POLITÉCNICO DE LEIRIA

Interactive Communication via Virtuality and Reality

AR Application Game Design

Escola Superior de Artes e Design
Master in Graphic Design

Caldas da Rainha, April 2020

Student / Wanjou Lu

Supervisors / Elga Ferreira
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Acknowledgments

First I want to thank my mother and my two sisters, who always respect and support every decision I have taken. Without them, I would not have made it through my masters degree.

I would like to thank Patrick Philippa, who had been an incredible mentor during the internship at &samhoud creative tech.

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Last, I would like to say a special thank you to Francesco Tripoli, for all the unconditional support and care in my life.

Abstract

This report presents the curricular internship carried out at the company &samhoud creative tech[1] , with the development of the practical project WKZ maatje AR application game[2] to the Wilhelmina Kinderziekenhuis Children's Hospital (WKZ). The goal was to help the WKZ young patients to feel more at ease and decrease anxiety and stress before, during, and after surgery with an AR application game. The project was completed during my internship with &samhoud creative tech team at the Department of Graphic Design in Amsterdam from October 5th, 2017 until February 28th, 2018.

The report is divided into four chapters. The first chapter describes the personal motivations for the internship, the company description and methodologies and the internship schedule.

The second chapter presents the theoretical context of the areas of digital image, UX & UI methodologies and game design for developing a game application.

The third chapter corresponds to the practical project of the internship - WKZ maatje AR application game.

In the fourth chapter, the conclusions about the development of the curricular internship and the practical results obtained are presented.

Keywords: screen, virtuality, interaction, semiotics, AR, game

[1] https://samhoudcreativetech.com
[2] https://samhoudcreativetech.com/cases/wkz-maatje/

Glossary

Android / Google Operating System

App / Abbreviation for application, software designed that can be downloaded onto a mobile phone or other mobile device.

Bar / A narrow bar next to the top and/or bottom of the mobile phone screen, usually used to place command icons or status information. A mobile App usually has menu bars, toolbars, tab bars, navigation bars, and status bars.

Gesture / A touch-based interaction based on movement on the screen.

Icon / a symbol or graphic representation on a screen of a program, option, or window.

iOS / iPhone and iPad Operating System

Prototype / An interface mockup that allows the user to test the navigation and the interaction.

UX (User experience) / It is a process focused in creating a design centered in the user experience with a product, solution or service.

UI (User Interface) / Refers to the visual design of the interface - the surface where a user interacts with the machine or device.

Wireframe / a two-dimensional illustration of a page's interface that specifically focuses on space allocation and prioritization of content, functionalities available, and intended behaviors.

List of Figures

Figure 42. The character Monkey in AR mode
Source: https://samhoudcreativetech.com/cases/wkz-maatje/

Figure 43. The applica on used in the consulting room
Source: Wilhelmina Kinderziekenhuis - 'WKZ-maatje' https://www.youtube.com/watch?v=Xfgtu9yGEHo

Figure 44. The application and the WKZ hospital
Source: Wilhelmina Kinderziekenhuis - 'WKZ-maatje' https://www.youtube.com/watch?v=Xfgtu9yGEHo

Figure 45. Splash screen

Figure 46. Onboarding screen-Hello! With <WKZ-maatje> you can bring a special buddy to life with 9 different steps during your hospital visit. This way your buddy will be always close to you!

Figure 47. Onboarding screen- Find all the puzzle pieces. Do you come across one of the nine puzzle pieces? Then scan it with your phone or tablet and get a new piece of story!

Figure 48. Onboarding screen- Scan the marker. Scan the marker you receive to bring your buddy to life. We call this augmented reality!

Figure 49. Onboarding screen- Again? Want to revisit a piece of the story? Then click on the puzzle piece in your menu. Scan the marker and your buddy will reappear.

Figure 50. Onboarding screen- Play a game. You can also play a game! Click on the icon and go to the game.

Figure 51. Onboarding screen- Camera. We do need access to your camera to play with your buddy. Hopefully you will find that OK!

Figure 52. Oops! We need access to your camera. Go to your phone's general settings and enable camera access for <app name>.

Figure 53. Request of the access of the camera

Figure 54. Choose your buddy (You can always change buddy.)

Figure 55. Choose your buddy - Monkey

Figure 56. Choose your buddy - Tiger

Figure 57. How do you want to call your buddy? - Monkey

Figure 58. How do you want to call your buddy? - Tiger

Table of Contents

Introduction

The screen now occupies a massive space of importance in contemporary society. It functions not only as a surface which contains and separates content from its surroundings, but also as a tunnel connecting reality with virtuality. Beneath the screen can exist a nearly infinite capacity for the storage of thoughts and ideas. Whatever fiction appears on the screen must be well constructed in order to outwardly extend an interpretative frame within which the viewer can interact. Therefore, in order to effectively convey the information to the viewer through the screen, the designer must make the effort to understand how the viewer interprets the messages.

I was very interested in exploring and developing design for digital media. It was important for me to understand the methodologies and requirements to be taken into account when that work is viewed on a screen and interactive. Hence, this report focuses on the development of UI & UX design on the screen, which is also the theme of the practical project that I carried out during my internship at &samhoud creative tech.

This report is divided into four chapters and the bibliography. The first chapter is the introduction, where the structure of the document is explained, the motivation that led me to choose the curricular internship, the company description and methodologies, and several campaigns that were launched in the past few years, the internship application that explains the process of being accepted through multiple interviews. The chapter concludes with the internship plan that describes both the work duties and schedules of this internship.

The second chapter aims to present the theoretical basis of the projects developed during the internship and the corresponding projectual methodologies. The chapter includes the characteristics of images, how people see images and associate them with past experience. On account of the arrival of the digital era, images have been used vastly on the screen, which changes the way humans use signs, symbols and images as well. To improve the communication experience via digital media, we adapted the methods and developed new strategies such as digital icons and even 3D representations. The chapter also briefly introduces the basic concept of user interface (UI) and user experience (UX), along with several usual methodologies of

user research to conduct during the development of UX & UI design. The last part of the chapter incorporates the ideas of games and play. As the qualities of games and play help shape the conditions of the communication, they have become common approaches in communication design. By combining the system of games and play with the communication design, the communicator not only can comprehend the context in a playful way, but also become more engaged in exchanging the information with the design as the role of players.

The third chapter presents the main practical project that was completed during the internship, WKZ-maatje app. The project WKZ-maatje is an AR app designed exclusively for the children's hospital Wilhelmina Kinderziekenhuis (WKZ) in Utrecht, Netherlands. The development of this project is described in detail. This chapter consists of the design goals, development process and the applications of the theoretical concepts from the previous chapter. It is hoped that this chapter can demonstrate the process of the app design which attempts to solve realistic difficulties.

The fourth chapter provides a moment of reflection on the completion of the internship. It describes the gains in professional and personal terms through a perspective of a foreign student.

1. Introduction of the internship

1.1. Motivation

The choice to do an internship was due to the great interest in contacting the reality of the professional market in Europe. Furthermore, through sharing the same workspace, I would be able to have a glimpse of the Western work culture.

In addition to the curiosity in experiencing the European working environment, I was interested in the resolution of real design problems through UI & UX design. Although UI & UX are two relatively new concepts, they have been practiced in an inestimable amount of objects in our daily life. I believe that design is strongly connected to humans' experience. To tailor a product to fit the user's needs, we must think from the perspective of the user.

Moreover, I also believe that a good design should be used easily and efficiently with delight and fun because life is already full of frustrations, such as the door wouldn't open, the map that is too hard to read, or the website that shows overloaded information without good organization. Thus, it was important for me to understand the methodologies and requirements to be taken into account when the concept is realized into the product.

I hoped that during this internship, I could expand my understanding of "users" and further practice my design knowledge with sufficient guidance in the professional context.

1.2. Company description

"Impact through games (...) our only goal is impacting behavioral change with our games."[3] (&samhoud creative tech website)

&samhoud is a company founded by Salem Samhoud in 1989 in the Netherlands. It has three consultancies in the Netherlands, Germany and Malaysia. &samhoud creative tech is one of &samhoud's brands. It specializes in creating cutting-edge campaigns and products that are built on innovative techs like AR, VR and voice. The belief of &samhoud creative tech is to connect and inspire people through digital approaches.

Figure 1. &samhoud creative tech logo

In 2016, &samhoud creative tech launched the campaign "AH Dino's. Albert Heijn presents: back to the Dinosaurs with Freek Vonk" with the game company Little Chicken and the local supermarket Albert Aijn. The ideal of this campaign is to bring Dutch kids the new experience of seeing live dinosaurs in augmented and virtual reality based on the educational purpose. Kids can collect the cards and learn more about the dinosaurs in 360 degrees through these simple gears.

Figure 2. Dino Campaign's TV commercial

[3] https://www.ranj.com/en/impact-by-serious-games-and-gamification/

Figure 3. The dinosaur viewed in AR

In 2017, &samhoud developed another product AH Ruimte with Albert Heijn again. AH Ruimte is an app which introduces children to the theme of 'space travel'. The kids will discover the fascinating world of space exploration in virtual reality (VR) and augmented reality (AR) together with astronaut André Kuipers.

Figure 4. AH Ruimte's feature art

Rabo Pin Pin was also launched in 2017. This app is a solution of Dutch bank Rabo-bank's issue - "As money is becoming less tangible, it has become harder for parents to discuss it with their children. How can they learn about the value of money?"

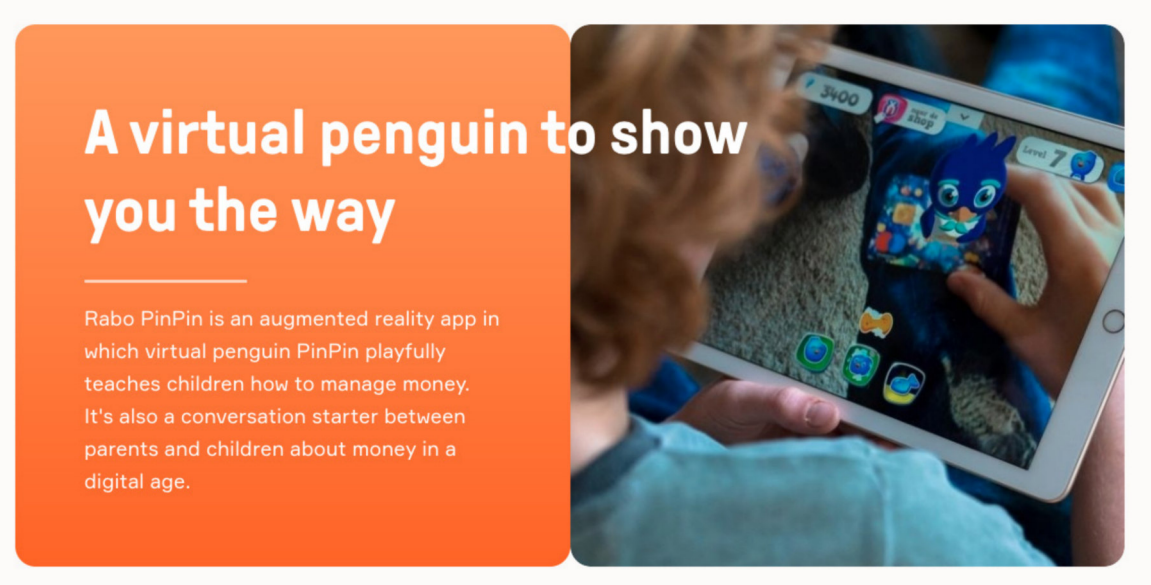


Figure 5. Rabo PinPin

App Rabo PinPin introduces money to children in a playful way. The app is connected to an actual Rabobank account, meaning the child has the possibility to check their own balance and save money. "PinPin the penguin, the guard of their savings, is brought to life using a mobile app. By taking good care of PinPin and giving him enough attention, children can earn virtual money. This way, they can buy PinPin gifts and get used to managing digital, financial transactions." (&ranj website)

In addition to the above cases, &samhoud creative tech has developed more digital solutions with AR and VR technologies that can be seen in figure 6.

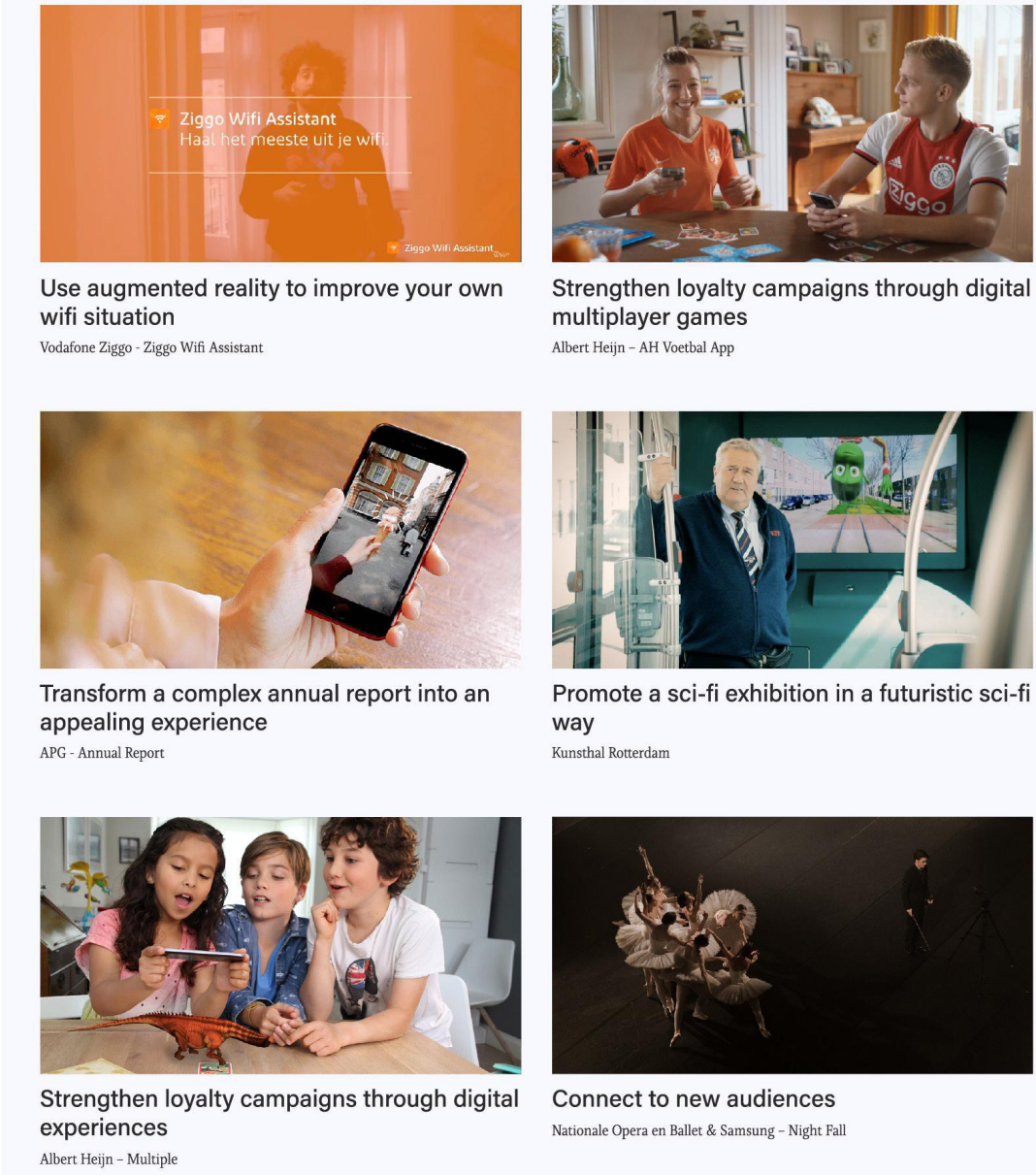


Figure 6. More cases from &samhoud brands

1.3. Internship application

To apply for the UI/ Visual Design internship at &samhoud creative tech, I provided a short introduction, CV, portfolio and answered a few questions through the website. Within 2 weeks, I received the invitation for the interview via email.

In total, there were 3 interviews through Skype. The first interview was hosted by Maartje Brünken, the producer of &samhoud creative tech. Maartje first described the history of the company, and then she wanted to know my background and the motivation of working in &samhoud. After a week, I had my second interview with the head of the design team, Patrick Philippa. The interview with Patrick lasted for about 25 minutes. During this interview, in addition to understanding my expertise, education background, personality and goals, Patrick also explained the culture of the company and the work responsibilities as the intern in &samhoud creative tech. The intern would be seen as an official employee, meaning everyone shares the same rights of expressing their opinions. A few days after, I was notified that I entered the third interview with the creative director Marijn Korver. The interview was short and rather casual, which didn't involve too many work-related questions.

A day after, I received a positive answer from &samhoud creative tech. The fact that I was the first intern who lives out of the EU they accepted, the HR addressed the possibility of arranging the work permit if needed.

1.4. Internship plan

Each week, the interns received new design tasks according to the schedule arranged by Patrick, the head of the design team. The tasks were announced on the shared calendar that everyone in the company had access. Each task would specify the names of the colleagues, and these people would work together to complete the assigned job. Usually, it required at least one designer and one strategist from the marketing team to collaborate on the same task.

The given tasks for the design interns varied from person to person. Depending on the person's skills and the evaluations from Patrick, the design intern would work on various design tasks, which include icons, presentations, mockups, illustrations, UI and UX designs.

In order to improve and grow as a team, there was a 30-minutes design meeting

where the design team could share new ideas, skills and opinions every Tuesday fternoon. Personal development was also an important part during this internship. Therefore, Patrick arranged monthly meetings with each design intern so as to help achieve their personal goals by providing assistance and advice.

My 5-months internship plan in &samhoud creative tech is described as follows: In the first month, I worked with colleagues from the concept team on several proposals in order to further understand how the company works. The main job for the design intern was to visualize the concepts and ideas that were come up by other colleagues. These proposals required a sufficient amount of knowledge of UI and UX design from the designer because all the concepts were based on Augmented Reality application development. The proposals included Heineken Experience, Albert Heijn's Future Store, Holland Casino Entertainment and so on. After one month, Patrick decided to assign the design of WKZ-maatje app to me, which would become my major task for the following 3 to 4 months during this internship. Besides working on the WKZ-maatje app design from November to February, sometimes I had to assist other colleagues from the design team with mockups, proposals, icons, etc.

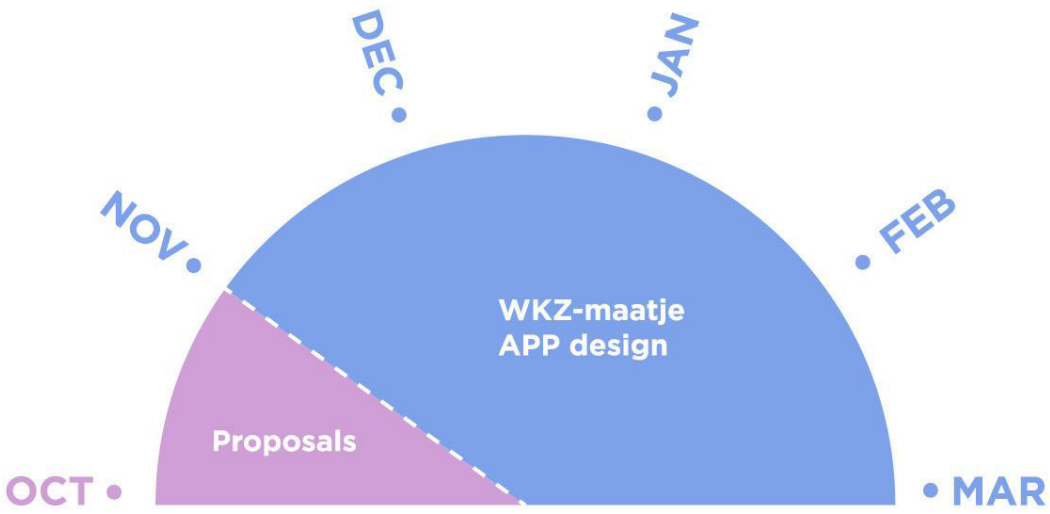


Figure 7. Internship schedule at &samhoud creative tech

2. Theoretical Context

2.1. Communication and Image

2.1.1. The image and its meaning

"Pictures, to be sure, are more imperative than writing, they impose meaning at one stroke, without analysing or diluting it." (Barthes, 1991, p.108) Roland Barthes once stated that the crucial attribute of images is how easily and expressive they can be. Images have great capacity to communicate the fluid meaning simply with a single stroke. Generally, images can refer to their subjects by outlasting the appearances, which at the same time are open to interpretation from the public without extra knowledge required. Comparing to images, understanding words requires from viewers to have a specific knowledge because words are abstract symbols or language signs.

However, the usage of image has been evolving rapidly and brought out another notion. Roland Barthes raised the following point of view. "But this is no longer a constitutive difference. Pictures become a kind of writing as soon as they are meaningful: like writing, they call for a lexis." (Barthes, 1957, p.109) The ways of employing the image nowadays indicate that the image has additional meanings and there is no similarity with what it presents in its appearance, the image is conceptualized. It outlines the content which cannot be seen. For instance, Roland uses a bunch of roses to illustrate this point, " Take a bunch of roses: I use it to signify my passion. Do we have here, then, only a signifier and a signified, the roses and my passion? Not even that: to put it accurately, there are here only 'passionified' roses." (Barthes, 1957, p.111) In this context, the image of roses extends the meaning beyond its appearance.

Writing requires certain context from the writer to compose a paragraph. However, the equivalent condition can be found in the image as well. The assigned meaning alters the image's identity, and it only speaks to the viewer who has the corresponding perception. Consequently, the image qualifies the concept of sign and

symbol. It illustrates a token that helps to define and explore facts. As the image is able to preserve the abstract idea and thought, it not only represents as a token that helps define and explore facts, but also builds the association with the communicators since the embedded meaning can be disclosed according to their past experience. In a way, the image has become a document manifesting how someone had seen something in the past.

The meaning of the image is given by an individual's experience, and even signs, the basic forms of communication, have no consistent grammar. The connection between the image and its meaning is arbitrary (figure 8).

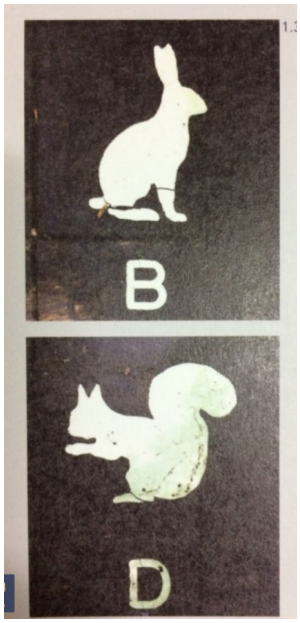


Figure 8. Arbitrariness - when B represents a rabbit and D represents a squirrel, the connection is arbitrary.

2.1.2. Sign, symbol, image

"The relation between what we see and what we know is never settled. Each evening we see the sunset. We know that the Earth is turning away from it. Yet the knowledge, the explanation, never quite fits the sight."(Berge, 1972, p.7)

Seeing is an act of perceiving with eyes. Through perceiving, people recognize things within their sight. However, what we see can not always fit what we know. In ancient times, people assumed that the earth was flat because their sight could not meet the other side of the planet.

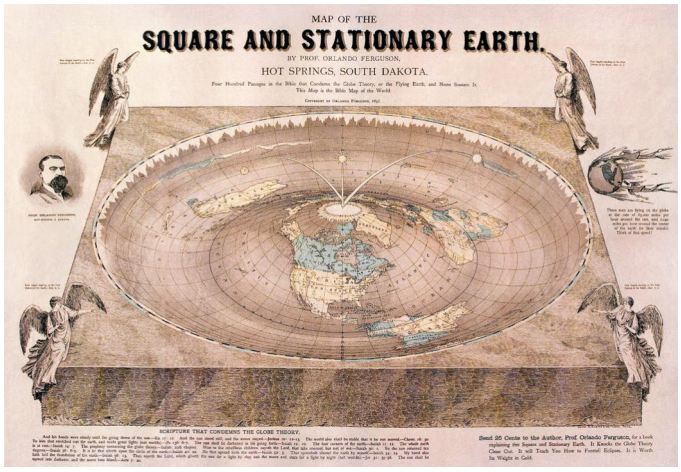


Figure 9. Flat Earth map drawn by Orlando Ferguson in 1893.

Despite the association between seeing and knowing could be unsettling, knowing has an absolute influence over the way we see things. The interpretation towards seeing also varies along with personal experience. We never look at just one thing; we are always looking at the relation between things and ourselves (Berge, 1972, p.9). To look is an act of choice. It is us who choose what we see because we are constantly moving - turning a page of newspaper, glancing at posters on streets, watching commercial videos while waiting for the next metro, and so on. We, as active agents, constitute our own visual realm.

The way we visualize things also indirectly affects how we interpret seeing across signs, symbols and images. Nowadays, there is an enormous amount of signs, symbols and images are invented every day, and each of them is man-made to designate objects or ideas. Signs are the basic forms of communication when we are not using spoken words. For instance, we tap on the screen to tell it what to do, and it responds to us. Through signs, we can share the same understanding with people who speak different languages. Symbols are the images we use to represent concepts and ideas. Signs and symbols, although they have no consistent grammar and syntax, have much in common with language (Hollis, 1990, p.34). Everything our eye sees can be thought of as a sign, including objects. A door, for instance, has been described as a ‘sign for entering’. The image is read by the brain. The association is given and established according to the humans’ shared memories. The image not only has a great capacity of containing abstract ideas, but also the flexibility of adopting new suggestions.

2.1.3. The image in digital media

Humans have developed valuable communication medias over thousands of years. Accompanying an increasing diversity of medias, the presentation of messages becomes more complex, which can be observed particularly in images after the digital era arrived. Since then, people have used the graphic form to exchange information more frequently than ever. The new digital mediums and the new technologies have been empowering the user to create and edit images easily. . People no longer only deal with the printed images remaining still on paper, but also with the abundant animated images on screen. By touching the buttons on the screen, triggering interactions and swiping between icons, people are in fact communicating with content given by others. The image has inevitably become one of the most common ways of exchanging thoughts.

Despite the rapid development of technologies enable humans to manipulate the graphic dimension easier than ever with advanced computer system. Back to 1982, where the digital icons had not yet been widely known, in order to make computer shaped to the masses, there was a main design problem that needs to be faced - 'how to improve the screen design till it is easily comprehensible? '

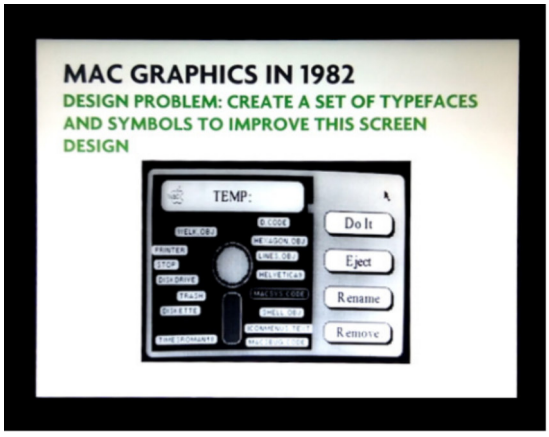


Figure 10. MAC graphics in 1982.

Susan Kare, an early pioneer of pixel art, establishes the visual language that serves the foundation of point-and-click computing by building several crucial sets of user interface design for the Macintosh system. The first constraint that the designer faced was the surface. The screen surface is a limited space formed with infinite pixels. Pixels are the smallest units of an image on the computer screen. In general, a pixel presents as a square or rectangle dot. Oftentimes, to display content with much details on the screen may lead to information overload. When the users, in this case, represent those who are not capable of communicating with the computer through codes, the design problem that the designer needs to solve is, essentially, by using only dots to compose perceivable information for the users. During Susan's following research, she began her approach by shortening the sentences into the least words, and illustrating the words into simpler figures with pixel dots. After the process of

simplification and visualization, the meanings on the interface remain precisely alike, whereas with completely different appearances (figure 11).

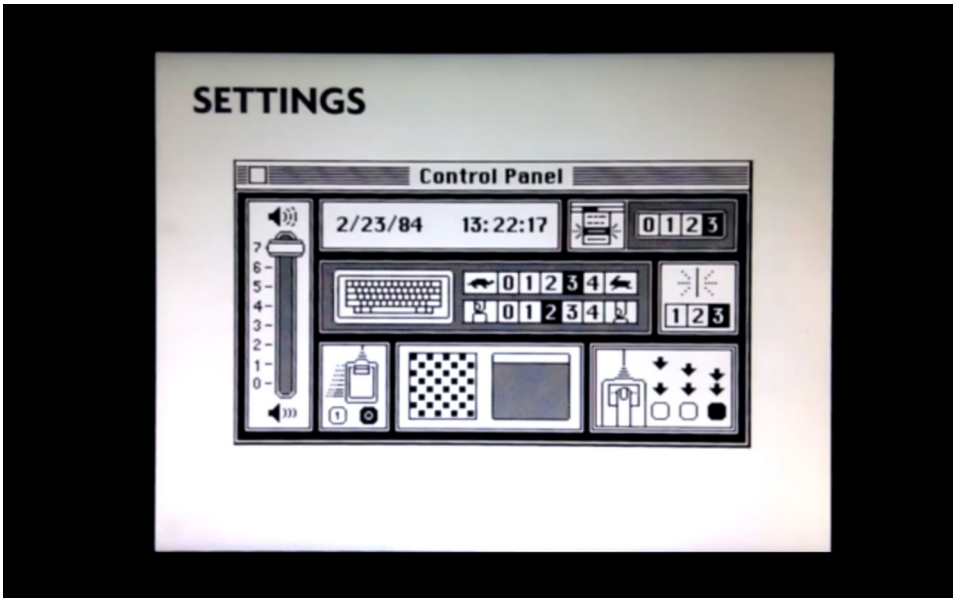


Figure 11. Susan Kare's interface design work for the Macintosh system

In the Macintosh system, Susan converted the words into a series of common images on the interface. These images are mostly shaped with simple lines and can be seen everywhere in our daily life. Susan cited her reference from the idea of "The university of cartooning" in the book Understanding Comics written by Scott McCloud, which inspired her with hundreds of influential icons. "When you look at a realistic face, you see it as the face of another, somebody who's particular but not you; however, when the details were taken away, you can easily see yourself" (figure 12) (McCloud, 1993, p.30). It is by reason of the enough abstract, so could the viewers project themselves in. The concept of cartoon offers the idea that by stripping down an image to its essential 'meaning', the meaning can be amplified through simplification. The icons created by Susan can not only be understood widely by the masses, but also keep the users more engaged in the digital mediums.

Figure 12.
Cartoon as a form of amplification through simplification

2.2. Interactive Communication

2.2.1. Combining the real and the virtual

Screens have unlocked the infinite field of all possible pictorial forms where the virtual zone assigns images the abilities of duplication, transformation, and even interaction with viewers across layers. Especially as the incorporation of AR cameras into smartphone applications and object recognition, the experience of interacting with two or even more dimensions has also become widespread.

The screen creates a relationship between reality and virtuality, by inviting the viewer from concrete world to interact with the virtual realm.To be able to perceive the environmental information in a new setting, people use the strategies of " wayfinding" based on their cognitive skills and habits (Sims, 1991, p.90). Therefore, in order to invite people to interact with the information in the virtual space, it is required to use the experience of the real world. As a result, in the case of app design development, the designer must translate the messages into a way that can be understood by the user and guide the user to gather the meanings through the experience.

2.2.2. Between the user and the screen

To interact means to communicate or to react (Cambridge University Press, 2019), and often to exchange further information. Interaction takes place across all over different occasions; smiling is a way of communicating with facial emotion, watering plants is a way of reacting to the needs of the plants, having a conversation is a way of exchanging thoughts, and so on. Generally speaking, interaction represents an active relationship between two objects that can be observed in numerous ways.

In order to design an interactive digital system, the understanding of the context of the system is required. Digital media theorist and entrepreneur Brenda Laurel brings the concept of representation to an understanding of the term: "...something is interactive when people can participate as agents within a representational context (An agent is 'one who initiates actions.')" (Laurel, 1993, p.112). Accordingly, the context should provide the people the representational access of becoming the agents as the people need to know their representational roles in the context. The game designer Chris Crawford defines the interaction process as a conversation, in its simplest form, starts out with two people, Joe and Fred. Joe must listen to what Fred says; Joe must think about it and develop a reaction; then he must express his

reaction to Fred. This process cycles back and forth,it's an iterative process in which each participant in turn listens, thinks, and speaks (Crawford, 2002, p.6).

In addition to the understandable context, the graphic presentation provides a crucial foundation for the construction of representation because most communication occurs through visual (sight) and/or auditory (sound) channels (Ashman, 2018, p.68); as it is mentioned in the previous section Communication and Image, the visual elements have an important role in the construction of meaning.

However, every medium has a certain surface in which the information is presented - the surface has limits, which gives it a shape. Given that the shape of the tablet and mobile phone screen is rectangular, the information has to be ordered within a rectangle. The context is therefore displayed within a string of layers of rectangles. Although this kind of presentation limits the user experience, it spotlights the interaction process because the user has to walk through every layer and interact with the buttons in order to receive the direction.

2.2.3. Feedback

The screen introduces the user to the virtual system in which various graphic messages speak to the user, and so does the user react to the messages by tapping on the interface along with the feedback. Feedback is the effect or output of an action during the interactive communication. While we are engaged in exploring an

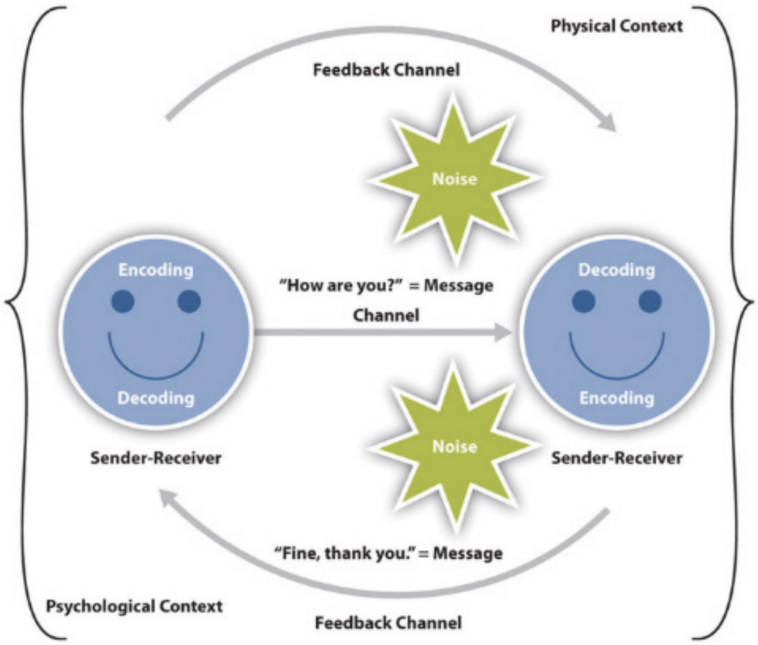


Figure 13.
The interactive model
of communication

app game as users, the screen responds with informative feedback, which forms a two-way process shuttling messages between users and screen/system. For instance, clicking the button “check” to tell the system that you understand and would like to proceed to see more. A loop of feedback creates “the interactive model of communication” in which participants alternate positions as sender and receiver and generate a narrative by sending messages and receiving feedback (Ashman, 2018, p.69).

2.2.4. Augmented Reality

The screen has unlocked all possible pictorial forms in which the virtual realm assigns images the abilities of duplicating, transforming, and even leading the user to visual experience across varied ~~mediums~~. Nowadays, even on a flat screen, the user can experience more than just 2D seeing but also the interactivity simulated by 3D graphics. That is to say, Augmented Reality technology enable new boundaries, like seeing beyond the surface.

AR refers to Augmented Reality. Augmented Reality is a field in which 3D virtual objects are integrated into a 3D real environment in real time. To identify AR as systems, there have three main characteristics (Azuma, 1997):

- Combines real and virtual dimension
- Interactive in real time
- Registered in 3D

Through Augmented Reality, the virtual objects display digital information that the user cannot directly detect with his own senses (Azuma, 1997) and the interaction context between the real and virtual environment influences the interactive experience. The incorporation of AR cameras into smartphones and the possibility of object recognition, the experience of interacting with two or even more dimensions has become widespread. However, the communication process is not limited to the user and the device, it expands to the environment in which the user is. The surrounding captured part of the real world becomes interactive. While the user is simultaneously engaging in the virtual and physical world contexts, he is also shaping the perspective in which he sees the real and digital dimension through the screen (Azuma, 1997).

Jun Rekimoto and Nagao, the creator of Navi Cam - a handheld AR application prototype in 1995, compared the proposed interaction system with other HCI systems in terms of human-computer and human-physical world interaction (figure 14). The AR scheme (figure 14.d) illustrates how the interaction takes place between

the human and computer in the real world. When interacting with spatial information, the interactive experience is also structured in a relational way with space.

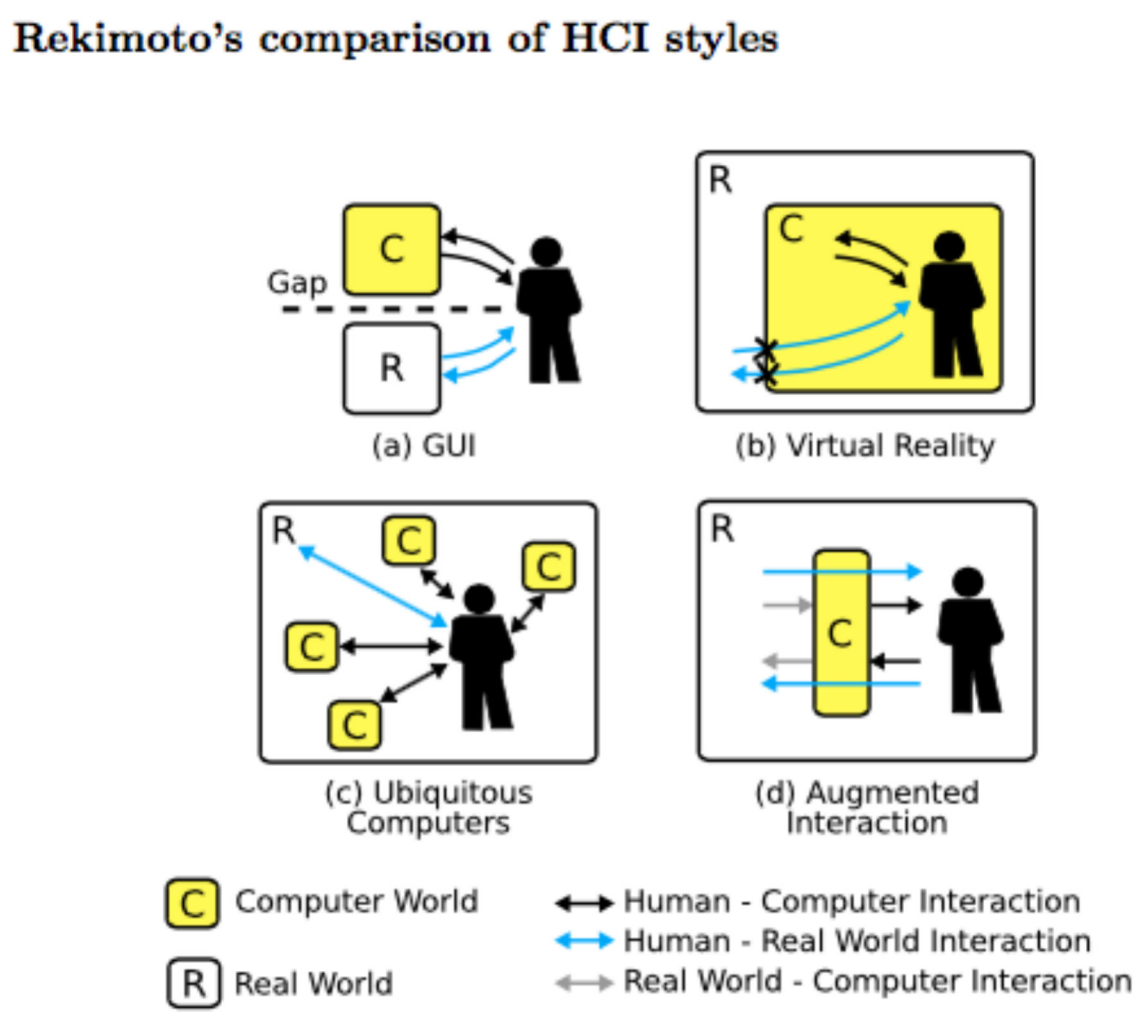


Figure 14. Comparison of HCI styles by Rekimoto and Nagao

2.3. UX & UI - User Experience & User Interface Design

2.3.1. User Experience Design

"User Experience", often abbreviated "UX", is the quality of experience a person has when interacting with a specific design. According to Don Norman and Jakob Nielsen, User Experience encompasses all aspects of the end-user's interaction with the company, its services, and its products.

Marc Hassenzahl created a model of Experience Design and pointed out that the design should start from the “why”:

(User)Experience Design (...) starts from the Why, tries to clarify the needs and emotions involved in an activity, the meaning, the experience. Only then, it determines functionality that is able to provide the experience (the What) and an appropriate way of putting the functionality to action (the How). Experience Design wants the Why, What and How to chime together, but with the Why, the needs and emotions, setting the tone. This leads to products which are sensitive to the particularities of human experience.

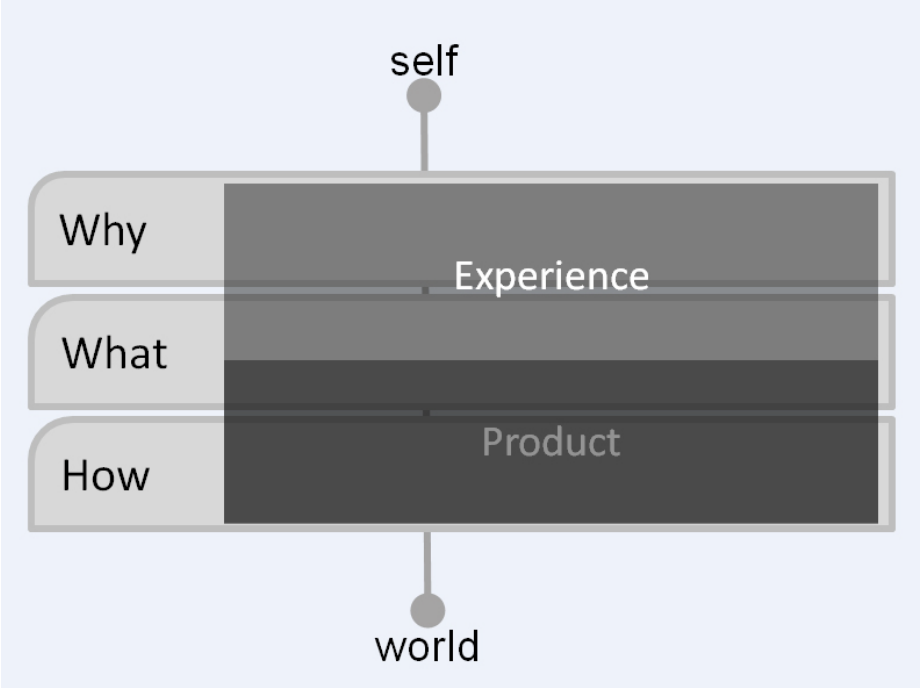


Figure 15. From the Why to the What and the How: Three levels to consider when designing technology-mediated experiences

Digital interaction is the central element in design for digital media. The user experience (UX) when interacting with the product, solution or system is designed by the designer in order to meet his needs and give a positive feeling when interacting. Creating a digital project that offers the user an appropriate experience, requires the collaboration of multiple disciplines in order to include practical functional, experiential, mental and affective aspects of human-computer interaction.

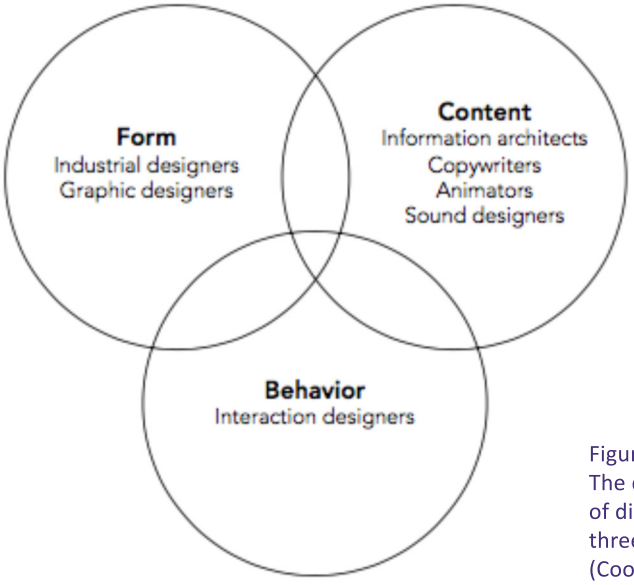


Figure 16.
The development of the user experience design (UX) of digital products consists of taking into account three aspects: form, behavior, and content (Cooper, Reimann, and Cronin, 2007).

2.3.2. User Interface Design

The interface is a computer-mediated surface or medium where communication takes place between the user and the artifact. The interface incorporates physical and communicative aspects of interactive activity (Marcus, 2002, p.24).

In our everyday lives we interact with several interfaces; such as remote control buttons, electric cooker control panels, keyboards, ATM, mobile phones, tablets and so on.

In 1993 Jakob Nielsen anticipated what "the next generation interface" would be like:
Several new user interface technologies and interaction principles seem to define a new generation of user interfaces that will move off the flat screen and into the physical world to some extent. Many of these next-generation interfaces will not have the user control the computer through commands, but will have the computer adapt the dialogue to the user's needs based on its inferences from observing the user.

The UI (User Interface) design is related to the development of the graphic interface. The design of its graphic properties, such as shape, position, scale and color, are defined in response to the user needs.

2.3.3. User Centered Design Methodologies

The area of User Centered Design consists of the application of specific methodologies in the different stages of the process, from research, design and testing of the product, solution, or system. There are several methodologies available in the context of User Centered Design, such as interviews with users, developing personas, user stories, user journey maps, usability tests, among others.

2.3.3.1. User Research: Personas, storyboards, journey maps

User research focuses on understanding user behaviors, needs, and motivations through observation techniques, task analysis, and other feedback methodologies. The types of user research vary from project to project. The following examples are some common user research in App design:

Personas

Personas are documents that describe typical target users. With appropriate research and descriptions, personas can paint a very clear picture of who is using the site or application, and potentially even how they are using it (Unger and Chandler, 2009, p.113).

Journey Maps

User journey maps are visual documents that tell the story of the persona experience: from the initial contact, throughout the usage process to a long term relationship.

In its most basic form, journey mapping starts by compiling the interaction narrative into a timeline. Next, the timeline is fleshed out with user thoughts and emotions in each phase in order to identify the opportunities to improve (Gibbons, 2018).

Journey maps are created from surveys conducted through user interviews, tests with users, web analysis, among others. A journey map displays this research through storytelling and visualization. It presents a humanized approach to show a user's true experience (Yale University, 2020).

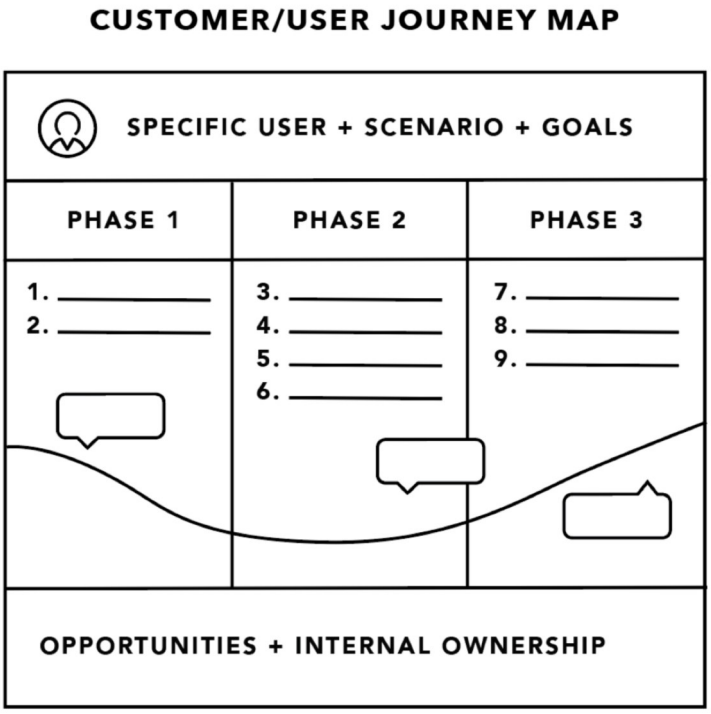


Figure 17. A form of user journey map

Storyboards

A storyboard is a visual sequence of events used to capture user interactions with a product/ solutions. Depending on the audience, a storyboard may be a better instrument for collecting how, when, where, and why someone could use your app.

Storyboards communicate stories through images displayed in a sequence of panels that chronologically map the storys' main events.There are always 3 common storyboard elements, regardless of form: a specific scenario, visuals, and corresponding captions (Unger and Chandler, 2009, p.147).

2.3.3.2. Design: Wireframes, information architecture, mockups and prototypes

Wireframes

The wireframe is a basic representation of all the visual components of a page and how they fit together. This simple drawing can present some annotations, indicating to the reader the navigation or other indication of interaction, requirements or functional specifications, as needed (Garrett, 2011, p.128).

Information architecture

Peter Morville and Louis Rosenfeld (2006), define the term "information architecture" as follows:

1. The structural design of shared information environments.

2. The combination of organization, labeling, search, and navigation systems within websites and intranets.

3. The art and science of shaping information products and experiences to support usability and findability.

4. An emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape.

In the field of app and web design, because the concept of hierarchical relationships is well understood by users and because software also tends to work in hierarchies, this is the most common type of structure:

In a hierarchical structure—sometimes called a tree or hub-and- spoke structure—nodes have parent/ child relationships with other related nodes. Child nodes represent narrower concepts within the broader category represented by the parent node. Not every node has children, but every node has a parent, leading all the way up to the parent node of the entire structure (or the root of the tree, if you prefer) (Garrett, 2011, p.93).

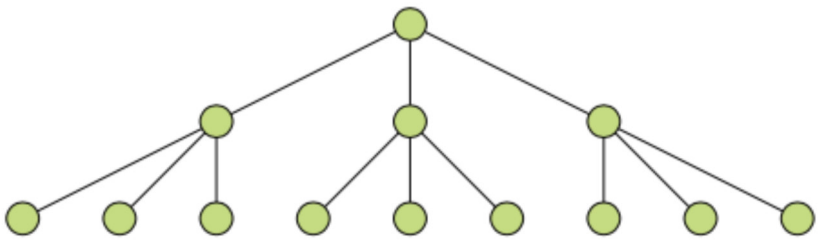


Figure 18. Hierarchical structure

Mockups
A mockup is typically a mid- to high- fidelity representation of the product's appearance, and shows the basics of its functionality. Mockups are filled with the visual details (such as colors, typography, etc.) and are usually static (Cao et al., 2015, p.9). A mockup's purpose is to show clearly what the final product will look like (Cao et al., 2015, p.19).

Prototypes
The prototype can be a low or high fidelity representation of the product that includes functionality and an improved version of the UI design. In addition to the information structure , the prototype introduces more depth to the early UI, allowing users to:

- :: *experience actual content*
- :: *interact with the UI in a way similar to the final product*
- :: *predict and solve usability problems before further development (Cao et al.,2015, p.10)*

2.3.3.3. Usability Testing

Usability testing is the practice of testing how easy a design is to use on a group of representative users. It usually involves observing users as they attempt to complete tasks, navigate and interact with the app. It is often conducted repeatedly, from early development until a product's release.

The main benefit and purpose of usability testing is to identify usability problems in the UX & UI design as early as possible, so they can be fixed before the design is implemented or programmed. As such, usability testing is often conducted on prototypes rather than finished products, with different levels of fidelity (i.e., detail and finish) depending on the development phase. Prototypes tend to be more primitive, low-fidelity versions (e.g., paper sketches) during early development, and then take the form of more detailed, high-fidelity versions (e.g., interactive digital mock-ups) closer to release (Interaction Design Foundation, 2020).

2.4. Game design

2.4.1. Play

It seems effortless to associate play with games because not only does “play” appear frequently in the game context, but also how often do we use the verb “play” to describe the sense of engaging in games. However, play and games contain distinct meanings according to varied occasions. For example, when two dogs chasing each other on a sandy beach, a girl dressing her stuffed animal with clothes, or tapping fingers on a piano’s keyboard so as to make a sound. These are activities that can be thought of as “play” which do not constitute a game. Vice versa, in some cases, play is ~~one~~ just one major component of play in certain fields. In the book *Rules of Play - Game Design Fundamentals (2004)*, it illustrates two kinds of relationships between play and games according to the observation:

Play is both a larger and a smaller term than "game," depending on the way it is framed. In one sense, "play" is a larger term that includes "game" as a subset. In another, the reverse is true: "game" is the bigger term, and includes "play" within it (Salen and Zimmerman, 2004, p.2).

Relationship one: Games are a subset of play.

Relationship two: Play is a component of games.

Figure 19. The relationships of play and games

When play is a component of games, the experience of play is one of the many ways of looking at and understanding games. Within the larger phenomenon of games, then, the play of the game represents one aspect of games. Although play is a crucial element of the larger concept of games,"play" is in fact a subset of "game." Rather than typological, this pairing of the terms represents a more conceptual approach that situates play and games within the field of game design (Salen and Zimmerman, 2004, p.2). As the relationships between play and games intertwine, that also proves how inseparable they are. To realize the goal of the app game that aims to ease the user's anxiety, play is certainly an essential approach to explore the context of virtual construction. What kind of play are we formalizing within the digital game? Is the formation of play going to shape the user's experience differently?

In the following, the definition of play is scrutinized through a few studies. In 1938, Dutch Anthropologist Johann Huizinga published a study of the play element in culture, *Homo Ludens ("Man the Player")*. Homo Ludens provides a definition of what Huizinga calls "play":

[Play is] a free activity standing quite consciously outside "ordi-nary" life as being "not serious," but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings, which tend to surround themselves with secrecy and to stress their difference from the common world by disguise or other means (Huizinga, 1995, p.13).

According to Huizinga, play is a representation in which one is able to picture an image of something different. It conceptualizes a dimension that facilitates the engagement from the participants. While playing, the participants volunteer their time, energy and effort to this created activity that harmonizes with certain fixed rules. To sum up the characteristics from Huizinga's definition, play is an extra-ordi-nary activity represented by a means that has boundaries and rules. Although play provides particular separation from its environment, it tends to group the players through its absorbing means. Furthermore, to extend the definition of play from Huizinga, the book *Man, Play, and Games (2001)* published by the French sociologist Roger Caillois responds to it with a list of definitions:

1. ***Free:*** *in which playing is not obligatory; if it were, it would at once lose its attractive and joyous quality as diversion;*

2. ***Separate:*** *circumscribed within limits of space and time, defined and fixed in advance;*

3. ***Uncertain:*** *the course of which cannot be determined, nor the result attained beforehand, and some latitude for innovations being left to the player's initiative;*

4. Unproductive: *creating neither goods, nor wealth, nor new elements of any kind; and, except for the exchange of property among the players, ending in a situation identical to that prevailing at the beginning of the game;*

5. Governed by rules: *under conventions that suspend ordinary laws, and for the moment establish new legislation, which alone counts;*

6. Make-believe: *accompanied by a special awareness of a second reality or of a free unreality, as against real life (Caillois, 2001, p.9).*

As Roger Caillois writes, this discussion intended to define the nature and the largest common denominator of all games although there remains a number of games that are not yet perfectly defined. However, it is undeniable that play shapes an imaginary place that is intended for players to commit themselves to another reality.

2.4.2. Goal and Rule

Every game includes at least one goal. *"The basic transaction we make with games is to agree to behave as if achieving victory is important, to let the objective guide our behavior in the game"* (Costikyan, 2002, p.12). A goal is an essential element to a game. That's it, incorporating goals into seemingly playful activities can transform them into games: running along the trail is just an activity, but racing with someone else and aiming for getting ahead along the same path will suddenly be considered as a game. In a game, one has to let the goal lead them to reach its outcomes and fulfill a completion, which also points out that a game's goal is a central mark of its structure.

As a goal functions like an index in a game, the context of a game should correspond with its goal. A game's goal is defined by its rules and is tightly interwoven into the formal structure of the game as a whole (Salen and Zimmerman, 2004, p.9). During a game, every action that players take should be based on reaching its goal. In short, a goal motivates players to follow a game's rules. After learning the game's goal, players make decisions according to the evaluation of arriving at the game's end point by following the rules. If players cannot judge how their actions are bringing them closer to or farther away from winning the game, they cannot properly understand the significance of their actions (Salen and Zimmerman, 2004, p.9). Therefore, setting goals for games becomes one of the initial steps for game design. However, goals should not be the only reason why people play games. As it is mentioned in the above, in a game, play can promote social interaction on account of its characteristics of shaping another reality where people can share their

experiences through exchanging property among the group.

Considering that rules of a game should leave no doubts for players,[4] the following list of rule characteristics sorted by the book *Rules of Play - Game Design Fundamentals* provides a general understanding for our research towards how rules function in games (Salen and Zimmerman, 2004, p.4):

:: Rules limit player action.

:: Rules are explicit and unambiguous.

:: Rules are shared by all players.

:: Rules are fixed.

:: Rules are binding.

:: Rules are repeatable.

2.4.3. Narrative

Narrative is a story or a description of a series of events, or a particular way of explaining or understanding events (Cambridge Dictionary, 2019). Narrative is found in all forms of human creativity, art, and entertainment, including literature, theatre, music and songs, comics, journalism, films and games, which are basically interpretative. Hence, framing the narrative into the game system can be a way to shape how the users perceive the game. In the publication *Games Telling stories? - A brief note on games and narratives* written by the game designer Jesper Juul, he concludes three observations on the comparison between narratives and games (Juul, 2001):

1. *The player can tell stories of a game session;*

2. *Many computer games contain narrative elements, and in many cases the player may play to see a cut-scene or realise a narrative sequence;*

3. *Games and narratives share some structural traits.*

[4] "The rules of a game are absolutely binding and allow no doubt. Paul Valery once in passing gave expression to a very cogent thought when he said: "No scepticism is possible where the rules of a game are concerned, for the principle underlying them is an unshakable truth.". . ." Indeed, as soon as the rules are transgressed the whole play-world collapses." Johann Huizinga, Homo Ludens: A Study of the Play Element in Culture (Boston: Beacon Press, 1955, p. 11)

Despite conceptually, games and stories are easily distinguished, there are still many similar qualities between them. The common traits in terms of structure that the design team seeks from the game and narrative schema is: they both have a starting point, events and an endpoint. As the game combined with the narrative begins, the players will experience a series of events that are interactively told with the identity of a game character. Hence, if the context of the game is arranged chronologically, the storyline can provide the major trajectory that helps structure the order of the events and the interaction triggered by the players. In addition, with a narrative in the game system, as the players perceive the background story of the game, it offers the players meaningful reasons to give actions in the game context.

2.4.4. Puzzle

Games possess so many different characteristics that many approaches are possible. As for the category of tablet game, In November 2019, 22.37% of all mobile apps were games, making it the biggest category according to the website Statista. (figure 20) 57.9% of the games played are puzzle games (Techjury, 2019).

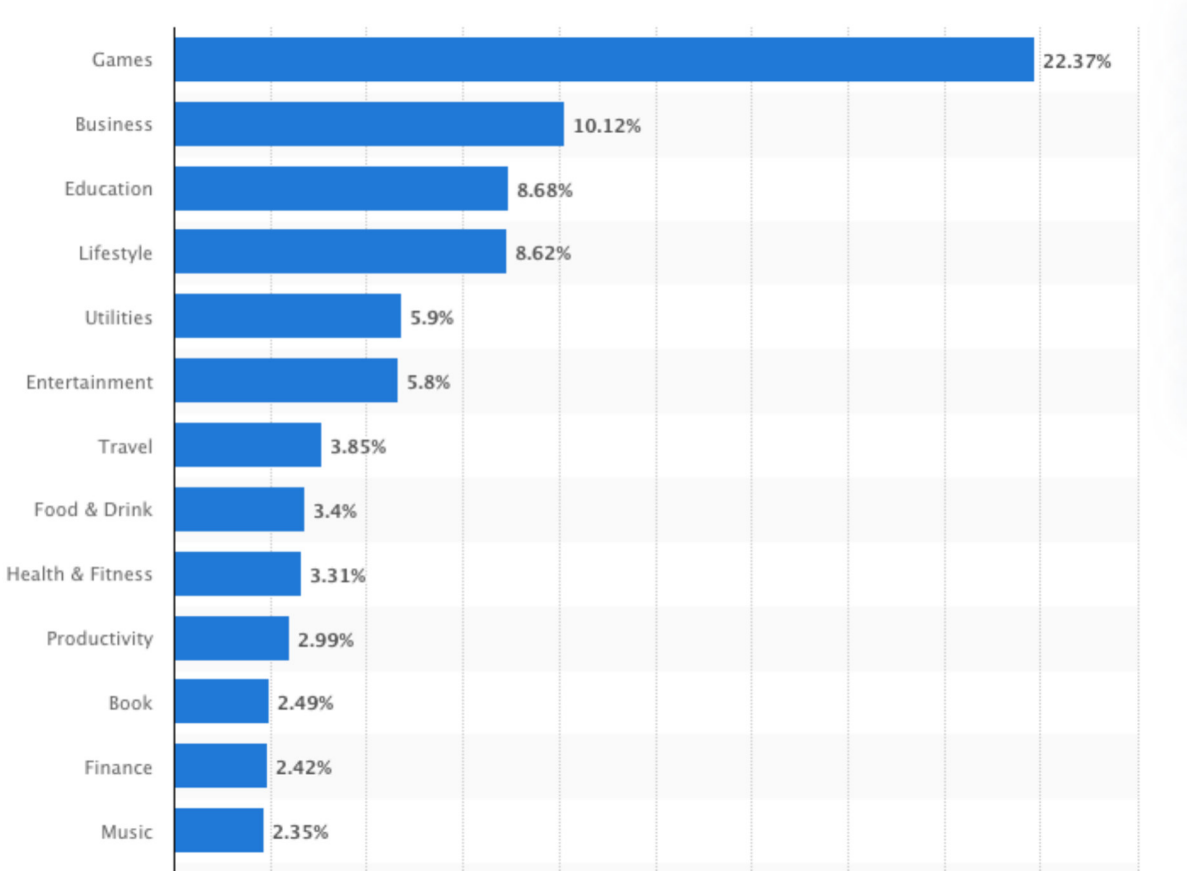


Figure 20. Most popular Apple App Store categories in November 2019, by share of available apps

The puzzle designer Scott Kim gives this definition of puzzle from a conversation with a puzzle collector Stan Isaacs:

1. *A puzzle is fun;*

2. *and it has a right answer.*

The first one points out that a puzzle is for playing. The second point explains what distinguishes a puzzle from other forms of play and games is that it always leads to a correct answer, meaning there is only one outcome. What's more, puzzles present the players with a logic structure to be solved with the assistance of clues, the players can easily measure the status of the play in some kinds of puzzle, and a jigsaw puzzle is one example.

A jigsaw puzzle is a game consisting of a lot of differently shaped pieces of cardboard or wood that you try to fit together in order to show the complete picture that the pieces make when they are all used (Cambridge Dictionary, 2019). As every puzzle piece has a different shape and its related image, the player can receive direct feedback from the actions of assembling pieces together according to the provided clues, which gives each action the significance.

In terms of structure, a jigsaw puzzle also displays an ideal representation of combining the narrative. First of all, not only is a jigsaw puzzle a rules-based system with a goal of finding a solution, it is also based largely on images, which can help illustrate the narrative in a graphic way that the younger children can perceive.

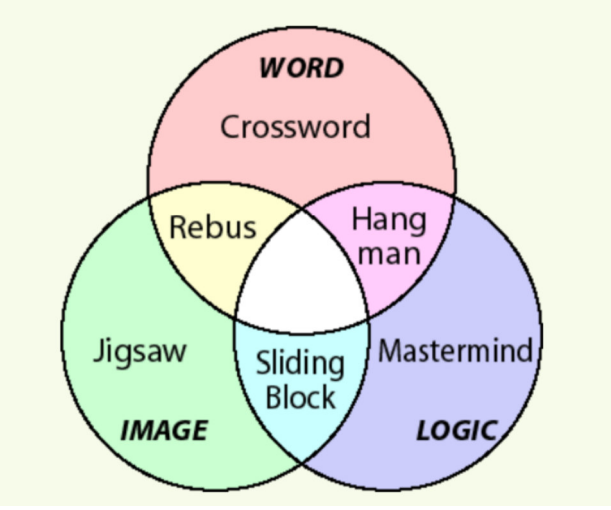


Figure 21. Puzzle Modality

Second, schematically, a puzzle challenges the player to get from a problem to a solution (figure 22), which is the result that is hoped to be seen during the game. In order to coordinate the design needs, the designer can also add variations to diverse the route from “problem” to “solution” based on this model (figure 23).

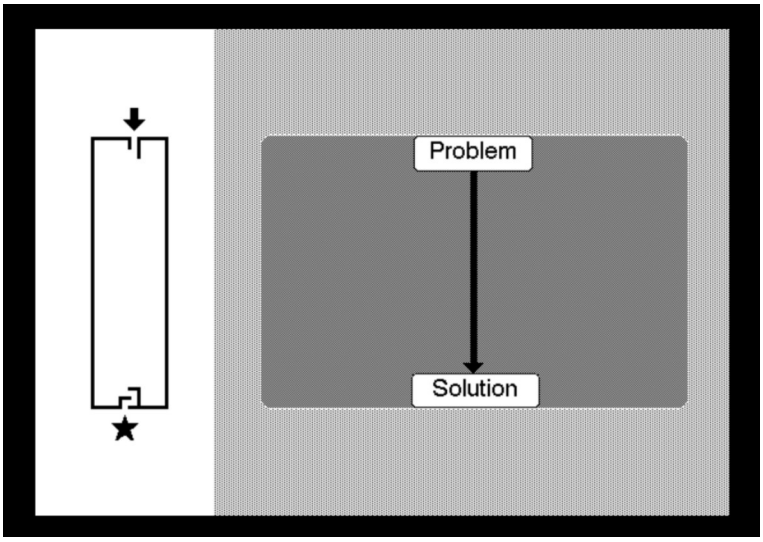


Figure 22. From a problem to a solution

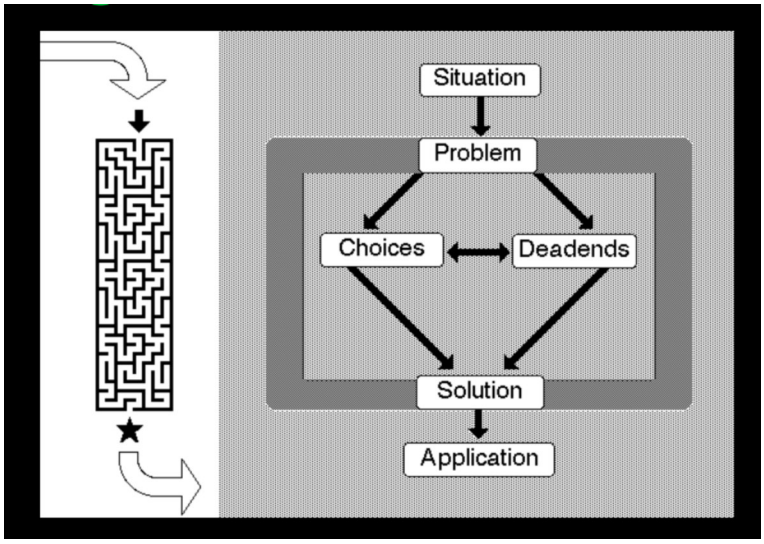


Figure 23. Variations

3. Practical Project

3.1. Goals

The project WKZ Maatje[5] is a collaboration between &samhoud creative tech and Wilhelmina Kinderziekenhuis Children's Hospital. The WKZ-maatje project began with one difficulty that was observed in children's hospital Wilhelmina Kinderziekenhuis (WKZ) where 5,000 young patients are hospitalized each year. The young patients often have to undergo surgery that requires anaesthesia and stay in the hospital for one day or more. Being hospitalized is scary and stressful for a lot of these young patients. The children's hospital WKZ hoped this problem could be overcome through a product designed by &samhoud creative tech.

Figure 24. The icon of WKZ-maatje

To attain the aim, there are two goals that are hoped to be realized in this app design:

1. *Ease the young patients' anxiety during their treatment*
2. *Lead the user to complete this puzzle game*

[5] https://samhoudcreativetech.com/cases/wkz-maatje/

The first goal is derived from the main need of WKZ hospital who expects to ease the young patient anxiety during and after experiencing the app; the latter is designed as a motivation to play the game.

3.2. Development process

&samhoud creative tech's concept team and the head of design team, Patrick, developed the concept for this project together after having the first meeting with the communication team from the Wilhelmina Kinderziekenhuis Children's Hospital (WKZ). When the concept was approved, I started to work on the wireframe with Patrick. After having the wireframe of the app, I was placed in charge of the UI design development, which included the icons, the buttons, the colors, the boxes, the background illustrations, etc. Additionally, the production of WKZ-maatje also included one programmer who was responsible for turning the design into a functional application, and one 3D graphic designer/ animator who designed the two main characters ,the tiger and the monkey, and the animations of the characters. Both were Dutch freelancers hired by &samhoud creative tech to participate in this app production. We worked closely with the programmer through exchanging thoughts on InVision and Slack group conversation. There were often intensive discussions during the production process between all the collaborators both online and in person.

The development process can be divided into the three main steps :

TASK
The young patients suffer pain and stress stemming from the treatment, which technology can make less burdensome.
↓
CONCEPT
Playful animal characters coupled with application-based storytelling provide an AR experience with the objective of easing the anxiety of the patients.
↓
METHOD
In order to materialize the concept, an AR app will be built through a comprehensible wireframe to be tested with the target users.

The designer's main objective was to be able to collect all the information available from collaborators in order to develop a product that would provide momentary comfort to young patients. The solution that the design team proposed consists of four parts:

:: Convert the concept into a wireframe structured by layers

:: Visualize the wireframe by means of graphic - sign, symbol, image

:: Combine the real and virtual through interaction

:: Use game and play system to optimize user experience

First, the wireframe was built in Sketch which is a design tool entirely vector-based and focused on user interface design. This part aimed to define the structure that would show how the layers would be displayed. The second part includes the development of graphic elements and analysis of the user's understanding of signs, symbols and images used. The third part enables the interaction with the wireframe. The last part involves the optimization process through the application of the game schema, defining the rules of the space, and expanding the engagement. The following section will provide more details on each step.

3.3. Narrative

Based on the design goal of making young patients feel more ease and further decreasing their anxiety in the hospital, the concept team and design team from &samhoud creative tech came up with a narrative. It is hoped that the young patients learn what they are going to undergo through the narrative and also engage more with the surroundings via interacting with the events from the story.

The narrative was first presented in a script by two animal characters: Frog and Giraffe. The decision about the characters was related to the previous design from the children's hospital department of WKZ:

> *In the animal world, the animals are invisible for most people, but only the special children who are receiving treatment in the hospital can see them. When the children are about to go to the hospital, Frog will show up to pick them up at home and invite them to Giraffe's birthday party. During this journey, the children can team up with Frog to help themselves get ready for the party because there will be a few things which have to be arranged along the trip before arriving at the destination. For example, picking up a gift or a cake. Halfway to the party, the children will lose their way. Soon after resting for a moment, they will end up at the party, and of course they will be brought home after finishing the trip! (The roles of Frog and Giraffe are interchangeable.)*

After the first version of wireframe was presented, the team from the WKZ hospital requested that the two characters should be replaced by Tiger and Monkey. The script was changed to the following by the concept team from the &samhoud creative tech:

The narrative was first presented in a script by two animal characters: Frog and Giraffe. The decision about the characters was related to the previous design from the children's hospital department of WKZ:

> *Monkey and Tiger both live in the animal world that is in the hospital, but that can only be seen by special children. They know the way there, the people and animals and are completely at home there. There they often play with each other, and their favorite activities are drawing together and coming up with jokes and riddles. Monkey comes to pick you up at home (when you choose Tiger it is the other way around), because he is very bored and it takes a while before he is with Tiger to draw together. Maybe in the meantime you want to keep him company and later on to Tiger? Eventually you end up at Tiger, and Monkey finally brings you home again. (Note: Monkey and Tiger are exchangeable.)*

After the decision about the characters was settled, the narrative was structured into 9 parts, and each part of the narrative has a corresponding place so as to conform to the procedure of accepting the treatment:

Step 1: At home
/ MONKEY
Hey buddy! I received a nice invitation from Tiger! "I'm a little bored. Will you come and play with me? "Of course I would like that! He lives in the hospital and I heard that you will go there too. If we go together, it will be much more fun, and time will pass much faster! Can I join you later? Let's go-die-jo!

Step 2: Waiting
/ MONKEY
Yes, we are here! The place where all my animal friends live. I feel at home here, and I know the way. Let's go to see my big friend Tiger. Oh yes, we also have to pick up some things. Pff .. If I had forgotten that, I would have been a big monkey.

Step 3: Nursing ward
/ MONKEY
This is one of my favorite places in the hospital. Here we can still play and .. Color and draw! When we arrive at Tiger's, we will have an awesome coloring page. By the way, do you know what Tiger loves? Riddles and jokes! So if you know one .. remember it well or practice sometime!

Step 4: Corridor
/ MONKEY
Here I am again. Is everything still going smoothly? Talking about corridors .. This seems like the right place for me to come up with a riddle for Tiger. Hmm .. think about it. He told me a good one recently. Hmm... Just think how it went again. Oh yeah! What do they call a cold monkey !? Do you know him? A cold monkey... That's a tricky one.

Step 5: Waiting room
/ MONKEY
Now we are at the waiting room, because you will be under general anesthesia. For me it is also the time to take a break. So that works out well. If you come out of your anesthesia, I will be there with you, and we can go visit our striped friend Tiger together. He also sent another message. (Voice Tiger) "I can't wait to see you again!"

Step 6: Operating room
/ MONKEY
(Gaaaaap) Poeehhpoeeh. It is now really time to go under anesthesia. I will stay around and then we will be ready to go on the adventure again. Let's think... What could I draw? Trees to swing in? Or coconuts to play with? Well... That will all come later. Good luck and see you soon!

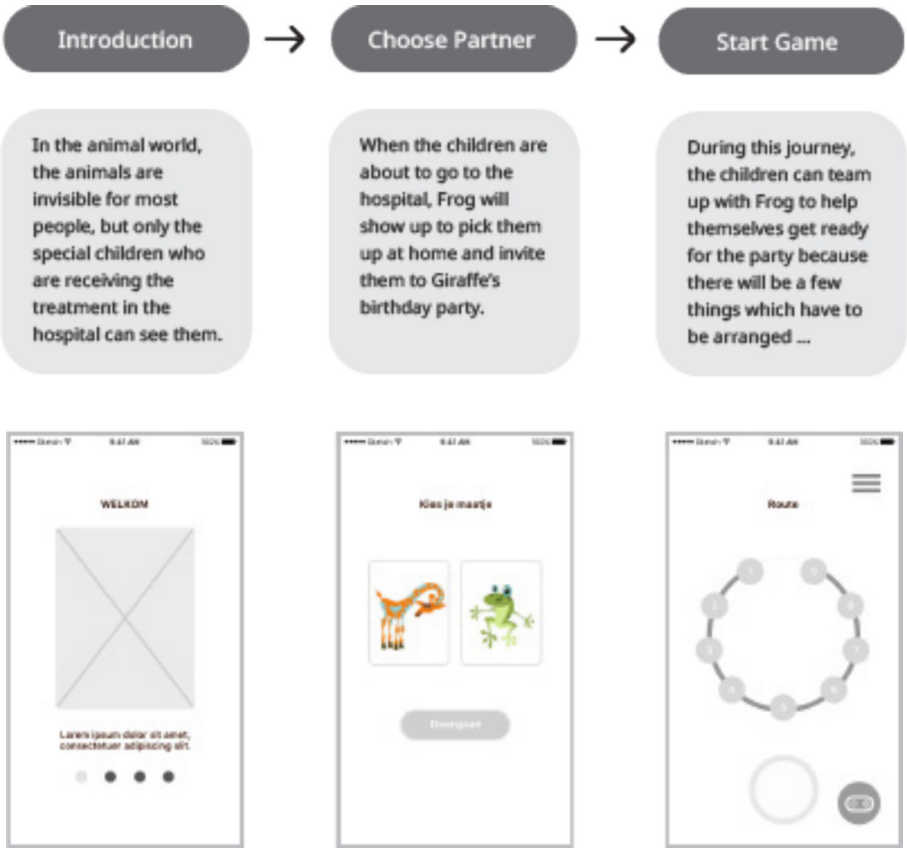
Step 7: Recovery
/ MONKEY
Bongiorno! I am back again, but boy .. I still feel a bit drowsy, maybe you too, but that is not bad at all. We just take it easy. Soon running, jumping and swinging at lianas will be possible again. As soon as we are with Tiger, we can play with him. Tiger will be happy when we get there. Keep your stamina.

Step 8: Nursing ward
/ Here two characters come together
Monkey: Tiger, there you are! Look who I brought!?
Tiger: Well the monkey is coming! You have been talking about this all the time! You arrive exactly on time. I was just getting bored.
Monkey: Ha, and how did that riddle go again? What do you call me again when I have a cold!?
Tiger: Haha, a brat(snotaap) of course!
Monkey: Haha oh yes! Come on, let's go coloring.

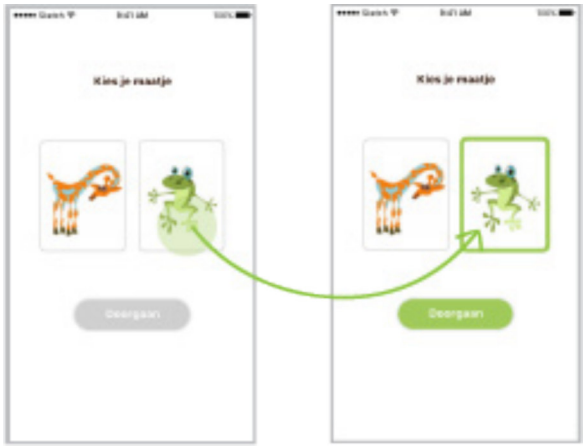
Step 9: Back home
/ MONKEY
So, that was the adventure for me. I also received a whatsapp from Tiger: (voice Tiger) "I thought it was very special that you were there. Thank you again." Nice! " It is also nice to be home again. See you soon, high five!

3.4. Wireframe

To transform this script to an application wireframe, the structure can be broken down to three main parts, and each part should be converted into graphic terms that well include the information, navigation and interface design:



Inside each part, the contained information is distributed into layers of steps that will lead the user to undergo the journey. Every layer has at least one interface element which provides orientation and links to another layer based on the order of information:



Considering the target users are 3 to 10 year old children, it's essential to store the information in a way that has no difficulties for them to navigate themselves. The chart (figure 25) demonstrates the relationships between the complexity and the structure of the sites. The more complex the structure is, the more knowledge that users require. To present easier access of information to the children, a certain amount of predictability should be shown and visualized along with a straight linear sequence (figure 25). This type of structure can be found especially from the landing page which serves as an entry point of the application.

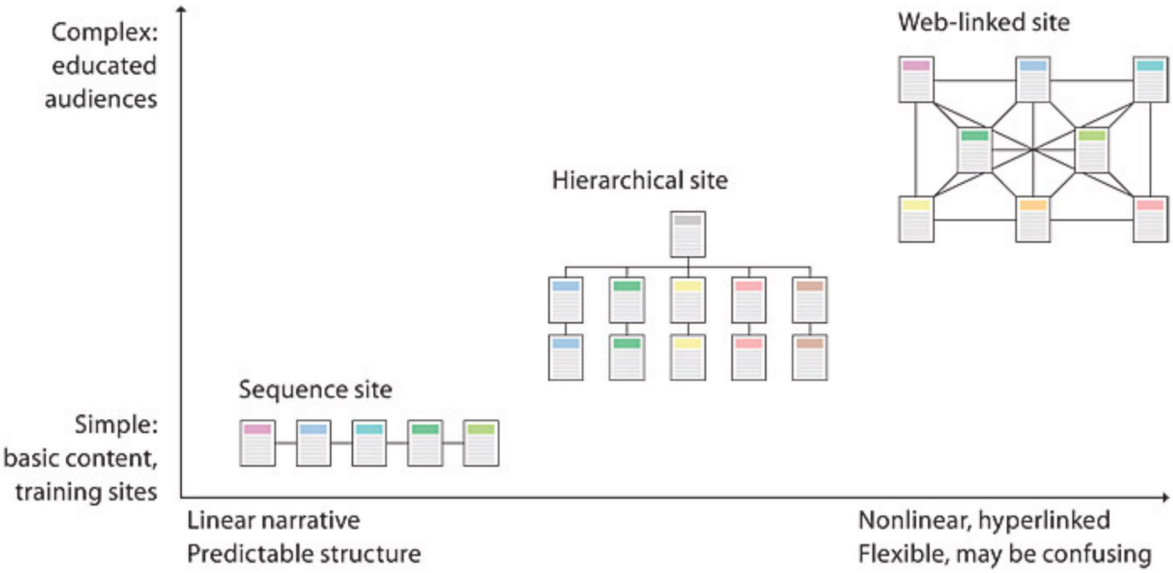


Figure 25. The chart of three different site structures.

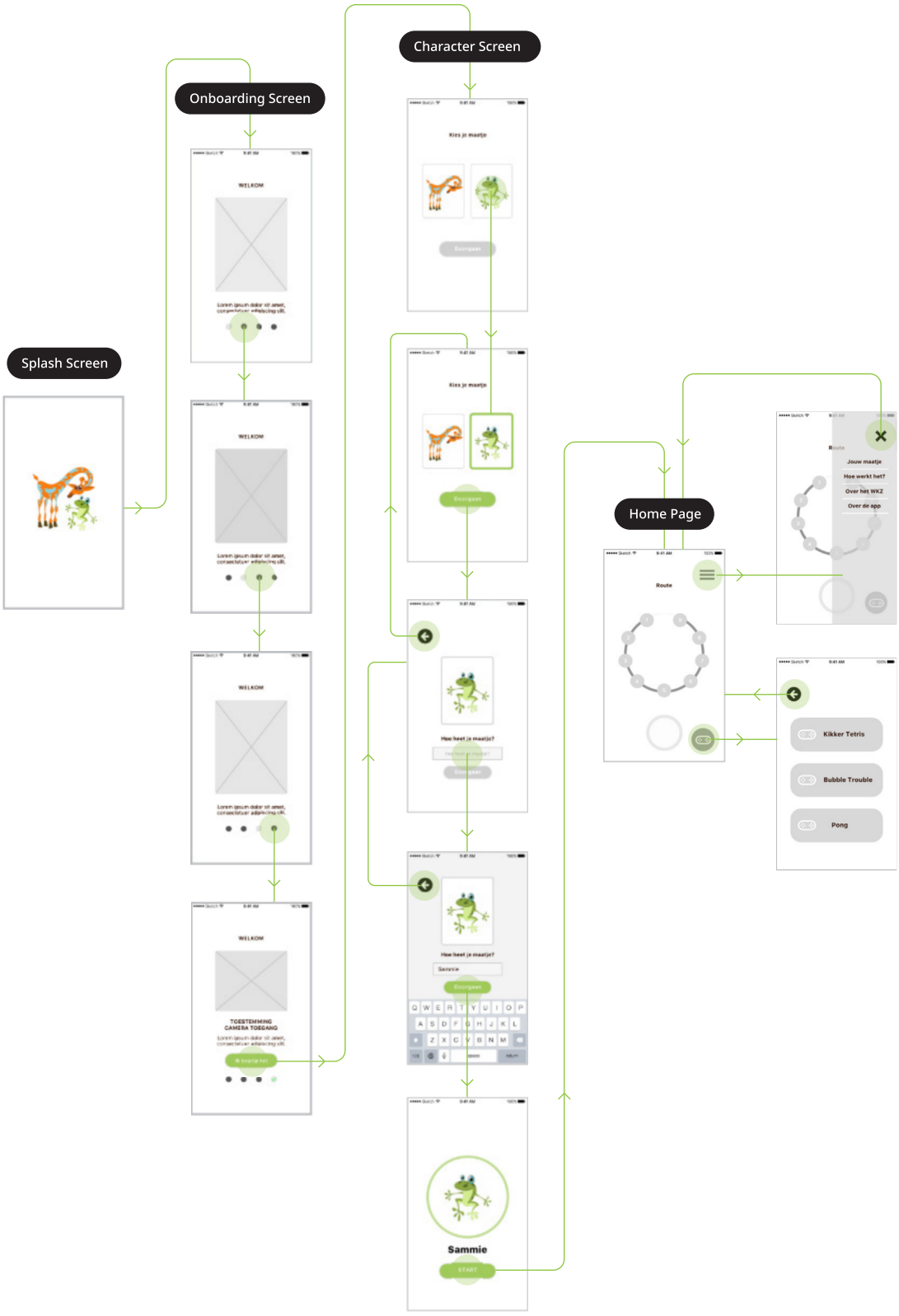


Figure 26. The first version of WKZ maajte's wireframe structure

The wireframe of WKZ-maatje was built in the software Sketch.[6] The wireframe was first presented with low-fidelity because the provided assets from WKZ hospital were not fully complete and definite in the beginning.

3.5. UI design

In the visual phase, the goal is to translate the product's desired image into a symbolic language that is easily understood by the target users As I mention before the age of the target audience of the app WKZ-maatje ranges from 3 to 10 years old. In order to create the wireframe for the audience, the design team decided to visualize the look and feel with a considerable sum of images. Not only because the image is an effective way of storing information, but also it helps the young user to read the interface by presenting their familiar visual language. The hospital WKZ team asked for the two cartoon characters of this app to be a tiger and a monkey because they generally symbolize courage and energy. These two cartoon animals can bring the young patient the playfulness through their vivid ways of telling stories. As the concept is based on the imaginary animal world, the design team decided to color the interface with features of the forest and the jungle where tigers and monkeys live in reality.

Figure 27.
The splash screen of WKZ-maatje with the characters Tiger and Monkey playing in the imaginary jungle

[6] Sketch is a wireframing tool that is primarily used for designing UI and UX of mobile apps and web since it's also a vector graphics editor. The files designed in Sketch can be saved in the commonly used formats like PNG, JPG, TIFF, etc, which leaves wireframe more capacity to be modified for a new purpose.

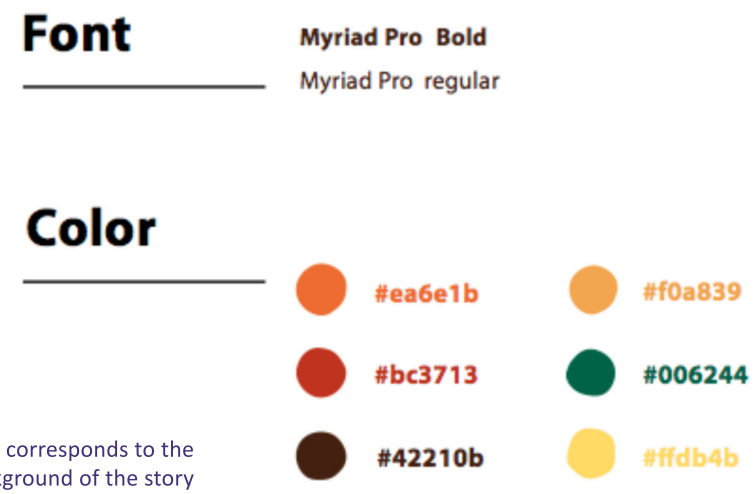


Figure 28. The color code that corresponds to the characters and the background of the story

Figure 29. The draft of the environment setting

Figure 30. The feature art of WKZ-maatje for Google play

Since the goal of WKZ-maatje app is to ease the young patient's anxiety, the look and feel of this app should be inviting and playful so as to engage the user. In addition to using illustration to enhance the visual impression, the graphics are characterized with seemingly hand-painted texture to convey its symbolic message, which attempts to simulate the childlike painting approach in order to associate the target audience's past experience. The color setting of the interface harmonizes with the tiger, monkey, forest and jungle, so it can create a consistent visual language for the user to better understand the app environment.

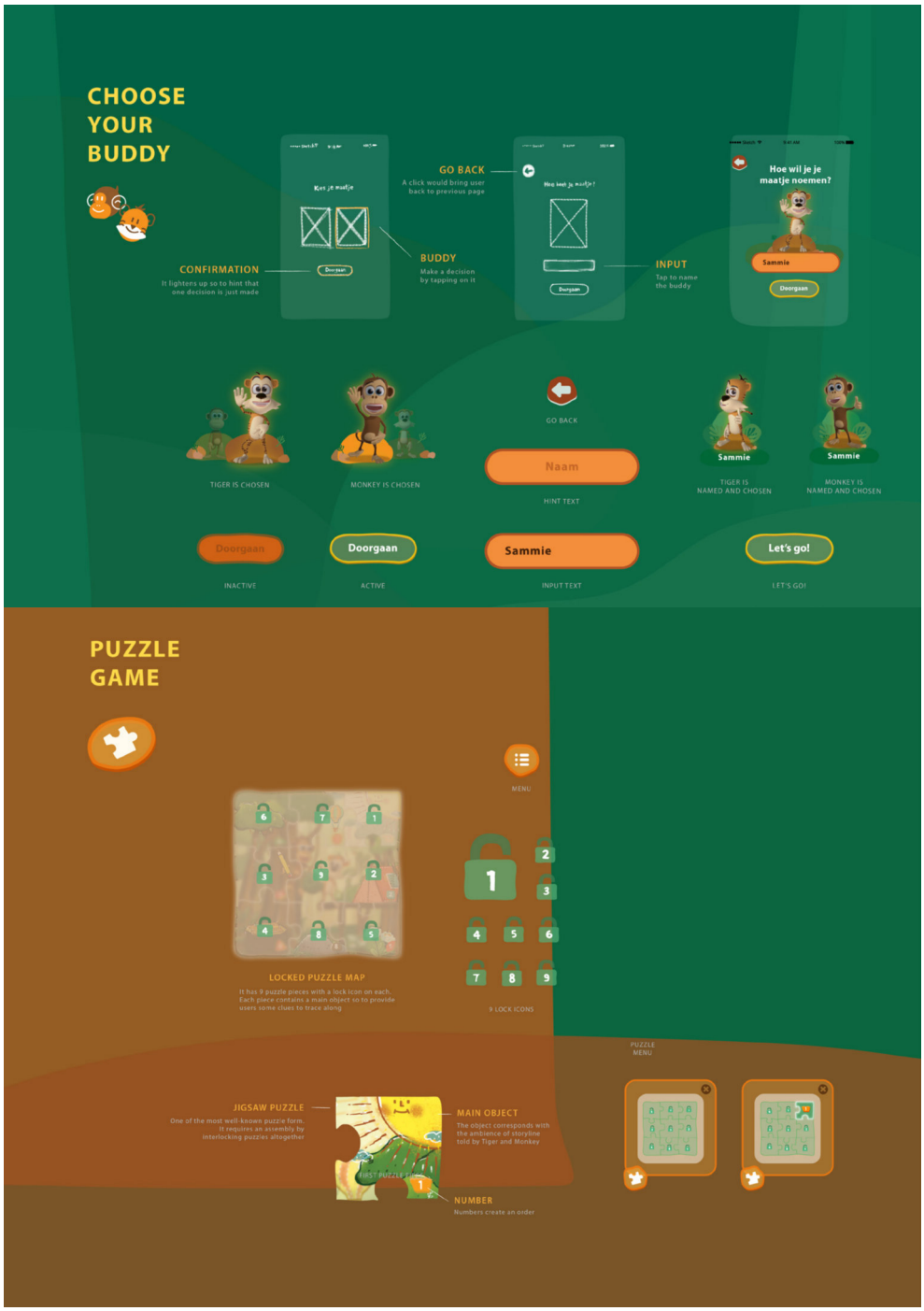


Figure 31. A series of button/ icon designs for WKZ-maatje

3.6. Puzzle

The structure of this app is mainly built based on the events happening back and forth between the app character and the user. The user will travel through a total of 9 events divided by the story according to the process of treatment with this app. Each event includes a dialogue told by the character Monkey/ Tiger informing the user of the following step that will occur during the real treatment in a metaphorical way.

In order to incorporate the jigsaw puzzle in the design, the home screen of this app shows a structure of a jigsaw puzzle. Each piece of the puzzle represents one individual event. The shape of the puzzle not only builds a clear paradigm structure, but also provides the evident clue that allows the young user to understand the context between the images at first glance.

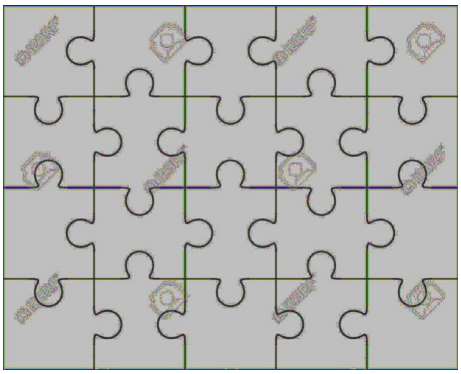


Figure 32. A conventional structure of a jigsaw puzzle

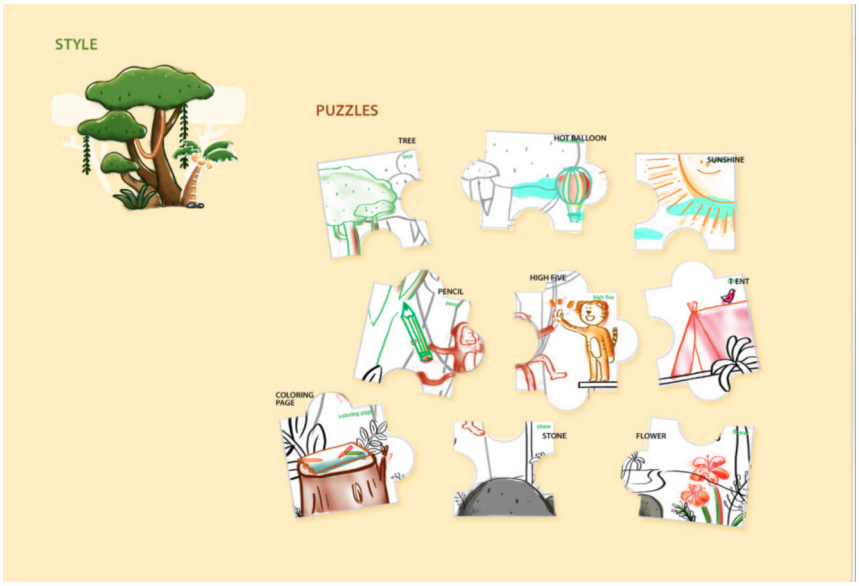


Figure 33.
The sketches of the
9 puzzle pieces

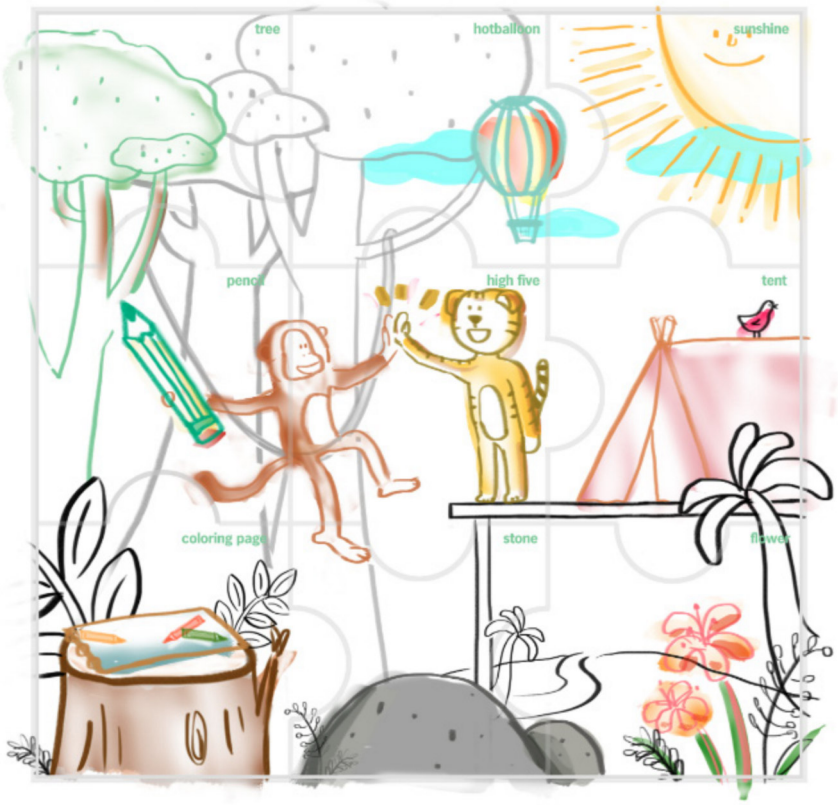


Figure 34. The sketches of the 9 puzzle pieces

Figure 35. The home screen of WKZ-maatje with the structure of the jigsaw puzzle

The next image (figure 36) describes the method of how the design team embeds the narrative and the puzzle into the game system. More specifically, during the journey, the children will receive one marker that represents the app character and 9 printed puzzle pieces that can be used to trigger the 9 corresponding events. Each puzzle is also distributed at different locations in the hospital. It is hoped that through the completion of the puzzle, the children will get a new notion of receiving the treatment and further see it as a playful experience.

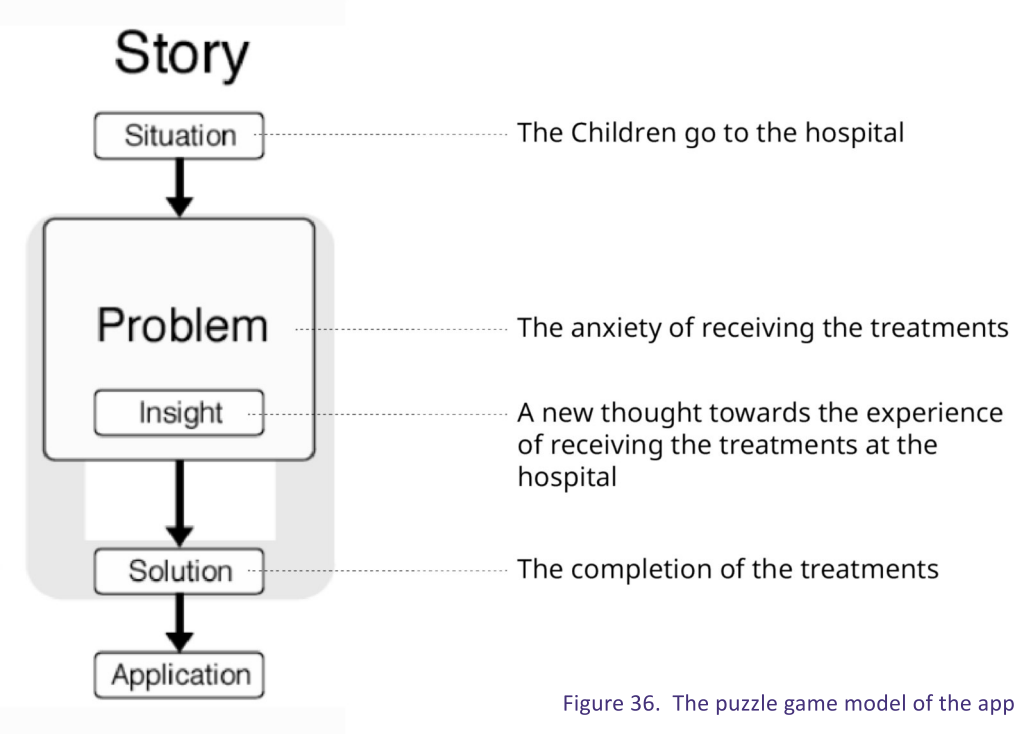


Figure 36. The puzzle game model of the app WKZ-maatje

Figure 37. The main marker that the user can scan to trigger the events

3.7. Result[7]

Figure 38. The main marker and the flyer

Figure 39. The puzzle piece 2 Tent

[7] https://samhoudcreativetech.com/ cases/wkz-maatje/ (This link includes the project description and demonstration video)

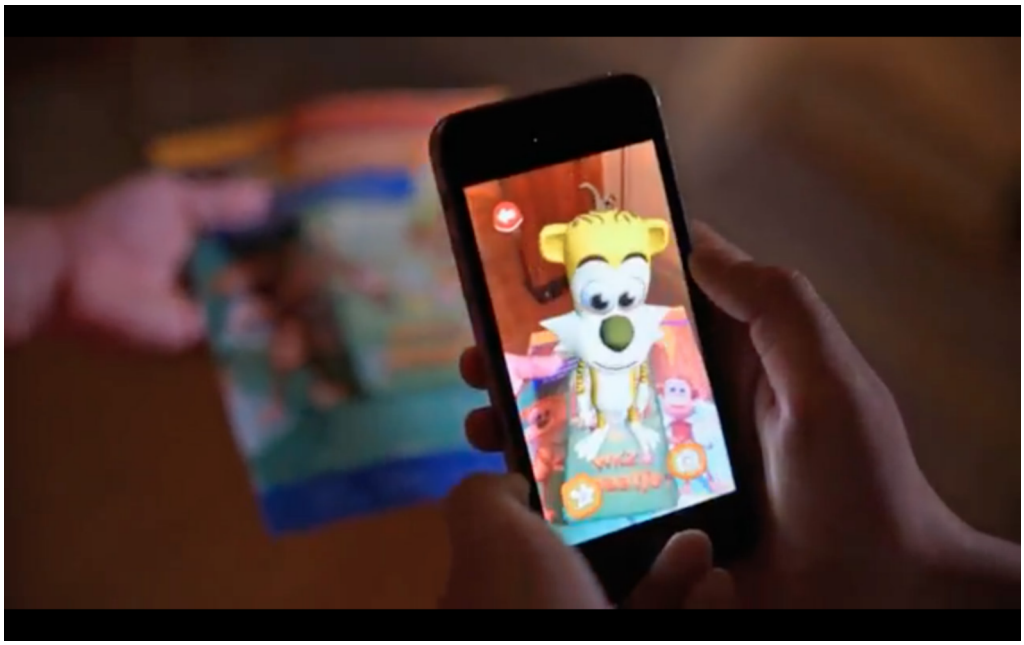


Figure 40. The character Tiger in AR mode

Figure 41. The interaction between the nurse and the patient

Figure 42. The character Monkey in AR mode

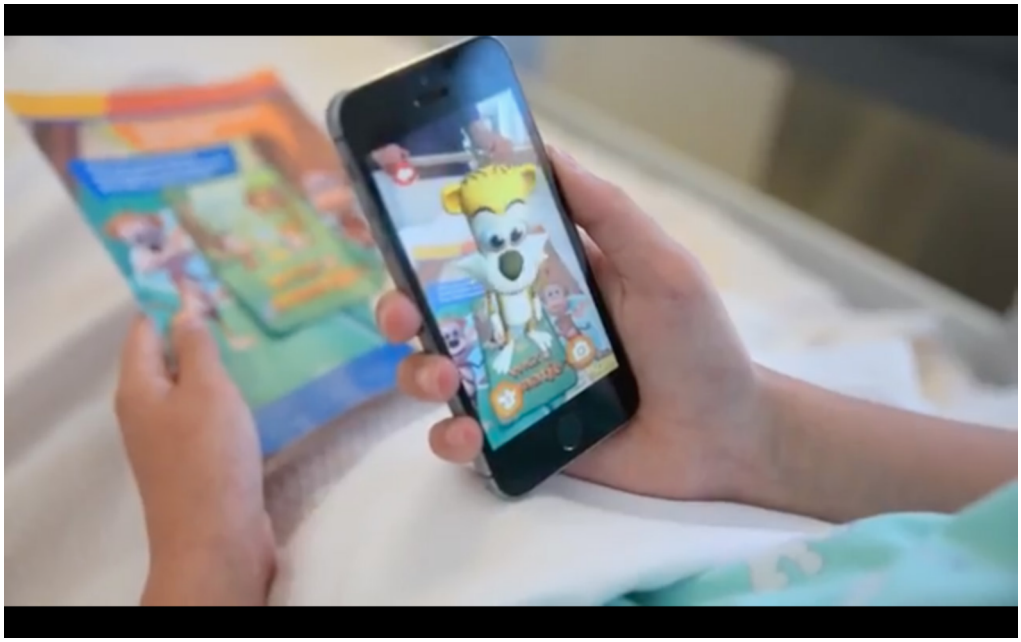


Figure 43. The application used in the consulting room

Figure 44. The application and the WKZ hospital

Figure 45.
Splash screen

Figure 46.
Onboarding screen-Hello!
With <WKZ-maatje> you can bring a special buddy to life with 9 different steps during your hospital visit. This way your buddy will be always close to you!

Figure 47.
Onboarding screen- Find all the puzzle pieces
Do you come across one of the nine puzzle pieces? Then scan it with your phone or tablet and get a new piece of story!

Figure 48.
Onboarding screen- Scan the marker
Scan the marker you receive to bring your buddy to life. We call this augmented reality!

Figure 49.
Onboarding screen- Again?
Want to revisit a piece of the story? Then click on the puzzle piece in your menu. Scan the marker and your buddy will reappear.

Figure 50.
Onboarding screen- Play a game
You can also play a game! Click on the icon and go to the game.

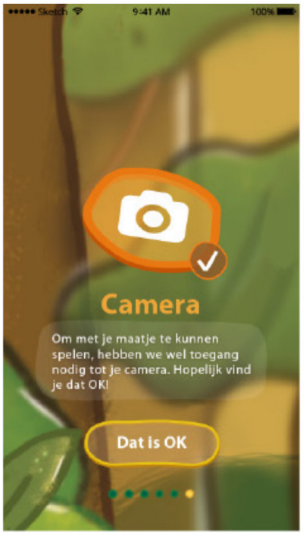


Figure 51.
Onboarding screen- Camera
We do need access to your camera to play with your buddy. Hopefully you will find that OK!

Figure 52.
Oops! We need access to your camera. Go to your phone's general settings and enable camera access for <app name>.

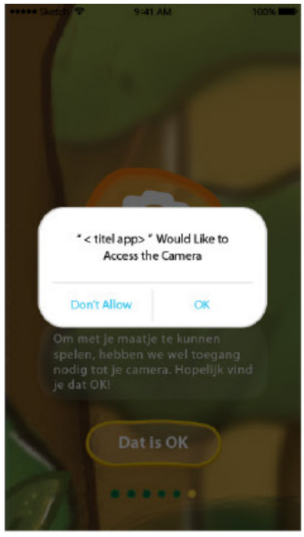


Figure 53.
Request of the access of the camera

Figure 54.
Choose your buddy
(You can always change buddy.)

Figure 55.
Choose your buddy - Monkey

Figure 56.
Choose your buddy - Tiger

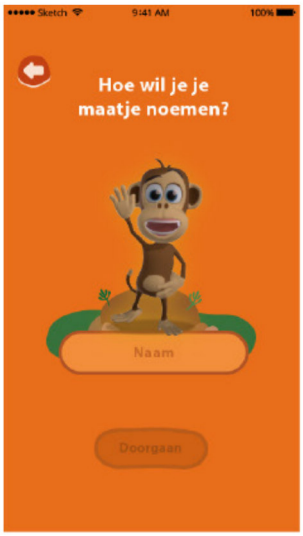


Figure 57.
How do you want to call your buddy? - Monkey

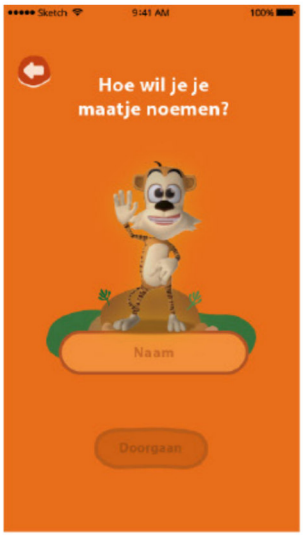


Figure 58.
How do you want to call your buddy? - Tiger

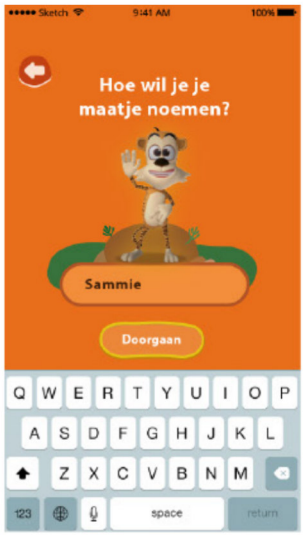


Figure 59.
How do you want to call your buddy? - Tiger Sammie

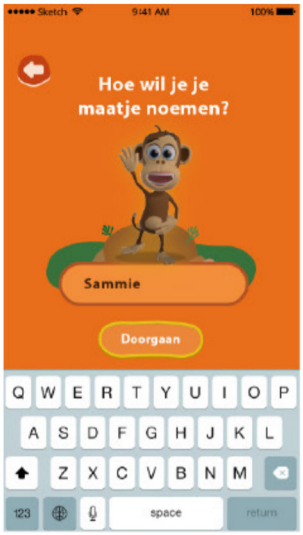


Figure 60.
How do you want to call your buddy? - Monkey Sammie

Figure 61.
Let's go! - Monkey

Figure 62.
Let's go! - Tiger

Figure 63.
Homescreen - the puzzle pieces are locked

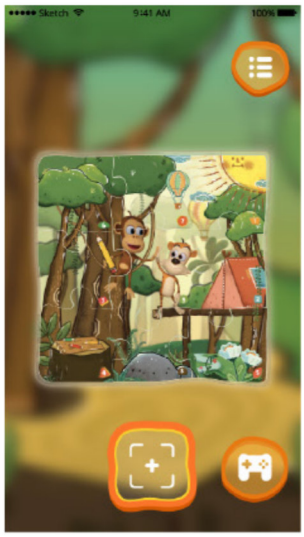


Figure 64.
Homescreen - the puzzle pieces are unlocked

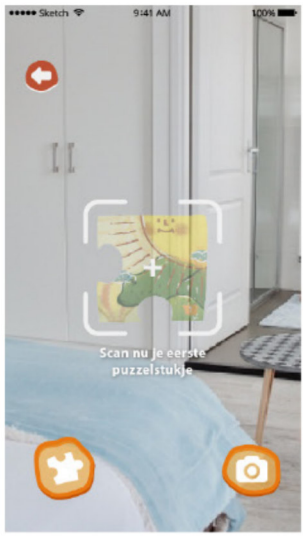


Figure 65.
Now scan your first puzzle piece

Figure 66. Scan

Figure 67. Photo taken

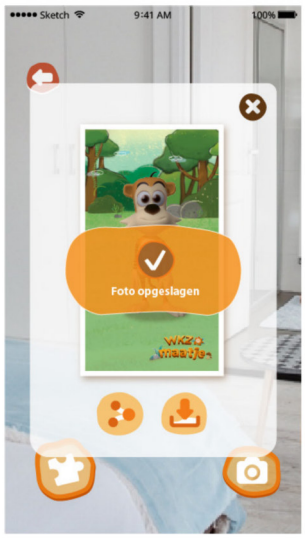


Figure 68. Photo saved

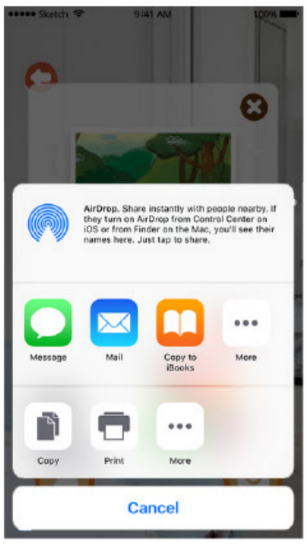


Figure 69.
Share photo

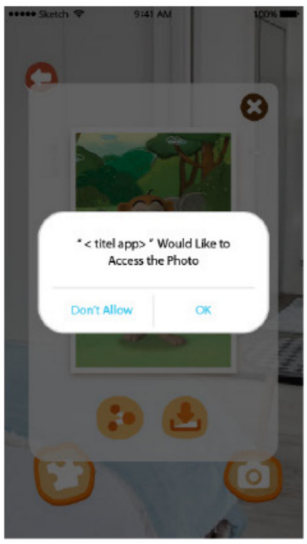


Figure 70.
Request of the access to Photo

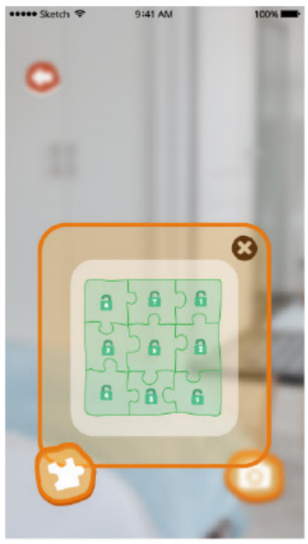


Figure 71.
Choose puzzle - puzzles are locked

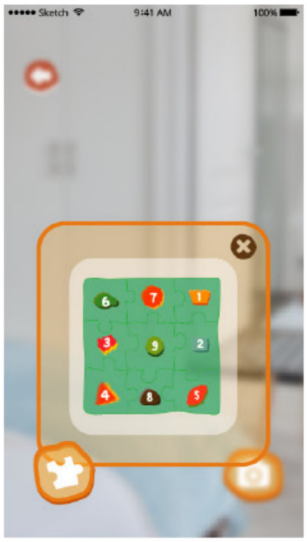


Figure 72.
Choose puzzle - puzzles are unlocked

Figure 73.
Menu

Figure 74.
About the App

Figure 75.
About WKZ

4. Conclusion

This internship provided me the opportunity to participate in a professional context as a communication designer and gave me a great understanding of AR/ VR related industries. Through knowing &samhoud creative tech's cases and datas, I recognized that the strategy of combining multimedia could be very effective with young users. Furthermore, because Amsterdam is a highly cosmopolitan city it was a very stimulating experience.

Professionally, I achieved the goal of applying the theoretical concepts and methods on a real product for an European company integrated in a design team. Given this chance, my knowledge of UI & UX design has grown extensively within these 5 months. This was also the first time I worked on the design product that involved Augmented Reality technology. Furthermore, due to the many successful products that &samhoud company produced, I learned how vital the element "play" is in this type of AR solution. As "play" promotes the formation of social groupings, the combination of play and AR technology increases the interaction between the user and their surroundings. However, unfortunately the process of developing the WKZ-maatje app involved little research of user data collection and user testing. It is partially because of the plenty of experience that &samhoud creative tech has in designing AR apps for children that, and also due to the privacy policy of the WKZ hospital.

Moreover, not only had I acquired professional design skills but also strengthened my communication skills through weekly meetings with my colleagues and other professional designers outside of the company. In Taiwanese culture, most of us are very used to group cooperation, but are not used to expressing personal opinions strongly in groups. During this internship, Patrick highly encouraged me to express my personal opinions as a good team player because in Dutch society, open and direct communication is an important element in all sorts of teamworks. Therefore, developing communication skills was definitely the biggest achievement in my personal growth.

In conclusion, the rich experience I had at &samhoud creative tech contributes to my perception of the UI & UX design field as well as my personal growth as a communication designer.

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