CULTUUR RONDOM VEILIGHEID

A game about safety culture

Master Thesis
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EXECUTIVE SUMMARY

The start of this project is a first version of a serious game that was designed by the company MEDD. This is an independent design and consultancy agency for healthcare. They designed this game as part of their 'Met Elkaar Durven Doen' toolbox, which they use in trainings and workshops. The Haga Hospital is the co-design partner of the game, named the Safety Game, and during the week of patient safety, a first version of the game was played by healthcare professionals of the Haga Hospital.

The main aspect of the game, are the question cards. These cards are divided into three themes: Patient Experience, Risk Management, and Culture and Behaviour (see image 0.1). Within these themes, the players get knowledge-based questions, topics to discuss, or small assignments. In a questionnaire done by MEDD in the Haga Hospital and through the reactions of the healthcare professionals that played the game, can be concluded that these three themes are themes that healthcare professionals would like to learn more about.

Image 0.1: The question card in three themes.

The assignment within this project is to further develop the existing design and make it applicable to other hospitals and healthcare organisations.

The Safety Game is meant to get healthcare professionals together and create awareness about safety and quality within hospitals. To provide background to why this is necessary, a literature review and field research are done. From this research can be concluded that an open culture is important to manage risks in the hospital. Unfortunately, most hospitals have a blame culture, where healthcare professionals don't correct each other or speak up in fear of the consequences. To change this blame culture into an open culture, the behaviour of the healthcare professionals needs to change (image 0.3).

To make healthcare professionals aware of their type of culture and how to change this, a serious persuasive game can be used. To design this serious persuasive game, the Persuasive Game Design model is used (Image 0.2 and Image 0.4).

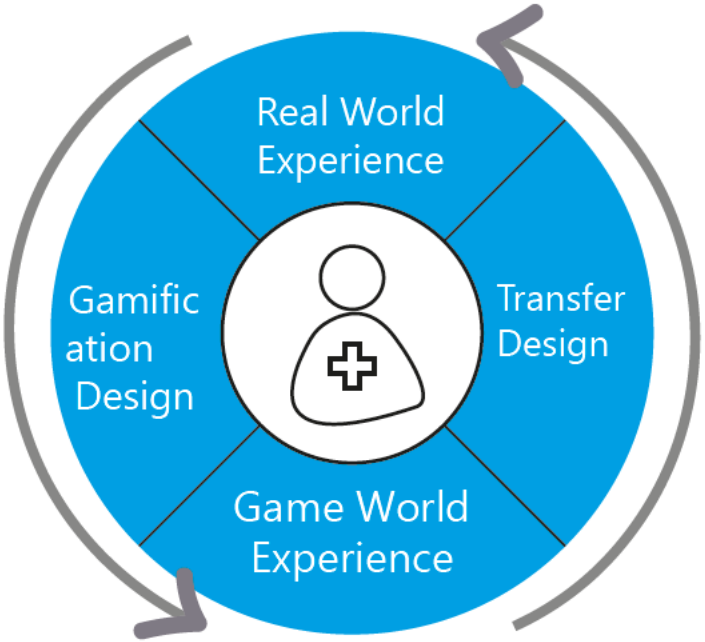

Image 0.2: The Persuasive Game Design model.

The research provided the insights to fill in the Real World Experience and the Gamification Design. From the research the goal was defined: Designing a meaningful, serious, persuasive game for healthcare professionals to gain lasting awareness on their behaviour regarding safety and how they influence their own safety and that of others.

In the ideation phase, three concepts were developed. From these three, a concept was chosen that is based on the idea of an escape room idea which is developed into a final design.

The final design consists of a small house that represents the hospital, a patient card, question cards in the earlier mentioned themes, a padlock to lock the hospital, three puzzles in the same themes as the question cards, and puzzle pieces (see image 0.5).

This design is tested in the Haga Hospital with healthcare professionals. The final design, the game 'Cultuur rondom Veiligheid', is proven to create awareness regarding culture and behaviour, and how this influences (patient) safety, thus reaching the design goal. The base of the final design can be used to be adjusted to fit other healthcare organisations or keep the game up to date by MEDD.

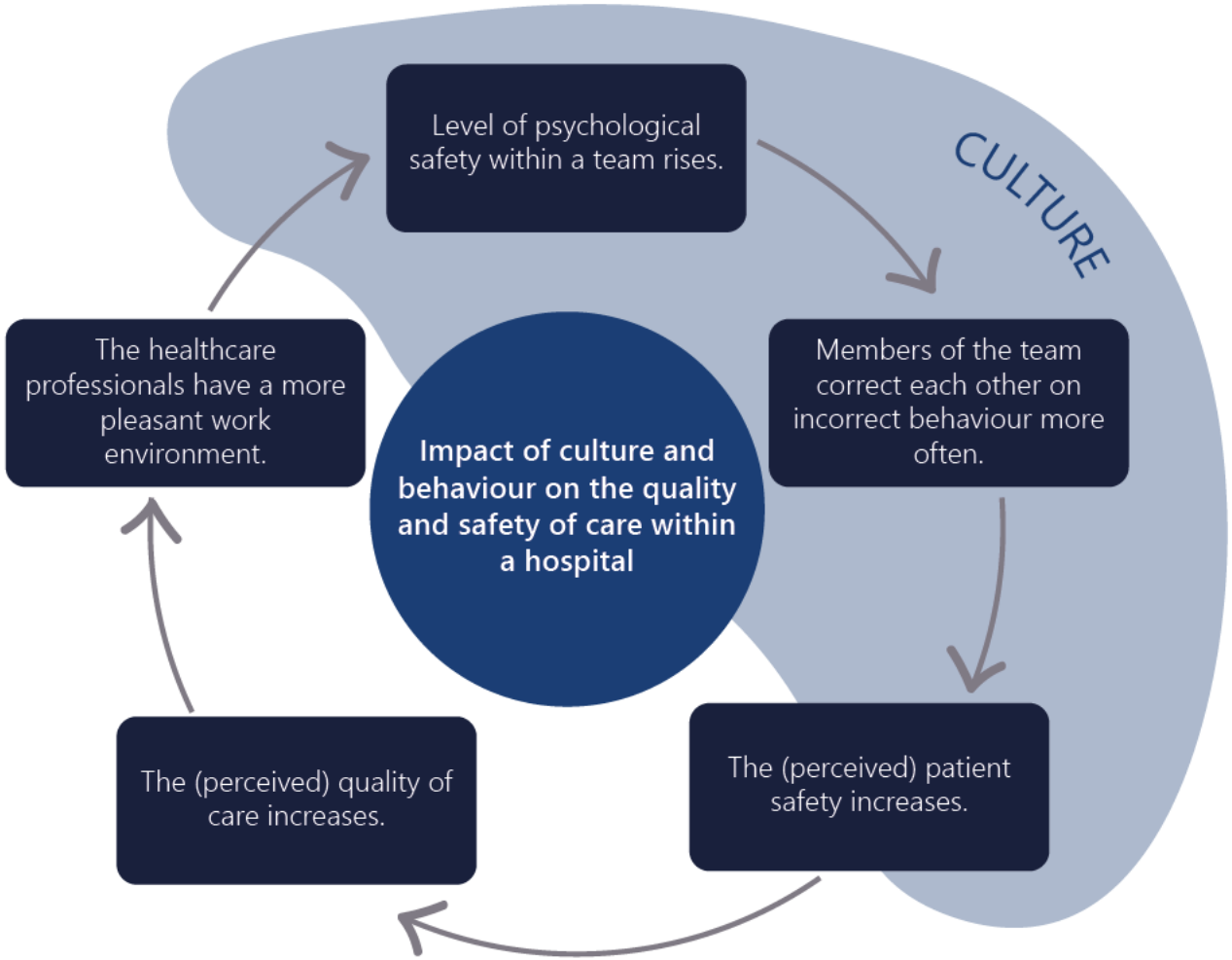

Image 0.3: The aspects that influence the culture within a healthcare context. This model is based on the literature review.

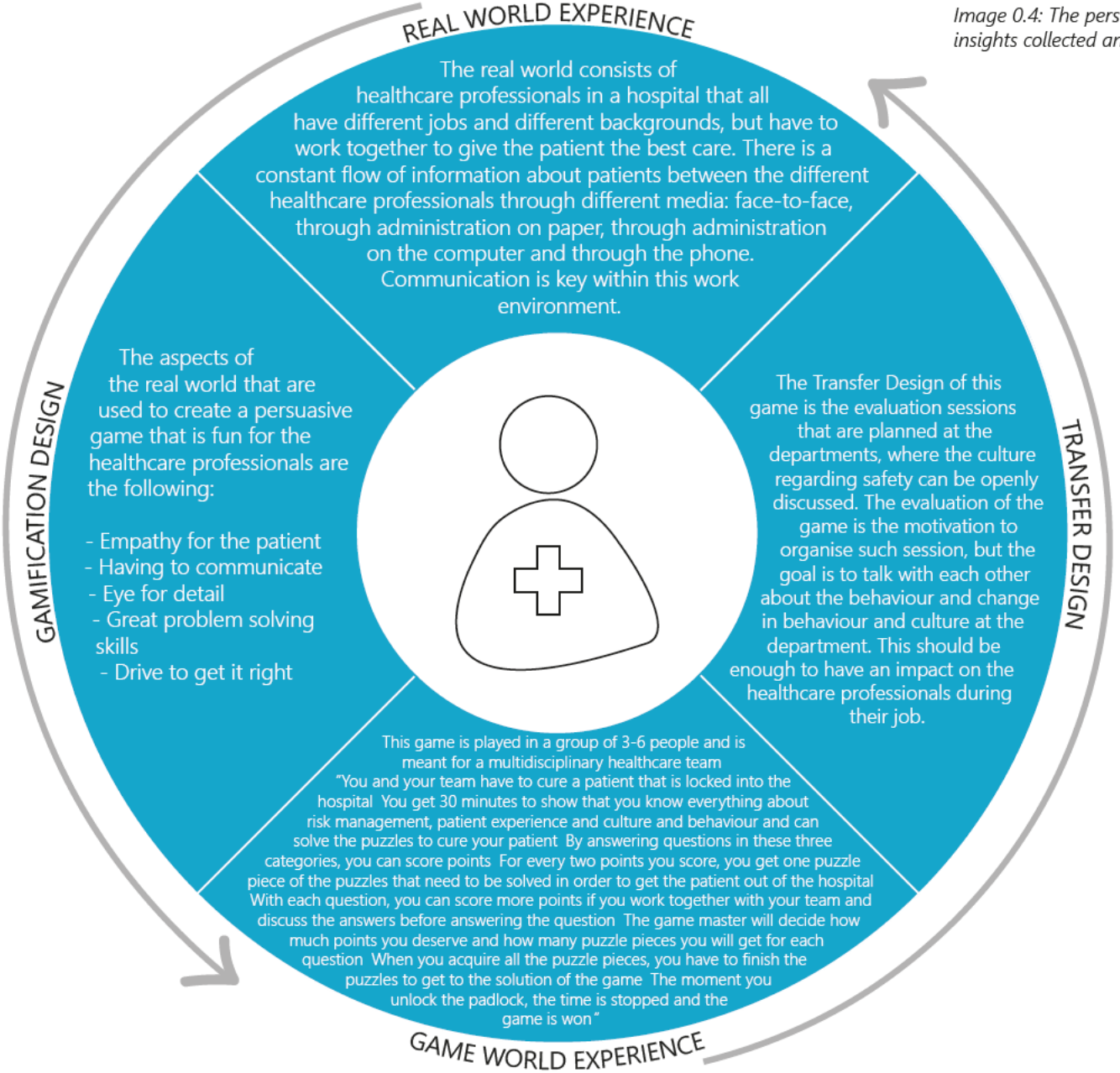

Image 0.4: The persuasive Game Design model, filled in with the insights collected and design made in this report.

Image 0.5: The final design of the game 'Cultuur rondom Veiligheid' photographed from different angles to show all the different aspects of the game.

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Spelkaart
AFDELING
MEDD

1. INTRODUCTION

This project is the development of a serious persuasive game in the healthcare context. This idea was created by the company MEDD and co-designed with the Haga Hospital. This chapter consists of an introduction of the stakeholders, the design that has been created by MEDD and the assignment that was formulated. Later in the report, an overview will be given of the literature review and field research that has been done, which lead to the design goal. This design goal was used to create a new version of the serious game. Some aspects could not be explained in the main report due to confidentiality. These can be found in the confidential appendix.

1.1 The stakeholders

The main stakeholder in this project is the company MEDD. This is an independent design and consultancy agency for healthcare. They use knowledge of the user, quality and safety in co-creation to improve healthcare processes and medical devices, and make them safer. They give trainings to healthcare organisations about risk management, design thinking and guidance during the process. MEDD has designed their own toolbox, the 'Met Elkaar Durven Doen' toolbox. This consists of the process toolbox, the risk toolbox and the newly added Safety Game. This game is being developed with the Haga Hospital in the Hague as co-design partner and is meant to bring healthcare professionals together to discuss three different topics: patient experience, risk management, and culture and behaviour. The game can also be used as a teambuilding activity.

The Safety Game is still in the design phase. A first prototype has been made and tested in the Haga hospital.

MEDD

Improving healthcare by design & development

1.2 The game

Due to confidentiality, only the core elements of the game are described in this chapter. The main aspect of the game, the playing cards, is the most important feature of the game, because these are used to kick-start the conversation between the players. The full explanation of the game can be found in the confidential appendix.

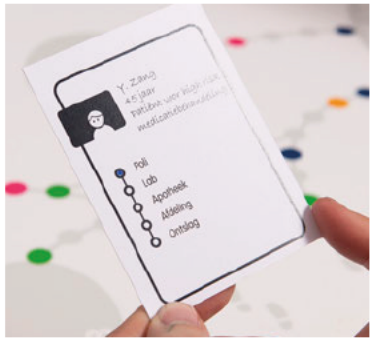
Image 1.1: A preview of the design of the board game.

The game is played on a board that shows the paths a patient can take through a hospital.

The game is interrupted twice to play toolbox games.

The main aspect of the Safety Game that MEDD has designed, are the question cards. These are the base of this idea. These question cards are divided into three categories: Risk Management, Patient Experience, and Culture and Behaviour. The questions in these categories are knowledge based questions, open questions with no right or wrong answer, or small assignments. These cards are physical question cards that motivate the players to come together and start a conversation with each other.

There are playing cards with small assignments to help or set a player back. This brings some dynamics to the game.



Each player has a persona card that shows what route they have to take on the board.

1.3 User test

After the first prototype was developed, the game was played in the Haga Hospital during the week of patient safety. These sessions were used as user tests and some participants filled in a questionnaire about their experience with the game. This questionnaire consisted of five questions and was filled in by seven participants. The questions were:

1. What was you experience of the game?
2. What went well?
3. What didn't go well?
4. Was the usage of the game clear?
5. Do you have any remarks? Are there aspects of the game that you would like to see changed?

Image 1.2: Healthcare professionals of the GGZ in Dordrecht during a user test.

Image 1.3: Healthcare professionals of the GGZ in Dordrecht during a user test.

The general reaction of the players is positive. They find it a very interesting way to learn from each other The game is a sociable way of learning from each other and the game is easily understood. What didn't go so well was the amount of time it took to play the game. Not all the participants had the time to stay and play the game untill the end. Two participants were not from the Haga Hospital and didn't know the answers to the questions that were tailored to the Haga Hospital. A few participants gave a remark on how to make the game more interesting or fitting to the context, but the general reaction was that the game was fun to play.

Because I was not present at these user tests and do not know how they were performed, I decided to conduct my own user tests. A complete user test was done at a GGZ organisation in Dordrecht, two introductions of the game were done at the LUMC and the LangeLand hospital. From these tests and introductions, I got a sense of the strong and weak points of the game.

Image 1.4: Healthcare professionals of the GGZ in Dordrecht during a user test.

The full set up of the user test can be found in Appendix B. The results of the user test and the introductions of the game are presented here..

Execution of the user test

In the GGZ the user test was done with two participants according to the procedure described in the appendix. In the LangeLand hospital in Zoetermeer, the test was done with two participants and the playing time was shortened to twenty minutes. One of the toolbox games was not played and the session was not videotaped. In the LUMC hospital the test was an introduction to one person and the game was played for five minutes. The toolbox games were not played and a conversation followed about the question cards. This session was not recorded.

Results

The general reactions of the players is very positive. They like the game and have fun playing it.

What do the users like?

In general, all the users like the effect of creating awareness with the tool (said by GGZ participants). They also like the fun way of starting a discussion (GGZ participants and LangeLand participants). The threshold is low to react to each other and express an opinion.

How does it help the users in creating more awareness in safety, and culture and behaviour?

As mentioned before, all the participants that played the game experienced the effect of creating awareness with the tool. What mostly helped them in this were the toolbox games. These were first done individually and discussed afterwards, which gave the participants the chance to look at the matter through someone else's eyes. During the general game, the participants also started discussions with each other on the more open questions, but that didn't have quite the same effect of awareness (this was observed at the GGZ institution and the LangeLand hospital). The key was starting the discussion between the participants to create that awareness.

What is redundant in the current tool?

In general, the participants liked the open questions and found the multiple choice questions less interesting. The multiple choice questions were answered individually, so they didn't spark a discussion as much as the open questions. At the GGZ, many abbreviations, which are asked in the multiple choice questions, were unknown to the participants, so they answered these questions through speculations instead of knowledge. Participants of the LUMC and the Lange Land hospital did know most of the answers to the multiple choice questions. In this situation the multiple choice questions didn't spark any interaction between the players, they answered these individually and continued playing.

What is impractical of this tool in its current design?
The board is big, which makes it difficult to carry along and to reach everywhere when it is put on the table. The user test was done within an hour and this was too short to finish the whole game. The GGZ participants stressed that healthcare professionals don't have a lot of time to be playing a game, so it should be to the point and not too long.
During the toolbox games, the board and the pawns were obstacles in the playing of the toolbox games.

The questions are tailored to the Haga hospital, which means that some participants couldn't answer many questions. These questions should be applicable to the facility that uses the tool.

Conclusion
From these tests and introductions, no clear conclusions can be drawn, because the test was done with few participants. The found strengths and weaknesses are points to consider when designing the follow up of this prototype.

1.4 The assignment

The prototype that has been designed by MEDD, has been reviewed by the users and has proven to be an effective way to get healthcare professionals to come together and discuss patient safety with each other. The main aspect of this game are the question cards in three categories. Through a questionnaire (filled in by 58 healthcare professionals of the Haga Hospital) done by MEDD in their design research for this game, it is confirmed that these are three themes that healthcare professionals of the Haga Hospital would like to learn more about.

All of the information given above is the base and starting point of this project. The assignment given by MEDD is to further develop this game for the hospital market and do research on how this game can be designed so it can be used in other healthcare organisations. The game should be fun to play, with question cards based on the three categories. The game should fit the context of the work environment of the healthcare professionals, be meaningful for the users and be easily updated by MEDD.

From the input of the company and the user tests reviewed and done, as previously described, the following requirements are defined.

Performance
1.1 The playing cards in three themes are used to get the healthcare professionals physically together and to start the conversation between healthcare professionals.
1.2 The game needs to be able to be played in a multidisciplinary healthcare team.
1.3 The fundamental idea of the game can be used for different types of healthcare organisations with the question cards in three themes as the centre of the idea.
1.4 The game has a maximum playing time of one hour.

2. RESEARCH

As explained in the previous chapter, the company MEDD has designed a prototype for a game about safety and quality of care within the Haga Hospital, referred to as the Safety Game. The Safety Game is meant to create awareness, and a deeper knowledge and understanding of safety and quality within the hospital. This is divided in three themes: risk management, patient experience and culture and behaviour. This chapter provides background to why it is necessary to create this awareness and what safety and quality within a hospital consists of. The research is done in two phases. The first phase is a literature review where papers have been analysed and an expert on the topic of safety is interviewed. The second phase is a field research, where the context within the hospital is analysed by walking along with nurses and interviewing healthcare professionals. The conclusion of this research is used to add requirements and wishes to the list. The insights that lead to these requirements and wishes are marked in the text and refer to the specific requirement or wish.

2.1 Literature review

Safety is a complex and vague concept. Safety is described in the Oxford dictionary as

"*The condition of being protected from or unlikely to cause danger, risk or injury*"
(Oxford Dictionary, 2019).

Being safe can be divided into two kinds: the first is being protected from hostile situations or people and the second is being protected from accidents or unintentional behaviour (Jop Groeneweg, personal interview, 2019). The latter will be discussed in this report, because it is assumed that healthcare professionals don't intend to cause harm or jeopardise the safety of a patient or colleague.

When breaking down the concept of safety, there are three types of safety to take into account (CGE Risk management, 2018):

1. Process safety
2. Physical safety
3. Psychological safety

Process safety is about using machines to control or monitor a potentially dangerous situation (IOGP, 2019). The process safety is in place to prevent a major hazard from happening. An example in the oil industry is monitoring the corrosion of the metal used in the pipelines to timely stop the oil flow or replace pipelines to prevent oil from spilling. In the healthcare an example of process safety is the usage of a drip feed that administers medicine to the patient. This drip feed gives an alarm when the medicine is running low or when there is a blockage in the lines, protecting the patient from harm.

Physical and psychological safety are both about an individual not getting hurt. They are often clustered in the term personal safety. Physical safety refers to the freedom from physical harm, which means that employees can't hurt themselves by accident. Psychological safety includes being free from worry for physical harm, aggression, harassment, and hostility (Thompson Rivers University, 2019).

These three types of safety are very important for both the employees of the hospital and the patients. Improving the (perceived) safety of the healthcare environment in turn improves the (perceived) quality of care (Baban, Montgomery, Panagopoulou , Todorova, 2013). The term 'perceived' is added, because psychological safety is very personal.

Bal, de Bont, Jerak, Meurs and Zuiderent (2009) describe safety and quality as a process that continually requires work from every person involved in the process. Jop Groeneweg, an expert in the field of safety culture in organisations, (personal interview, 2019, see Appendix A) calls it risk management, because safety is about avoiding risks. In general, there are four types of risks (Bal et al. 2009):

1. Simple risks

As the name states, these risks are simple and have a clear solution. Whether a simple risk is a risk is not dependent on the context where the risk occurs (Bal et al. 2009).

An example of a simple risk is not wearing a seatbelt in a moving car. Whether the driver is going 50 km/h or 120 km/h, it is still a risk to not be wearing a seatbelt. The solution to this risk is simple: put the seatbelt on.

2. Complex risk

A complex risk is similar to a simple risk, but does not have such a straight forward solution. It is a risk no matter the context (Bal et al. 2009).

An example of such a risk in healthcare is the risk of an infection. This is a complex risk, because there are many different factors that can cause an infection, but it is undesired in every situation. To avoid this risk, hospitals have protocols on how to treat patients, when to wash hands etc.

3. Uncertain risk

A risk can be uncertain because there is a knowledge gap or an uncertainty. There is little reliable data about the topic, the assumptions are uncertain, or there is measurement uncertainty. The outcome of acting on the risk is unknown, so it is uncertain whether it is a risk (van Staveren, University of Twente, 2016).

An example of an uncertain risk in healthcare is trying a new treatment on a patient. There is a chance that the therapy will have very bad side effects and it is unknown whether the patient will recover because of this new treatment.

4. Ambiguous risk

The 'ambiguity' refers to different interpretations a certain situation can have to different people that determines whether something is a risk or not. It is dependent on what type of person you are, who is involved, what the consequences may be, etc. (van Staveren, University of Twente, 2016).

An example of an ambiguous risk in healthcare is when a nurse is worried about a patient on the nursing department, because this patient has been acting differently, but there are no indications that the health of the patient has gotten worse. The doctor that visits the patient on his/her rounds doesn't see the issue, because he/she only sees the measured vitals of the patient and has a short chat with the patient. In this chat, the patient seems fine to the doctor, but the nurse is still worried something might be wrong. The nurse and doctor both interpret the situation differently.

For the simple and complex risks, following a clear protocol is enough to avoid these risks from happening. For the uncertain and ambiguous risks, a protocol is not enough. In this case the risks need to be openly discussed among healthcare professionals to find the best solution in every new situation such a risk appears.

R 1.8

Communication

Bijnen, Okuyama and Wagner (2014) also stress the importance of the communication within a healthcare team. They describe that defining risks with each other is important for the understanding of risks for everyone who is part of the team. Communicating about risks also means correcting each other during the job. Bonacum, Graham and Leonard (2004) describe that it is important in healthcare to correct each other, to learn from each other and avoid possibly harmful situations, but that correcting each other or evaluating mistakes in healthcare organisations is difficult. It is often seen as putting the blame on someone. The presence of psychological safety is important for healthcare professionals to dare to speak up (Lyndon, Sexton, Simpson, Rosenstein & Wachter, 2012). This psychological safety is determined by the behaviour of all persons involved. If correcting each other creates a negative response, the healthcare professionals will be less likely to correct each other (Jop Groeneweg, personal interview, 2019). This behaviour, in turn, is determined by the culture within the healthcare facility and healthcare team.

R 1.8

Culture

In the Oxford dictionary culture is described as

"The ideas, customs and social behaviour of a particular people or society"
(Oxford Dictionary, 2019).

R 1.6

Whether a person feels psychologically and physically safe depends on the culture within the group. Healthcare organisations, particularly hospitals, are tricky environments when it comes to culture. For decades, there was a strict hierarchy within hospitals (Brennan, Green, Oeppen, Smith, 2017). During a surgery, for example, the surgeon made the decisions and the team had to follow up on what the surgeon wanted, even if they did not agree. This kind of culture does not allow anyone from the "lower ranks" (e.g. a scrub nurse) to correct a colleague, even if they think the decision of the colleague might have negative consequences for the patient.

In the late seventies in aviation, a new way of working was introduced: Crew Resource Management (CRM). This built upon good communication within a team and making sure that team members work together and listen to each other. The reason this got introduced, is several incidents when someone of higher hierarchical level (like a pilot) did not listen to a warning from someone of a lower hierarchical level (like a flight attendant or air traffic controller) (Haerkens, 2016). Since the introduction of CRM it has been evolving and it has also been introduced in the healthcare sector about a decade ago. Unfortunately this has proven difficult to implement. Some hospitals, for example the Haga hospital in the Hague, use simulation training where a certain scenario, e.g. the stressful admission of a patient, is played out. These trainings help in creating awareness about the culture and importance of CRM, but they take time and it is often difficult to gather a multidisciplinary team to perform the simulation. This makes the change in culture very slow in hospitals.

Even though CRM has been introduced to hospitals over a decade ago, according to research done by Akkermans, Friele, Laarman and Legemaate (2016), many hospitals still have a blame culture: an environment where incidents are kept quiet and colleagues do not correct each other because of fear of the consequences. The psychological safety is low. To try and change this, many types of systems were created where healthcare professionals can anonymously report risks and unsafe behaviour. These systems, like VIM ('veilig incident melding') reporting, are a step in the right direction, but are occasionally used to blame one another for unsafe behaviour (personal observation in a hospital), which does not create more psychological safety. This psychological safety is important for safety and quality of care, because in a group with high psychological safety people are more inclined to speak up to a colleague, because they know that speaking up won't have negative consequences for them personally (Morrison and Milliken, 2003). Another flaw of the VIM system is that it simplifies the risks. The situations with uncertain or ambiguous risks can't be correctly reported, so they are not handled correctly (Bal et al., 2009).

R 1.7

As mentioned earlier, the hierarchy within the organisation of a hospitals is deeply rooted. However, this can be used in a positive way, to increase the psychological safety. Operational supervisors have an examplary function for the rest of the team. If they show the desired behaviour, which is to correct each other and accept that you are being corrected, it is easily copied by the group (Akkermans et al., 2016).

R 5.1

The ideal situation

In the ideal situation, the healthcare facility has an open culture where everyone (nurse, doctor, anaesthesiologist, janitor, etc.) can address one another about safety matters. This means that no one feels ashamed or attacked when they are corrected and they take the time to discuss ambiguous and uncertain risks within the team. In this situation, the employees are not ashamed to share unsafe behaviour, mistakes of their own or ask questions, so these can be discussed within the team. The job for the supervisors is to facilitate this ideal situation. They should react adequately when a notification is made, regarding safety, by a person of the team and always consider the psychological safety of the team (Bal et al., 2009).

Changing culture

The ideal situation is different from the current situation, in image 2.1 and 2.2 the difference between the two situations is sketched. To be able to change the culture within a group of people or organisation, Jop Groeneweg (personal interview, 2019) says that you have to give the people an easy task during which they can show the desired behaviour. By creating an environment where they can practice the ideal situation, the team gets familiar with it. In the petrochemical industry, Shell introduced the rule that everyone always has to hold the handrail of the stairs when they are taking the stairs. Because it is such a simple rule to follow and to check if people are following the rule, the threshold to correct colleagues is low. Holding on to the handrail of the stairs became a stepping stone for the intervention on how to correct each other (Jop Groeneweg, personal interview 2019).

R 1.8

Image 2.1: A sketch of the blame culture that many hospitals still have.

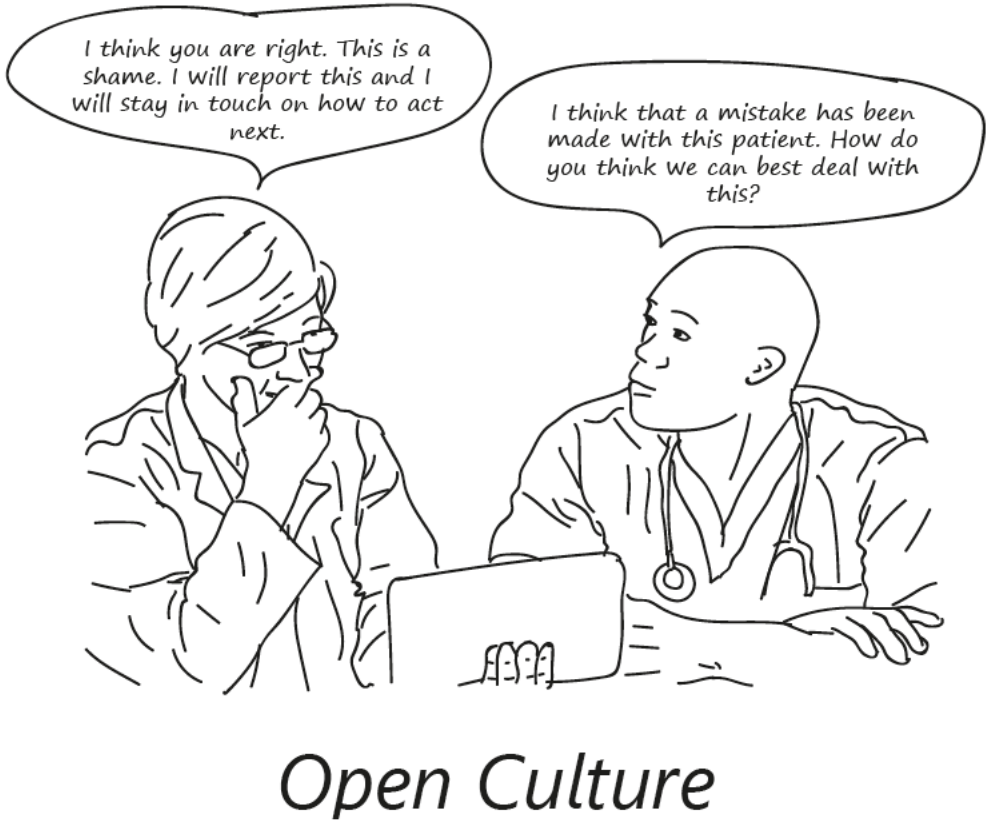


Image 2.2: A sketch of the deal situation, an open culture.

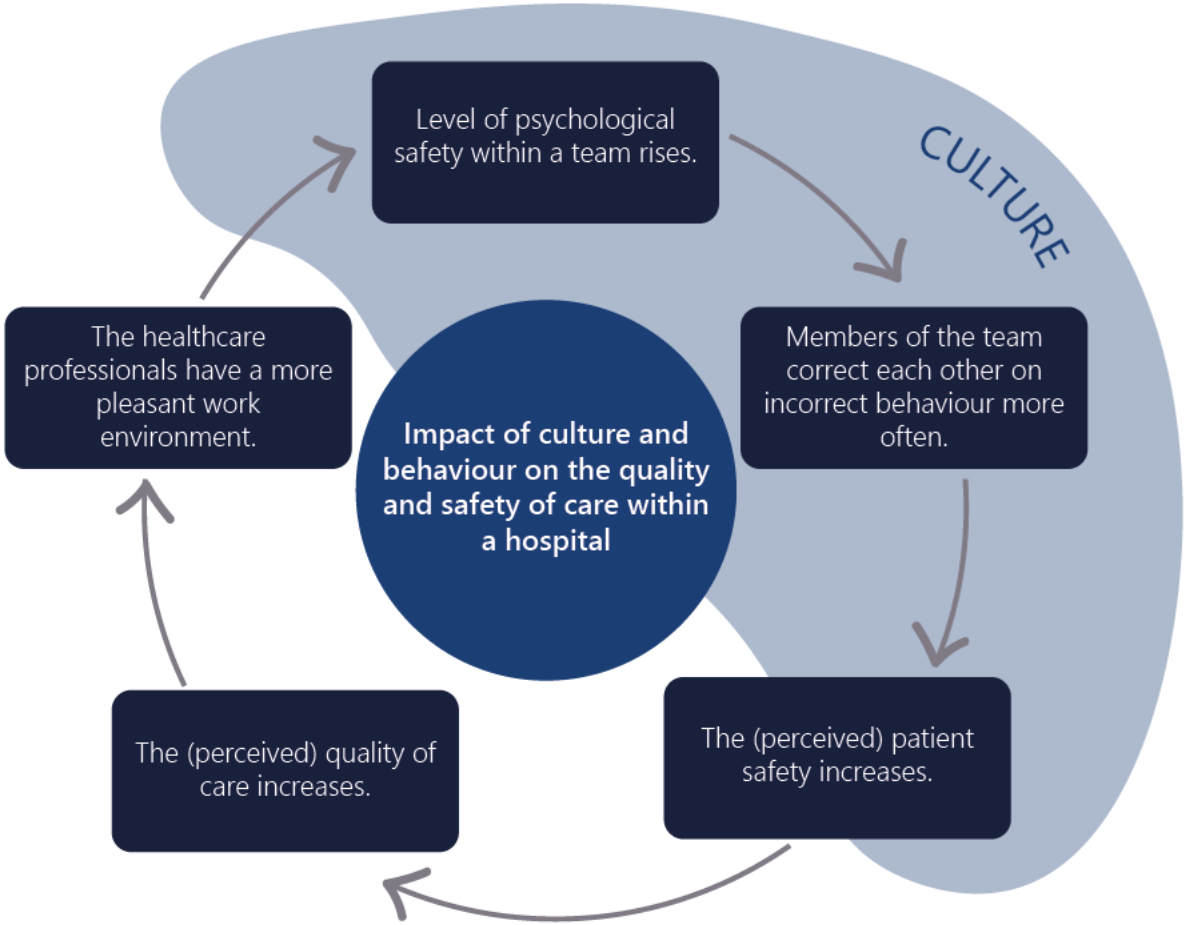


Image 2.3: A model made based on the information from Jop Groeneweg. The model shows the impact of culture and behaviour on the quality and safety of care through different segments.

According to Jop Groeneweg (personal interview, 2019), if a tool is created to change culture, it needs to meet two criteria:

1. There is room for feedback

W 1.3 The users of this tool, need to have the idea that it is making an impact. If this is not the case, the users should be able to discuss this. If the tool is making a difference, the users should be able to express whether they are satisfied with the change and why (not). By giving feedback the users can track the change that is initiated and the tool becomes meaningful.

2. The tool should spark an emotional connect

W 1.5 This emotional connect creates a feeling of wanting to change behaviour. The tool must be emotionally important to the users. A way to create an emotional connect is to use 'I statements', which can be evoked by the questions used in the tool. With 'I statements' users have to talk about their own experiences, which makes it more personal.

The impact of culture and behaviour is visualized in a model that shows the relation between the different segments: level of psychological safety, members of the team correcting each other, the perceived safety, the perceived quality of care and the work environment of the healthcare professionals (see image 2.3). This model is based on the information gathered in this chapter and the input from Jop Groeneweg and represents the culture within a hospital or department. As can be seen from the model, all the individual segments need to be already present in the current situation to improve the current situation and strive for the ideal situation.

Serious, persuasive gaming

As mentioned before by Jop Groeneweg (personal interview, 2019), to change culture and behaviour, the ideal situation needs to be practiced. Kolb (1984) made a model that underlines why giving people a practice environment can help in teaching them the desired behaviour. This is a model that shows what stages are part of the learning process. According to Kolb, there are four stages:

1. Experience (feeling)
2. Seeing and overthinking (seeing)
3. Abstract conceptualization (reflecting)
4. Experimenting (doing)

By going through all these stages (not necessarily in this order), the learning effect increases. Using a practice environment, a person can go through all four stages multiple times and learn the desired behaviour.

R 1.4 Some hospitals, like the Haga hospital, already use simulation training to practice the desired behaviour. However, this training is time costly, which makes it hard to gather a sufficient team to make the training successful. As a result the simulation training doesn't occur very often, making it hard for the participants to give feedback on this tool and emotionally connect to it.

A popular way to create a practice environment is through serious gaming (Bogers, Faber-de Lange, Weijers & Westerman, 2014). The definition of a serious game is "a game that facilitates realistic simulations to train the players or help them to learn or experience new competences" (Dalmolen & Monen, 2013). Serious games have been used in healthcare before in different shapes and with different goals. There are many types of games that can be an inspiration to a serious game. The most important features are that the game fits the context and reaches the desired goal. This means that the form of the game should follow from function and context (de Ridder, Vegt, Vermeeren, Visch, 2016). Two types of games that have already been tested in healthcare are the 'HAN zorggame' (Bogers et al., 2014) and the card game 'Kwaliteit in Mensen' (van Leeuwen, 2011).

HAN ZORGGAME

The HAN zorggame is a role playing game developed by the Hogeschool van Arnhem en Nijmegen, a college in the Netherlands. This game is meant to create awareness of the chain of healthcare, the patient journey, and the efficiency of the hospital. The game was tested in the healthcare environment. The test proved that the players gained more insights into the efficiency of the hospital and how their department could contribute to this by playing the game (Bogers et al., 2014).

KWALITEIT IN MENSEN

The card game 'Kwaliteit in Mensen' is a game with cards that have questions or assignments on them. Every person of a healthcare department that wants to join can pick a card and take it along with them during their shift. At the end of the shift the results of the cards can be discussed in a discussion session among all the healthcare professionals that joined. There has been a positive response to these cards, because it gets the conversation started between healthcare professionals. It is a step towards better communication within a healthcare team. (van Leeuwen, 2011)

R 1.7 Earlier it was stated that open communication is very important in the healthcare environment for the quality of care. By creating the ideal situation through a game, the threshold of starting a conversation is lowered. In such a situation the risk of social 'failure' by saying something wrong is smaller, because it is a game, a 'fake' R 2.2 situation (Vegt, Visch,2013). For the design of the game, it is important that the players enter the game wilfully, it should not feel as an obligation (Kolb & Kolb, 2010). By forcing people to play, the psychological safety gets lowered which prevents the players to fully emerge themselves in the game, lowering the success of the game. R 2.1-2.9 Iten and Petko (2016) state in their research that the game should be fun to play, but that it should stay clear and to the point. Adding extra features just to make it more fun makes the game vague and can make the players stray from the learning goal. For a complete view on the requirements for designing a game, the book The Art of Game Design, a book of lenses, is used (Jesse Schell, 2008).

The persuasive game design model

For designing a game, Anderiesen, van der Kooij, Vegt and Visch (2013) have developed the Persuasive Game Design (PGD) model. The definition of a persuasive game is: "Game design aiming to create a user experienced game world to change the user behaviour in the real world" (Anderiesen et al., 2013). This definition links to the earlier mentioned definition of a serious game. The PGD model, designed by Anderiesen et al., helps define how to design a game that fits the context and reaches the desired goal.

This model includes the real world experience, gamification design, the game world experience, the transfer design and the user in the centre. The real world experience is the context that the user is involved in and what needs to be changed through this persuasive game. From this real world, the gamification aspects can be derived. These are aspects that can be used in the game to motivate the players to play the game. In the healthcare context, the gamification aspects are the aspects that motivate the healthcare professionals to do their job the best they can. These aspects make them enjoy their job. These gamification aspects are taken into the design of the game world, they determine the type of experience the users will have in the game world. Finally the transfer design is the way the user changes his/her behaviour in the real world as a consequence of playing the game.

The literature review is used to fill in the first part of the PGD model, the real world experience. To fill in the gamification design, a field research is done.

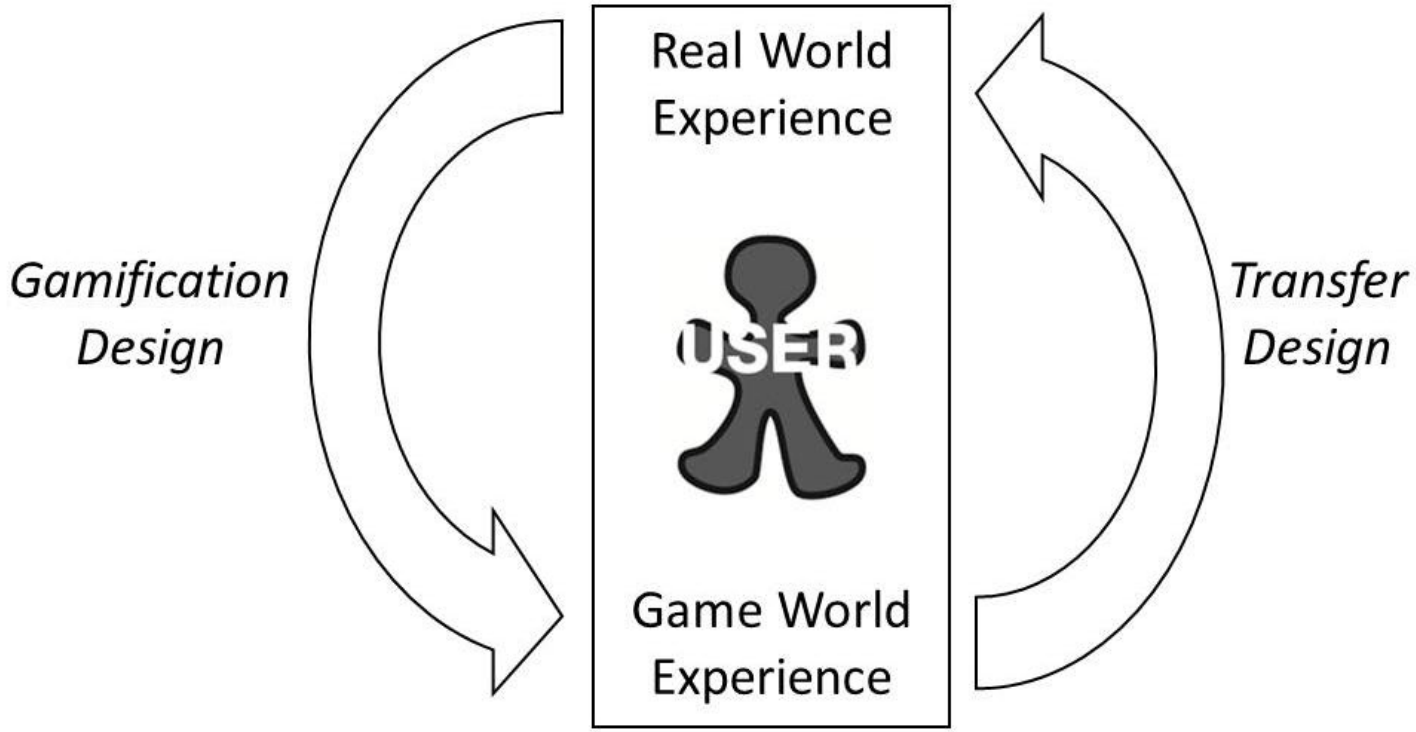


Image 2.4: The persuasive Game Design model, as designed by Anderiesen, van der Kooij, Vegt and Visch (2013).

2.2 Field research

In this field research, nurses of the Haga hospital are shadowed (this is described in the confidential appendix) and different healthcare professionals of the Haga hospital are interviewed. This created an idea of what motivates healthcare professionals to come to work every day and do their job to the best of their abilities.

Collecting data

A group of nurses from the Haga Hospital was shadowed for an entire work shift, to get an idea of a typical workday for these nurses. The focus of this research method was to observe the nurses during their shift and see what motivates them to do their job. During this tagging along, some nurses, doctors and a unit head were interviewed on their motivation to do this type of job and the aspects they loved the most of their job. These interviews were done in an informal setting, through a conversation, so there is no documentation of the questions and answers. The conclusion of the observations and interviews are given here.

Gamification aspects

Healthcare is a very broad sector with many different job descriptions, from surgeon to pharmacy assistant, to head of a department. These are all different types of people with different levels of education, but they do have some similarities. Some aspects of the "real world" (the broad context of a hospital) apply to everyone. These aspects are important for the job or are aspects that motivate the healthcare professionals to do their job.

What drives the healthcare professional:

- *Empathy for the patient*

Taking care of another person means that you have to have a lot of patience and a big heart. Every person in the hospital who takes care of patients, has empathy for these patients, in their own way. Making sure the patient gets better is top priority.

- *Wanting the best care for the patient*

This connects to the previous point. These people do not only want the patient to get better, they strive for the best care for the patient.

What the healthcare professionals need to do their job right:

- *Clear communication*

Communication is key within a healthcare team. When something changes in the situation of a patient, all care givers of this patient need to be made aware of the new situation.

- *Eye for detail*

Taking care of an ill person is looking for patterns and deviations from this pattern. Small details matter in every aspect of the job, whether it is a patient having surgery, a patient getting the right type and amount of medication, or a patient describing a small deviation from their normal daily life. Healthcare professionals are trained to catch the small details that can make the difference.

- *Great problem solving skills*

Except for being able to spot the details, healthcare professionals are faced with difficult problems every day. They have a limited amount of time and many patients to treat. Next to that they have patients that have their own needs and wishes.

- *Drive to get it right*

This is connected with wanting the best care for the patient and great problem solving skills. Healthcare professionals have an internal drive to do their job the best they can, because it is about human lives.

All of these aspects can be used in the design of the game world experience to motivate the user (in this case any type of healthcare professionals) to play the game and have fun while playing.

2.3 Conclusion

In this chapter, the healthcare context was explored. Through a literature review the context of the culture around safety and risk management was sketched and through a field research the motivation the healthcare professionals have to do their job is explored. These insights are used to fill in the Persuasive Game Design (PGD) model. This model is created by Anderiesen, van der Kooij, Vegt and Visch (2013) and is used to structure the designing of a persuasive game.

To conclude, a serious persuasive game can be used to increase the (perceived) safety within the hospital, which increases the (perceived) quality of care. Using the PGD model, a game can be designed for the healthcare professionals in a hospital to practice the desired behaviour in an ideal situation, which then can be used to change the behaviour in the real world.
Communication is key in the hospital. To be able to manage any type of risk within the healthcare domain, the healthcare professionals have to communicate the risks to each other and correct each other when protocol is not being followed. This is difficult, because of the hierarchy within hospitals and the blame culture that many hospitals have. Crew Source Management training and 'Veilig Incident Melden' did not change the blame culture within these hospitals yet, because these methods take a lot of time and energy, or are used as an anonymous way to put the blame on someone.

In a serious persuasive game the ideal situation can be practiced to make all the healthcare professionals familiar with it, in a safe environment. If mistakes are made in the game world, it won't have fatal consequences for the patient. Through this method, healthcare professionals can be made aware of their own behaviour and how this influences the culture within their department. This awareness will help to change the behaviour in the real context.

With all this information, the PGD model is filled in:
The user is in the centre of this PGD model. In this context, the user is a healthcare professional in a hospital. The real world experience is the current context that these healthcare professionals are in and the gamification design are aspects that can be used to make the game interesting for the healthcare professionals to play. In the Game World Experience, the healthcare professionals should be able to create the ideal situation, which is an open culture.

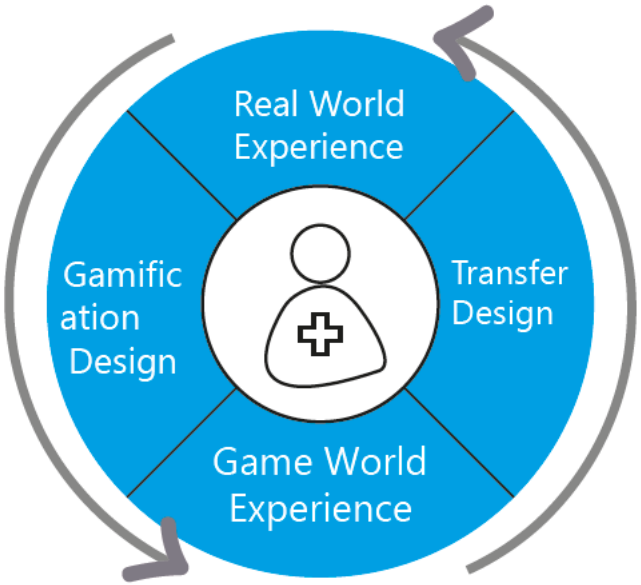


Image 2.5: The persuasive Game Design model, redesigned by me. This is the format that is used in this report.

The real world experience

The real world consists of healthcare professionals in a hospital who all have different jobs and different backgrounds, but have to work together to give the patients the best care. There is a constant flow of information about patients between the different healthcare professionals through different media: face-to-face, through administration on paper, through administration on the computer and through the phone. Communication is key within this work environment. By communicating clearly with each other, the healthcare professionals can manage risks that occur in treating a patient. To be able to do this, the healthcare professionals should feel psychologically safe to speak up and correct each other where necessary. Unfortunately, in most departments of a hospital, there is a blame culture, preventing healthcare professionals to correct each other and learn from each other. If this blame culture is changed into an open culture, where everyone can correct each other and there is no fear of getting blamed or feeling ashamed, the patient safety increases.

Gamification design

The aspects of the real world that can be used to create a persuasive game that is fun for the healthcare professionals are the following:

- Empathy for the patient
- Wanting the best care for the patient
- Having to communicate
- Eye for detail
- Great problem solving skills
- Drive to get it right

Game world experience

In the game world, the healthcare professionals should be able to experience the ideal situation, which is an open culture in the hospital. They should be able to correct each other, ask questions to each other and dare to say they don't know something, without getting judged for it.

The insights of this research are used to define the problem and make a design brief, which is used in the ideation phase. The most important requirements and wishes that are derived from the research are stated here.

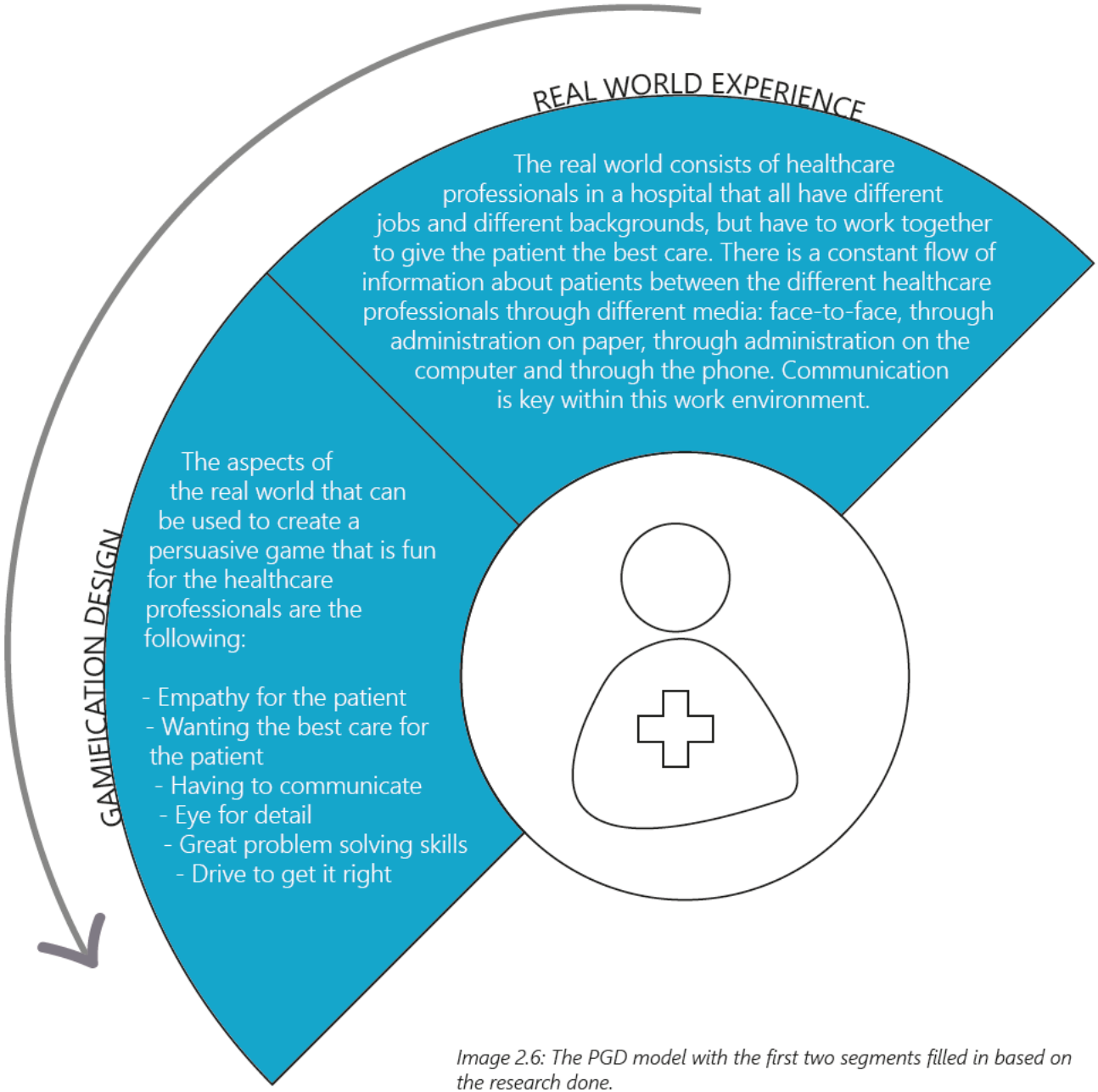


Image 2.6: The PGD model with the first two segments filled in based on the research done.

From the literature and field research, a couple of demands and wishes can be added to the list. The full list can be found in Appendix C, here the requirements and wishes which are highlighted in the research text are listed.

Requirements

Performance

1.4 The game has a maximum playing time of one hour.
1.6 The game helps to understand how culture can be changed, it makes the players aware by using question cards in three themes: Patient Experience, Risk Management, and Culture and Behaviour.
1.7 Players of the game have to feel psychologically safe while playing the game.
1.8 The game should encourage players to show the desired behaviour as is described in the ideal situation: clear communication between healthcare professionals, they correct each other on the job and understand how their behaviour effects the safety of their colleagues and the patient.

Game Design

2.2 The game has to be entered wilfully

Appearance

5.1 The game should appeal to the board/person in charge that has to order and implement it, in regard to the price, the goal of the game and the effecivity of the game.

Wishes

Performance

1.3 Players get to reflect on their current culture and how his is changing through the game
1.5 The players should have an emotional connect with the game.

3. DESIGN BRIEF

In the previous chapter, the context of this project was explored. This lead to an understanding of safety in the healthcare environment and can be used to define the problem. In the first chapter, the assignment of this project was explained. In this chapter, the problem that the assignment solves is be defined, based on the research done. A design brief is used to define the scope of the design phase.

3.1 Problem definition

After doing a literature review and a field research, the problem definition, that the assignment is the solution to, can be made. To make this definition, the WWWWWH method is used (Delft Design Guide), which means that the questions what, who, where, when, why and how are answered. The complete overview of this method can be found in Appendix D. In this chapter, a short conclusion of this method is given.

The problem is the closed culture at departments of the hospitals in the Netherlands where employees of the hospital (healthcare professionals) don't feel psychologically safe enough to correct each other on behaviour that influences quality and safety of care. This culture is called a blame culture and every healthcare professional has to deal with this culture during their work shifts. It prevents healthcare professionals to learn from each other and timely prevent mistakes from happening. The solution lies in the way the healthcare professionals behave, how they react to each other and how motivated they are to work as best and as safe as they can to keep the quality of care maintained.

3.2 Design brief

The problem definition states the problem that needs to be solved. To define how this problem will be solved, the design brief (Delft Design Guide) is formed. This defines the goal of the project and how this goal will be achieved. In image 3.1 it is shown what this design brief is based on and in image 3.2 is shown what the design brief leads to.

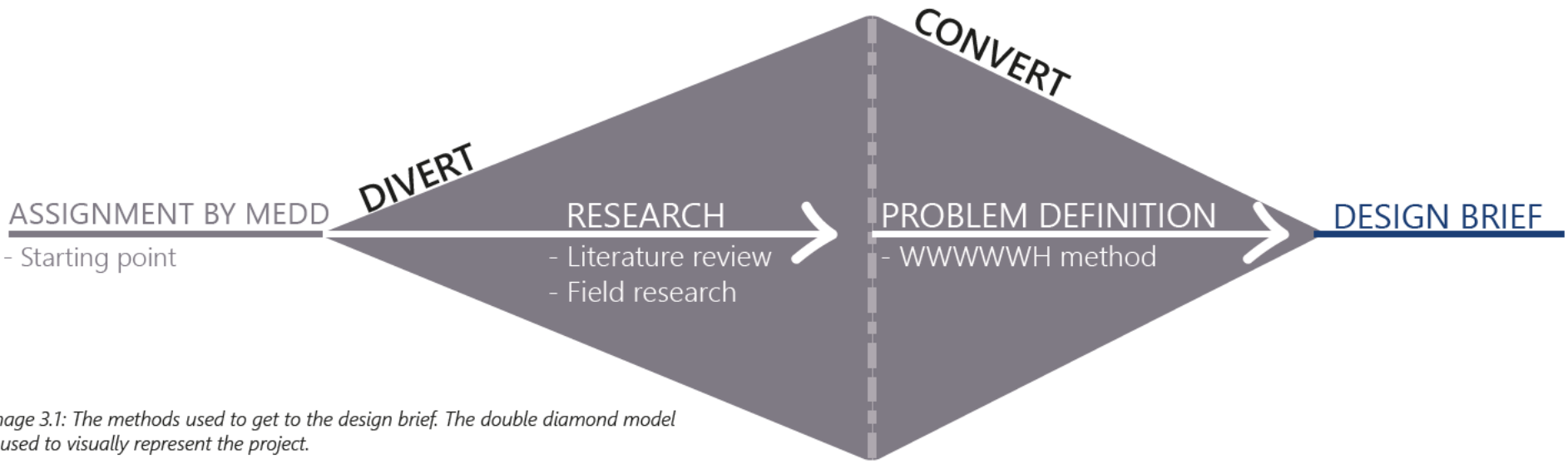


Image 3.1: The methods used to get to the design brief. The double diamond model is used to visually represent the project.

Goal
Designing a meaningful, serious, persuasive game for healthcare professionals to gain lasting awareness on their behaviour regarding safety and how they influence their own safety and that of others.

The serious persuasive game should motivate the users to change behaviour if necessary.

Creating awareness
To make the healthcare professionals understand their own behaviour and why they should correct each other, they should be aware of the situation.

- Understand how they work (what is their own behaviour)
- Understand how to deal with feedback
- Know how and when to correct a colleague

Changing behaviour
To be able to correct each other, this should be accepted by everyone. The way someone reacts on feedback or correction, determines the culture within the group of people. If this is a culture with a high psychological safety, the feedback will be taken in well and dealt with. Otherwise it won't be accepted and someone might feel personally attacked.

- Going from a blame culture to an open culture
- Taking own responsibility (in learning and correcting each other)

Team building
In healthcare, the healthcare professionals have to work together a lot. It makes it easier if they know how to communicate with each other. They can learn this through the serious game where they have fun together. It becomes a team building activity.

With this serious game, the participants can practice the ideal situation in which they act out the desired behaviour. This applies to starting the discussion with each other as well as refreshing the memory on various knowledge. From this, lasting awareness is created.

The Safety Game that MEDD has designed has this same goal. As mentioned in chapter 1.3, the user test results, the game does not completely match the desires of the context and the company yet. This is why a further development is done. The main aspect of the game are the playing cards in three categories: Patient Experience, Risk Management, and Culture and Behaviour. These categories are confirmed by the users through a questionnaire and during the interview after the user tests. These playing cards and categories will be preserved, with the only adjustment that the questions will be generalised, so they can be used in any hospital.

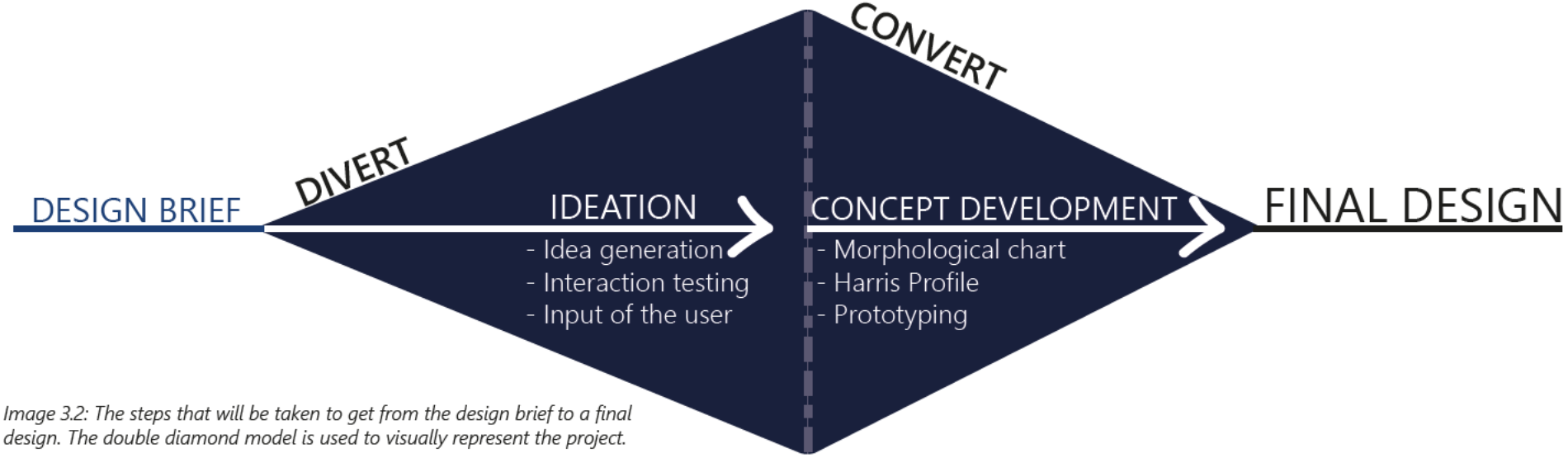
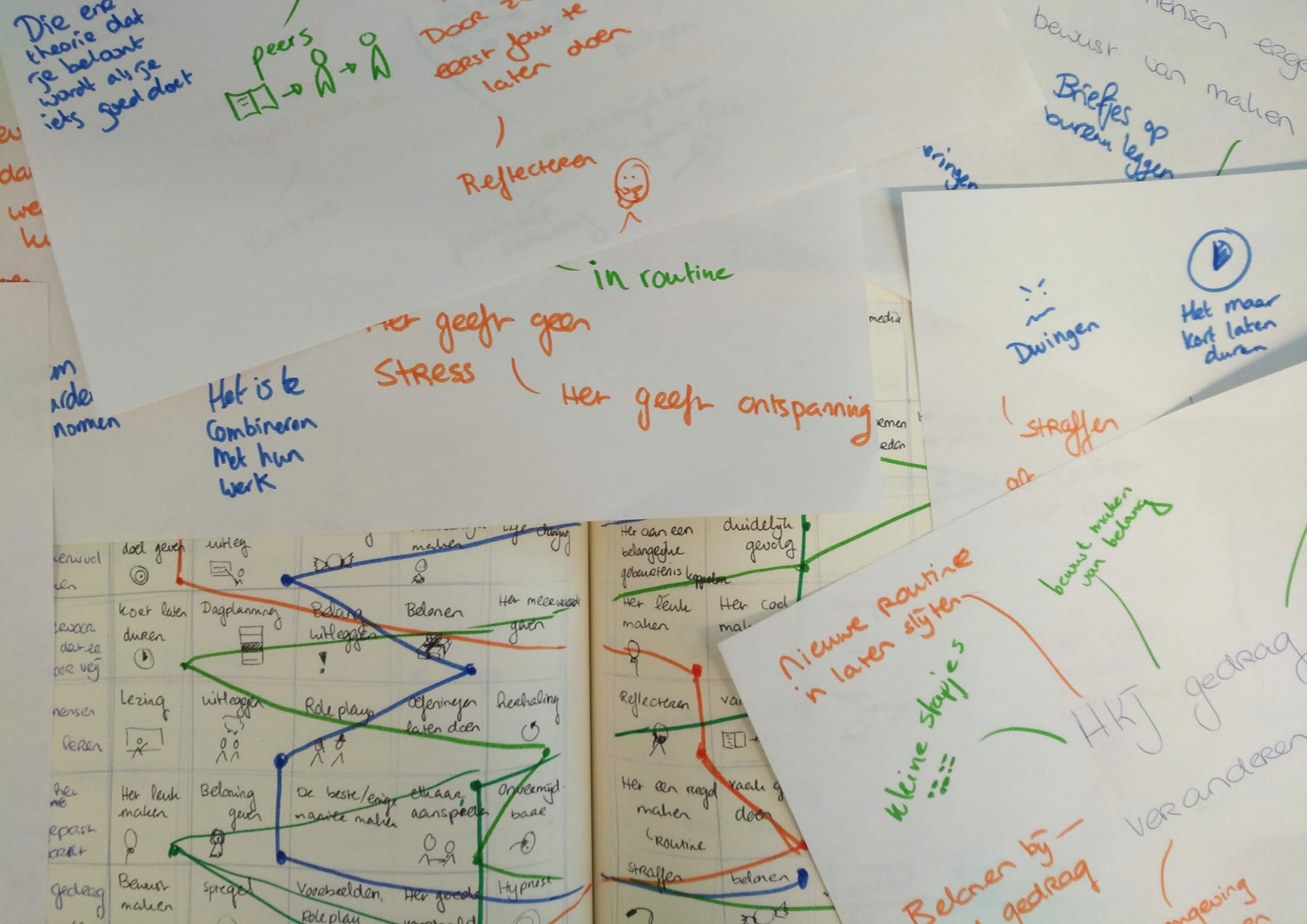


Image 3.2: The steps that will be taken to get from the design brief to a final design. The double diamond model is used to visually represent the project.


Die ene theorie dat je bedoelt wordt als je iets goed doet
peers
Door ... eerst jouw te laten doen
Reflecteren
in routine
Het geeft geen Stress
Het geeft ontspanning
Het is te Combineren Met hun werk
Dwingen
straffen
Het maar kort laten duren
bewust maken van belang
Nieuwe routine in laten slijten
kleine stapjes
HKJ gedrag
veranderen
Belonen bij gedrag
doel geven
uitleg
koer laten duren
Dagplanning
Belang uitleggen
Belonen
Lezing
uitleggen
Rolplay
oefeningen laten doen
herhaling
Het leuk maken
Belang geven
Bewust maken
spiegel
Voorbeelden
Hypnose
Het aan een belangrijke gebeurtenis koppelen
duidelijk gevolg
Het leuk maken
Reflecteren
Routine
straffen
belonen

4. IDEATION PHASE

In the previous chapter, the problem is defined and the goal of the project is mapped out in the design brief. The design brief is the starting point for the ideation phase, in which multiple ideas will be generated to create concepts. These concepts are concepts of the game world that needs to be created as part of the PGD model. The ideation is done in three phases. Firstly, ideas are created through different methods. Secondly, the interaction between players is tested with some paper prototypes. Lastly, the ideas and paper prototypes are presented to healthcare professionals within the Haga hospital to include their opinion. The result of each phase is put into a morphological chart (Delft Design Guide) from which three concepts are made.

4.1 Ideas

To create ideas, different methods were used. The idea generation was kicked off by using How To's (Delft Design Guide), which were based on the design brief. In a brainstorm session (Delft Design Guide) with more Industrial Designers, more How To's were created which were clustered and gave four design directions. In a morphological chart, the results of the brainstorm were combined with the gamification aspects from the PGD model. This resulted into three ideas.

How To's

The first step taken was generating How To's from the requirements and wishes that came from the research done. How To's are questions which are formulated to divide the 'problem' in many different aspects.

For example: Requirement 1.6 ; The game helps to understand how culture can be changed, it makes the players aware by using question cards in three themes: Patient Experience, Risk Management, and Culture and Behaviour.
The How To: How to make people aware? (See image 4.1)

This has been done for different aspects of the problem, here are all the How To's made:
- How to make someone aware?
- How to make something last?
- How to make something relaxing?
- How to make a team grow closer together?
- How to start a discussion?
- How to make something fun?
- How to make something dynamic?
- How to make something meaningful?

The full visual overview of these How To's can be found in Appendix E. These How To's are used in the development phase to fine tune design.

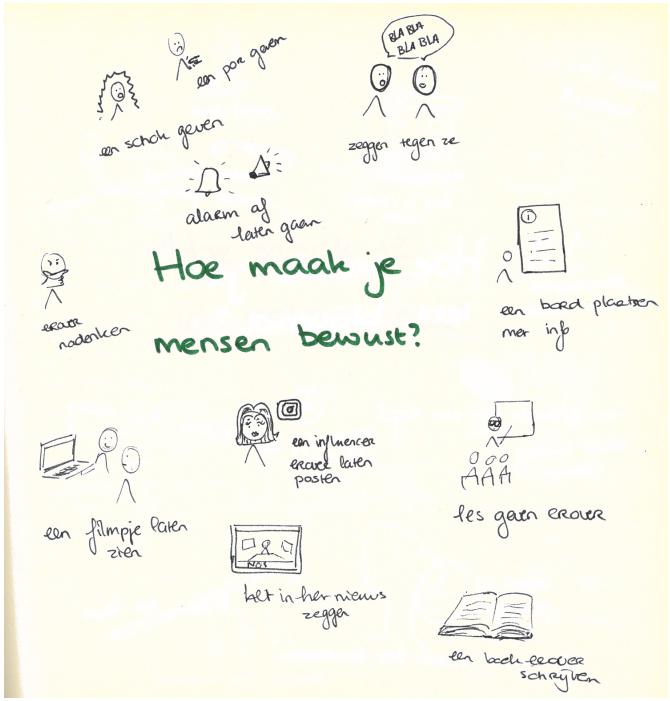


Image 4.1: An example of a How To. This one is used in the ideation.

Brainstorm

The How To's were done alone, but the Brainstorm method is generally done in a group of people. A group of fellow students from the IDE faculty was assembled to brainstorm over this project.

The following steps were followed:
- First the team was introduced to the context of the project.
- Next the general idea was explained, the design brief was shared.
- As a last step, How To's were generated together and each How To was written on a separate sheet.

A timer was set for two minutes and every member of the team got a sheet with a How To question. Every two minutes the sheets were circulated, so everyone could write ideas at every How To (see image 4.2).

When all the How To's had been circulated, the time was stopped and the different ideas were clustered. The problem is too complex to end up with concrete ideas through this method, so the clustered ideas gave idea directions. The clustering was done through a morphological chart (Delft Design Guide), which can be found in Appendix F.

The design directions that came from the clustering, are:

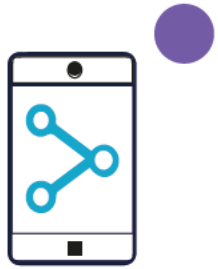
1. Let the healthcare professionals make something by themselves. It is done in multiple relaxing sessions where the healthcare professionals can relax and reflect on their behaviour.
2. There is a lesson on behaviour and influence of behaviour on culture. These are multiple lessons and the healthcare professionals that are part of these lessons and display the desired behaviour get rewarded.
3. Smaller assignments where healthcare professionals have to help each other or correct each other on the assignment. The assignment is centred around the patient.
4. Giving consequences to behaviour by having a strict department head that gives the right example. Once in a while there is a session to reflect.

Combining the ideation and the gamification aspects in the PGD model, some ideas were created. This combining can be seen in image 4.3, which also shows the first three ideas.

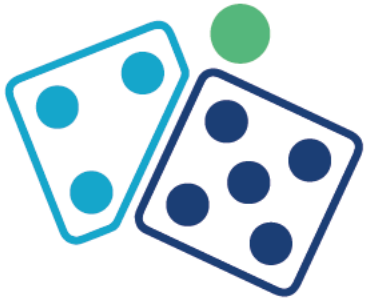
1. A digital idea
2. A board game idea
3. An escape room based idea

Image 4.2: Some of the How To's created with the group.

 Brainstorm direction	Let healthcare professionals make something by themselves. It is done in multiple relaxing sessions where the healthcare professionals can relax and reflect on their behaviour.	There is a lesson on behaviour and influence of behaviour on culture. These are multiple lessons and the healthcare professionals that are part of these lessons and display the desired behaviour get rewarded.	Smaller assignments where healthcare professionals have to help each other or correct each other on the assignment. The assignment is centred around the patient.	Giving consequences to behaviour by having a strict department head that gives the right example. Once in a while there is a session to reflect.		
 Gamification Aspects	Empathy for the patient	Wanting the best care for the patient	Having to communicate	Eye for detail	Great problem solving skills	Drive to get it right



Digital Idea



Board Game Idea

Escape Room Idea

Image 4.3: A visual representation of the clustering of the design directions with the gamification aspects. With coloured dots, the ideas are linked with the direction and aspects on which they are based.

4.2 Interaction testing

When the first ideas started flowing, it became clear that this problem could be solved in many different ways with many types of games. Every type of game has its own interaction between the players. This is why an interaction testing session is done. To be able to do this, the two physical ideas that followed from the generation of ideas on the previous page were made into paper prototypes. Each idea that was paper prototyped, can be played in different types of interaction. The goal of testing the desired interaction, is to find out what fits the context of the healthcare professionals the best and to see if there is a significant difference between the types of interaction.

To investigate what kind of interactions exist in games, multiple existing (board) games were analysed.
The interactions that can be derived from how other games are designed are:

a. Playing as one group together, there is no individual scoring
b. Playing as one group together, but there is individual scoring
c. Playing as individuals against each other

To test this, two type of games were paper prototyped with different aesthetics. This was done, to make sure that the results of the test are not dependant on the type of game that was played.

Board 1 is a board with no path on it, there are circles with names of the different departments in the hospital (see image 4.4). The players have a pawn that has to go through the hospital, based on a persona card with patient journey, but they can only go from one place to another by giving a correct answer to the questions.

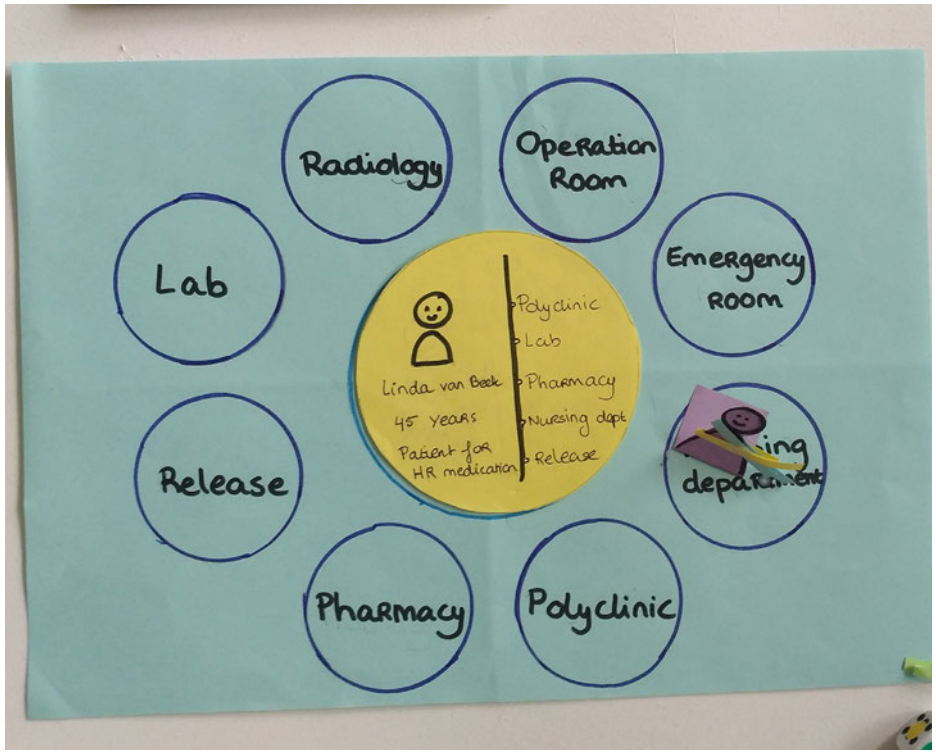


Image 4.4: A picture of board 1.

Image 4.5: A picture of board 2.

Board 2 is a board with a path through the hospital (see image 4.5). The path consists of loose parts, which means that the path can move and be blocked. The players have to think strategically on how they will guide their patient through the hospital in this moving maze. The paths can be moved, but this can only be done if a player answers a question correctly.

The interaction testing was done with friends and family, who have no medical background. Some question cards from a different game were used that have knowledge-based questions and small assignments on them. The test was done with a group of three people and myself as the game master. Each board was tested with all three interactions, which means that six different situations were tested. Each situation took 10 minutes of playing and a few minutes of questions for the participants.

Results

In image 4.6 an overview is given of the results. With both boardgames, the participants liked the interactions **a** and **c**. The interaction where they had to work together as a group, but got individual scoring (**b**) created frustration between the participants, which is not the interaction that is desired. In situation 1.a and 2.a the participants worked together and helped each other. The difference between those situations is that in situation 2.a the participants divided tasks. The strategic person took on the task to look at the board and find the fastest way through the hospital, while the others had to answer questions. In situation 1.a the group worked together to answer the questions.
In 1.b and 2.b there was no difference between the situations. The players felt uncomfortable in these situations, because they were confused whether their personal scoring was more important than the group performance. Some frustration arose between the players in these situations.

In 1.c and 2.c the players had less interaction with each other. They were thinking about their own questions quietly. In situation 2.c, the game proceeded very slowly, because the participants had to find the best strategy and how to change the board.

Name situation	Type of game board	Type of interaction	Result
1.a	Board 1	Playing as one group with no individual scoring.	The participants worked together, they took the question cards in turn and answered them together.
1.b	Board 1	Playing as one group with individual scoring	The participants feel uncomfortable and some frustration arises between them while playing.
1.c	Board 1	Playing individually against each other	The participants individually answer the questions. There is little interaction between the players when answering the questions.
2.a	Board 2	Playing as one group with no individual scoring.	The participants worked together, but divided the tasks. The most strategic one was in charge of the board, the others answered the questions.
2.b	Board 2	Playing as one group with individual scoring	The participants feel uncomfortable and some frustration arises between them while playing.
2.c	Board 2	Playing individually against each other	The participants individually answered the questions. There is little interaction between the participants and the game proceeds slowly, because each participant has to think about the best strategy.

Image 4.6: An overview of the results of the interaction test.

4.3 Input of the user

The paper prototypes were not only used to test the interaction between players, they were also used to present the first ideas to the intended user, the healthcare professionals. First, the ideas and type of interactions were presented to the employees of the department Quality and Safety in the Haga Hospital. After this presentation, the group got to give feedback to the ideas and give a preference. Two other sessions were planned with nurses and doctors from the Intensive Care and a nursing department in the Haga Hospital. In these sessions, the healthcare professionals gave their opinion on the ideas and added some extra wishes which would make the game more interesting to play.

The wishes that the healthcare professionals mentioned are:

- Make the game time limited

The healthcare professionals stressed that it should not take longer than 45 minutes to play the game. They preferred 30 minutes, because a clinical lesson usually takes 30 minutes.

- Make sure the discussion can flow

The goal is to get the healthcare professionals to think and talk about the patient safety and how their behaviour can influence this. This means that there should be room for a discussion about it.

- Simulate the desired behaviour

The employees of the Quality and Safety department liked the idea of giving the players a task in which they have to show the desired behaviour. This comes close to simulation training.

- Stimulate interaction between people

The players can't get a discussion going if they don't interact with each other. The game should stimulate the interaction between the players.

- Zoom in on culture at departments

The Haga Hospital has been very invested in their culture and how culture and behaviour are linked to risk management. The nurses and doctors mentioned that they would like to learn more about culture and how to improve their culture. A game would be more interesting to these healthcare professionals if it zoomed in on the culture.

4.4 The combination

After diverting the focus during the ideation phase, a morphological chart is used to converge the ideas into three concepts. These concepts are further explained on the next pages. One of these concepts is chosen to be continued with in this project.

On this page a visual is shown of the morphological chart (see image 4.7). In this visual, the left column refers to the ideation method is used and the columns to the right show the idea directions generated from this method. With coloured dots and coloured lines, the different idea directions are connected with each other and combined into one concept. The concepts are coded with a colour.

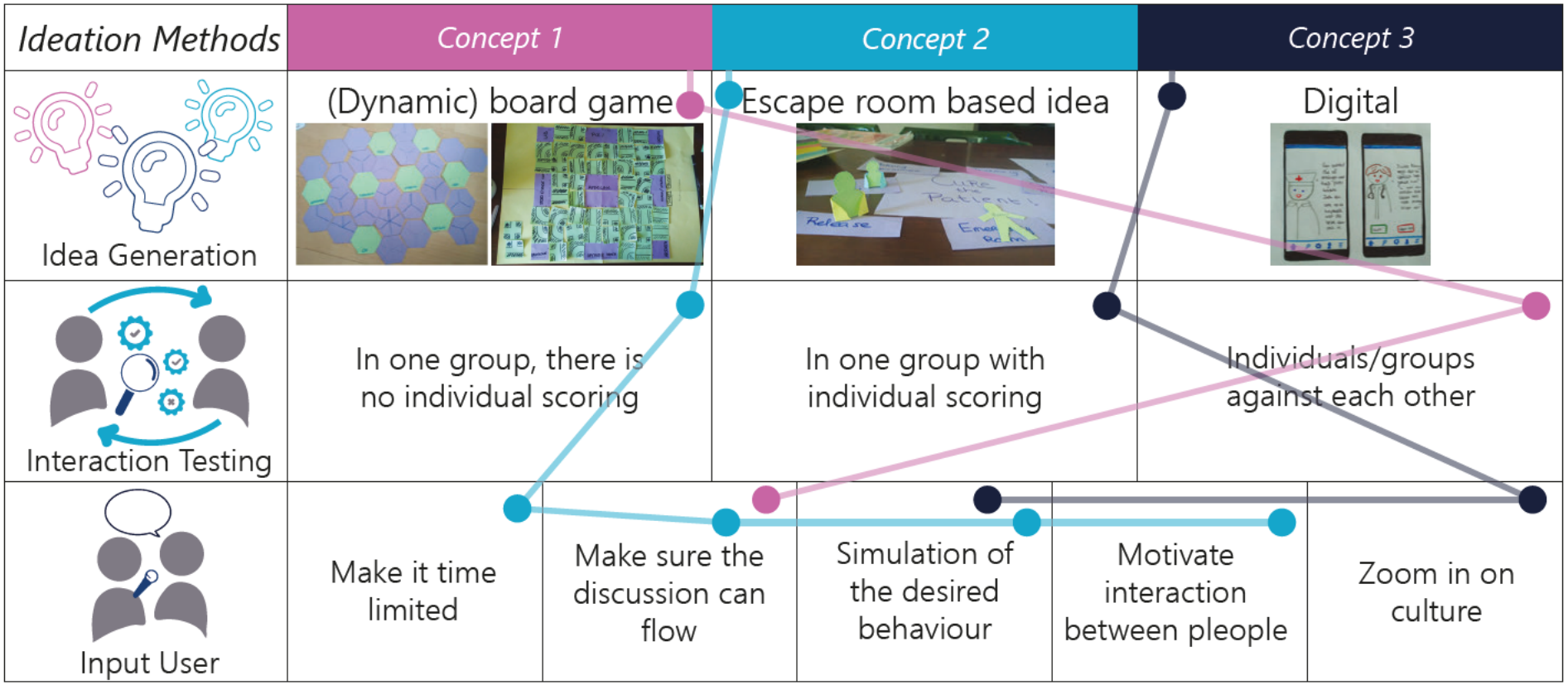
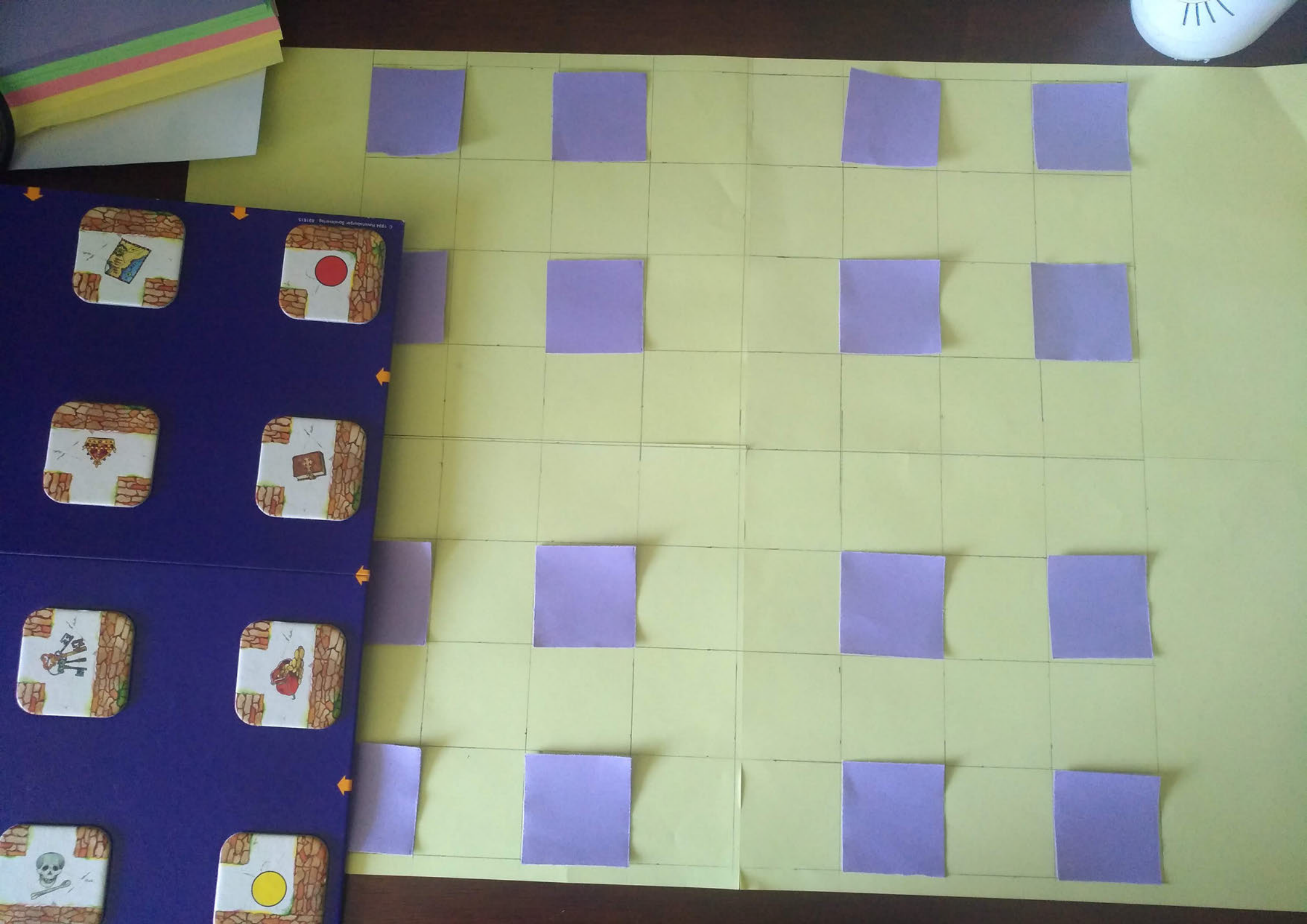


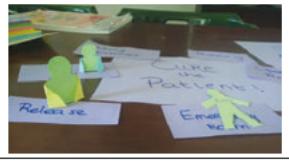
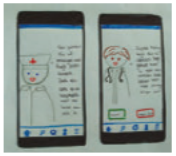
Image 4.7: The morphological chart used to create three concepts.



5. CONCEPTS

In the previous chapter, the ideation phase is described, where different ideas were generated and clustered into three concepts. Those three concepts are shortly presented in an overview here below. In this chapter each concept will be explained in more detail. Each concept is detailed with the same criteria, so they can be compared to each other.

Image 5.1: An overview of the three concepts that will be presented in detail.

	Concept 1	Concept 2	Concept 3
 Brainstorm direction	Let the healthcare professionals make something by themselves. It is done in multiple relaxing sessions where the healthcare professionals can relax and reflect on their behaviour.	Let the healthcare professionals make something by themselves. It is done in multiple relaxing sessions where the healthcare professionals can relax and reflect on their behaviour.	Smaller assignments where healthcare professionals have to help each other or correct each other on the assignment. The assignment is centred around the patient.
 Gamification Aspects	- Empathy for the patient - Wanting the best care for the patient - Having to communicate - Eye for detail	- Empathy for the patient - Having to communicate - Eye for detail - Great problem solving skills - Drive to get it right	- Having to communicate - Drive to get it right
 Interaction	Individuals/groups against each other	In one group, there is no individual scoring	In one group with individual scoring
 User Input	- Make sure the discussion can flow	- Make it time limited - Make sure the discussion can flow - Simulation of the desired behaviour - Motivate interaction between people	- Simulation of the desired behaviour - Zoom in on culture
 Appearance	(Dynamic) board game 	Escape room based idea 	Digital 

5.1 Concept 1: The Board Game

This concept is very similar to the first prototype made of the Safety Game. It consists of a board that has the floor plan of the hospital, pawns, question cards, persona cards and a checklist. Take a look at the visual of the filled in PGD model of this concept to see the full description of the idea.

Similarities to the original prototype

Almost every aspect of the original prototype is kept. The first thing that has been adjusted is that the board is changeable. The paths between the stops can be changed, which gives an extra challenge for the players. The second adjustment is that this game is played in teams of two or three healthcare professionals against each other. This is done, because there is a chance that a healthcare professionals needs to leave during the game. Within the group, the healthcare professionals can interact with each other, motivating them to communicate with each other.

Playing time

The playing time is about 30-45 minutes. It ends when one team reaches the exit of the hospital with three tokens.

Production and price

An estimate has been made of the production time and the selling price. The production time is calculated to be four weeks and the selling price is estimated between €30,- and €50,-. The calculations can be found in Appendix G.

Maintenance

To keep the game relevant, the playing cards will have to be updated. This will require input from the hospital (what themes or kind of questions they would like). To maintain the game, an evaluation session with the hospital will have to be planned. The new playing cards can be printed, but they can also be sent digitally. The hospital will get the documents that are needed for the toolbox games digitally, so they can print them. MEDD can also renew the utilities needed for the toolbox games for a small fee. All the parts that get lost (pawns, dice, tokens) can be renewed by MEDD for a small fee.

Based on similar existing games and the reaction of healthcare professionals in the Haga Hospital, the following positive and negative aspects are listed.

+ It is a team-building activity
+ There is the element of competition between the teams
+ Within the teams there is room for cooperation and communication
+ There is no time pressure, so the discussion can flow
+ It can be played in a multidisciplinary team

- To be able to play the game, a big group needs to be assembled
- The playing of the game can go on for longer than 45 minutes
- The aesthetics of the game might scare off people that don't like playing board games.

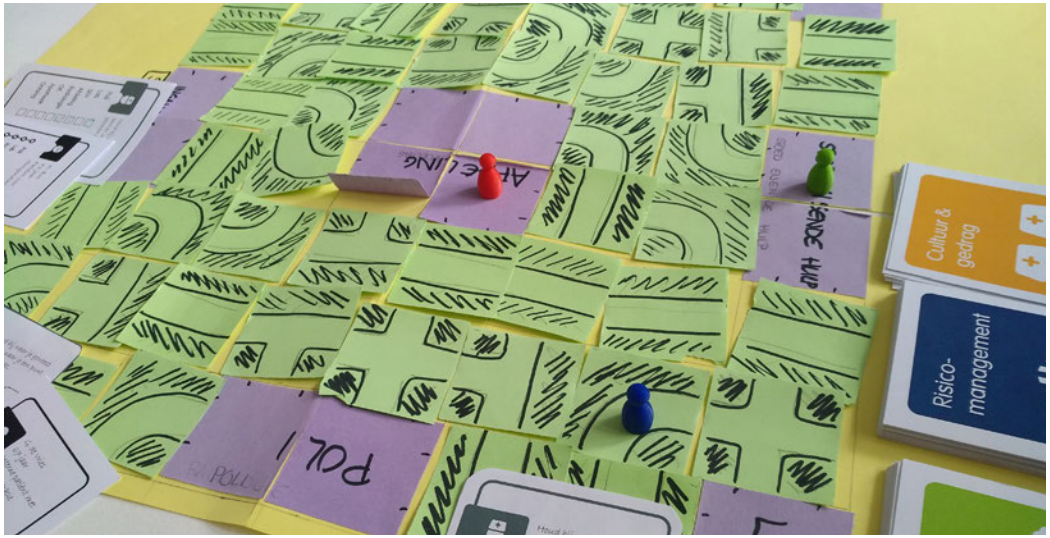
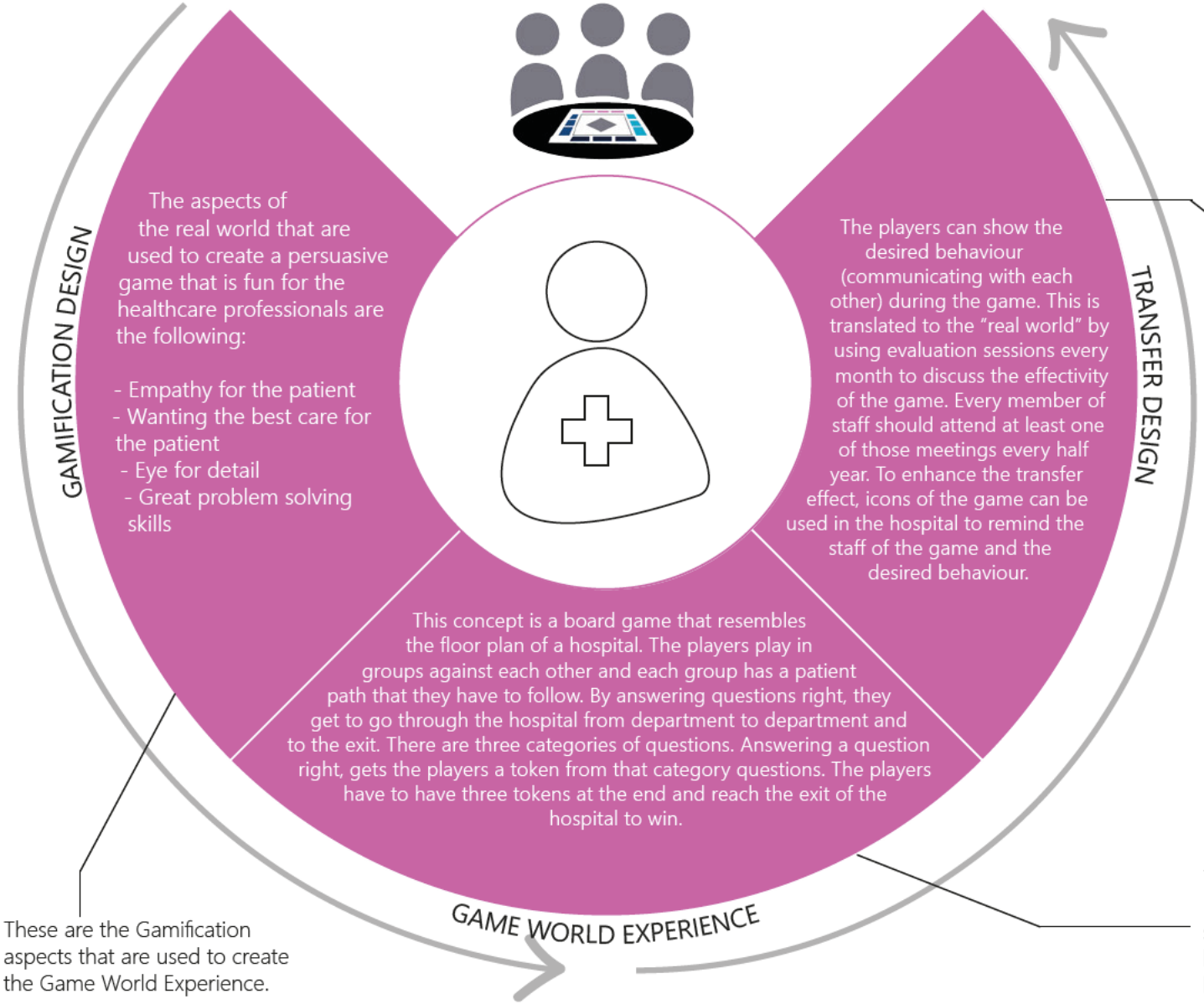


Image 5.2: The paper prototype of this concept.

Image 5.3: The paper prototype of this concept.



The Transfer Design is the way that this concept will have an influence on the real world. Through the Transfer Design, the users get to use the skills they learned in the game. In this case, through evalutaion sessions, the healthcare professionals can evaluate the effect of the game on their department and through icons that can be put on the white board on the department, small reminders can be made to stimulate the game behaviour in the real world.

These are the Gamification aspects that are used to create the Game World Experience.

This is the explanation of the Game World Experience. The Game World Experience should motivate players to show the desired behaviour. In this concept, the desired behaviour is motivated through a group dynamic and the goal to get the patient through his/her journey.

Image 5.4: The PGD model filled in for this concept. Here the Game World Experience of the game is explained and how this has an effect on the Real World experience through the Transfer Design.

5.2 Concept 2: The Puzzle Game

This concept is based on the idea of an escape room. The players play in one group together to follow the path of a patient. The game consists of question cards, pawns, a representation of the hospital (which can be a board), a timer and persona cards. Take a look at the visual of the filled in PGD model of this concept to see the full description of the idea.

Similarities to the original prototype

This game is very different from the original prototype, but it still has similarities. The question cards in the game are the same as in the original prototype. The same persona cards can be used as in the original prototype. The biggest differences are that there is no visual path of the patient, that the game is time limited and that it is played in one group that has to work together.

Playing time

The maximum playing time is 30 minutes. The game ends when the team reaches the goal or if the time runs out.

Production and price

An estimate has been made of the production time and the selling price. The production time is calculated to be four weeks and the selling price is estimated between €30,- and €50,-. The calculations can be found in Appendix G.

Maintenance

To keep the game relevant, the playing cards will have to be updated. This will require input from the hospital (what themes or kind of questions they would like). To maintain the game, an evaluation session with the hospital will have to be planned. The new playing cards can be printed, but they can also be sent digitally. The hospital will get the documents that are needed for the toolbox games digitally, so they can print them. MEDD can also renew the utilities needed for the toolbox games for a small fee. All the parts that get lost (pawn, dice, tokens) can be renewed by MEDD for a small fee.

Based on similar existing games and the reaction of healthcare professionals in the Haga Hospital, the following positive and negative aspects are listed.

+ It is a team-building activity
+ The time is limited
+ The scores of each team can be compared, which gives the element of competition
+ It demands good communication within a team
+ It can be played in a multidisciplinary team

- For the session to start, there have to be enough participants
- The game is time limited, so the discussion might get cut short

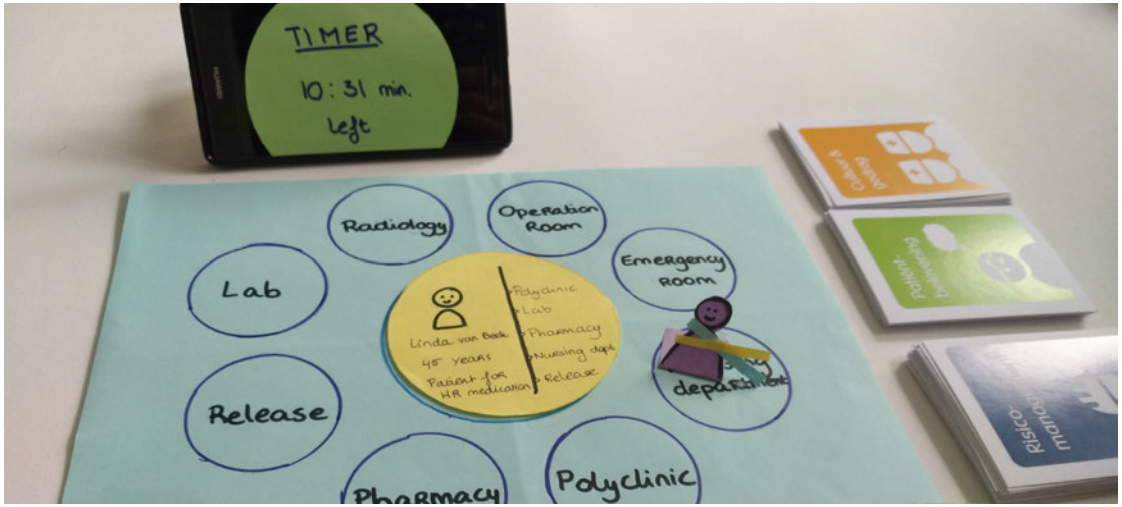
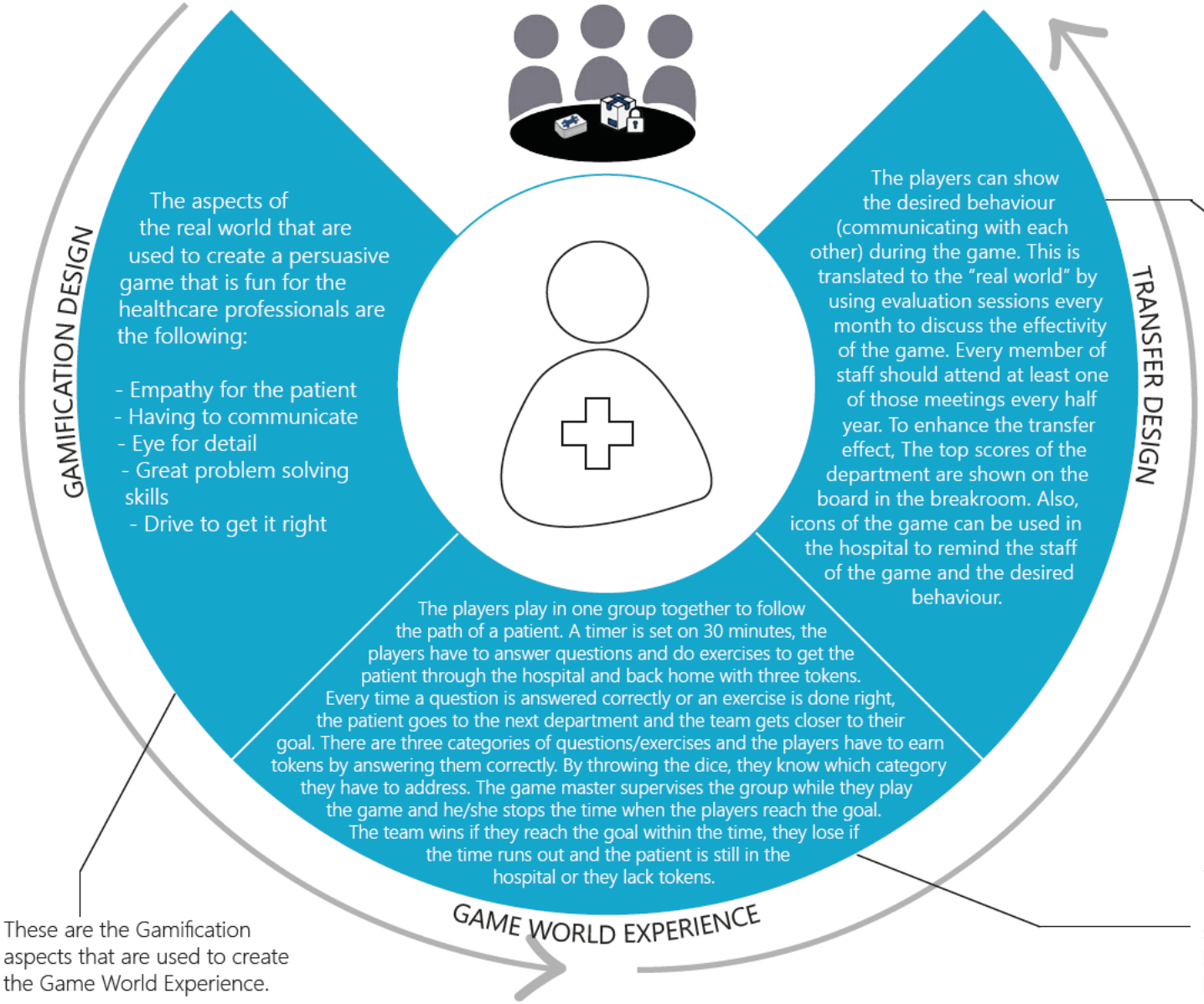


Image 5.5: The paper prototype of this concept.

Image 5.6: The paper prototype of this concept.



These are the Gamification aspects that are used to create the Game World Experience.

The Transfer Design is the way that this concept will have an influence on the real world. Through the Transfer Design, the users get to use the skills they learned in the game. In this case, through evaluation sessions, the healthcare professionals can evaluate the effect of the game on their department. The best scores are listed at the department, stimulating everyone from the department to become part of the group that played the game. Through icons that can be put on the white board of the department, small reminders can be made to stimulate the game behaviour in the real world.

This is the explanation of the Game World Experience. The Game World Experience should motivate players to show the desired behaviour. In this concept, the desired behaviour is motivated through a group dynamic and the goal to get the patient out of the hospital before the time runs out.

Image 5.7: The PGD model filled in for this concept. Here the Game World Experience of the game is explained and how this has an effect on the Real World experience through the Transfer Design.

5.2 Concept 3: Shapp your Culture

This concept is something completely different, because it is a digital concept. Players can download this game in the form of a digital application. The game consists of questions and assignments for individual players and a smart phone or computer is needed to be able to play this game. Take a look at the visual of the filled in PGD model of this concept to see the full description of the idea.

Similarities to the original prototype

The only similarities this game has with the original prototype, are the questions asked and assignments given within the game. This is a digital version of the question cards in the three categories, as presented in chapter 1.

Playing time

This game is played every day for about 2 – 10 minutes. Every week the evaluation session will take about 30 minutes.

Production and price

An estimate has been made of the production time and the selling price. The production time can vary from 3 months to a year, this depends on how many functionalities the digital interface will have. The selling price is estimated between €0,- and €50,-, this depends on how professionally this app is designed. The calculations can be found in Appendix G.

Maintenance

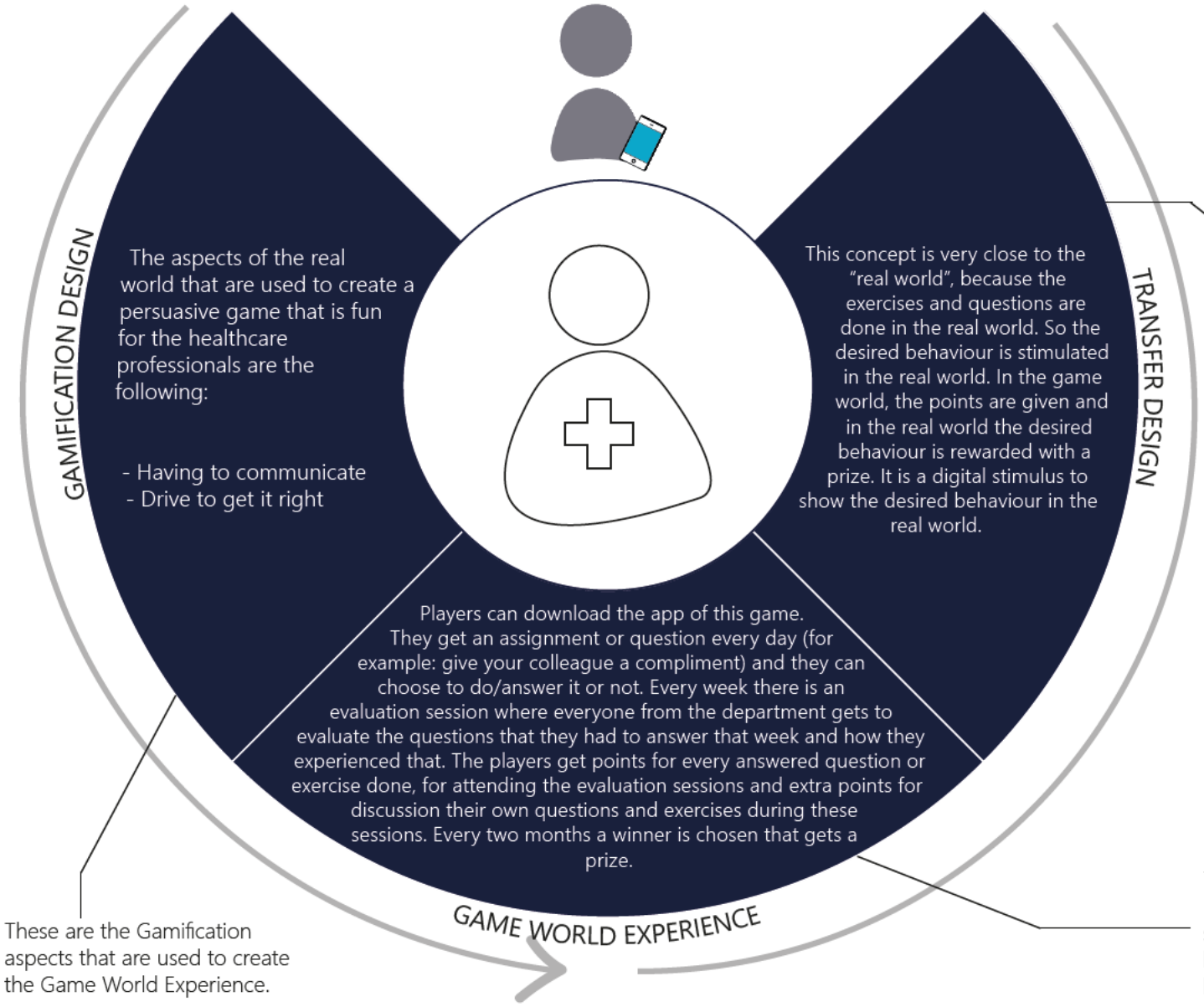
To keep the game relevant, the questions and assignments will have to be updated. This is easily done through the digital platform. For the input of the update, MEDD will need input from the players, which can be collected through the evaluation sessions done in the hospital. Feedback can also be collected on a digital platform through the app. When new questions and assignments are made, they only have to be added to the app and the app gets updated. Dependant on how professionally the app is designed, this is easily done.

Image 5.8: A digital prototype of this concept.

Based on similar existing games and the reaction of healthcare professionals in the Haga Hospital, the following positive and negative aspects are listed.

+ There is the element of competition between individuals of a department
+ It can be easily updated and renewed
+ The progress of the department gets evaluated and monitored digitally
+ The departments can compete against each other in terms of their progress within the department

- It is hard and time costly to realize
- The participants need to own a smart phone to be able to participate
- It is not necessarily fun to play



These are the Gamification aspects that are used to create the Game World Experience.

The Transfer Design is the way that this concept will have an influence on the real world. Through the Transfer Design, the users get to use the skills they learned in the game. In this case, the users are already asked to perform the desired behaviour in the real world while playing the game. This is extra motivated through evaluation sessions. Here the healthcare professionals can evaluate the effect of the game on their department.

This is the explanation of the Game World Experience. The Game World Experience should motivate players to show the desired behaviour. In this concept, the desired behaviour is motivated through questions and assignments that directly influence the real world.

Image 5.9: The PGD model filled in for this concept. Here the Game World Experience of the game is explained and how this has an effect on the Real World experience through the Transfer Design.

6. COMPARE AND DECIDE

In the previous chapter, the three concepts were presented that followed from the ideation phase. These concepts each have their own aspects that makes them fit for the context. To be able to make a choice with which concept to continue, a Harris Profile (Delft Design Guide) is used. In this Harris Profile, a list of requirements and wishes are chosen and put in order of importance. In this chapter the order of importance of the requirements and wishes will be explained and the Harris Profile is performed, ending with a concept choice.

Order of importance

The requirements and wishes are rated on importance for the project, for the company and for the user. The requirements and wishes that are important for the project are requirements and wishes that followed from the research that is done. The requirements and wishes that are important to the company are requirements and wishes that are stated at the beginning of this report, in chapter 1. These requirements and wishes are seen as part of the assignment. The requirements and wishes that are important to the user are the requirements and wishes that followed from interviews with healthcare professionals. After each group has given their opinions on the importance of the requirements and wishes, a final list was made of the most important requirements and wishes put in order of importance.

Harris Profile

To make a choice between the three concepts, a Harris Profile (Delft Design Guide) is used. For this Harris Profile, the most important requirements and wishes are listed and the concepts are rated on how well they fulfil this requirement or wish. The concepts are rated by me, after all three concepts are presented to the user and the company, so their opinions are taken into account in the rating. The concept that scores the best will be further developed.

From image 6.1 can be seen that the Puzzle Game has the best score.

Image 6.1: The Harris Profle filled in for all three concept ideas.

The Board Game

The Puzzle Game

Shapp your Culture

		The Board Game	The Puzzle Game	Shapp your Culture
R 1.8	The game should encourage players to show the desired behaviour as is described in the ideal situation.			
R 2.1	The game has the element of competition.			
R 1.4	The game has a maximum playing time of one hour.			
R 1.3	The game has to be adjustable to other hospitals and healthcare organisations.			
W 1.4	The game enhances team performance, team cohesion and psychological safety on the job.			
R 1.1	The playing cards in three themes are used to get the healthcare physically together and to start the conversation.			
R 1.6	The game helps to understand how culture can be changed, it makes the players aware.			
W 3.1	The price is around €30 for the department of the hospital.			
W 1.2	The game helps in breaking the strict hierarchy that exists in hospitals.			


Risico-
management
Cultuur &
gedrag
De patiënt
A. Janssen
25 jaar
Patiënt met spoed
OK
Als deze patiënt binnen de tijd
ontslagen wordt uit het
ziekenhuis, krijgt het spelende
team twee minuten speeltijd
cadeau.
VIM
Puzzel
PLANETREE
Puzzel
SBARR
Puzzel

7. CONCEPT DEVELOPMENT

In the previous chapters, three concepts are presented, from which the Puzzle Game was chosen as the best concept. This concept is based on the idea of an escape room. The goal is to create a prototype that can be tested in the hospital. To get from the concept description given in chapter 5.2 to a working prototype, many aspects need to be designed and thought through, which is done in this chapter.

Escape room: The Game

The idea for an escape room at home already exists and can be bought in the store. For this project, such a game was bought and played to find out the different aspects that make an escape room game successful.

The basics of this game are: the timer, counting down an hour, the different assignments locked in envelopes and can only be opened if the previous assignment is solved, the code language and parts of the code that is hidden in the assignments/ puzzles, and the puzzle pieces that create the solution.

Image 7.1: The escape room board game that can be bought in the store.

The question cards

It was mention in the design brief (chapter 3) that the playing cards are the main aspect of the game. These playing cards are divided into three categories: Patient Experience, Risk Management, and Culture and Behaviour. These three themes are kept in the new design, and many of the original questions can be used in the new design. Some adjustments were made to a few questions, to make the questions more general or rewritten into 'I statements' to make it more personal (Jop Groeneweg, personal interview, 2019). Some questions were added to motivate players to correct each other in the game world (see images 7.2 and 7.3). All the questions can be found in the confidential appendix.

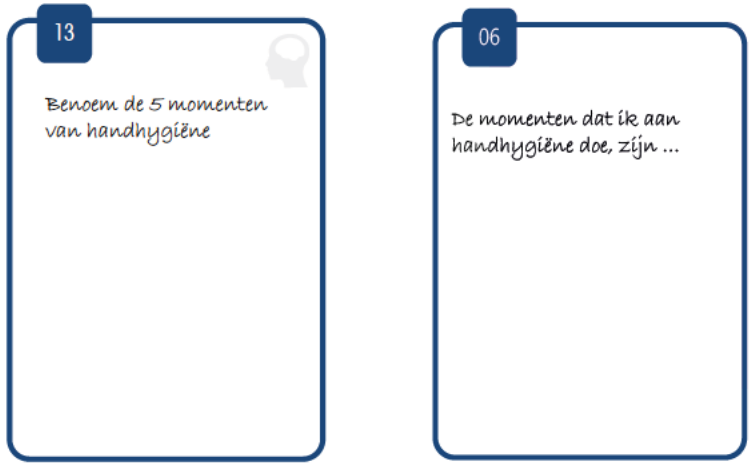


Image 7.2: An example of a question card that is modified.

In the original prototype, there was also a category of pink playing cards. These playing cards were small assignments that could change the course of the game. These cards are not kept in the new design, because these cards were meant for the board game where the players play against each other and that does not fit the

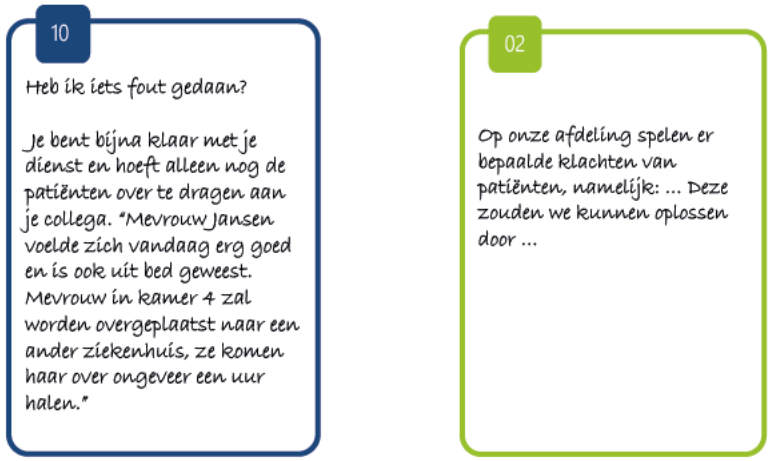
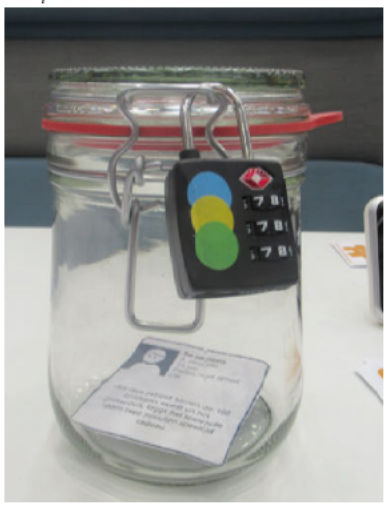


Image 7.3: An example of questions that are added to the game.

interaction in the new design where all players play together.

The goal

Image 7.4: The 'hospital', which is a jar, and the locked in patient.



Every game needs to have a goal to achieve (Schell, 2008). The goal in the original prototype was to get a patient past all the stops on its journey and out of the hospital. The player who first leaves the hospital wins. The interaction between the players is different in the new design: the players have to work together to reach the goal. The ultimate goal of getting a patient out of the hospital can be kept. This fits the idea of an escape room where people physically get locked in and have to get out. At the start of the game, a patient gets locked into the 'hospital' and the players have to get the patient released within the time.

The time limit

As mentioned in the research done, healthcare professionals don t have much time. Taking care of the patients and keeping up with administration is generally enough to keep the healthcare professionals very busy. The interviewed healthcare professionals stressed that it is very important that this game does not take more than 45 minutes, and they would prefer 30 minutes. This is why the time limit of playing this game is set on 30 minutes. If the game needs to be set up, explained and cleaned up, it might take up to 45 minutes. If the game would take up more time, the healthcare professionals will be less inclined to play it, because they often don't have this extra time.

Image 7.5: A kitchen timer that is used in the prototype to keep track of the time.

The puzzles

In the original escape room game, there are puzzles to be solved to get a code that leads to the next set of puzzles and ultimately to the escape. These puzzles are part of the escape room experience and they link to the problem solving skills of healthcare professionals, which are mentioned in the PGD model. This is why the new design of the game needs puzzles to be solved. The playing cards are divided into three categories. These three categories are the inspiration for the puzzles. Because a three digit padlock is used to lock up the 'patient in the 'hospital', each category can have its own puzzle to solve, which leads to one of the digits of the padlock. When all three puzzles are solved, the three digits will unlock the padlock and release the patient.

To make the puzzles relevant to the category, the protocols that the Haga hospital has regarding risk management and VIM are analysed. Together with an employee of the Quality and Safety department of the Haga hospital, the protocols were reviewed and the most fitting parts of protocol that can be turned into puzzles was found. For the patient experience, the PLANETREE method that the Haga Hospital uses to increase the patient experience is chosen. This method is divided into three categories that each have a couple of criteria. There are a total of twelve criteria. For the category risk management, the SBARR protocol is chosen, which is the guideline for healthcare professionals on how to communicate with each other when they discuss a patient. SBARR stands for Situation, Background, Assessment, Recommendation, Repeat-Back. Each section has steps that the healthcare professional needs to go through for clear communication. There are a total of nineteen steps. For the category culture and behaviour, the 'Veilig Incident Melden' flowchart as chosen. This flowchart guides the healthcare professionals in what they have to do when a (near) incident occurs and what happens with the notification that is made. There are seven steps in the flow chart.

These three protocols are cut up in pieces to be made into puzzles.
Because these puzzles should lead to three digits to open the padlock, a secret code is added to some of the puzzle pieces. This code consists of Greek symbols that stand for the number 1, 2 or 3, or stand for a plus or minus (see image 7.6). If a puzzle is solved correctly, the Greek symbols make a sum, which leads to the correct digits for the padlock. The players are provided with a hint to the solution (see image 7.8).

Simple

Iten et al. described in their research that a serious game should be fun to play, but doesn't need extra elements to make it more fun to play. These extra elements can only divert the players' attention from the goal of the game. This is the reason I chose to keep the game very simple. The players have to answer questions per category to get points, with every two points scored, a puzzle piece of the puzzle in that category is handed to the players. When all the puzzle pieces are handed to the players, the players can get to solving the puzzles, which leads to the digits of the padlock and the release of the patient. The amount of points that gets handed to the playing team is determined by the game master, who can be anyone from the department. The playing team can get more points per question if they work together, which should stimulate the desired behaviour between players: correcting each other and discussing mistakes. With some questions extra points can be scored if a protocol is shown on the computer.

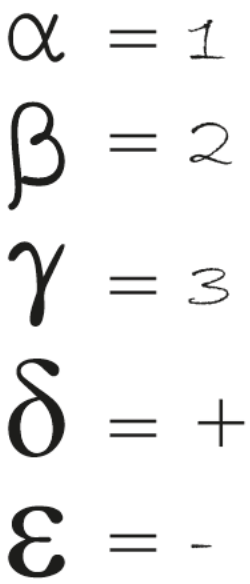


Image 7.6: The Greek symbols that are the secret code.

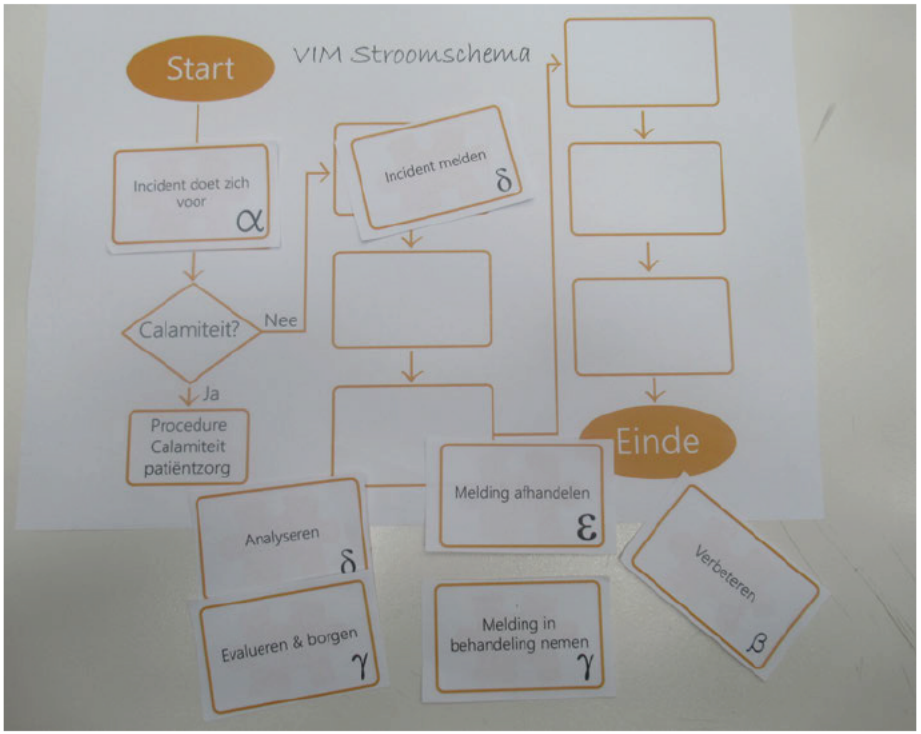


Image 7.7: The puzzle of the VIM flowchart. This puzzle belongs to the category Culture and Behaviour.

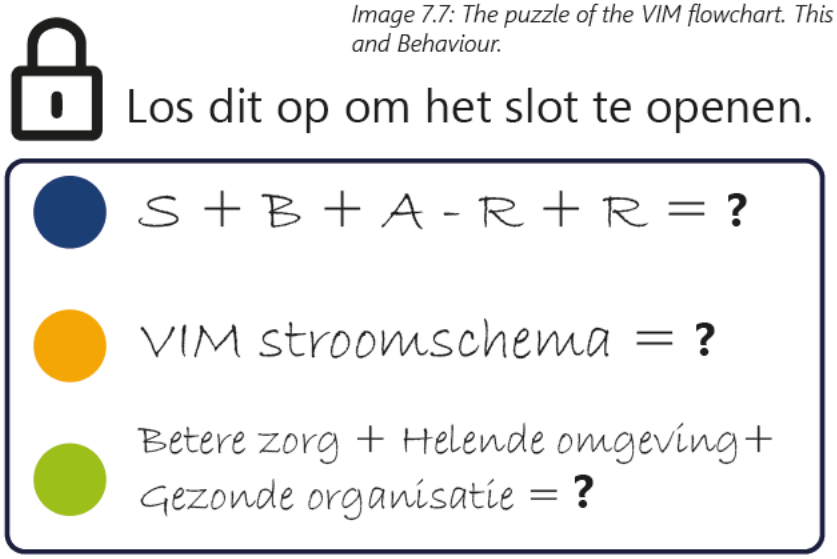


Image 7.8: The solution diagram, showing the players how to open the lock.

Image 7.9: The complete prototype that is used for the user testing with healthcare professionals.

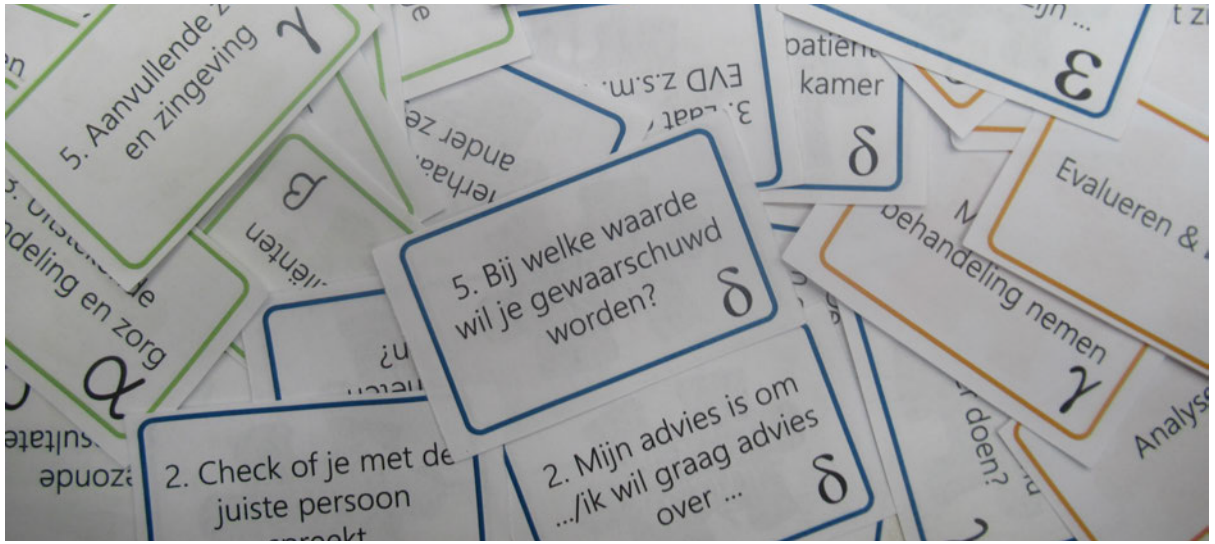


Image 7.10: An impression of the puzzle pieces and the secret code on them

8. CONCEPT VALIDATION

The new design is tested in the hospital context with intended users, to validate the success of this design. The hospital context and intended users are the healthcare professionals in the Haga hospital. In this chapter, an overview is given of the setup of the test and the results. From these tests can be concluded whether the design is a success and what needs to be adjusted to fit the context.

The goal

The goal of this user test is to validate the design decisions made in the development of this game and to check whether the project goal, which is stated in chapter 5, is achieved. A couple of those design decisions are: the playing cards, the puzzles, and the time limit of the game. These choices should lead to the healthcare professionals becoming aware of their own behaviour and how this influences safety. These choices should also lead to wanting to play this game and start a discussion with each other. Finally, the game should be a team building activity.

Research question

How successful is this Puzzle Game in the hospital context in a team of healthcare professionals in creating awareness on their behaviour regarding safety and how they influence their own safety and that of others?

8.1 Prototype

To be able to test the concept, a prototype is made. This prototype is not the final design, but a design that can be easily adjusted if necessary.

The hospital is represented by a jar that can be locked with a padlock, the time is kept with a kitchen timer, and the question cards, persona's, puzzle pieces and puzzle templates are printed on regular paper and cut into shape.

8.2 Recruiting participants

The user test is set up to be tested in the real context, which means that the goal is to test it in a hospital with a multidisciplinary team. Through the department Quality and Safety of the Haga Hospital, different departments were contacted in the Haga Hospital and asked if they wanted to participate in this user test. The departments were asked whether the test could be done in a multidisciplinary team and it was stated that there should be at least three participants for the test.

8.3 Set up of the test

The healthcare professionals usually don't have much time to spend on such extra activities, so the user test needed to be adjusted to the limited time the healthcare professionals had. The full user test took an hour, the shorter version took 40 minutes. Prior to the user test, the room was set up with the game, a camera, a computer and consent forms. When the participants arrived, I introduced myself and explained the project in a short introduction. The participants were asked to sign a consent form for filming the user test.

Image 8.1: The set up of one of the user tests in the Haga Hospital.

The game was shortly explained and the participants got the time to read the patient card, which got locked in the jar. The time was started and the players started to play the game. The exact time of playing is dependant on how well the players play the game, but the maximum playing time is 30 minutes. Two tests were shortened into a maximum playing time of 20 minutes.
When the participants were done playing, they were asked a few questions about the game and their experience in playing it, which took 10 – 15 minutes.

Questions

What did you like about the game?
What did you dislike about the game?
What went well?
What didn't go well?
Would you play this more often?

Execution of the test

Four departments in the Haga Hospital responded that they wanted to help and user tests were scheduled with these departments.
The LUMC and the LangeLand hospital were also contacted, after they had shown interest in the game and the development of this game. Unfortunately no tests were planned.

From the four tests that were scheduled, two tests were shortened. The participants had asked if the test could take up a maximum of 40 minutes, because they didn't have more time. This was done by shortening the playing time to a maximum of 20 minutes and make the interview take a maximum of 10 minutes.

To make sure that the participants of the shortened test got the opportunity to finish the game within the shortened time a small adjustment was made to the rules of the game. In the concept, the players get a puzzle piece per two points that they score. In the shortened user test, the players get a puzzle piece per one point that they score. This small adjustment made sure that the participants of the shorter test also got the chance to win the game.

Image 8.2: The set up of one of the user tests in the Haga Hospital.

	Normal length user test	Shortened user test
Introduction + signing the consent form	10 minutes	10 minutes
Explanation of the game	2 minutes	2 minutes
Time given to play the game	30 minutes	20 minutes
Questions about the game experience	10 - 15 minutes	5 – 10 minutes
Total length of the user test	~ 60 minutes	~ 40

Image 8.3: An overview of the steps taken during the user tests.

Image 8.4: A picture of a group of healthcare professionals during the user test.

8.4 Results

The Puzzle Game is tested with four different groups of different departments. Two groups were multidisciplinary, two groups were with only nurses. The sizes of the groups varied, from four to eight players. Three tests were done at 15:00 hours, which is the moment that the day shift ends and evening shift starts. Because the evening shift is already ready to start, the day shift group can finish their shift with the user test. One test was done at 10:00 hours.

The general reaction of the players was very positive. Every group dove right into the game and was determined to get the patient out of the hospital before the time was out. When answering the questions and solving the puzzles, the groups showed the desired behaviour and took the time to listen to each other and correct each other, even though the time was ticking away. Two groups divided tasks and the other two did everything with the whole group. Both strategies worked to achieve the goal of the game. When a group achieved the goal, everyone cheered and laughed.

Answers to the questions:

What did you like about the game?

All the participants were very enthusiastic about the game. The aspects they liked the most are the clear goal, e.g. getting the patient released out of the hospital, and that they play together against time. The fact that the game can't take longer than 30 minutes got a very positive reaction from the participants.

What did you dislike about the game?

Some participants, mostly in group 4, thought that the questions were too simple. The participants of group 3 had had a very busy day and were not in the mood for a game, so they said that it was the wrong timing to play the game. They also mentioned that the puzzles might not be the most relatable puzzles for their department.

What went well?

Three groups got the patient out and they were very happy about that. Every group mentioned that they thought the cooperation within the group went very well and that they knew more than they expected when they started playing.

What didn't go well?

One group didn't get the patient out of the hospital in time. They said that it was due to their very busy shift they had. They were very tired and not really in the mood for a game.

Image 8.5: A picture of a group of healthcare professionals during the user test.

Image 8.6: A picture of a group of healthcare professionals during the user test.

Would you play this more often?
All the groups said that they would play this game more often. They were interested in the dynamic of the game, and how this could easily be changed with a new category of questions or a completely different team. Most teams were also very interested to see what group of people would get the best score on their department.

	Department	Group composition	Number of participants	Date and time	Short or normal version	Time left
GROUP 1	Gynaecology	Multidisciplinary	8	27-6-2019 10:00	Normal	4:17 minutes of 30 minutes
GROUP 2	Neurology	Only nurses	4	28-6-2019 15:00	Normal	6:19 minutes of 30 minutes
GROUP 3	Neonatology	Only nurses	4	2-7-2019 15:00	Short	0:00 minutes of 20 minutes
GROUP 4	Elderly care	Multidisciplinary	6	3-7-2019 15:00	Short	4:12 minutes of 20 minutes

Image 8.7: An overview of the results of the user tests.

Image 8.8: A picture of a group of healthcare professionals during the user test.

Image 8.9: A picture of a group of healthcare professionals during the user test.

8.5 Conclusion

The research question stated for these user tests was: How successful is this Puzzle Game in the hospital context in a team of healthcare professionals in creating awareness on their behaviour regarding safety and how they influence their own safety and that of others?

From the results of the user tests can be concluded that the Puzzle Game is very successful in creating awareness. The healthcare professionals had realisations during the game about their behaviour and how this influences the safety. One group of participants stayed after the game to discuss some realisations they had during the game.

From these four tests and post-test interviews, conclusions can be drawn which will be used to improve the final design of the game.

- Composition of the team

In the requirements, it is stated that the game should be able to be played in a multidisciplinary team. From the user tests it is observed that the goal is better achieved with a multidisciplinary team. If the team has different disciplinaries, the players learn from each other and have more discussions with each other. In a monodisciplinary team the players have the same knowledge, and knowledge gaps. Because of this, the players agree with each other quickly and a discussion is not necessary. This does not mean that the game can't be played in a monodisciplinary team, it just means that the goal of the project is not quite achieved in such a setting.

- The questions

Some questions were considered very simple, some questions were considered very difficult or irrelevant. Because it differed what questions were considered easy and difficult per group, it can't be concluded which questions should be changed. What can be concluded from this, is that the questions should get checked by a group of healthcare professionals within the hospital, to make sure they are tailored to user.

- Time of day

With some departments, the only possibility to play such a game is at the end of the day shift. This is at 15:00 hours. The chances are that healthcare professionals won't feel like playing a game at that moment, because of a busy shift that they had. When the participants of the user test are asked when they could be able to play the game, they say that 15:00 hours is the only possibility. With group 1, the test was done at 10:00 hours, and eight participants had time to join the game. This means that it should be decided per department when it is the best time to play the game.

Images 8.10: A group of healthcare professionals during the user test.

- Length of playing time

When asked, all participants agreed that half an hour was perfect for this game. They stressed that it should not exceed 45 minutes. The fact that the game could not last longer than 30 minutes appealed to the participants. They were very motivated by the time ticking away and wanted to reach their goal before the time ran out.

- Size of the group

Each user test was played with different sizes in groups. Initially, the requirement to the game was that the group should have at least three players, but there was no maximum. After observing the groups during the user tests, the conclusion can be drawn that the group should not be bigger than six people. In group 1, there were eight participants and they formed two small groups instead of working together in one big group.

The insights from the user test with the new design are used to iterate on the design and create a final design for this game. In the next chapter, the final design is presented.

Images 8.11: A group of healthcare professionals during the user test.

Images 8.12: A group of healthcare professionals during the user test.


De patiënt
A. Janssen
25 jaar
Patiënt met spoed
OK
Als deze patiënt binnen de tijd ontslagen wordt uit het ziekenhuis, krijgt het spelende team twee minuten speeltijd cadeau.
Patiënt-beleving
Risico-management
Cultuur & gedrag
MIN
SEC
START STOP

9. FINAL DESIGN

In this chapter, the final design, the game 'Cultuur rondom Veiligheid', is presented. First an overview is given of all the aspects of the game and how it is played. After that, an advise is given on how to introduce this game to hospitals and how to keep it relevant. The circle of the PGD model is closed by adding the last aspect of this model, which is the transfer design. This is a recommendation and has not been tested.

9.1 Cultuur Rondom Veiligheid

This game is played in a group of 3-6 people and is meant for a multidisciplinary healthcare team.

"You and your team have to cure a patient that is locked into the hospital. You get 30 minutes to show that you know everything about risk management, patient experience and culture and behaviour and can solve the puzzles to cure your patient. By answering questions in these three categories, you can score points. Every two points is worth one puzzle piece of the puzzles that need to be solved in order to get the patient out of the hospital. With each question, you can score more points if you work together with your team and discuss the answers before answering the question. The game master will decide how many points you deserve and how many puzzle pieces you will get for each question. When you acquire all the puzzle pieces, you have to finish the puzzles to get to the solution of the game. The moment you unlock the padlock, the time is stopped and the game is won."

Setting up the game

Put the three puzzle templates, the picture of the 'cultuurladder', the solution diagram, a blank piece of paper and a pen on the table in a closed folder. Put the small hospital unlocked on the table with a patient card next to it. Shuffle the question cards per category and put them face down on the table close to the hospital. Shuffle the puzzle pieces per category and put these face down on the table close to the seat of the game master. Put the booklet with answers to the questions near the game master. Set the timer to 30 minutes and put it on the table where the players can see it. The game is set up.

Image 9.1: The set up of the game 'Cultuur rondom Veiligheid'. with a zoom in on the hospital, the question cards and the timer.

Image 9.2: The set up of the game 'Cultuur rondom Veiligheid'. with a zoom in on the puzzles and the solution diagram.

Playing the game

First the players get to read the text written on the patient card. Once everyone has read it, the patient gets locked up in the hospital and the timer is started. Thirty minutes get counted down. The players of the game have to work together to answer the questions and score points. To answer the questions in the three categories, it is allowed to use the computer. With every two points that are scored, the players get one puzzle piece in the category of the scored points. The game master decides how many points the playing team gets with their answers. The game master is not playing the game with the players, he/she is observing the players and only handing out puzzle pieces. The booklet with answers guides the game master in determining how many points a playing team deserves with their answers. When all the puzzle pieces are scored, the puzzles can be completed. For completing the puzzles, no extra help is allowed to be used.

The solution of each puzzle will give one digit, and with three puzzles this means that the three digit padlock can be unlocked. The padlock is colour coded. There is a solution diagram, which is given to the players, and shows the way the puzzles need to be interpreted to get to the right answer.

Once the right digits are found and the padlock is opened, the time is stopped and the team has won.

After playing the game, the game master writes down the names of the team members and the time they had left in the scoring booklet. This is done to keep score which team has performed the best.

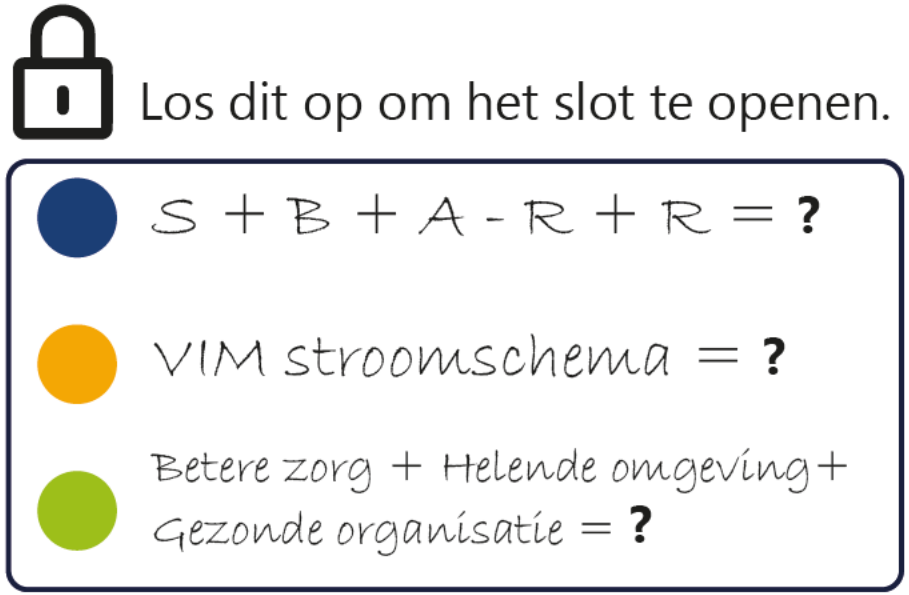


Image 9.3: The solution diagram leading to the unlocking of the padlock. The coloured dots resemble the dots on the padlock.

Image 9.4: The padlock that needs to be unlocked to get the patient out of the hospital. The coloured dots indicate the order of the digits.

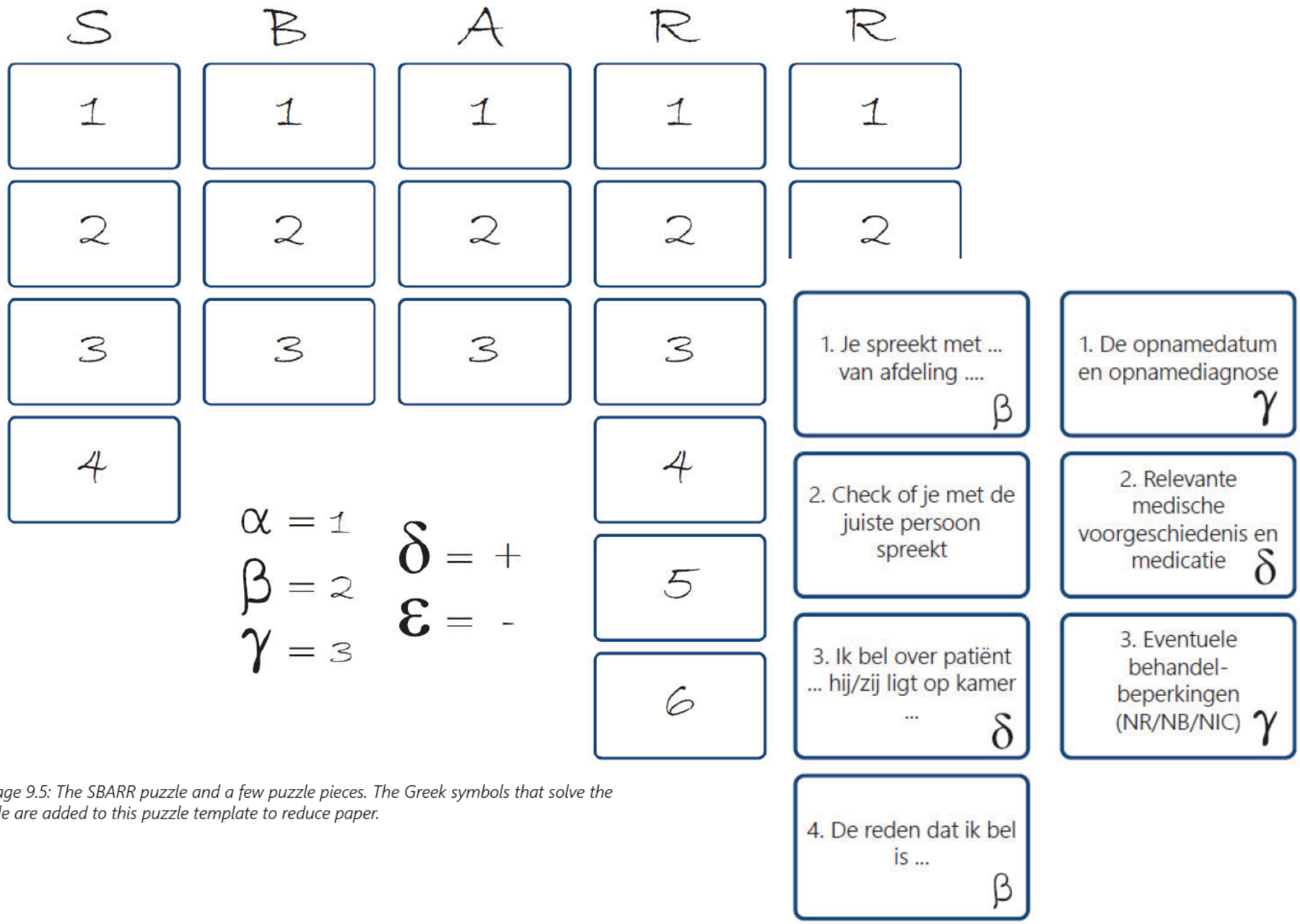


Image 9.5: The SBARR puzzle and a few puzzle pieces. The Greek symbols that solve the code are added to this puzzle template to reduce paper.

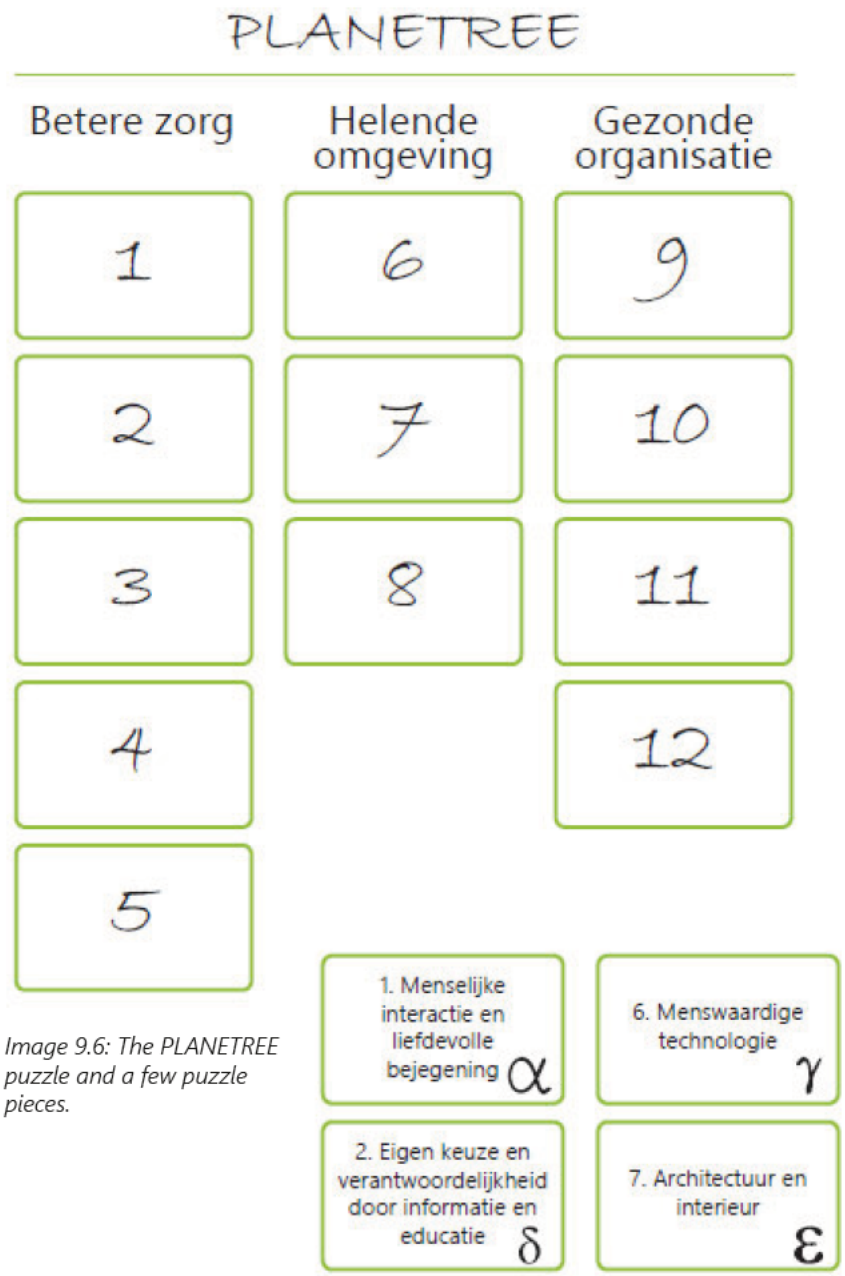


Image 9.6: The PLANETREE puzzle and a few puzzle pieces.

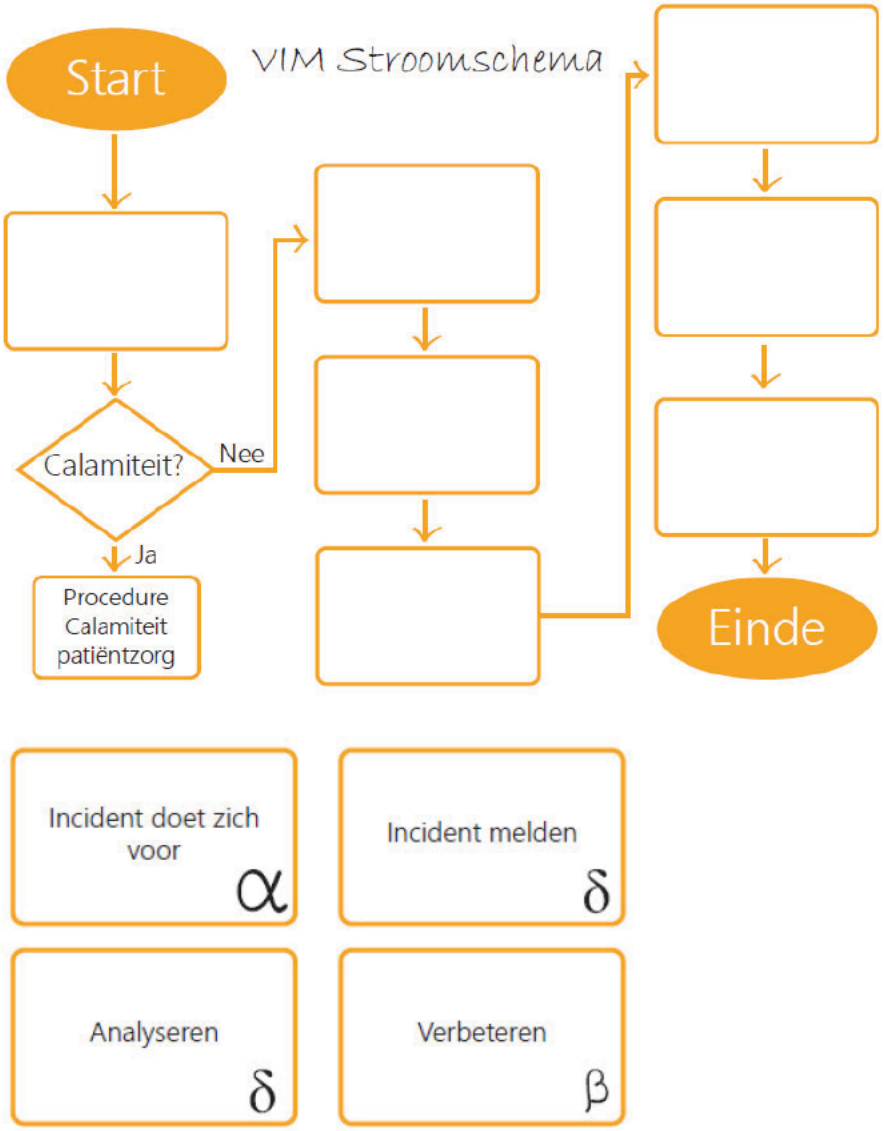


Image 9.7: The VIM puzzle and a few puzzle pieces.

Image 9.8: The small house that represents the hospital. This is made from wood, so it can be customized with paint or stickers.

9.2 Introduction to the user

This game is made as a part of the MEDD Toolbox 'Met Elkaar Durven Doen'. This means that it is not a standalone product, but part of a variety of services that MEDD can offer. To make the game a success in the hospitals, an advice is given on how to introduce the game and how to keep it relevant. See the visual on the next page for the visual representation of this advice.
A first version of the game is a standardized version. This consists of the question cards, puzzles and puzzle pieces designed in this project. This game will be offered to the clients of MEDD in combination with a training or workshop session. During these sessions, input can be collected for further development of the game.
If this game is developed to be a standalone product that MEDD can offer, the following path can be followed:
For the first introduction, it should be played with the department Quality and Safety and with the unit heads of different departments in the hospital. This is something that MEDD can do during a training day.

After all the unit heads are introduced with this game, each department of the hospital can decide whether they want this game or not. This game can then be played in different groups with the unit head as their game master. All the scores are kept in a small booklet at the department, so each team can compete for the best score.

When the majority of the healthcare professionals at a department have played the game, a new version of the game can be designed by MEDD. The input for the updated version of the game can be given through the unit heads of the departments in the hospital, directly to MEDD through a workshop session, but this can also be done with a supervisor from the department Quality and Safety. If the latter option is chosen, MEDD can organise a workshop session with supervisors of the game of the Quality and Safety department of each hospital that plays the game. This will give input on a national scale to what hospitals find important to train their employees on. After such a workshop session, MEDD can create new themes or question cards and puzzles with the input from the hospitals and sell the update to the hospitals.
To make this game applicable for other health organisations, a similar path can be chosen. MEDD can make a first version with the input of one type of organisation, which then can be offered to every health organisation.

9.3 Transfer Design

The Transfer Design of this game is the evaluation sessions that are planned at the departments, where the culture regarding safety can be openly discussed. The evaluation of the game is the motivation to organise such session, but the goal is to talk with each other about the behaviour and change in behaviour and culture at the department. This should be enough to have an impact on the healthcare professionals during their job.

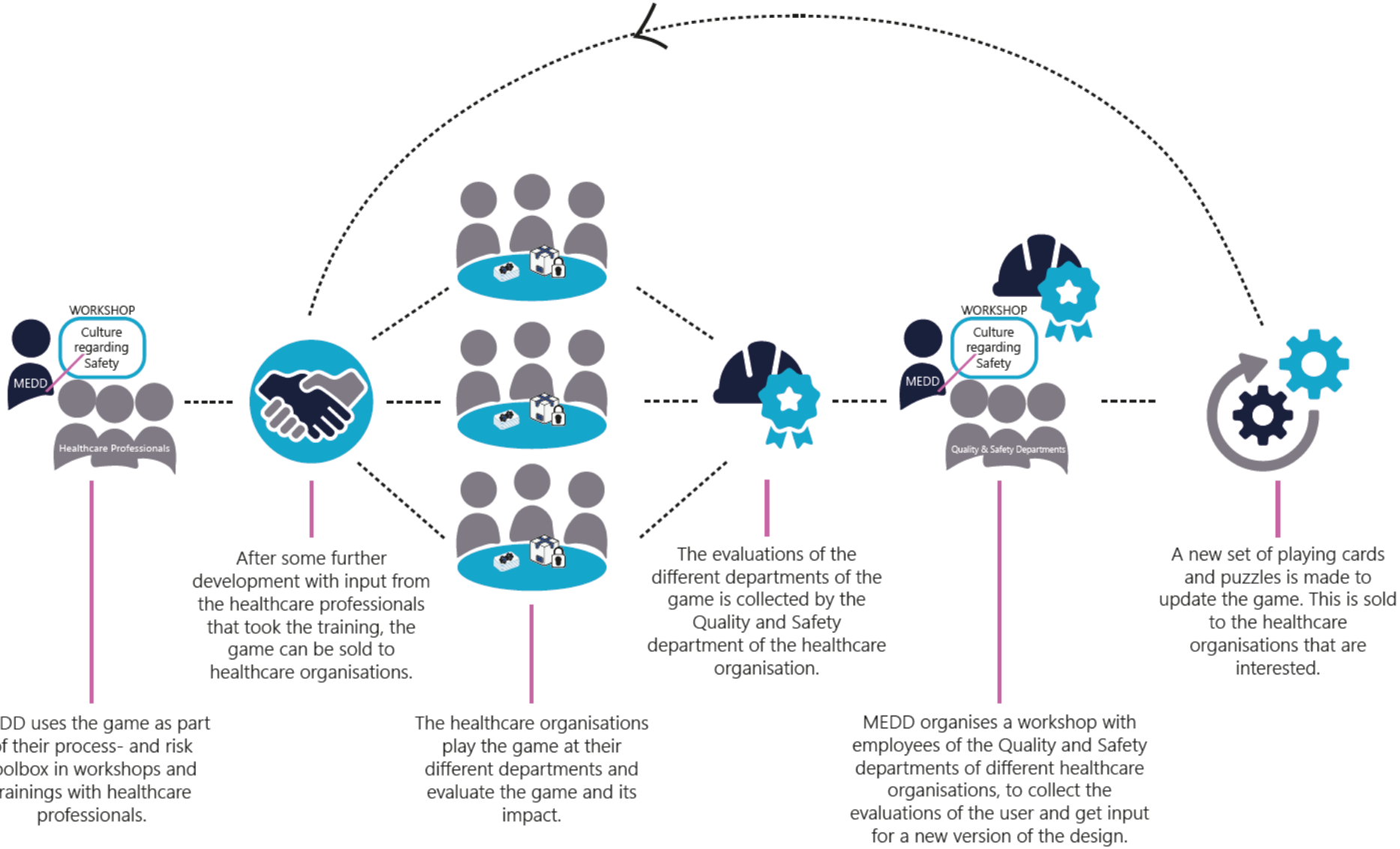


Image 9.9: A visual visual representation of the implementation advice given to the company.

10. CONCLUSION

This report presents a project that is done for the company MEDD with co-design partner the Haga Hospital in the Hague. This project is a master thesis of the master Design for Interaction at the TU Delft.
In this report, the 'Cultuur rondom Veiligheid' game has been introduced. This game has been designed according to the Persuasive Game Design model.

10. 1 Persuasive Game Design model

The Persuasive Game Design (PGD) model is designed by Anderiesen, van der Kooij, Vegt and Visch (2013) for structuring the design steps in designing a persuasive game. This model includes the real world experience, gamification design, the game world experience, the transfer design and in the centre the user. The real world experience is the context that the user is involved in and what needs to be changed through this persuasive game. From this real world, the gamification aspects can be derived. These are aspects that can be used in the game to motivate the players to play the game. In the healthcare context, the gamification aspects are the aspects that motivate the healthcare professionals to do their job the best they can. It's what makes them enjoy their job. These gamification aspects are taken into the design of the game world, they determine the type of experience the users will have in the game world. Finally the transfer design is the way the user changes his/her behaviour in the real world as a consequence of playing the game.

In this report, this model is filled in. The Real World Experience and the Gamification Design are defined by the literature review and field research that has been done. The Game World Experience is a combination of the Gamification Design and the ideas generated in the ideation phase. With interaction testing and input of the intended user, the Game World Experience was fine tuned. Ultimately, after testing the designed concept, some recommendations were done to create a Transfer Design. These were not tested, because of the limited time of the project. The filled in model can be found in image 10.2, and a picture of the final design is shown in image 9.1 and 9.2.

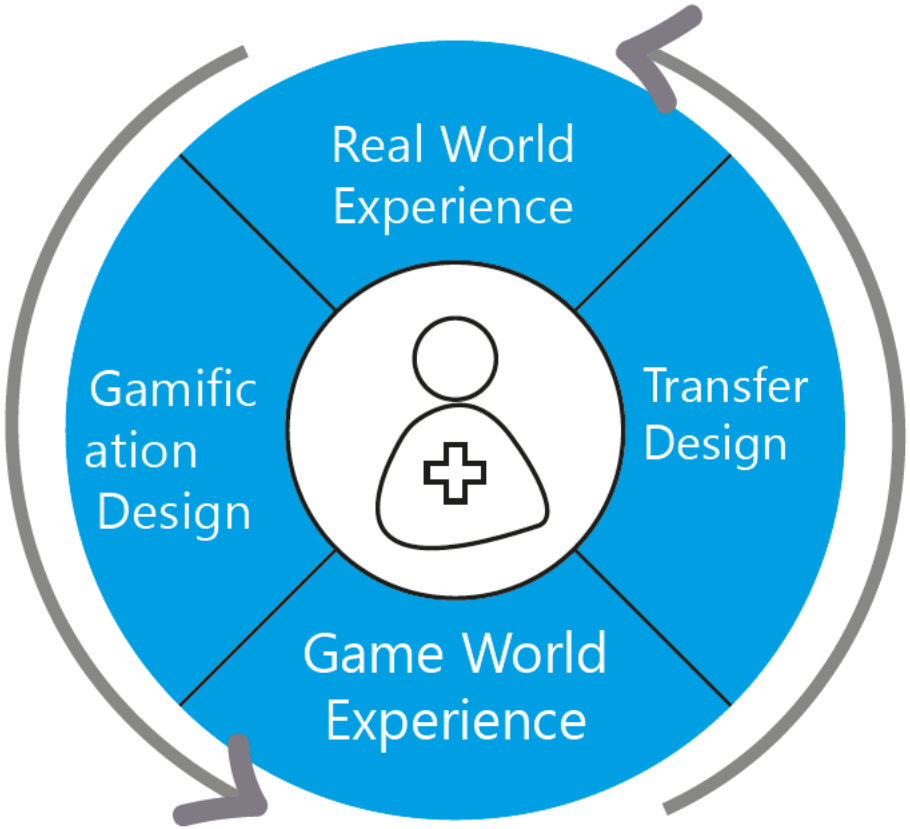


Image 10.1: The persuasive Game Design model, redesigned by me. This is the format that is used in this report.

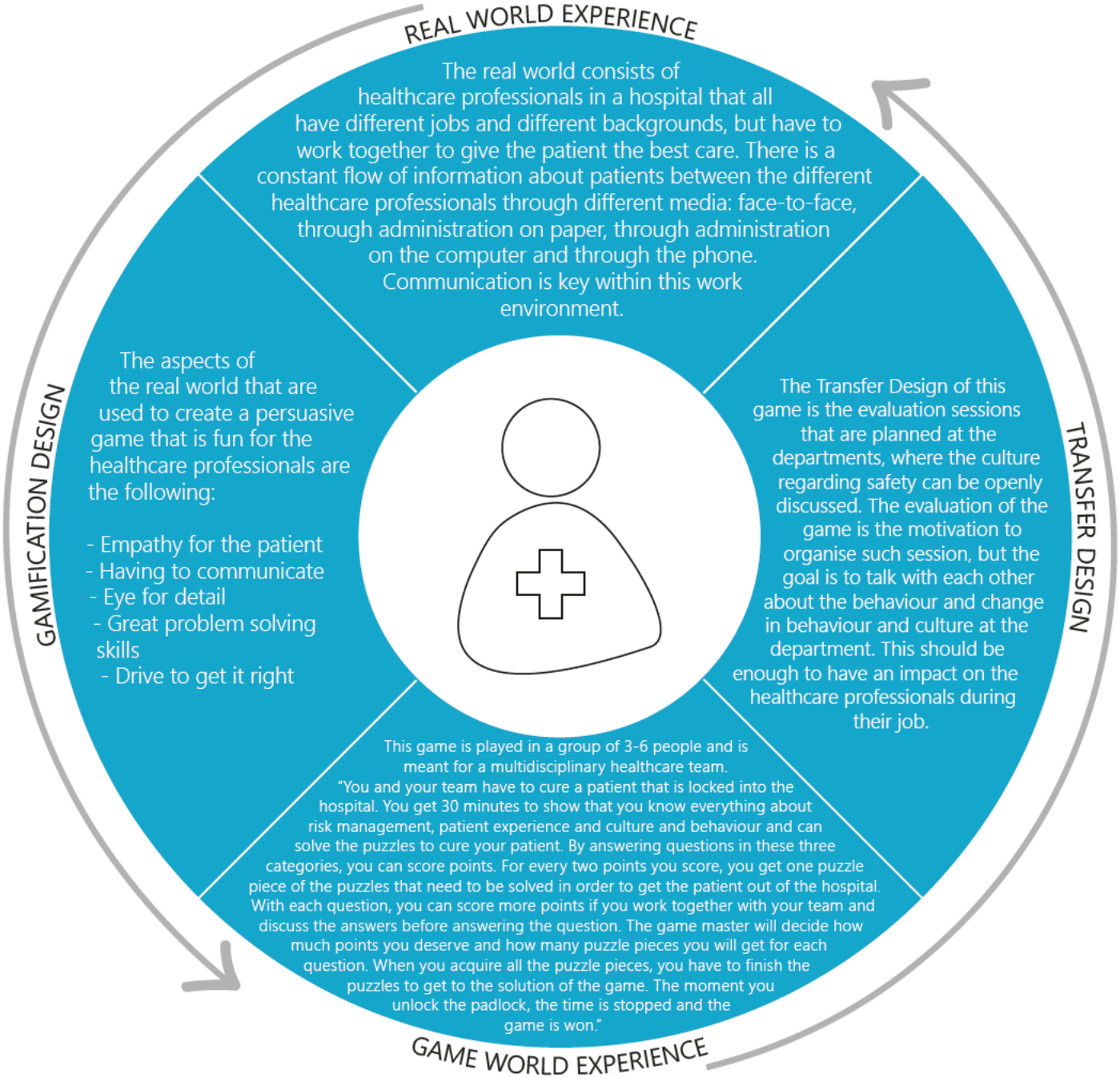


Image 10.2: The persuasive Game Design model, filled in with the insights collected and design made in this report.

10.2 Validation of the final design

User tests were conducted in the Haga Hospital with healthcare professionals to validate the design decisions made in the development of this game and to check whether the design goal, which is defined in the design brief (chapter 5), is achieved. A couple of those design decisions are: the playing cards, the puzzles, and the time limit of the game. These choices should lead to the healthcare professionals becoming aware of their own behaviour and how this influences safety. The design goal is: Designing a meaningful, serious, persuasive game for healthcare professionals to gain lasting awareness on their behaviour regarding safety and how they influence their own safety and that of others.

The research question used is: How successful is this Puzzle Game in the hospital context in a team of healthcare professionals in awareness on their behaviour regarding safety and how they influence their own safety and that of others?

From the user tests could be concluded that this setup of a game is a suited way to spark the interest of the healthcare professionals for the subject culture and behaviour regarding (patient) safety. The participants of the user tests had fun while playing the game and had some realisations regarding their behaviour on the job. The question cards sparked the discussion between the healthcare professionals and every participant mentioned that this is a fun and low key way to refresh their knowledge. The game was successful in creating awareness on the behaviour of the healthcare professionals and how this influenced (patient) safety. However, this test was only done in the Haga Hospital in the Hague, so this conclusion can't be drawn for healthcare professionals of any hospital. The participants were interviewed immediately after playing the game, when the memory was still fresh, so there can be no conclusions drawn whether this awareness lasted with the healthcare professionals. It is unknown whether the healthcare professionals changed their behaviour in the real world as a result of playing the game.

Images 10.3: A group of healthcare professionals during the user test.

10.3 Evaluation of the final design

A list of the most important requirements and wishes for the project, company and intended user was drawn up to make a choice in the design. These requirements and wishes are used to evaluate the final design on.

Requirement 1.8: The game should encourage players to show the desired behaviour as is described in the ideal situation: clear communication between healthcare professionals, they correct each other on the job and understand how their behaviour effects the safety of their colleagues and the patient.
The game encouraged the players to show the desired behaviour in the game world, which was observed during the user tests. The healthcare professionals corrected each other, they communicated with each other and even admitted their own mistakes on the job.

Requirement 2.1: The game has the element of competition.
In the Game World Experience, the players have to compete with time. This is a motivation for the team to try their best and work together. In the post-user test interview, the participants were asked if they were interested in competing against other teams of their department. The participants were very enthusiastic about this idea and said that if I would hang up a sheet with the teams that played the game and their scores, they would want to compete for the best score.

Requirement 1.4: The game as a maximum playing time of one hour.
The game has a time limit of 30 minutes, which means that it can't be played for longer than that.

Requirement 1.3: The game has to be adjustable to other hospitals and healthcare organisations.
The questions and puzzles in the game are generalised, so other hospitals could probably play this game. This has not been tested, so this is not validated. To be able to use this game in another healthcare facility, the questions and puzzles will have to be adjusted and tailored to the type of healthcare facility. The cost of these adjustments is not high, because the puzzles and question cards are all printed on paper. Adjusting the game can be time costly for MEDD.

Wish 1.4: The game enhances team performance, team cohesion and psychological safety on the job.
This wish can not be validated, because the participants of the user test were only observed during the playing of the game and not on the job afterwards. During the game, the healthcare professionals did work together and had fun together. In the post-user test interviews, the participants mentioned that they did see this game as a teambuilding activity.

Requirement 1.1: The playing cards in three categories are used to get the healthcare professionals physically together and start the converstaion.
To play the game, the players have to be in the same room, which means that it brings people physically together. In the user tests was observed that the question cards sparked the discussion between the players.

Requirement 1.6: The game helps in understanding how to change culture, it makes the players aware.
From the user tests and the interviews that followed, can be concluded that the players do feel more aware of their behaviour and the culture on their department. Whether the players understood how to change their culture, was not validated during the user tests.

Wish 3.1: The price of the game is around €30,00 for a department of the hospital.
The production of the final prototype that has been made cost €23,00 (see Appendix G). This is the price for one prototype, hand made by me. If this prototype is made in batches, the prices will probably be lower per game. This means that the game can be sold for €30,00 including a profit for the company.

Wish 1.2: The game helps in breaking the strict hierarchy that exists in hospitals.
This is another aspect that should be monitored over time, so it could not be validated in this project. What could be observed during the user tests with a multidisciplinary team, is that there was no clear hierarchy in those groups while the players played the game. The players used each others' expertise, relying on the unit head to know the policy questions and the nurses to answer when they have to wash their hands. Whether this helps in breaking the hierarchy in hospitals could not be validated.

In short, the 'Cultuur rondom Veiligheid' game that has been designed, meets the design goal in creating awareness on behaviour regarding safety and how this influences safety. During the game, the ideal situation, an open culture, is created through questions and assignments that have to be answered and solved by the playing team and within the time limit. The intended user, the healthcare professionals, are enthusiastic about the game and would like to play it more often. The game can be part of the 'Met Elkaar Durven Doen' toolbox of the company MEDD and can be used in training sessions and maybe eventually sold as a standalone game. Whether this game created lasting awareness could not be validated due to the limited time of the project.

11. RECOMMENDATIONS

This project is done with a strict time limit, which means that not every aspect of the game could be validated within the time. In this chapter some final recommendations are given, to show which aspects of the game should be further designed.

11.1 Transfer design

The Transfer design that is discussed in the report is the organisation of evaluation sessions of the game at the departments and hanging a list with the best scores in their breakroom. This could work as a Transfer design, but the effectivity is not validated. Chances are that the healthcare professionals don't think these evaluation sessions are important and that these sessions eventually never get planned. To make a real impact with the Transfer design, a digital reminder to the game should be developed. This digital reminder could be similar to the digital concept that was presented in chapter 5.3. The app can be used to ask the participants that have played the 'Cultuur rondom Veiligheid' game to find similarities between the Game World Experience that they had during the game and the Real World Experience that they have every day during their shift. This might have a better transfer effect, creating lasting awareness. This digital tool can also be used to reflect on any changes that occur on the department regarding safety culture. The need for a digital reminder is underlined by Saskia Tiggelaar who has developed a physical escape room in the Prinses Maxima Centrum. In a personal interview (June, 2019), she underlined that an escape room game is a very good way to create awareness, but to make it last, a digital e-learning or reminder is needed.

11.2 Validation in other hospitals

In the requirements it was stated that this game should be able to be played in other hospitals. The question cards were generalized, so the game was less tailored to the Haga Hospital, but it is not validated whether these questions fit other hospitals. This validation could be done by conducting user tests, as described in this report, with more hospitals.

Not every hospital uses the same methods in improving patient experience. The puzzle for this category in the game is based on the method that the Haga Hospitla uses, which is PLANETREE. To make sure every hospital can play this game, this puzzle should be adjusted to the method that the hospital needs to improve the patient experience.

11.3 Other healthcare organisations

One of the requirements listed, stated that the fundamental idea of this game should be applicable to different healthcare organisations. How applicable the fundamental idea is, has not been validated. This could be validated through a brainstorm session with one of those healthcare organisations, where new questions and puzzles are designed.

11.4 Market introduction

In this report, a very brief advice was given on how this game could be implemented in the company, as a training tool or a standalone product. To be able to implement this product on the market, a clear and thought trough market plan should be developed. This plan should include an estimation on how many versions of the game are to be made and what the costs are of the development of the game when this is done in batches. From this calculation, a selling price can be estimated which will have an influence on how MEDD can use this game. If the production is very expensive, the game can be best used as a tool in training sessions. If the production costs are low, the game can be sold to healthcare organisations with a profit.

11.5 Validation of lasting awareness

In the design brief, it was stated that the goal of the ideation phase is to design a game that creates lasting awareness. In the user tests done, it was clear that awareness was created about culture and behaviour, but it could not be validated whether this awareness lasted. To validate this, a evaluation session could be scheduled with the participants of the user tests done in this project. By asking them how they experienced the game and whether this game changed something in their behaviour, it can be checked if the awareness created during the user test has lasted.

12. ACKNOWLEDGEMENTS

This project was made possible by many different people. First of all, I would like to thank Kitty ter Borg from the company MEDD that has given me the opportunity to do this project. I appreciate the enthusiasm that Kitty put in the project and the deep dive she gave me into this context of safety culture.

I would like to thank my mentor Sylvia Mooij and chair Richard Goossens for being my guiding light in this project. The positive attitude and constructive feedback that they provided always got me motivated to keep on going. I have learned a lot from them and I really enjoyed the relationship I had with them during the project.

Another person that has been vital to this project is Clarie from the Haga Hospital. She showed me the ropes in the hospital and made sure that I got to experience the culture on the departments in the Haga Hospital. Through Clarie all the user tests were planned, which helped in validating the final design.
During the research done, many experts were contacted to help me learn about the context. I would like to thank Jop Groeneweg and Valentijn Visch in particular for taking the time to help me in my project. They helped me to quickly get an idea of the context and how to use the tools provided to me.

There are many more people that helped me in understanding the context of this project and guided me. This is a very long list, so instead of naming everyone separately, I would like to just generally thank everyone that helped me, in the past five months, on a scientific level and in understanding the healthcare context.

On an emotional level, I would like to thank all my friends and family. In particular I would like to thank Alexander, for always picking up the pieces whenever I fell apart. I want to thank all the boys from EJL 2019, because they kept me sane. The trips on the water were always exactly the kind of diversions that I needed during this project. I want to thank my flatmates and parents for taking care of me when I needed it and finally I would like to thank everyone that has kept my spirit up during this project. It has helped me in becoming the designer that I am today.

13. REFERENCES

Akkermans, A.J., Friele, R.D., Laarman, B.S., Legemaate, J. (2016). *OPEN en eerlijke omgang met klachten in incidenten in de zorg: Verslag van het eerste jaar van leernetwerk OPEN.* Utrecht: NIVEL.

Akkermans, A.J., Friele, R.D., Legemaate, J. (2015). *'Openheid na medische fouten: waar staan we?'* Nederlands Tijdschrift voor Geneeskunde, 38, 1617-1620.

Anderiesen, H., van der Kooij, K., Vegt, N., Visch, V. (2013). *Persuasive Game Design: A model and its definitions.* Delft: Technical University of Delft.

Baban, A., Montgomery, A., Panagopoulou, E., Todorova, I. (2013). *Improving quality and safety in the hospital: The link between organizational culture, burnout, and quality of care.* British Journal of Health Psychology, volume 18, issue 3.

Bal, R., de Bont, A.A., Jerak, S., Meurs, P.L., Zuiderent, T. (2009). *Veiligheid in de zorg. Achtergrondstudie bij de Staat van de Gezondheidszorg.* Rotterdam: Institute of Health Policy & Management.

Bijnen, B., Okuyama, A., Wagner, C. (2014). *Speaking up for patient safety by hospital-based health care professionals: a literature review.* Osaka, Japan: BMC Health Services Research.

Bogers, E.A.I., Faber-de Lange, B., Weijers, S.J.C.M., Westerman, R.A. (2014). *De HAN-Zorggame: Spelenderwijs werken aan ketendenken in de zorg.* Nederland: Hogeschool van Arnhem en Nijmegen.

Bonacum, D., Graham, S. Leonard, M. (2004). *The human factor: the critical importance of effective teamwork and communication in providing safe care.* Qual Saf Health Care 13: i85-i90.

Brennan P.A., Green, B., Oeppen, R.S., Smith, D.W. (2010). *Challenging hierarchy in healthcare teams – ways to flatten gradients to improve teamwork and patient care.* British Journal of Oral and Maxillofacial Surgery, vol 55, issue 5.

Dalmolen, S., Monen, H. (2013). *Serious gaming an gamification: Wat kan de logistiek ermee?* Retrieved March, 2019, from http://www.logistiek.nl/Logistieke-dienstverlening/algemeen/2013/8/Serious-gamingen-gamification-wat-kan-de-logistiek-ermee-1341752W/.

Groeneweg, J. (2018). *Risk management in general.* Retrieved April, 2019, from https://www.cgerisk.com/2018/01/risk-management-general/.

Groeneweg, J. (2019). Personal interview.

Haerkens, M. (2017). *Samenwerken, communicatie, aanspreken: teamaspecten van patiëntveiligheid.* Handboek patiëntveiligheid, chapter 23: 321-328.

Holdrinet, D. (2008). *'Al spelende leert men!' Het effect van gaming op besluitvormingsprocessen, teamprestatie, cohesie, en psychologische veiligheid*. Utrecht: Universiteit Utrecht.

International Association of Oil & Gas Producers. (2019). *Process safety.* Retrieved April, 2019, from https://www.iogp.org/oil-and-gas-safety/process-safety/.

Iten, N., Petko, D. (2016). Learning with serious games: *Is fun playing the game a predictor of learning success?* British Journal of Educational Technology, Vol 47: 151-163.

Kolb, A.Y., Kolb, D.A. (2010). *Learning to play, playing to learn: A case study of a ludic learning space*. Cleveland, USA: Weatherhead School of Management, Case Western Reserve University.
Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development.* Prentice Hall.

van Leeuwen, K. (2011). *Verbetering teamgeest, efficiëntie en patiëntveiligheid*. Retrieved June, 2019, from http://www.kwaliteitinmensen.nl/indemedia/201103artikelzorgkaarten.pdf

Lyndon, A., Sexton, J.B., Simpson, K.R., Rosenstein, A., Wachter, R.M. (2012). *Predictors of likelihood of speaking up about safety concerns in labour and delivery*. BMJ Qual Saf, 21: 791-799.

Morrison, E.W., Milliken, F.J. (2003). *Speaking up, remaining silent: the dynamics of voice and silence in organisations*. J Manage Stud, 40: 1353-1358.

Oxford Dictionary. Retrieved May, 2019, from https://www.lexico.com/en/definition/safety.

Oxford Dictionary. Retrieved May, 2019, from https://www.lexico.com/en/definition/culture.

de Ridder, H., Vegt, N., Vermeeren, A., Visch, V. (2016). *Player Experiences and Behaviours in a Multiplayer Game: designing game rules to change interdependent behaviour.* Delft: Technical University of Delft.

Schell, J. (2008). *The Art of Game Design, a book of lenses.* Chapter 3: page 34.

van Staveren, M. (2019). *Risicoleiderschap*. Master course, University of Twente.

Thompson Rivers University. (2019). *Personal safety*. Retrieved April, 2019, from https://www.tru.ca/safety/workinglearningsafely/personal.html.

Vegt, N., Visch, V. (2013). S*ocial Gaming Rules: changing people's behaviour through games*. Delft: Technical University of Delft.


MIN
SEC
START
STOP
Patiënt-
beleving
Risico-
management
Cultuur &
gedrag

APPENDIX

APPENDIX A: Interview Jop Groeneweg

Dr. Jop Groeneweg is a professor cognitive psychology at the University in Leiden and specializes in risk management. He recently joined the Technical University in Delft to do research. He also wrote books and is the man behind the internationally acknowledged Tripod Model.

His admission to the TU Delft has made it convenient to me to speak with him about my graduation project. In his research 'Just Culture' he dives into the culture of health facilities, amongst others.

Groeneweg believes that you should not start with creating awareness. He says this is a very western trend to make everyone aware of everything, he believes in changing behaviour first and creating awareness later. He talked about an example in the petrochemical industry where they introduced the rule that everyone has to hold the handrail of the stair when they are using the stairs. Because it is such a simple rule to follow and to check if people follow this rule, the threshold to correct colleagues is lower. Holding on to the handrail of the stairs became a vehicle for the intervention how to correct each other. This was very successful.

After introducing this first simple rule that was successful, Shell introduced the twelve lifesaving rules that everyone can correct each other on. This worked, because the employees were already accustomed to correct each other on the stairs.

This is an example of cognitive dissonance, change the behaviour into the desired behaviour without explicitly explaining this to the person involved. Another example of cognitive dissonance is the annoying sound that cars make when the driver has not put on the seatbelt. To stop the annoying beeping sound, the only thing the person has to do is put on the seatbelt, and this is what they do, whether they are aware of their increased safety or not.

If the goal is to change the behaviour, the tool should be very specific and simple, says Groeneweg. There are two important features for this tool to make it meaningful. The first is that there should be room for feedback on it. Does it really make an impact? Did a doctor, nurse, medical specialist or manager act differently because of the tool that was used? If so, why and how? If not, why not? By giving feedback to the users, they can track the change that it initiated and it becomes meaningful.

The second feature is that it should spark an emotional connect, to create that feeling of wanting to change behaviour. This means that the users feel that it is important. A way to create an emotional connect is to use 'I statements', which can be evoked by the questions of the tool. With 'I statements' the users have to talk about their own experiences, which makes it feel more important for them, it makes it personal. Instead of asking them: 'what are the rules when washing your hands?', you ask: 'what do you do when you wash your hands?'.

The last thing that Dr. Groeneweg gave me a tip on for this project, is that to make this tool a success, the operational management has to be enthusiastic about it. With Shell, they started with training the managers and leaders in the company and once they were enthusiastic about the tool or idea, the managers and leaders got to train their employees. This made it feel more important for the employees. You don't want people to think that using the tool is a command from the department Quality and Safety, because they will feel obligated to do it and they won't get that emotional connect. The operational leader/manager (for example the head of the department) has to be trained well, so they know the meaning and get excited for it and, to know how to create an atmosphere with psychological safety where every employee can openly say what they want to say.

APPENDIX B: User test

B.1 Setup

First a short introduction is given to the participants of the user test.

For a graduation project with the company MEDD, a tool is being developed to create insight within healthcare teams about risk management, patient experience, and culture and behaviour. A prototype is created that will be used in this user test to test this way of evaluating. The results of this user test will be used to create a new prototype.

Goal
The goal of this user test is to find out the strong and weak points of the prototype as it has been designed now. The research questions that have to be answered in this user test are:

What are strong features of the tool?
- What do the users like?
- How does it help the users in creating more awareness in safety and culture and behaviour?

What are weak features of the tool?
- What is redundant in the current tool?
- What is impractical of this tool in its current design?

Participants
The user test takes place in the 'real' context. In this case it means that the tool will be used by healthcare professionals within a healthcare facility. The participants are chosen through the network of the company MEDD
The team that will be testing consists of at least two and at most ten people. I will lead the game.

The test
It consists of three stages:

- Preparation
- The game
- Debriefing

In total, the user test will take one hour for the participants.

Preparation
Before the participants arrive, the room is set up for the test. This means that the game board is put on the table with all the acquired question cards, pawns and dice. A camera and voice recorder are set up to tape the user test for research.
When the participants arrive, I introduce myself and give the introduction. The participants get explained why the session will be taped and they are asked to fill in a consent form. When the consent form is signed, the camera and voice recorder are turned on and the user test begins.

The game
1. The participants make teams if there are more than six players.
2. The players choose a pawn that they want to play with and put this pawn on the right place on the board.
3. The players throw the dice to determine who gets to start.
4. The game is played according to the rules.
5. After ten minutes an alarm goes off and the player play a toolbox game. This lasts for five minutes. After that the game is resumed.
6. After twenty minutes an alarm goes off and another toolbox game is played. This lasts for fve minutes. After that the game is resumed.
7. After 35 minutes, the game is ended (if it was not done yet) and a winner is elected.

The debriefing
The participants are interviewed on their experience of the game. They are questioned about the game itself, the interaction with other players, the toolbox games and the good and bad features of the game. After this interview, the user test is done.

B.2 Consent form

To be able to film the user test, a consent form was signed by the participants. This consent form is written in Dutch, because all the participants of the user tests were Dutch.

Toestemmingsformulier

Ik ga akkoord met de vrijwillige deelname aan dit gebruiksonderzoek dat wordt afgenomen door een onderzoeker van de TU Delft namens het bedrijf MEDD. Deze onderzoeker is Mina Boogaard.

Ik begrijp en geef toestemming voor het gebruik en publicatie van de opnames (informatie, foto's, film en audio opnamen) door deze onderzoeker. Ik begrijp dat de gegevens en informatie die ik deel vertrouwelijk en anoniem zal worden behandeld. Ik begrijp dat de informatie en opnames alleen voor onderzoeksdoeleinden worden gebruikt. Daarnaast zullen de opnames alleen beschikbaar zijn voor de onderzoeker van de TU Delft en MEDD en kunnen intern getoond worden aan werknemers van de TU Delft en MEDD. Als opnames extern moeten worden getoond zal mijn gezicht niet herkenbaar in beeld komen en mijn stem onherkenbaar gemaakt worden. Alle opnames, met uitzondering van de foto's die gebruikt zijn in rapporten, zullen zes maanden na de afronding van het afstudeerproject worden gewist. Naar verwachting wordt het afstudeerproject eind juli 2019 afgerond.

Hierbij doe ik afstand tot enig recht dat ik kan hebben om de opnames te inspecteren of goed te keuren. Daarnaast doe ik ook afstand tot elk recht om de onderzoeker van de TU Delft en MEDD aansprakelijk te stellen van het maken, bewerken en gebruiken van de opnames zoals het hierboven beschreven staat.

Graag hieronder tekenen om aan te geven dat u dit toestemmingsformulier gelezen en begrepen hebt en dat uw eventuele vragen zijn beantwoord.

Datum: _____

Uw naam: _____

Uw handtekening: _____

Handtekening onderzoeker: _____

Bedankt!
Ik waardeer uw deelname.

APPENDIX C: List of Requirements and Wishes

Requirements

Performance

1.1 The playing cards in three themes are used to get the healthcare physically together and to start the conversation between healthcare professionals.
1.2 The game needs to be able to be played in a multidisciplinary healthcare team.
1.3 The fundamental idea of the game can be used for different types of healthcare organisations with the question cards in three themes as the centre of the idea.
1.4 The game has a maximum playing time of one hour.
1.5 The game is easy to understand and can be explained within ten minutes.
1.6 The game helps to understand how culture can be changed, it makes the players aware by using question cards in three themes: Patient Experience, Risk Management, and Culture and Behaviour.
1.7 Players of the game have to feel psychologically safe while playing the game.
1.8 The game should encourage players to show the desired behaviour as is described in the ideal situation: clear communication between healthcare professionals, they correct each other on the job and understand how their behaviour effects the safety of their colleagues and the patient.
1.9 The game can be played more than once.

Game Design

2.2 The game has to be entered wilfully
2.3 The game has a goal.
2.4 The game has rules.
2.5 The game can be won and lost.
2.6 The game is interactive.
2.7 The game has a challenge.
2.8 The game engages players.
2.9 The game is a closed, formal system.

Content

4.1 The main feature of the game is the playing cards.
4.2 The playing cards are divided into three themes: Patient experience, Risk management, and Culture and Behaviour.
4.3 The content is understandable for everyone with a medical background who works in a hospital.
4.4 The content of the game should make healthcare professionals aware of their behaviour and culture within the hospital and how this is linked to safety and quality of care.

Appearance

5.1 The game should appeal to the board/person in charge that has to order and implement it, in regard to the price, the goal of the game and the effecivity of the game.

Size and weight

6.1 The game should be able to be handled by any healthcare professional in the hospital.

Price

7.1 The game should be affordable for a department of a hospital.

Wishes

Performance

1.1 The players of the game change their behaviour during work if this is necessary
1.2 The game helps in breaking the strict hierarchy that exists in hospitals.
1.3 Players get to reflect on their current culture and how his is changing through the game
1.4 The game enhances team performance, team cohesion and psychological safety on the job.
1.5 The players should have an emotional connect with the game.

Content

2.1 The content is easily created and renewed.

Price

3.1 The price is around €30 for the department of the hospital.

APPENDIX D: WWWWWH Method

WHAT

What is the problem? What has been done to solve it?

The "problem" is that there is a closed culture at departments of the hospitals in the Netherlands where employees of the hospital (healthcare professionals) don't feel like they can correct each other on behaviour that influences quality and safety of care. This culture is called a "Blame-culture". Over the years, hospitals have taken action to change this "blame-culture" by introducing easy and anonymous ways of reporting behaviour of themselves or others. This has increased the safety and quality a bit, but has not completely changed the way healthcare professionals behave towards each other.

WHEN

When did the problem occur? When should it be solved?

The problem occurs every day, when healthcare professionals see a colleague doing something wrong (or not completely right) and they don't interfere and correct that colleague. It also occurs when the healthcare professional is not aware of the danger that they are causing themselves and others by their behaviour.

WHO

Who has the problem? Who have an interest in finding a solution? Who are the stakeholders?

Anyone who works at the hospital has this problem. They will be referred to as healthcare professionals. The management of the hospital as well as the healthcare professionals have an interest in finding a solution, because it makes the work environment more pleasant for the healthcare professionals and makes the hospital a safer place.

WHY

Why is it a problem? Why is there no solution?

It is a problem, because it blocks the healthcare professionals from working in the safest way possible, learning from each other in every situation and having a more relaxed atmosphere amongst each other. The reason why there is no solution, is because it is a very complex problem. It involves changing people's behaviour, which has been trained otherwise for decades. It involves breaking through the hierarchy of a hospital, which is very deeply rooted.

WHERE

Where is the problem? Where is the possible solution?

The problem occurs at the workplace, during the work shifts, between the healthcare professionals, and between the healthcare professionals and patients. The solution lies in the way these people behave, how they react to each other and how motivated they are to work as best and as safe as they can to keep the quality of care maintained.

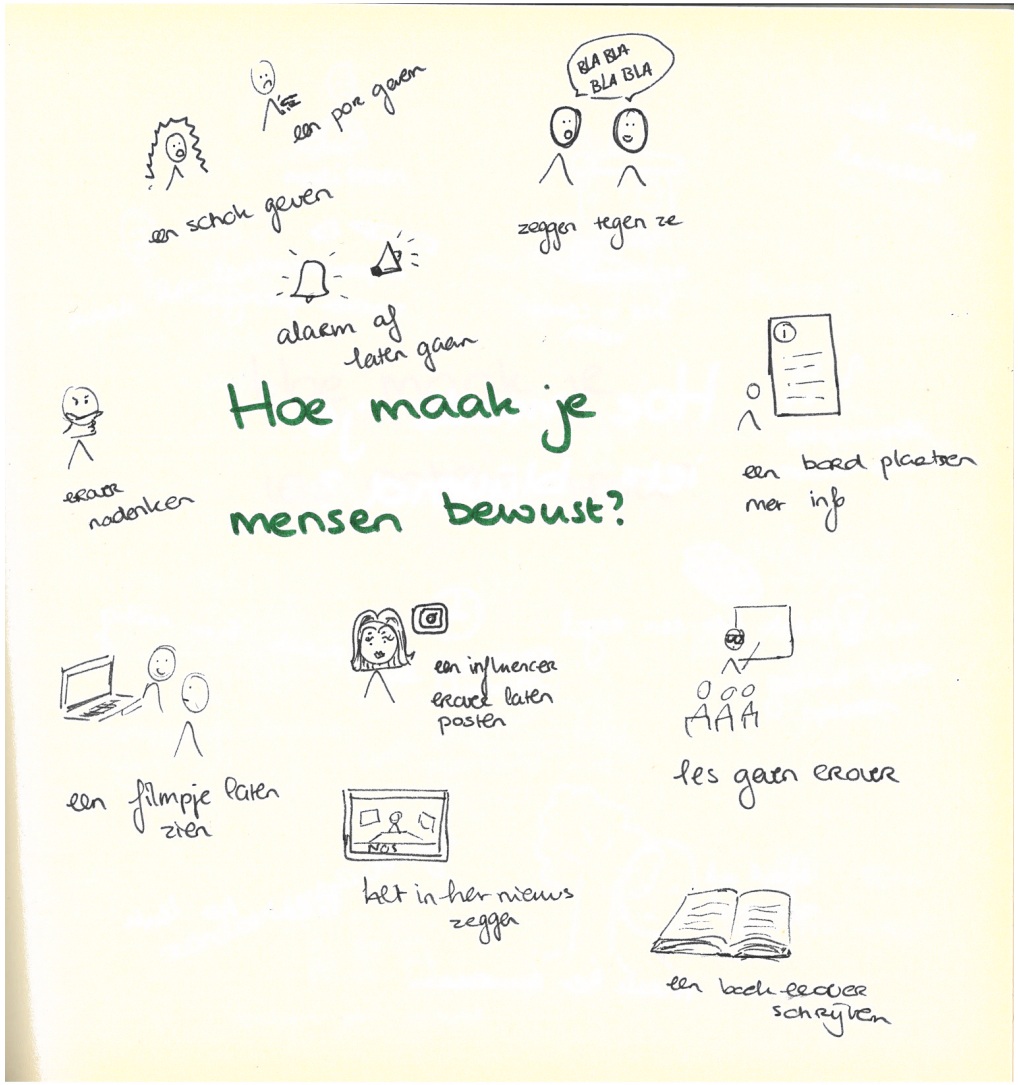
HOW

How did the problem come about? How did the stakeholders try to solve the problem?

It is a way of behaving which was accepted for a very long time. The hierarchy in hospitals was always very important and it was common that a nurse could not question the decisions or behaviour of a specialist. Now that we know that correcting each other creates a safer environment, which increases the quality of care, the previously described behaviour is not desired anymore. The hospitals have tried to get healthcare professionals to correct each other by using digital platforms where everyone can (anonymously) make a complaint or report certain behaviour of themselves or of a colleague. This has had some impact, but not that much to change the culture within a hospital.

APPENDIX E: How To's

The How To's shown in this part of the Appendix are the How To's that were generated individually and used to look back on while developing the chosen concept.



met een leuk muziekje

door het dynamisch te maken

door het te kunnen personaliseren

door het spannend te maken

Hoe maak je iets DYNAMISCH ?

door het heel snel laten gaan

door het elke keer anders te maken

Door het te laten bewegen

door telkens met andere mensen te zijn

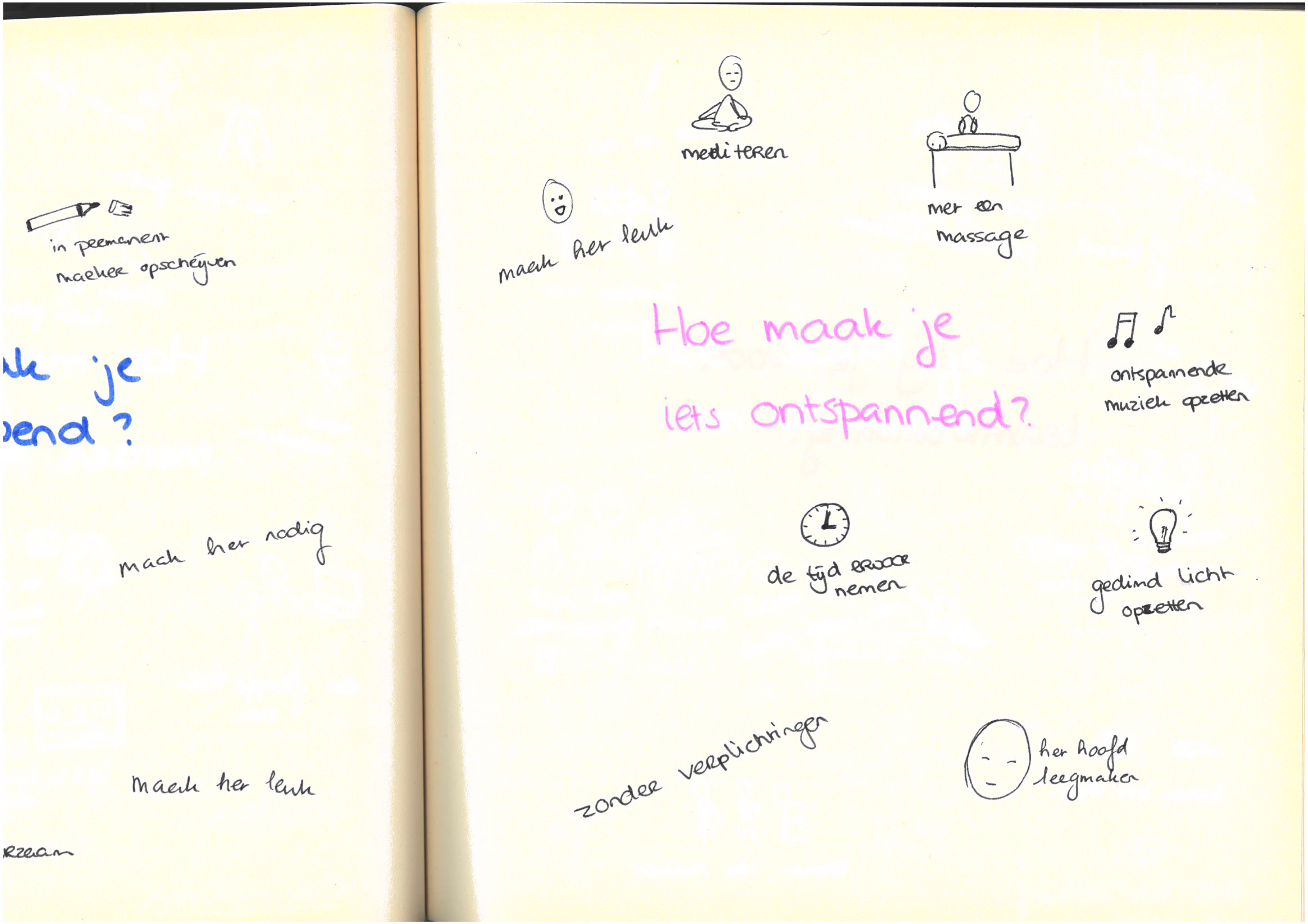
door het onverwachtbaar te maken

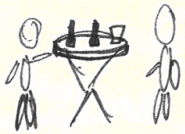
laten verassen

element of surprise

door het beweeglijk/flexibel te maken

Door het elke keer anders te doen


in permanent marker opschrijven
ak je
pend ?
mach het nodig
maak het leuk
rzaam
mediteren
maak het leuk
met een massage
Hoe maak je iets ontspannend?
ontspannende muziek opzetten
de tijd ervoor nemen
gedimd licht opzetten
zonder verplichtingen
het hoofd leegmaken



Barbeden met elkaar

VOOR

ng?

samen gaan eten

enge

samen iets maken

!

met een stelling

?

door een vraag te stellen

Hoe start je een discussie?

door het niet eens te zijn

Door iets te laten gebeuren

door te evalueren met elkaar

maak het normaal

het in cement zetten

in permanent marker opschrijven

Hoe maak je iets blijvend?

maak het een regel

maak het nodig

maak het duurzaam

maak het leuk

mediteren

maak het leuk

Hoe maak

iets ontspann

de tijd ervoor nemen

zonder verplichtingen

escaperoom

of puzzel

samen een probleem oplossen

Barsten met elkaar

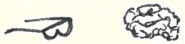
wie is de mol

Hoe zorg je voor teambuilding?

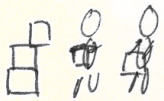
een spel spelen

een challenge

samen gaan eten



samen iets leren



samen iets maken

!

met een stelling

Hoe sta
een dis

door het niet eens te zijn

Door iet
laten geb

Hoe maak je iets leuk?

Met een beloning

door het te versieren

met een leuk muziekje

door het leuke kleurtjes te geven

door het dynamisch te maken

met competitie

door te werken naar een doel

door het te kunnen personaliseren

door het spannend te maken

door het samen te doen

door je er goed bij te voelen

door het exclusief te maken

het heel snel laten gaan

Hoe maak je DYNAMISCH

door telkens met andere mensen te zijn

door het onverspeld te maken

laten verassen

element

Door het elkee keer anders te doen

Hoe maak je iets betekenisvol?

Het personaliseren

een consequentie aan koppelen

het belangrijk maken

eruit gelaten

onderdeel van een routine

het gevoel maken

door het verbindend te maken

het leuk maken

een doel geven

emotioneel maken

het moeilijk maken

definiëren wat het betekent

? Is er behoefte aa
aan te passen

5/4/2019

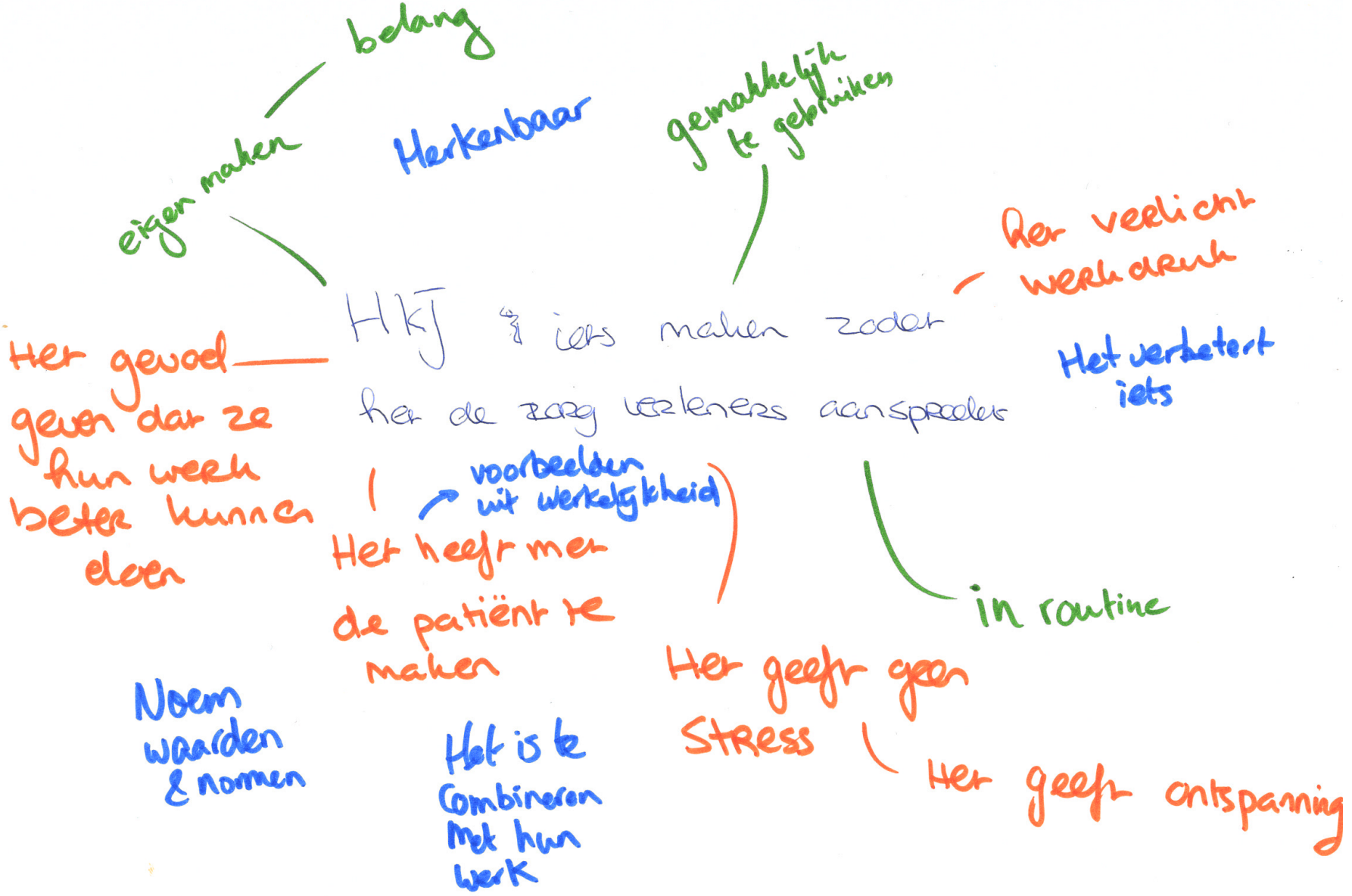
Midterm meeting is
vrijdag 26 april all

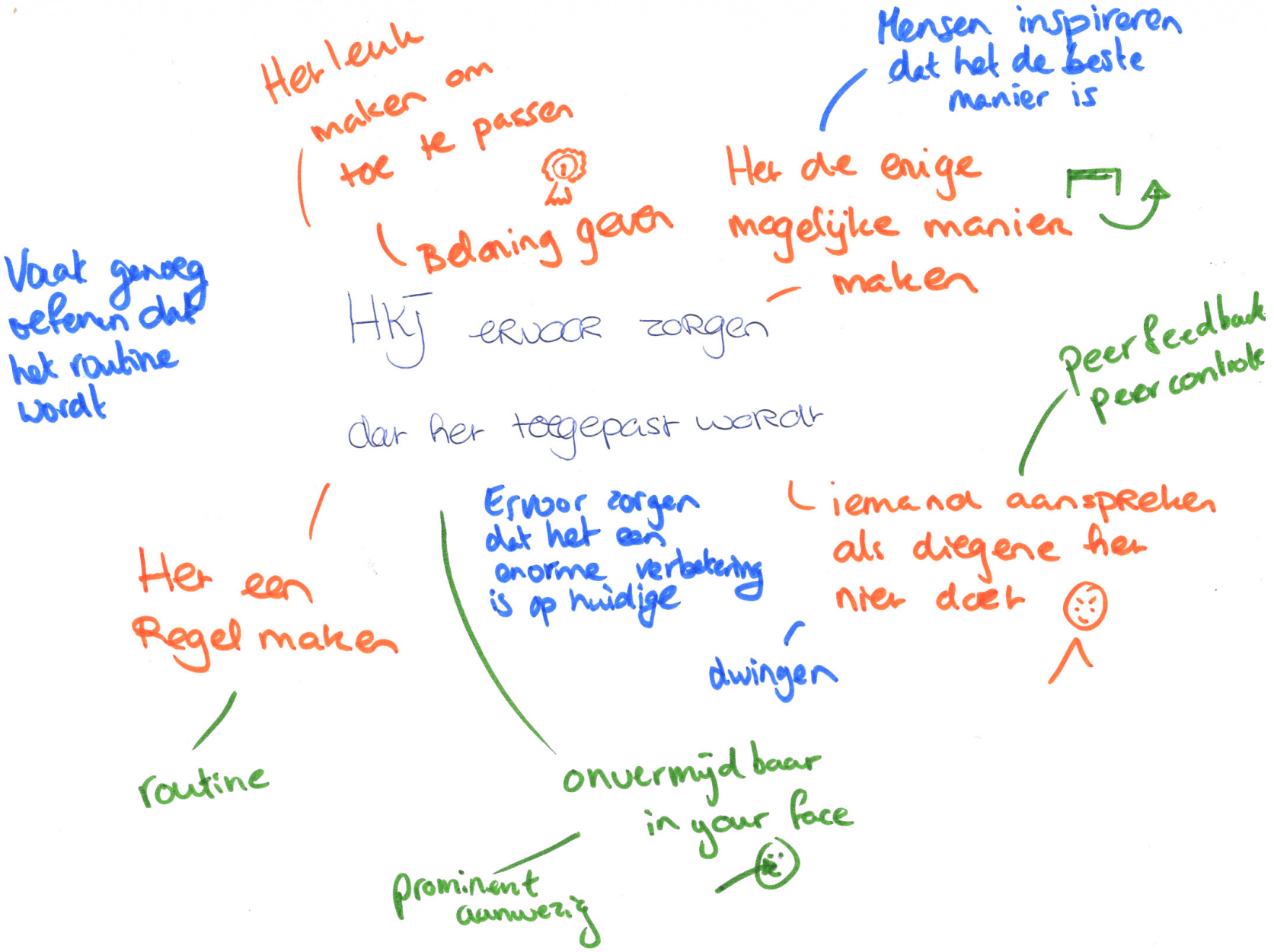
-> verslag : lit. o
-> eerste ideeën
-> user tests uitv
-> pilot tests met

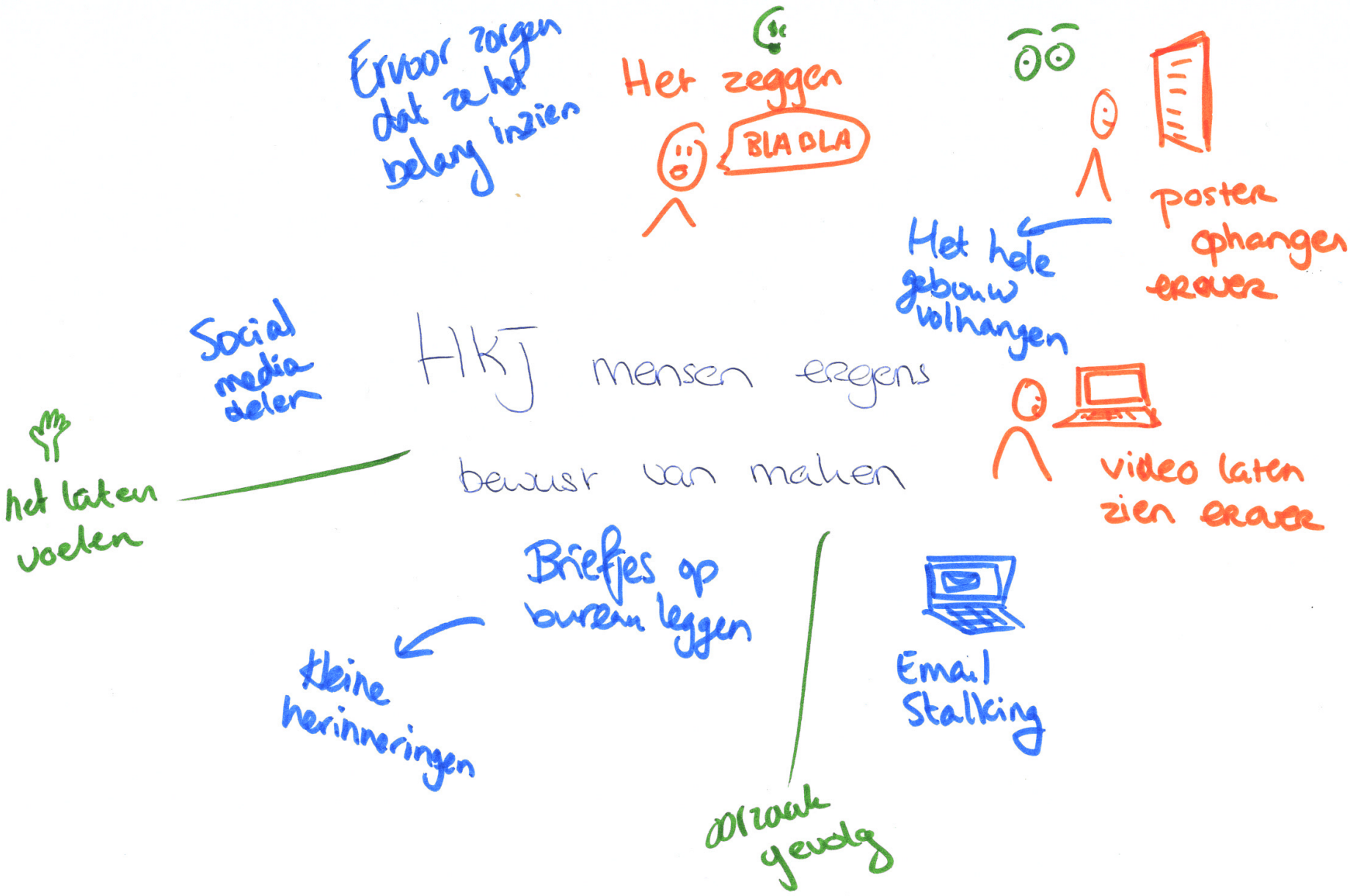
APPENDIX F: Brainstorm

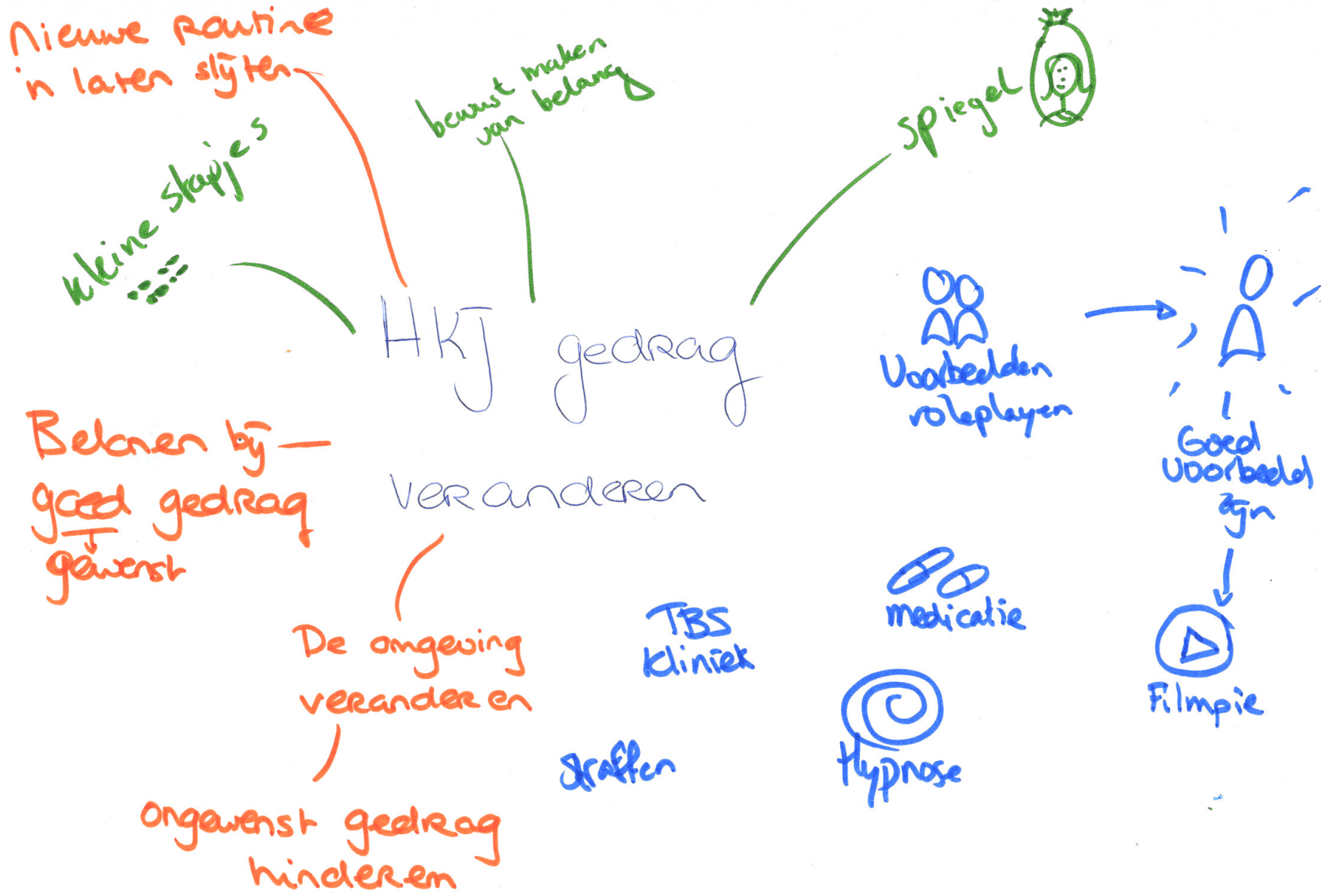
F.1 How To's

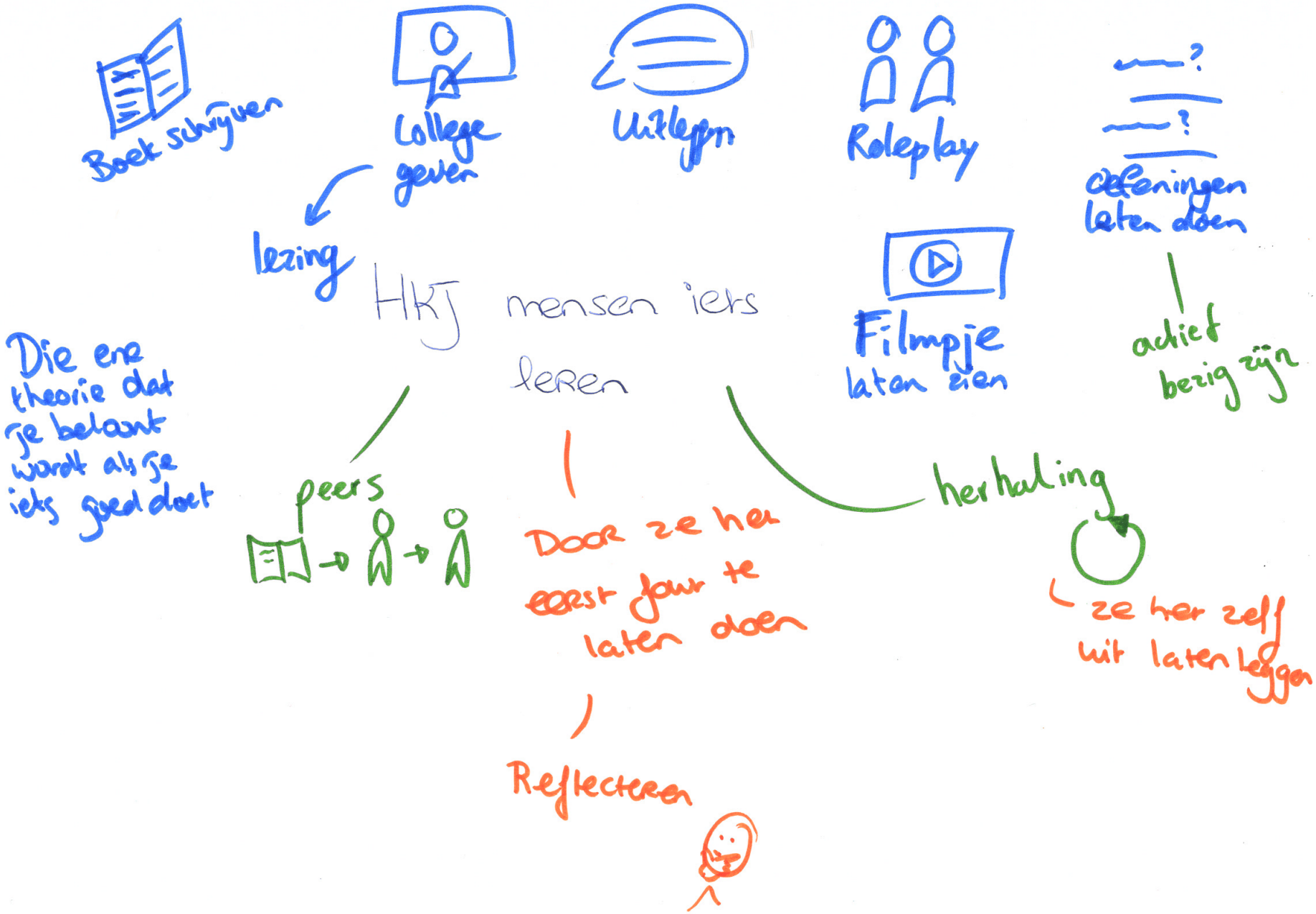
First a set of How To's were generated and filled in by the group. An overview is given in this part of the Appendix.


belang
eigen maken
Herkenbaar
gemakkelijk te gebruiken
HKJ & iets maken zodat
Het veelvuldig werkdruk
Het verbetert iets
Het gevoel geven dat ze hun werk beter kunnen doen
hen de zorg verleners aanspreekt
voorbeelden uit werkelijkheid
Het heeft met de patiënt te maken
in routine
Het geeft geen Stress
Het geeft ontspanning
Noem waarden & normen
Het is te Combineren met hun werk


Het leuk maken om toe te passen
Beloning geven
Mensen inspireren dat het de beste manier is
Het de enige mogelijke manier maken
Vaak genoeg oefenen dat het routine wordt
HKJ ervoor zorgen
dat het toegepast wordt
Peer feedback
Peer controle
Iemand aanspreken als diegene het niet doet
Het een Regel maken
Ervoor zorgen dat het een enorme verbetering is op huidige
dwingen
routine
onvermijdbaar
in your face
prominent aanwezig

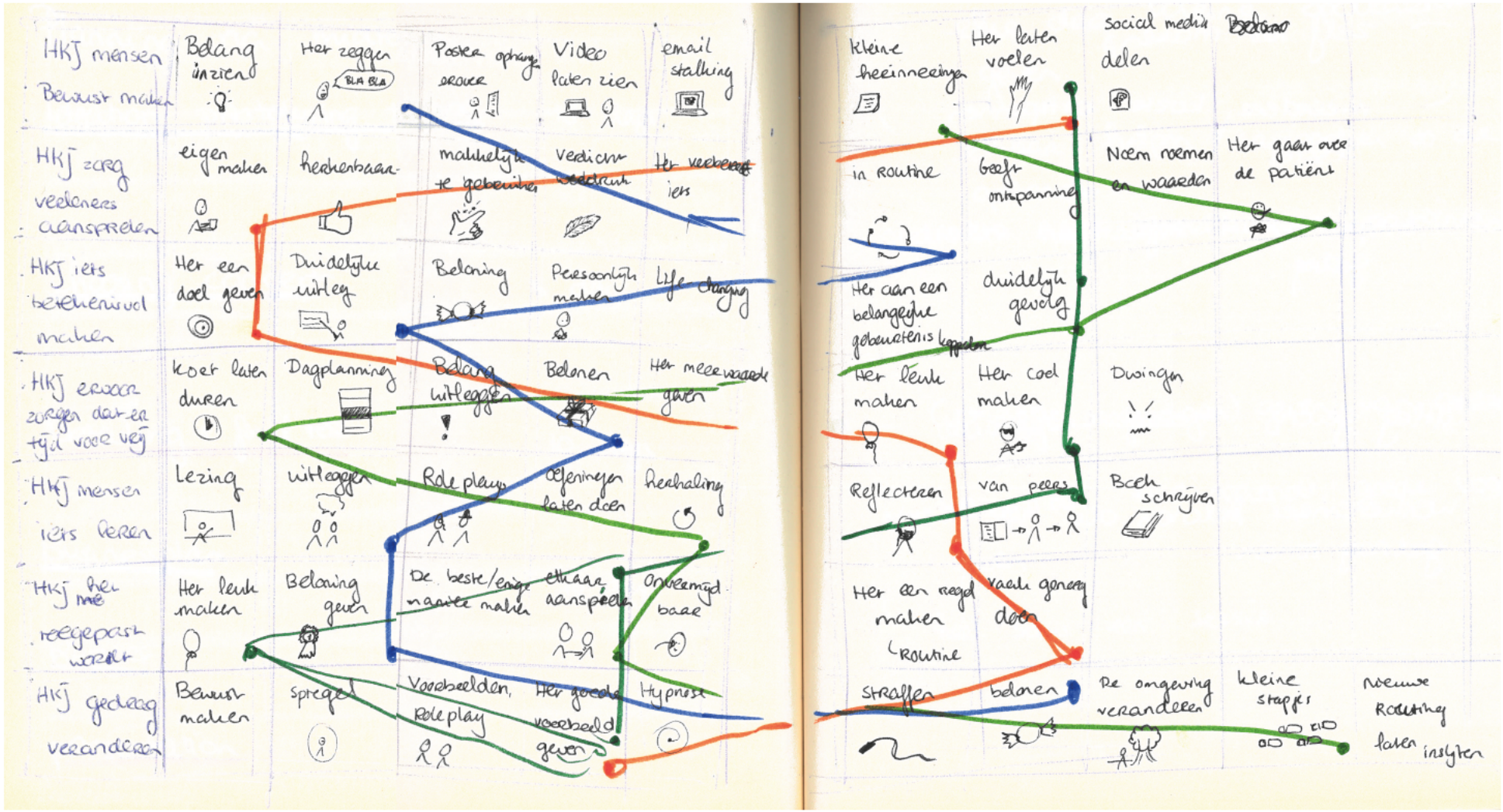

Ervoor zorgen dat ze het belang inzien
Het zeggen
BLA BLA
poster ophangen ervoor
Het hele gebouw volhangen
Social media delen
HKJ mensen ergens
bewust van maken
video laten zien ervoor
het laten voelen
Briefjes op bureau leggen
kleine herinneringen
Email Stalking
Vrouw gevolg


Nieuwe routine
'n laten slijten
kleine stapjes
bewust maken
van belang
spiegel
HKJ gedrag
Belonen bij
goed gedrag
gewenst
Veranderen
De omgeving
veranderen
ongewenst gedrag
hinderen
TBS
kliniek
straffen
medicatie
hypnose
Voorbeelden
roleplayen
Goed
voorbeeld
zijn
Filmpje


Boek schrijven
College geven
Uitleggen
Roleplay
oefeningen laten doen
lezing
HKJ
mensen iets leren
Filmpje laten zien
actief bezig zijn
Die ene theorie dat je bekant wordt als je iets goed doet
peers
herhaling
Door ze het eerst zelf te laten doen
ze het zelf uit laten leggen
Reflecteren

F.2 Morphological Chart

A morphological chart was used to cluster the How To's into design directions.



APPENDIX G: Production time and costs

G.1 Concept 1: The Board Game

Production time
The time to produce this game when it is completely designed, will be about four weeks. The board game needs to be printed, the box of the game needs to be made, the cards need to be printed, etc.

Estimated price
Board: €2,50 - €10,00 (depends on the size, the amount of colour, the quality)
Pawns + dice: €1,00 (for 5 pawns and one dice)
Playing cards: €5,00 - €15,00 (depends on the size, the amount of cards, the amount of colour, the quality)
Tokens: ~€1,00
Toolbox exercises: €5,00
Box: €5,00 - €10,00 (depends on size, quality, amount of colour)

Total cost: €19,50 - €42,00

Selling price will be between €30,00 and €50,00.

F.2 Concept 2: The Puzzle Game

Estimated production time
The time to produce this game when it is completely designed, will be about four weeks. The boardgame needs to be printed, the box of the game needs to be made, the cards need to be printed, etc.

Estimated price
Board: €0 - €10,00 (depends on the size, the amount of colour, the quality)
Pawn + dice: €0,50 (for one pawn and one dice)
Playing cards: €5,00 - €15,00 (depends on the size, the amount of cards, the amount of colour, the quality)
Tokens: ~€1,00
Toolbox exercises and other utilities: €5,00
Timer: €0,00 - €5,00 (a phone of the game master can be used as a timer)
Box: €5,00 - €10,00 (depends on size, quality, amount of colour)

Total cost: €16,50 - €46,50

Selling price will be between €30,00 and €50,00.

F.3 Concept 2: Shapp your Culture

Estimated production time
The time to produce an app like this differs. There are ways to create it for free, but this means a big time investment from MEDD and this way adds are added in the app. If it has to be developed and rolled out professionally, the production time will take up to a year. It will take 3 – 4 months for the front end to be programmed and 6 months for programming the back end. If the front end is good enough (this means that the game can be played through a browser, instead of an app), the production time is shorter.

Estimated price
Unprofessionally with adds: €0,00
Offering it for free to the hospitals that are clients of MEDD

Professionally front-end design: ~€3000,00 (this depends on in which country the programming is done)
Selling price: €30,00 per department that wants to play the game. This means that 100 departments in the Netherlands will have to buy this game to be even on the price. Every hospital differs in how many departments they have, so in case 40 departments per hospital buy the game, at least 3 hospitals will have to be interested in this game.

Professionally back-end design: €10.000,00 (this depends on in which country the programming is done)
Selling price: €50,00 per department that wants to play the game. This means that 200 departments in the Netherlands will have to buy this game to be even on the price. Every hospital differs in how many departments they have, so in case 40 departments per hospital buy the game, at least 5 hospitals will have to be interested in this game.

F.4 Final Design

The cost of the final design are also calculated to give an idea of the total cost.

Estimated price

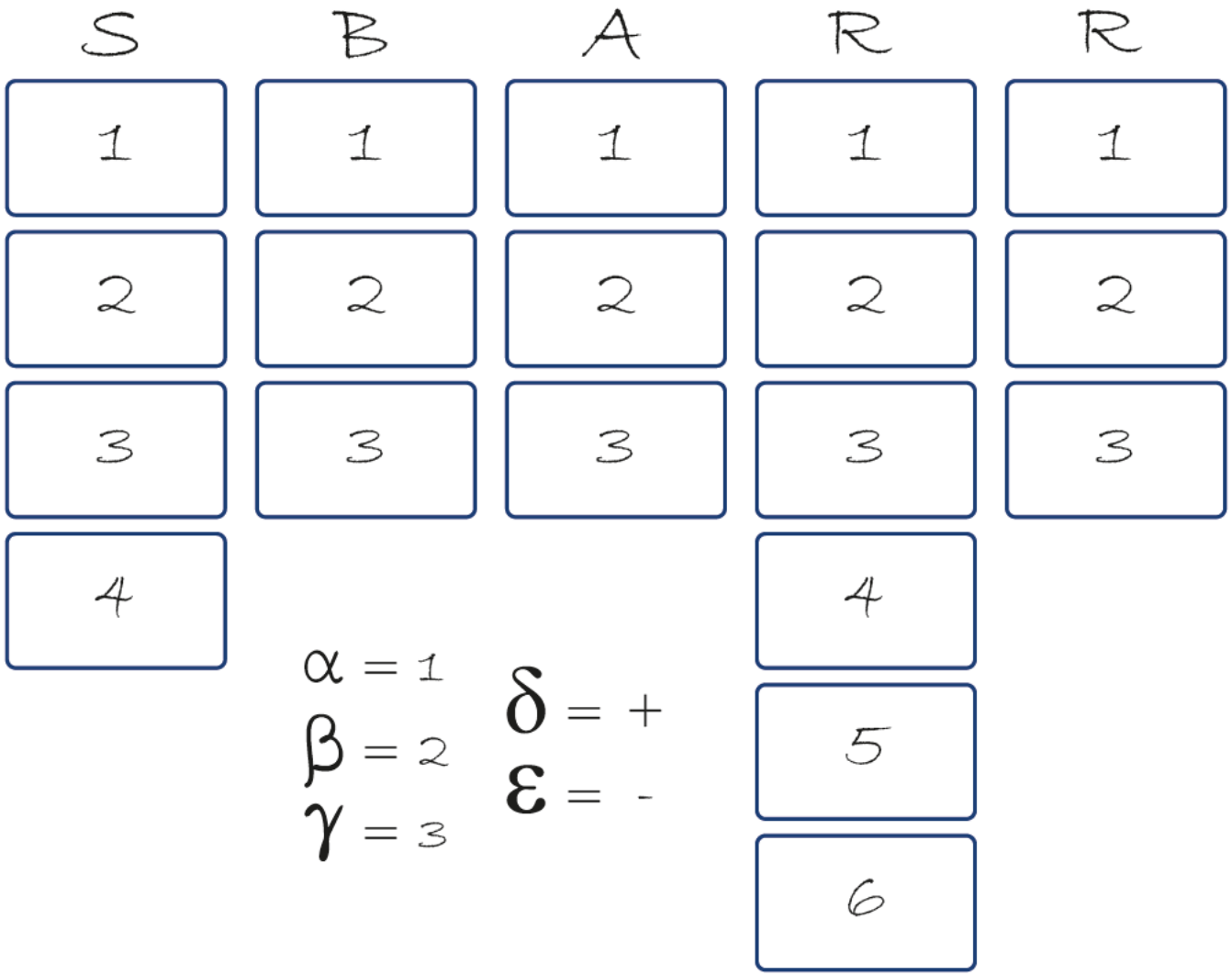
The wooden house €3,00
Printing costs (puzzles, questions cards and puzzle pieces, booklets) €10,00
The lock and lock system €10,00

Total: €23,00

These were the costs to make the prototype that is presented in the report.

APPENDIX H: The puzzles and puzzle pieces

H.1 The SBARR puzzle



1. Je spreekt met … van afdeling ….

β

2. Check of je met de juiste persoon spreekt

3. Ik bel over patiënt … hij/zij ligt op kamer …

δ

4. De reden dat ik bel is …

β

1. De opnamedatum en opnamediagnose

γ

2. Relevante medische voorgeschiedenis en medicatie

δ

3. Eventuele behandel-beperkingen (NR/NB/NIC)

γ

1. De EWS is…

β

2. De vitale parameters zijn …

ε

3. Ik denk dat het probleem is …

α

1. Ik wil dat je er direct/over … minuten komt

γ

2. Mijn advies is om …/ik wil graag advies over …

δ

3. Wat kan ik nu verder doen?

γ

4. Hoe vaak wil je de EWS gemeten hebben?

5. Bij welke waarde wil je gewaarschuwd worden?

δ

6. Wanneer zal ik weer overleggen?

γ

1. Herhaal wat de ander zegt!

β

2. Noteer de afspraken in EVD.

δ

3. Laat opdrachten in EVD z.s.m. valideren.

α

H.2 The PLANETREE puzzle

PLANETREE

Betere zorg	Helende omgeving	Gezonde organisatie
1	6	9
2	7	10
3	8	11
4		12
5		

1. Menselijke interactie en liefdevolle bejegening α

2. Eigen keuze en verantwoordelijkheid door informatie en educatie δ

3. Uitstekende behandeling en zorg α

4. Gezond eten, drinken en bewegen δ

5. Aanvullende zorg en zingeving γ

6. Menswaardige technologie γ

7. Architectuur en interieur ε

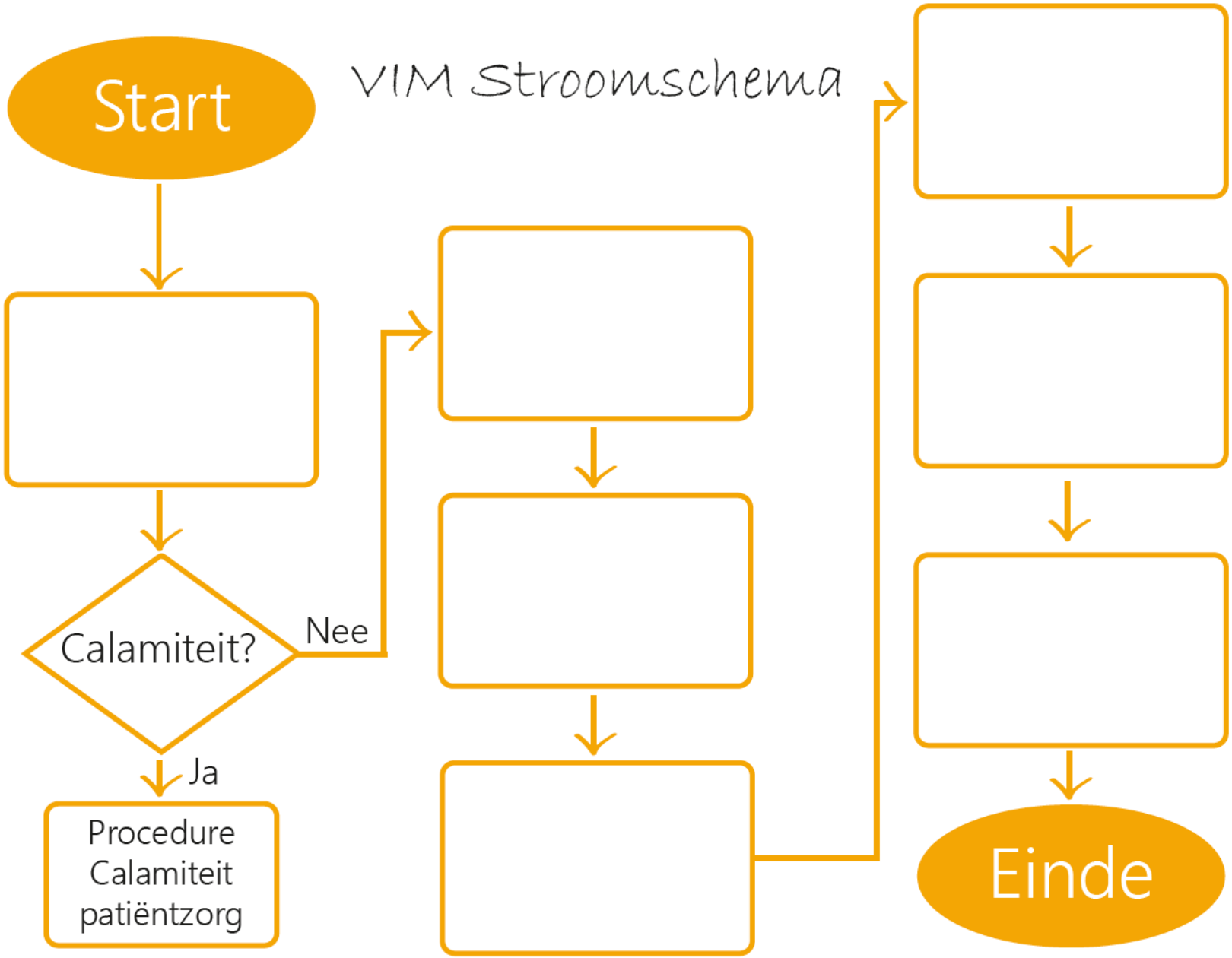
8. Vrienden, familie en gemeenschap spelen een positieve rol β

9. Tevreden cliënten β

10. Tevreden en gemotiveerde medewerkers δ

11. Gezonde financiële resultaten α

12. Goede marktpositie en relaties met belanghebbenden


VIM Stroomschema
Start
Calamiteit?
Nee
Ja
Procedure Calamiteit patiëntzorg
Einde

Incident doet zich voor

α

Incident melden

δ

Melding in behandeling nemen

γ

Analyseren

δ

Verbeteren

β

Melding afhandelen

ε

Evalueren & borgen

γ

APPENDIX 1: Project brief as approved

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name
initials
student number
street & no.
zipcode & city
country
phone
email

[redacted]

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD ( ) DfI ( ) SPD

2nd non-IDE master: _____

individual programme: - - (give date of approval)

honours programme: ( ) Honours Programme Master

specialisation / annotation: (★) Medisign
( ) Tech. in Sustainable Design
( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair Richard Goossens dept. / section: AED

** mentor Sylvia Mooij dept. / section: PIM/MCR

2nd mentor Kitty ter Borg

organisation: MEDD

city: Doorn country: the Netherlands

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Richard Goossens date - - signature

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

Of which, taking the conditional requirements into account, can be part of the exam programme _____ EC

List of electives obtained before the third semester without approval of the BoE

YES all 1st year master courses passed

NO missing 1st year master courses are:

name date - - signature

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: APPROVED NOT APPROVED

Procedure: APPROVED NOT APPROVED

comments

name date - - signature

Initials & Name M.M. Boogaard Student number 4288890

Title of Project Developing a playful tool for quality and safety in healthcare facilities

Developing a playful tool for quality and safety in healthcare facilities — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 18 - 02 - 2019 — 19 - 07 - 2019 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

The company MEDD is a consultancy and design agency for healthcare. They offer, among other things, consultancy and workshops for hospitals to learn them about safety and risk management, so the hospital can improve their quality of care. They have developed a process and risk toolbox that gets tailored to the wishes of the hospital, to effectively teach the hospital staff (from manager to student) about process and risk, increasing the knowledge of safety and quality of care.

To improve quality of care in a hospital, the behaviour and culture within the hospital should improve first. By improving the culture, changing it into a culture where staff members can speak up about risks that occur and openly discuss those without being scared of getting blamed, staff members are more likely to be aware of the risks and avoid these. This awareness makes the staff members work in a safer way, which in turn improves the quality of care for the patient.

To facilitate this open conversation, MEDD, in cooperation with the Haga Hospital, has designed a boardgame which has the previously mentioned toolbox imbedded in it. This boardgame is based on the game Trivial Pursuit and has three themes that it discusses: Culture & Behaviour, Risk Management, and Patient Experience. While playing this game, the players (hospital staff) get to discuss these themes in a relaxed and open atmosphere, learning from each other and becoming more aware of the culture in their team/hospital.

MEDD has designed the first version of the game, but this is far from done. My project will be about developing this game, which I will refer to as 'the tool'.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: A usability test with the tool at the Haga Hospital.

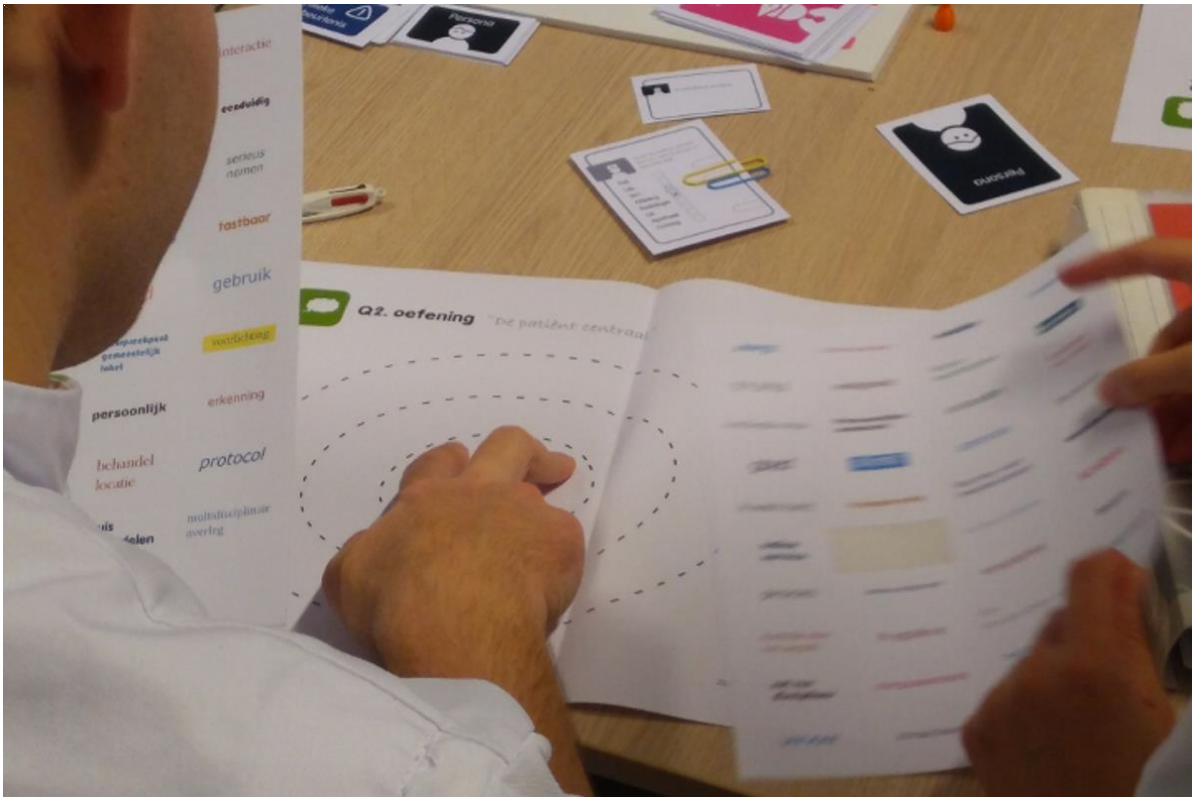


image / figure 2: A usability test with the tool at the Haga Hospital.

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

With concrete rules and protocols, many simple safety issues have been resolved. The problem is that the ambiguous or uncertain risks can't be resolved with rules and protocols. To resolve these kinds of risks, the healthcare team has to work together and define their view on these risks. By creating a culture where every member of the team can give input, the safety will be improved, which will improve the quality of care.

My goal will be to improve the tool MEDD has designed to bring this team together and make them aware of their culture and way of working. This will make them more aware of the safety and quality of care within the healthcare facility.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

The goal of the assignment is to design a tool that creates a culture where every member of the healthcare team can give input, to improve the safety, which will improve the quality of care. By using the tool, the healthcare team has to work together and define their view on these risks. The tool will have to be interesting, meaningful, up to date and fun to use.

As mentioned before, MEDD has already made a first version of this tool. I will start with doing a literature research on the safety and quality management in healthcare, the benefits of gamification and the bridge between gamification and healthcare.

After this period of literature research, I will be doing user tests on the current tool that MEDD has designed, to see what I should improve this tool on. These user tests will take place in the Haga Hospital. Also, I will be observing and interviewing staff at the hospital to learn what their day looks like and at what point this tool could be meaningful.

After gaining this knowledge of the literature research and the user tests, I will be developing and improving the tool. I will be prototyping and testing during this phase to come to a tool that is fun, meaningful, interesting and up to date. What I will finish with is a game (this does not have to be a boardgame) that brings the healthcare team together to play and creates an open atmosphere where anything can be openly discussed. It will give all the staff members a chance to learn from each other and create a shared understanding of culture & behaviour and quality & safety. The game will be developed to a point that MEDD can offer it to hospitals in combination with consultancy or as a standalone product. I will finish with a finished tool for hospitals, a suggestion for a business plan and a suggestion on how this tool could be changed to be used for other health facilities like a GGZ.

Initials & Name M.M. Boogaard Student number 4288890

Title of Project Developing a playful tool for quality and safety in healthcare facilities

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 18 - 2 - 2019 19 - 7 - 2019 end date

Initials & Name M.M. Boogaard Student number 4288890

Title of Project Developing a playful tool for quality and safety in healthcare facilities

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

There are a couple of competences that I want to show I have acquired during my masters:

- Conduct user tests/work in session in the real context
Within this project, there has already been done a lot of research and a first concept has been prototyped. I want to show I can evaluate this existing prototype using the real context, so with healthcare teams. When I make a prototype of my own, I want to show I can evaluate my own design as well.

- My graphic skills
I have aquired quite some graphic skills during my internship at 42Tech. In the design of the toolbox, I want to show what I have learned.

- Make a relevant product
During the course EI, I have learned how to make a product relevant for the user. I would like to show this skill in my graduation project.

There are also competences that I would like to learn during this project:

- How to write a business plan for an idea
During my masters I have often started with an idea, but the main focus was always the experience of the user. I have little experience in making a business plan and what kind of steps need to be taken before a product can enter the market and be sold. I would like to learn this from working together with MEDD.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name M.M. Boogaard Student number 4288890

Title of Project Developing a playful tool for quality and safety in healthcare facilities