where this action will take the user.

There are elements within the courses that have informational value to the user, and to keep consistency, they are all illustrated with the same icon. These are highlighted with a hovering effect, such as when the user wants to gain more knowledge concerning kitchen appliances. The user then will have to hover over shown elements. The elements will then get a blue hue that shows the user what element is clickable.

Requirements specification

Task and stakeholder requirements

Task requirements: "Adopt a human-centered design approach to create a usable interactive system". Following a human-centered design approach, the stakeholders are included throughout the design process. Doing this ensures that the solutions presented are usable from the user's perspective, and by keeping it human-centered, the design is adaptable to the users. The design is a derivative of a holistic approach to a design process, where the users have been a significant part of the process.

SiA's requirement is that the information should be available on demand, and easy to interpret on all devices. To design a solution that fulfils the stakeholder's needs, we have built the prototype within the limits and advantages of Figma.

The users need to navigate through the application on an interactive system that allows interaction with elements.

To help specify the tenants' requirements, they were introduced to a questionnaire containing questions regarding both fire and emergencies and how they would like to be engaged in such a course (Figure 6). The foundation regarding the presentation of information within the application was built by including the stakeholders in how they would like to be exposed to it.

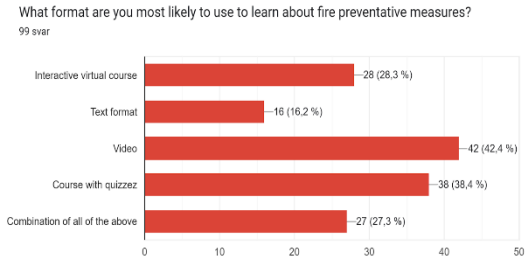


Figure 6: A result from the questionnaire.

The data collected from this questionnaire has been used both as an insurer and as a knowledge-based insight into how students relate to fire prevention and emergencies.

Contextual inquiry:

In the project's early stages, the group members performed ethnographic research where the developers met with the client and the users. The interviews were conducted over two days, in which the developers got introduced to the client's requirements, the tenant's wants, and the layout of the buildings.

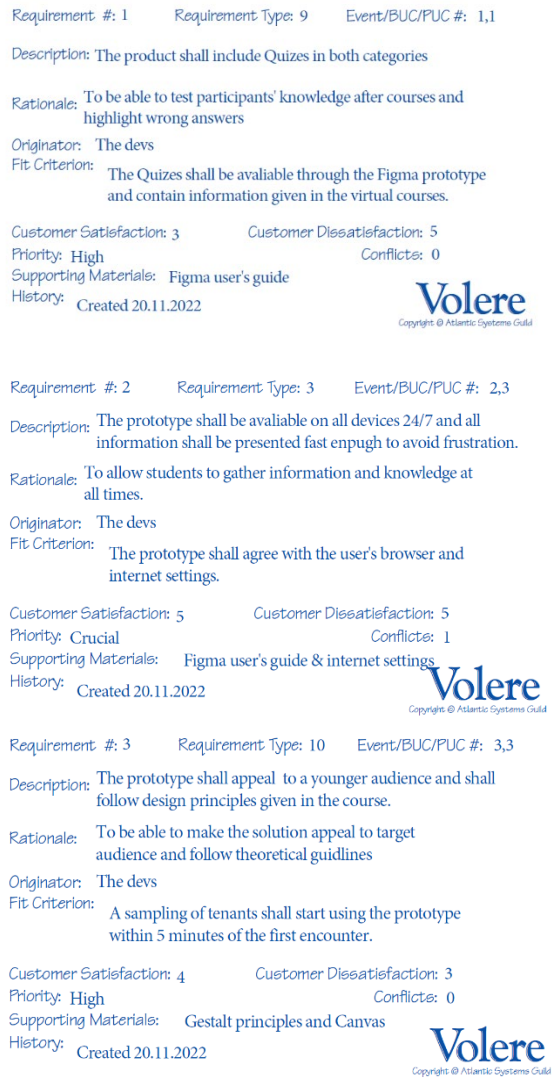
Semi-structured interview:

To gather insight to relevant information and understanding what causes most of the fire alarms at student housings, the group conducted interviews with the fire department in Grimstad. These interviews had a coarse template in which certain questions were planned, but still there were room to develop relevant follow-up questions on the spot.

Volere Requirements:

The following three individual Volere snow cards, also known as Volere Requirement shells, identify requirements within the

application. The different components within each card form the atomic requirements. Both functional and non-functional requirements have been mentioned, with different priorities. Robertson, J & Robertson, S (2012).



Universal design

Considering the diversity of the users, it has been important to assess the design against the universal design principles (Benyon, 2019, p. 105) to make it as inclusive and accessible as possible. The prototype has been designed to be equitable, flexible, and easy to use, regardless of abilities. The user is not overwhelmed with information but rather handed it proportionally of their choosing. What they click on is what they receive information on, and it is hard to do something wrong when your actions are reduced to clicking and reading. Completing the course requires minimum physical effort and can be used by anyone possessing a computer with internet access. Through the data gathering, it was shown that one of the tenants' wanting's was a product that required minimal cognitive resources, as they are often depleted after studying and working within dashboards.

High-fidelity prototyping

To build a functional prototype that showcases the system's features in the best way, Figma was chosen as a tool for the digital prototype. In the beginning, the prototype was very low fidelity and coarse. By following an iterative approach to this prototyping aspect, and through user testing and feedback, it gradually became finessed. At the latest stage of development, it is now a fully clickable prototype that lets the user navigate through the different stages of the courses. With all the different elements in the prototype, it becomes dynamic and interactive. The application mainly focuses on devices with bigger screens, such as desktops, laptops, and tablets. The reason why this is best suitable for larger screens is that there are large images containing information. Therefore, it can become difficult to see parts of the images on smaller devices. However, this does not exclude smaller devices from being usable, but they are less optimal.

Through the development of the prototype, we have followed some of the principles provided in the course.

Consistency

Considering that this application is a pure informative experience, every item made

clickable has a distinguished design that makes it obvious to the user that these are clickable elements. We have made the design easy to use and intuitive by keeping the clickable elements as consistent as possible. (Schors. O., 2019)

Clarity

To keep the navigation user-friendly and predictable, the navigation has pictures of the room brought forward by the clickable element (Figure 7).

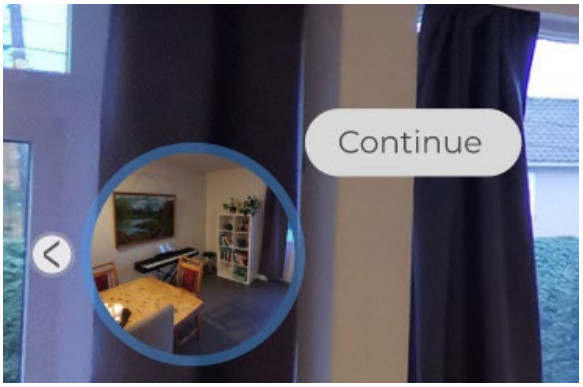


Figure 7: A screenshot of the application showing a clickable navigation element

By keeping the navigation as recognizable as possible, the aim is to cultivate cognitive memory and expectation where the user has previously done a task likened to the next. By minimizing the cognitive load on the users, one can maximize the usability. This is done by keeping the design sleek and with as few functions as possibly required for the application to satisfy the user. (Schors. O., 2019)

Interaction

The second part of clickable elements within the visual courses is the appliances relevant to the course. These are highlighted by a transitional blue hue overlay that contains the clickable element. This is a compelling way of explaining to the user what element is hovered over, and because there are sometimes elements close to one another, it gives a smaller chance of miss-clicking. Aesthetically, it also gives the prototype a boost. Regarding design principles, it surprises and strengthens the experience within the scope of interaction. (Schors, O., 2019)

Visual hierarchy

To keep the dashboard layout easily understandable by its users, one focuses on distinguishing elements by their importance. The application shows this focus on the main page, where the two categories are shown (Figure 8).

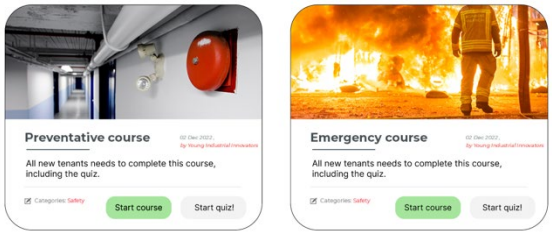


Figure 8: When entering the application, two categories are shown.

By dividing the two categories in to two elements, it informs the user that these are two equally essential elements. The users' focus is set on the start course buttons within each element at the start of the course due to its contrast and visual hierarchy. (Schors. O., 2019)

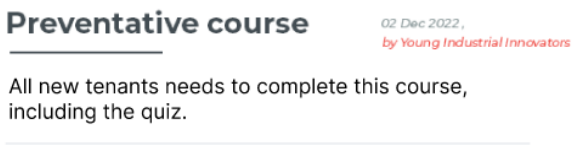


Figure 9: A closer view of the bold header shown in figure 7.

The bold header informs the user of its content, and the following text with a smaller font size is supplementary information of less importance (Figure 9).

Contrast

Within the application, the principle of contrast stands out by separating elements from their vicinity by color. The way certain buttons and clickable elements are dissimilar

conveys to the user that these elements have different properties. (Gordon K., 2020)

Evaluating the design

The prototype for the "Fire prevention and emergency" application was created with a human-centered approach adhering to the six characteristics of Human-centered design (ISO 9241, 2010, as cited in Vezzoli et al., 2018). This means that users have been involved throughout the iterative process of the design and development. The first design was presented to users for evaluation, then adjusted based on the feedback before being presented again. This went on for several rounds and was helpful in fulfilling the criteria of the project. Understanding the problem and the target group, and how to find a solution that will satisfy both the client and the users' needs, was the main priority for this project.

The prototype was tested by our fellow students, tenants at SiA and lecturer, Dr. Ghislaine Maurice Norbert Isabwe. In each round of testing, the participants were asked to interact with the prototype and give feedback based on different criteria. The testing was arranged either asynchronous online or physical meetings at the campus. The participants gave feedback based on the following questions:

- Are the clickable elements intuitive to use? If not, why?
- Is it easy to navigate through the different rooms? Are there any viable solutions to improve navigation?
- Is the navigation between courses, quizzes, and home screen intuitive or does it need improvement?

Figure 10 holds a summary of the various stages of the prototype testing. The "root causes" column are direct problems uncovered by user testing, the countermeasures are actions done to improve the prototype and the result column is the end goal from the testing.

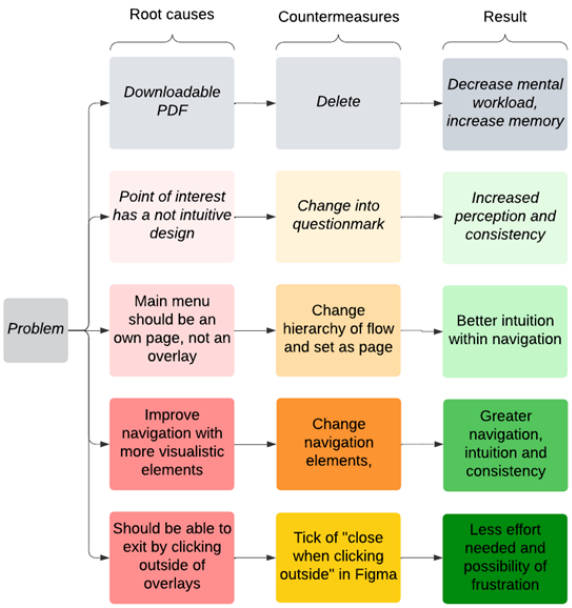


Figure 10: Illustration showing a summary of the different stages of the prototype testing.

The goal of the user testing was to improve the prototype based on ease of use, effectiveness, and satisfaction. The major changes made to the prototype to achieve these goals were the ability to click outside of overlays to close them, to have the main menu as a separate page (not an overlay) and to change the appearance of all clickable buttons.

The illustration in figure 11 shows the iterative process of designing icons for the prototype, based on user testing feedback. The symbols are sorted from top to bottom, from oldest to newest, respectively. The left column represents icons for clickable elements containing text, the middle column applies to navigation and the right column relates to closing overlays or returning to the previous page. The final iteration focuses on

a similar, minimalistic, and circular design with graphics, and description, of what the user can expect when interacting with the buttons. These iterations were a result of feedback from user testing.

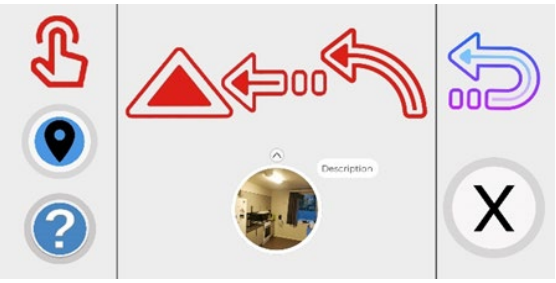


Figure 11: Illustration showing the iterative process of designing icons for the prototype, based on user testing feedback.

Conclusion

Following the content of the course and requirements from the given task, this project has been conducted with a Human-centered approach, observing the principles of HCD and Universal Design. User studies and usability testing has been carried out, and the users have been involved throughout the design process. The project report has addressed the problem space and presented a solution, analyzed, and specified the context of use and design, as well as the user requirements. A conceptual model and prototype have been developed considering the stakeholders' requirements, and the design of the prototype has been evaluated. The experience gained from this project has been of great value regarding the group members' understanding of interaction design, and the acquired knowledge from this will without doubt be an important part of the members' foundation when starting off a career in multimedia design.

References

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